FINAL REPORT
July 30 2025

NYSERDA
Lancaster Central School District

ZEV TRANSITION PLAN



wendel

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Section 1 Introduction



Introduction

Lancaster CSD and NYSERDA have obtained Wendel's services to conduct a study regarding the transition of the district's current diesel and unleaded gasoline school bus fleet to battery electric buses (BEBs) by 2035. The deliverables of the study include a transition plan providing the district a guide to transitioning the fleet based on current NYS mandates. Should the current mandates change, this plan will provide the necessary information for the district to adjust the plan accordingly.

Abbreviations

Abbreviation	*Definition*
AHJ	Authority Having Jurisdiction
BEB	Battery Electric Bus
CAD	Computer Aided Design
CSB	Clean School Bus
CSD	Central School District
DC	Direct Current
ECM	Energy Conservation Measure
EPA	Environmental Protection Agency
kV	Kilo Volt
kVA	Kilo Volt Ampere
kW	Kilo Watt
kWh	Kilo Watt hour
Li-NMC-G	Lithium Nickel Manganese Cobalt Oxides
MAX	Maximum
MIN	Minimum
MMBtu	One Million British Thermal Units
MPG	Miles Per Gallon
MT CO2e	Metric Tons of Carbon Dioxide Equivalent
MVA	Mega Volt Ampere
MW	Mega Watt
N/A	Not Applicable
NFPA	National Fire Protection Association
NYS	New York State
NYSERDA	New York State Energy Research & Development Authority
O&M	Operation & Maintenance
OAT	Outdoor Air Temperature
OEM	Original Equipment Manufacture
PON	Program Opportunity Notice
RFI	Request for Information
SOC	State of Charge
TVIP	Truck Voucher Incentive Program
V2G	Vehicle to Grid
V2V	Vehicle to Vehicle
V2B	Vehicle to Building

Background

In April 2022, New York State enacted a mandate requiring all school buses to be zero-emission, as part of the 2022–2023 State Budget. This mandate, codified in Education Law Section 3638, requires that beginning July 1, 2027, all new school bus purchases and leases must be zero-emission, and by July 1, 2035, all school districts must exclusively operate and maintain zero-emission school buses. A zero-emission school bus is defined as one propelled by an electric motor and associated power electronics that draws electricity from a hydrogen fuel cell or battery, or otherwise operates without direct emission of atmospheric pollutants. At present, zero-emission school buses are primarily battery electric, while other types, such as hydrogen fuel cell buses, are still in development and not yet widely available.

Recent amendments to this law, passed as part of the 2024–2025 State Budget, do not change the 2035 requirement but introduce flexibility to the 2027 purchasing mandate. School districts may apply for a two-year extension to the 2027 deadline, with the New York State Education Department (NYSED) required to release the application process and qualification criteria by December 31, 2025.

Additionally, districts may apply for a second two-year extension if they are actively working on a Fleet Electrification Plan (FEP). The budget also includes an additional $100 million to support school bus electrification, though allocation details are forthcoming. Despite the new flexibility, districts are strongly encouraged to begin adopting zero-emission buses as soon as possible to gain hands-on experience and prepare for full-scale transition by 2035.

Lancaster CSD elected to prepare for these requirements by developing a transition plan that would provide the district with the planning tools and flexibility necessary to ensure a seamless transition to zero-emission. In November 2024, Lancaster CSD contracted with Wendel and NYSERDA through PON 4192 – P12 Schools: Flexible Technical Assistance Program in developing a transition plan that provides a path towards a fully battery electric bus (BEB) fleet by 2035. The program goal is to provide districts with a study that evaluates and recommends infrastructure upgrades that can be used to make informed decisions regarding design and implementation to reduce energy loads and assist in conversion to carbon free fuels. This transition plan can be used as a guide to the district in transitioning and implementing battery electric buses, hereinafter referred to as BEBs.

Scope of Work

The detailed scope of work can be found in Appendix D - Original Scope of Work and include the following major tasks:

Task 1: Project Kickoff and Status Meetings
Task 2: Data Collection
Task 3: Route Analysis

Task 4: Conceptual Charging Strategy
Task 5: Electrical Utility Analysis
Task 6: Concept Development and Phasing Plan
Task 7: Transition Plan Cost Estimates
Task 8: Final Report

Deliverables for each task above detailing the results and findings of the task are included in the appendices. This report is a summary of the findings of the individual letter reports generated from each task.

Note on Technology

BEB technology is emerging and rapidly changing. Electric bus battery capacities are increasing as this technology grows while battery sizes and weights continue to decrease due to charge density improvements. Supporting equipment, such as chargers, are also evolving in terms of charger sizes, an increase in features and improving energy efficiencies. As battery capacities increase, the need for larger chargers also increases to enable fully charging a larger battery in the same amount of time.

During cold weather, battery electric school buses face unique challenges when it comes to charging and performance. Low temperatures can significantly affect battery efficiency and charging speed, as cold weather slows down the electrochemical reactions within the battery cells. This can lead to longer charging times and reduced range per charge, impacting the BEB's operational capabilities. Additionally, extreme cold can cause batteries to temporarily lose some of their stored energy, further limiting performance. To mitigate these issues, bus operators need to monitor and manage charging schedules to optimize performance during cold weather conditions.

The recommendations in this report regarding bus battery capacities and charger sizes are based on the route analysis and conceptual charging strategies developed in Tasks 3 and 4, utilizing minimum required sizes, technology that is currently available as well as manufacturer recommendations. As BEB and charger technology evolves, superior bus capacities and charger configurations may become available. This superior equipment may be substituted for the equipment proposed in this report in order to increase efficiency or bus performance. If an increase in charger size is desired, Lancaster CSD should confirm compatibility and capacity with the vendor and their utility provider, prior to purchasing.

It should also be noted that at the time of this report, fire and building codes have not been updated to include recommendations for preventing or managing battery electric fires. Although the frequency of BEB fires are significantly less than their diesel counterparts, Lithium-Ion batteries burn much hotter than a diesel fire and are extremely difficult to extinguish. Wendel has developed a fire protection protocol for BEB fires and, working with insurance agencies and various state fire marshals, has obtained approval for implementation of this protocol where BEBs are stored and maintained. It is important to note that the local Authority Having Jurisdiction (AHJ) is the primary authority for approval

of fire protection protocols. As the codes are updated to address battery electric fires the recommendations of this report should be reviewed and updated as necessary and/or required.

Section 2 Executive Summary

Executive Summary



Strategy, Goals & Constraints

Wendel developed a transition plan to provide the district with the planning tools and flexibility necessary to ensure a seamless transition to a fully BEB fleet. The goal of the transition plan is to provide a path towards a zero-emission bus fleet by 2035 by providing Lancaster CSD with a study that evaluates and recommends infrastructure upgrades that can be used to make informed decisions regarding design and implementation to reduce energy loads and assist in conversion to carbon free fuels. This transition plan can be used as a guide to the district in transitioning to a BEB fleet and implementing BEBs.

Wendel utilized the following guiding principles to develop ZEV transition plans:

- No impact on student experience
- Limit constraints on operations
- Reduce implementation cost and complexity
- Minimize impact on workforce

Wendel has identified the following constraints to transition to a fully BEB fleet:

- Vehicle range limitations
- Charging duration requirements
- Utility demand requirements
- Demand on facilities and operations
- Maintenance knowledge

Analysis Results

Wendel analyzed current bus route data and determined the anticipated energy requirements per route. The anticipated energy requirements per route were then used to determine minimum battery size requirements, charging requirements and charging durations necessary. The district currently has (67) buses performing routes in house and has (20) contracted bus routes owned, driven and stored by a third party. For the purposes of the study, Wendel included (15) of these routes in this study in order to be conservative and account for a possible situation where they would need to be run by the district. Route information was unavailable, so the district requested the route start time, end time, and mileages of Bus 409 to be used as a placeholder.

Bus Storage/ Charging Locations	Depot address after electrification:	4082 Walden Ave, Lancaster, NY 14086
	Number of buses at this depot location:	89
	Number of proposed chargers at this location:	87
	Number of proposed charger positions at this location:	89
	Bus storage type:	Outdoor
	Ownership of the depot:	District owned
	Bus ownership:	District owned (20 Contracted)

Table 1 Bus storage and charging locations summary

Wendel evaluated seven different bus manufacturers and four different charger sizes ranging from 24 kW to 180 kW. The analysis includes the review of battery capacities, charger levels, and outputs. Wendel has analyzed these bus manufacturers per the existing routes to determine the performance of each bus configuration. The district has stated that they currently utilize IC buses, thus, Wendel has utilized IC as the basis of the investigation for the proposed electric buses. IC currently does not offer electric Type-A buses. Thus, Bluebird was utilized for the Type-A buses.

New York State Education Department (NYSED) defines the bus types as follows:



Type A – Chassis type is "Cutaway." School buses are a bus body constructed on a cutaway front-section vehicle with a left driver's door, they are designed to carry 10 to 25 students. Type A school buses can be split into two sub-groups: Type A-1, having a Gross Vehicle Weight Rating (GVWR) of 10,000 pounds or less, and Type A-2, having a GVWR of 10,000 pounds or more.



Type B – Chasses type is "Conventional." School bus is a bus body constructed and installed upon a front-section vehicle chassis, or stripped chassis, with a GVWR of more than 10,000 pounds; these are much smaller than a standard conventional school bus and designed to carry 10 to 27 students. Part of the engine is beneath and/or behind the windshield and beside the driver's seat, the entrance door is then placed behind the front wheels.



Type C - Chassis type is "Conventional." School bus is what most people imagine when they think of a "traditional" school bus. A Type C school bus is often called a "conventional" bus, the body is installed upon a flat-back cowl chassis with gross vehicle weight rating of more than 10,000 pounds, designed for carrying up to 78 students. The engine is in front of the windshield and the entrance door is behind the front wheels.



Type D - Chassis type is "Conventional." This "transit-style" school bus is a body installed upon a chassis, with a gross vehicle weight rating of more than 10,000 pounds and designed for carrying up to 90 students. The engine is often behind the windshield and beside the driver's seat or it may be at the rear of the bus, behind the rear wheels. The entrance door is ahead of the front wheels.

	Bus Size	Bus Type	Route Buses	Spare Buses	Total Buses
Buses	210 kWh – IC BEB	Type C	22	0	**22**
	315 kWh – IC BEB	Type C	43	7	**50**
	No Current Replacement	Type A & Type C	17	0	**17**
			82	7	**89**

Table 2 Proposed Bus Summary

Chargers	Charger Size	Route Bus Chargers	Spare Bus Chargers	Total Chargers	Total Proposed Charging Positions
	24 kW	2	3	5	**5**
	60 kW	69	0	69	**69**
	120 kW	10	2*	12	**14**
	180 kW	1	0	1	**1**
		82	5	87	**89**

Table 3 Proposed Charger Summary

Among the routes for the (82) route buses examined, it was determined that the routes for (17) of the buses cannot currently be performed by a BEB as BEBs do not currently have adequate battery capacity at the existing bus size to meet these route demands. Wendel recommends that these buses be converted to BEBs towards the end of the transition plan. This will allow for the development of larger battery capacities which may enable the district to implement BEBs without splitting the routes in the future.

Total Number of Route Buses:	**82**
Percent of Route Buses that can be electrified with current technology based on their existing daily routes:	**79%**

Buses that cannot be electrified with current technology					
Bus	Bus Type	Minimum BEB Size Required	Highest Route Distance (miles)	Reason	Notes
412	Type C	329 kWh	61	Bus Size does not currently exist	Wait for technology to become available
433	Type C	406 kWh	77	Bus Size does not currently exist	Wait for technology to become available
434	Type C	586 kWh	111	Bus Size does not currently exist	Wait for technology to become available
436	Type C	360 kWh	65	Bus Size does not currently exist	Wait for technology to become available
437	Type C	380 kWh	71	Bus Size does not currently exist	Wait for technology to become available
441	Type A	359 kWh	95	Bus Size does not currently exist	Wait for technology to become available
442	Type C	322 kWh	61	Bus Size does not currently exist	Wait for technology to become available
449	Type C	333 kWh	62	Bus Size does not currently exist	Wait for technology to become available

Bus	Bus Type	Minimum BEB Size Required	Highest Route Distance (miles)	Reason	Notes
451	Type C	348 kWh	66	Bus Size does not currently exist	Wait for technology to become available
453	Type C	378 kWh	68	Bus Size does not currently exist	Wait for technology to become available
456	Type C	349 kWh	64	Bus Size does not currently exist	Wait for technology to become available
457	Type C	324 kWh	59	Bus Size does not currently exist	Wait for technology to become available
458	Type A	210 kWh	53	Bus Size does not currently exist	Wait for technology to become available
469	Type C	477 kWh	89	Bus Size does not currently exist	Wait for technology to become available
487	Type C	317 kWh	60	Bus Size does not currently exist	Wait for technology to become available
501	Type C	346 kWh	65	Bus Size does not currently exist	Wait for technology to become available
504	Type C	355 kWh	66	Bus Size does not currently exist	Wait for technology to become available

Table 4 Buses with Route Issues

Utility Requirements & Impacts

The projected power requirements for the charging of BEBs requires a new utility service feed from NYSEG and an additional transformer. This is based on the assumption that a charge management system is used. The utility has completed the feeder study and did not state any concerns with supporting the project's anticipated required power to charge the electric fleet. It should be noted that kVA, as shown in Table 5 below, represents the total electrical load—including both usable (real) and reactive (wasted) power—which is important for sizing utility equipment and infrastructure. In contrast, kW measures the actual usable power consumed by the customer and is the unit typically shown on utility bills to reflect demand and energy usage.

Peak Demand	Fully Connected Peak BEB Demand/ Load:	6,181 kVA
	Anticipated Peak BEB Demand/ Load:	2,736 kVA
District-side Infrastructure	• Medium voltage switchgear (Lancaster CSD owned). • Pad-mounted 3750 kVA transformer (outdoor lawn area). • 5000A main switchboard for chargers and distribution panels. See Section 7 Concept Development & Phasing Plan for more information.	

Utility-side Infrastructure	NYSEG to provide design and recommendations of necessary service upgrades upon Lancaster CSD's submittal of a Work Request. Based on anticipated load it is assumed that the utility would need to provide a new utility feed from overhead primary distribution and new/upgraded 1200A single tap from their distribution system.

Table 5 Utility Impact Summary

Phases & Costs

Wendel has estimated the capital cost to implement battery-electric buses and supporting charging infrastructure to achieve 100% zero-emissions bus operations by 2035. Transition plan phases were determined by a sample bus implementation/procurement schedule provided by Lancaster CSD. The bus implementation schedule in Figure 1 below determines when infrastructure is required per phase. The transition plan can be adjusted if Lancaster CSD decides to purchase buses at a rate that is different than the suggested procurement plan which can be found in Table 29 BEB Procurement Schedule in Section 5 Conceptual Charging Strategy of this report. Based on this transition plan and bus implementation schedule, Lancaster CSD will be fully transitioned to a zero emission battery electric fleet by 2035 through (3) proposed phases as seen below. Lancaster CSD should note that early permitting and utility coordination may be necessary to prior to the phase dates shown below. The district should look to begin these processes simultaneously with Phase 1 design.

	Existing	2027	2028	2029	2030	2031	2032	2033	2034	2035	Total
BEB Bus Procurement Schedule	0	9	11	9	8	9	8	9	11	15	89
210 kWh BEB	0	0	0	1	0	5	4	4	5	3	22
Cumulative 210 kWh BEBs	0	0	0	1	1	6	10	14	19	22	
315 kWh BEB	0	9	6	5	4	4	3	5	5	9	50
Cumulative 315 kWh BEBs	0	9	15	20	24	28	31	36	41	50	
Placeholder	0	0	5	3	4	0	1	0	1	3	17
Cumulative Placeholder BEBs	0	0	5	8	12	12	13	13	14	17	
Total Battery Electric Bus Fleet Size	0	9	20	29	37	46	54	63	74	89	89

Current Fleet Size	89
New Proposed Buses	0
Proposed Fleet Size	89

Figure 1 Anticipated Battery Electric Bus Procurement By Year

Phase 1 (2027 – 2029) of implementation will require electrical upgrades including a new medium voltage switchgear, transformer, new power distribution equipment, primary cable trench from new service to the new medium voltage switchgear, power feeds and charging equipment for up to (29) chargers, and fire protection upgrades.

- Charging system infrastructure for Phase 1: **$9,467,000**
- Fire Protection infrastructure: **$1,658,000**
- Total Phase 1 estimated cost: **$11,125,000**

Phase 2 (2030 – 2032) of implementation will require electrical upgrades including new charging switchboards, and power feeds and charging equipment for up to (27) additional chargers.

- Total Phase 2 estimated cost: **$5,411,000**

Phase 3 (2033 – 2035) of implementation will require electrical upgrades including a new primary switchboards, and more power feeds and charging equipment for up to (29) additional chargers.

- Total Phase 3 estimated cost: **$8,169,000**

The total estimated cost of the transition construction is **$24,705,000**

The following items were excluded from the estimates:

1. School District portion of any estimated charges for the utility to upgrade the system to provide the power required to the site for bus charging
2. Utility fees
3. Construction Management (CM) fees
4. Phasing costs within each phase
5. Costs of the BEBs themselves
6. Chargers, equipment, and all other costs associated with the charging of the district's non school bus vehicles

The costs associated with the BEBs themselves are not included in the above costs per phase or in the cost estimates included in Section 8 Transition Plan Cost Estimates. Table 6 below shows the estimated costs of the proposed BEBs as of the date of this report. Costs may vary based on region, date of procurement, and customization of the buses including add-ons and warranties.

Make	Bus Type	Bus Size (kWh)	Estimated Base Cost per Bus
IC Bus	Type C	210	$405,000
IC Bus	Type C	315	$475,000

Table 6 BEB Estimated Cost per Bus

Incentives and Grants

Leveraging financial incentives to fund BEBs and charging infrastructure can help with the transition from diesel or gasoline powered buses to BEBs. Grants, rebates, vouchers, and tax credits can help mitigate the higher upfront vehicle costs and infrastructure investments. Several State and federal programs offer funding opportunities for both BEBs and chargers. The following incentives are not guaranteed and are only applicable as of the date of this report. All information is from NYSERDA's Electric School Bus Guidebook[1], an online resource available to the public. Please contact your NYSERDA representative for more information including eligibility, program requirements, and application process.

New York School Bus Incentive Program – School Bus Voucher

School Bus Type Base	Base Voucher	Priority District Bonus	Scrappage Bonus	V2G Add-on	Wheelchair Add-on
New Type A	$114,000	$28,500	$47,500	$9,500	$8,000
New Type C	$147,000	$36,750	$61,250	$12,250	$8,000
New Type D	$156,000	$39,000	$65,000	$13,000	$8,000
Repowered A	$105,000	$21,000	N/A	$7,000	N/A
Repowered C	$135,000	$27,000	N/A	$9,000	N/A

Table 7 NYSBIP School Bus Voucher from NYSERDA's School Bus Guidebook

Joint Utilities of New York Medium- and Heavy-Duty EV Make-Ready Pilot

Utilities may provide incentives up to 90% of the utility-side infrastructure costs and up to 50% of customer-side costs to qualifying projects. Customer-side incentives are subject to dollar per kW caps, which vary by utility.

Utility	Customer-Side Incentive Cap
Central Hudson	$658.36/kW
Con Edison	$980.76/kW
National Grid	$440.96/kW
NYSEG	$409.07/kW
Orange and Rockland	$592.77/kW
RG&E	$712.08/kW

Table 8 Make-Ready Pilot Incentives from NYSERDA's School Bus Guidebook

[1]NYSERDA. (2024, June). Retrieved from Electric School Bus Guidebook Guide 4: Financial Incentives: https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Programs/Electric-School-Bus/Financial-Incentives-for-Electric-School-Buses-and-Chargers.pdf

New York School Bus Incentive Program – Charging Voucher

Type	Base Voucher Amount	With Fleet Electrification Plan
Non-Priority District	$25,000	$55,000
Priority District	$35,000	$65,000

Table 9 NYSBIP Charging Voucher from NYSERDA's School Bus Guidebook

Environmental Impacts

Annual Savings		
Existing Bus Usage		
Diesel Fuel Usage	85,230.2	Gallons/Year
Gasoline Fuel Usage	72,801.4	Gallons/Year
Total Fossil Fuel Usage	158,031.6	Gallons/Year
Existing Energy Usage	20,921.6	MMBtus
Proposed Bus Usage		
Electricity Usage	3,641,274.0	kWh/year
Proposed Energy Usage	12,424.0	MMBtus/year
Energy Savings		
Total Energy Savings	8,497.6	MMBtus/year
Total CO2 Savings	1,059.7	Metric Tons/year

Table 10 Annual Savings Summary

The switch to BEBs from diesel buses would save approximately 8,497.6 MMBtus of energy or a 48.14% reduction in energy consumption. This is equivalent to 1,303.4 Metric Tons of CO2 emissions per year.

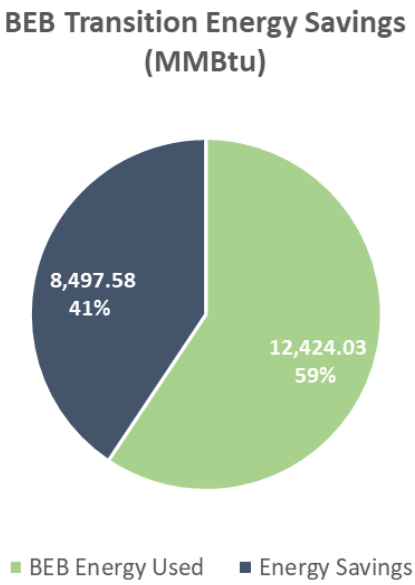


Figure 2 BEB Transition Energy Savings (MMBTU)

Section 3 Data Collection

DATA COLLECTION

Data collection plays a vital role in understanding, optimizing, and managing BEB transitions. It enables evidence-based decision-making, facilitates operational efficiency, and supports the successful integration of BEBs into existing school district systems.

Wendel submitted an RFI to Lancaster CSD on July 19th, 2024, to gather key data required to perform proper analyses. The requested data included:

- Bus Fleet Information – Fleet size (current and projected), bus replacement plan/schedule, current EV manufacturer, bus types/size
- Bus Schedules and Route Data – Detailed bus routes, departure and return times, operational hours, mileage, fuel consumption, operational contingency/resiliency plans.
- Bus Parking/Storage Arrangements – Indoor/Outdoor, location
- Fueling – current operational requirements for fueling
- Utility Data – Name of local utility, existing service size (kVA) and voltage, Utility contact
- Existing School Electrical Distribution Information – existing capacity, condition, expansion capability. Any as-built electrical site drawings (one-line distribution drawings)
- Existing Site Plan – CAD file of overall site plan
- Fleet maintenance data and historical cost

Received information can be found in Appendix F - Information Received from Client.

Bus Fleet Information

Bus fleet information is vital for effective planning, replacement strategies, and financial planning related to the transition of BEBs. It forms the foundation for a well-informed and successful BEB transition plan. Lancaster CSD provided a bus list containing (89) buses with their associated age, make, model, etc. Of these (89) buses, (67) are route buses, and (22) are spares. The district also has (20) contracted bus routes owned, driven and stored by a third party. For the purposes of the study, Wendel included (15) of these routes in this study in order to be conservative and account for a possible situation where they would need to be run by the district. Therefore, Wendel assumed these buses would be driven by (15) of the district's existing (22) spare buses changing the breakout of buses to be (82) route buses and (7) spare buses. Table 11 below shows the breakout of these buses by bus type and model number. A full table with bus names and details can be found in Appendix F - Information Received from Client.

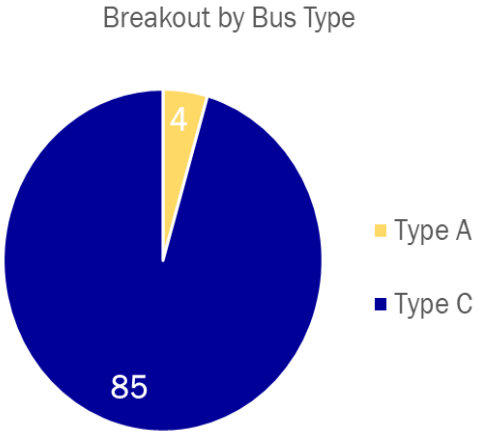


Figure 3 Bus Type Breakout

Vehicle Types & Quantities		
Bus Type	**Model Number**	**Quantity of Buses**
Type C	IC / Leonard Bus	85
Type A	IC / Leonard Bus	4
Grand Total		***89***

Table 11 District Vehicle Types and Quantities

New York State Education Department (NYSED) defines the bus types as follows:



Type A – Chassis type is "Cutaway." School buses are a bus body constructed on a cutaway front-section vehicle with a left driver's door, they are designed to carry 10 to 25 students. Type A school buses can be split into two sub-groups: Type A-1, having a Gross Vehicle Weight Rating (GVWR) of 10,000 pounds or less, and Type A-2, having a GVWR of 10,000 pounds or more.



Type B – Chasses type is "Conventional." School bus is a bus body constructed and installed upon a front-section vehicle chassis, or stripped chassis, with a GVWR of more than 10,000 pounds; these are much smaller than a standard conventional school bus and designed to carry 10 to 27 students. Part of the engine is beneath and/or behind the windshield and beside the driver's seat, the entrance door is then placed behind the front wheels.



Type C - Chassis type is "Conventional." School bus is what most people imagine when they think of a "traditional" school bus. A Type C school bus is often called a "conventional" bus, the body is installed upon a flat-back cowl chassis with gross vehicle weight rating of more than 10,000 pounds, designed for carrying up to 78 students. The engine is in front of the windshield and the entrance door is behind the front wheels.



Type D - Chassis type is "Conventional." This "transit-style" school bus is a body installed upon a chassis, with a gross vehicle weight rating of more than 10,000 pounds and designed for carrying up to 90 students. The engine is often behind the windshield and beside the driver's seat or it may be at the rear of the bus, behind the rear wheels. The entrance door is ahead of the front wheels.

Bus Schedules and Route Data

Vehicle schedules and route data for all buses was provided by Lancaster CSD. The data provides specific information on each individual route that is driven by Lancaster CSD's fleet of school buses.

This data included departure and arrival times, total duration, and mileage for each route. Wendel included a 5% safety factor within the calculation, assuming there would be changes to routes. If route changes are greater than 5%, the changes can be addressed in detailed design. Each route duration includes 15 minutes after the bus is taken off the charger to account for energy utilization before the route. The duration and distance of the routes are essential to determine the energy requirements of each route, the viability of opportunity charging, and the bus battery size required.

The routes were then combined into “am” and “pm” routes. Each route group has a start and finish time, total duration, and total distance. Table 12 below shows a sample of the received routes broken up. The full table can be found in Appendix F - Information Received from Client.

AM & PM Route Schedule					
Vehicle Name	AM/PM	Total Distance (Miles)	Start Time	Finish Time	Duration (Minutes)
502	AM	13.93	6:06:00 AM	7:20:00 AM	74
502	PM	13.79	1:48:00 PM	3:12:00 PM	84
503	AM	7.72	6:24:00 AM	7:20:00 AM	56
503	PM	15.54	1:48:00 PM	3:13:00 PM	85
504	AM	10.81	6:24:00 AM	7:20:00 AM	56
504	PM	12.75	1:48:00 PM	3:00:00 PM	72

Table 12 Sample of Route Grouping

The following additional metrics were calculated to improve the accuracy of the analysis portion of the plan. Wendel calculated the deadhead distance and duration based on an assumption of 10% as approved by the district. Deadhead reflects the bus driving with no students onboard which will yield higher driving efficiencies.

- Active Distance (mi)
- Deadhead Distance (mi)
- Active Duration (Minutes)
- Deadhead Duration (Minutes)
- Resting Duration "On" (Minutes)
- Average Speed (mph)
- Time between AM/PM Routes

Data from previous studies was utilized to enhance the depth and comprehensiveness of the analysis. By leveraging the valuable insights and findings from these earlier investigations, Wendel was able to build upon existing knowledge and establish a stronger foundation for their study.

Section 4 Route Analysis

ROUTE ANALYSIS

Wendel analyzed the available bus route data for each route to determine the time and distance required for a bus to complete the routes. The analysis developed energy requirements per route and determined the minimum battery size requirements, charging requirements, and charging durations necessary per route.

Route Adjustments and Process

- (15) contracted buses are assumed to be brought back in house and would be driven by (15) district owned spare buses. These contracted routes were assumed to have the same start and end times and mileages as bus 409 per district request.
- Bus 479 has (2) PM routes, one of them is new this year for picking up an out-of-district child. To remain conservative, this longer route was included in the study in place of the other short route.
- Spare buses (Spare – 440, Spare – 468), both originally listed as Type-A BEB's. There are no sufficient BEB sizes for these Type-A buses to replace route buses, so they have been switched to Type-C.
- Route Buses 506, 507 and 508 did not exist at the time of the study but will be purchased in 2025 as Type-C Diesel buses according to the district. These were not included in the study.

Utilizing the provided information from Lancaster CSD along with BEB data from previous studies[2], a route analysis was performed to determine the minimum and maximum kWh usage to satisfy each route. Wendel determined the energy associated with the routes to ensure the proposed bus and charger sizes meet the energy requirements of each route.

The route analysis does not consider extracurricular trips which may occur immediately before or after the routes. The proposed bus and charger sizes may not be able to meet the energy requirements of routes that have an additional extracurricular trip before or after. The route analysis also does not consider emergency closings, power outages, or any other unforeseen circumstances.

Calculations and Assumptions

The BEB efficiency inputs used in the analysis are shown in Table 13 BEB Efficiency Inputs and are derived from BEB performance data analyzed in previous studies that Wendel conducted as referenced in the paragraph above as well as EPA recommendations.

Battery efficiencies at worst case (High Battery Usage) and best case (Low Battery Usage) were determined by applying the EPA recommended range/efficiency impacts to the Original Equipment

[2] Previous studies include CT Transit Hamden Charging Model and CT Greater Bridgeport Transit Low/No Grant which aided in the assessment of charging scenarios to lead to better informed decisions on charging infrastructure, strategies, and operations.

Manufacturers (OEM) Rated Efficiencies per BEB manufacture cut sheets. It was assumed a battery would experience within 20% of OEM rated efficiency at Low Battery Usage and within 50% at High Battery Usage. Best case usage assumes little/no HVAC usage, efficient regenerative braking, and/or an outdoor air temperature around 60-70°F. Worst case usage assumes extreme cold/heat, forgetting to precondition while charging, traffic/long stops, and/or poor regenerative braking/aggressive driving.

The resting battery usage is associated with the time when a bus is "on" while waiting for its route to begin. A resting duration of 15 minutes before routes was assumed for all buses representing the time a bus is unplugged from the charger and is sitting waiting to begin it's route. This time may be used for preconditioning or safety checks. The resting battery usage is attributed primarily to keeping the heater on. A usage of 20 kWh/hour was utilized as an assumption based on an average BEB heater size of 20 kW.

Deadhead battery usage is assumed to be more efficient based on the weight of a full bus compared to an empty bus along with an understanding that a bus with no students on it will not be making stops.

BEB Efficiency Inputs:

	Type A	Type B	Type C	Type D	
OEM Rated Efficiency	1.12	0.00	1.58	1.35	kWh per mile
Low Battery Usage	1.55	N/A	2.18	1.87	kWh per mile
Low Deadhead Battery Usage	1.24	N/A	1.74	1.50	kWh per mile
Resting Battery Usage (Heat only)	20.00	N/A	20.00	20.00	kWh per hour
High Battery Usage	2.48	N/A	3.48	3.00	kWh per mile
High Deadhead Battery Usage	2.19	N/A	3.08	2.65	kWh per mile

Table 13 BEB Efficiency Inputs

Analysis Assumptions:

- Maximum time bus is "on" and unplugged from charger before route start is 15 min.
- Heater energy usage is 20 kW at air temperatures below 10 Degrees Fahrenheit.
- Low battery usage represents best case usage with little/no HVAC usage at moderate OA Temperatures.
- High battery usage represents worst case usage with extreme cold/heat, traffic/ long stops.

Charging Variables	
Dead Head Miles	10%
Charging Rate Safety Factor	90%
Route Safety Factor	5%
Efficiency Safety Factor (Distance)	11%
Maximum Battery Level	90%
Anticipated Degradation	90%
Minimum Battery Level	10%

Table 14 Charging Variables

Utilizing the route data, inputs, and assumptions described in the paragraphs above, Wendel calculated the maximum kWh used for each route group with the following formula:

Maximum Energy Usage (kWh) Calculation:
*(Active Distance * High Battery Usage) + (Deadhead distance * High Deadhead Battery Usage) + (Resting Duration * Resting Battery Usage)*

Equation 1 Maximum Energy Usage

The graph in Figure 4 BEB Range in Cold Weather represents a real-world cold weather example of a BEB in Duluth Minnesota between January 2019 and December 2021[3]. This study performed by National Renewable Energy Laboratory (NREL) exhibits a range decrease of approximately 33% at times of temperatures below 30°F. The results of this case study align with Wendel's route analysis strategy and assumptions.

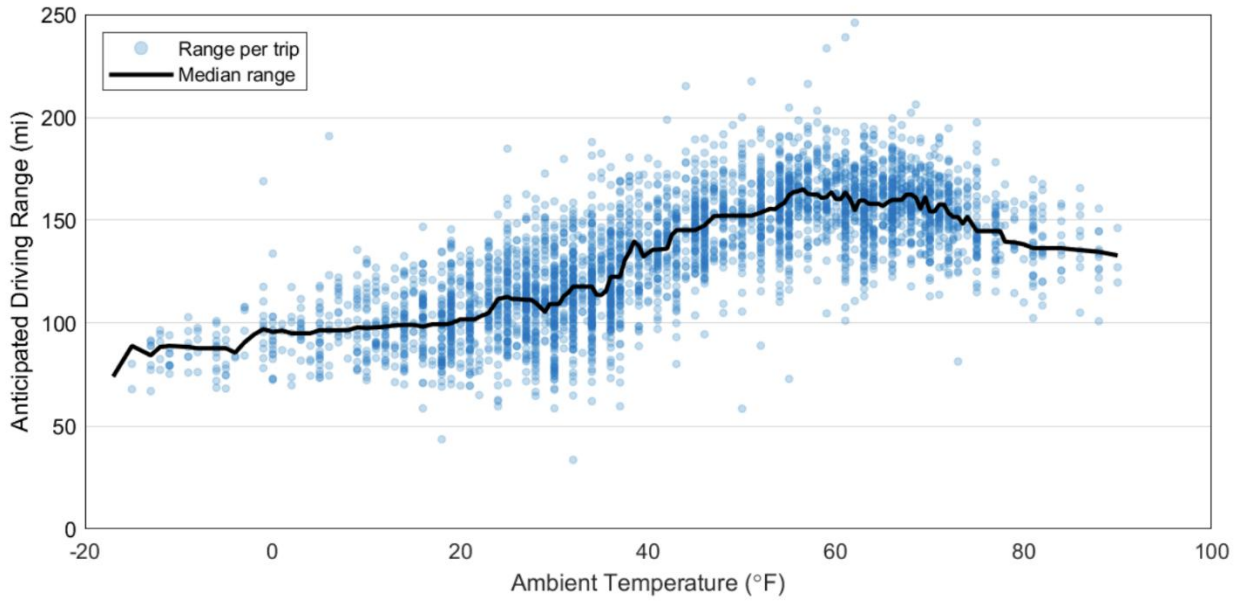


Figure 4 BEB Range in Cold Weather

Energy Requirements of Bus Routes

Wendel reviewed the route information provided by the district, a copy of the route schedule as received has been included in Appendix F - Information Received from Client. Based on the evolving needs of Lancaster CSD's transportation fleet, (20) buses are currently contracted. During discussions, Lancaster CSD's team stated their intention to introduce (15) of the (20) contracted buses into the

[3] Jeffers, Matthew, Leslie Eudy, Erik Bigelow, Greg Olberding, and Amy Posner. 2022. Duluth Transit Authority Battery-Electric Bus Evaluation. Golden, CO: National Renewable Energy Laboratory. NREL/ TP-5400-83038. https://www.nrel.gov/docs/fy22osti/83038.pdf.

fleet as daily route buses. Each of the (15) contacted buses re-introduced will share identical routes to bus 409. It was assumed that once a bus returns to the bus garage after its route, it would begin charging if it would not leave for its next route for another 45 minutes. Wendel combined the (67) route buses with the (15) contracted to get (82) total route buses. (82) total route buses and (7) spare buses led us to the (89) buses total. Buses 506, 507 and 508 were undelivered with no given routes, so they were not counted in our analysis.

The route information was used to determine the times that buses would be departing and arriving at the bus garage where charging would take place. It was assumed that once a bus returns to the bus garage after its route, it would begin charging if it would not leave for its next route for another 45 minutes.

The route analysis utilizes the received route distances to develop the anticipated energy requirements per route and then uses those energy requirements to determines the minimum BEB battery size requirements. The analysis then determines the minimum charger size and charging durations necessary per route based on the minimum battery size requirements and the anticipated energy requirements.

Table 15 below shows the maximum energy usage calculated by the route analysis (refer to Equation 1).

Bus Number	Bus Type	Highest Route Distance (miles)	Highest Energy Usage (kWh)
409	Type C	44 Miles	169.2
412	Type C	61 Miles	237.1
415	Type C	53 Miles	202.6
433	Type C	77 Miles	292.6
434	Type C	111 Miles	422.2
436	Type C	57 Miles	154.2
437	Type C	71 Miles	273.6
439	Type C	50 Miles	191.7
441	Type A	95 Miles	258.8
442	Type C	61 Miles	93.2
444	Type C	34 Miles	138.6
445	Type C	43 Miles	171.0
448	Type C	40 Miles	159.6
449	Type C	62 Miles	239.7
450	Type C	53 Miles	206.3
451	Type C	66 Miles	250.8
453	Type C	68 Miles	272.4
455	Type C	38 Miles	151.5
456	Type C	37 Miles	140.5
457	Type C	59 Miles	233.1
458	Type A	53 Miles	146.7
459	Type C	34 Miles	133.6
460	Type C	41 Miles	162.6
461	Type C	35 Miles	52.1
462	Type C	40 Miles	153.2
463	Type C	33 Miles	135.7

Bus Number	Bus Type	Highest Route Distance (miles)	Highest Energy Usage (kWh)
464	Type C	31 Miles	124.0
465	Type C	33 Miles	134.1
466	Type C	43 Miles	172.0
467	Type C	32 Miles	71.1
469	Type C	89 Miles	343.4
470	Type C	40 Miles	159.9
471	Type C	37 Miles	149.5
472	Type C	42 Miles	169.1
473	Type C	30 Miles	119.3
474	Type C	38 Miles	152.9
475	Type C	33 Miles	134.0
476	Type C	43 Miles	169.8
477	Type C	35 Miles	141.8
478	Type C	57 Miles	222.4
479	Type C	25 Miles	100.6
480	Type C	40 Miles	161.7
481	Type C	27 Miles	51.8
482	Type C	37 Miles	142.5
483	Type C	46 Miles	182.8
484	Type C	43 Miles	169.4
485	Type C	24 Miles	96.9
486	Type C	34 Miles	139.5
487	Type C	60 Miles	228.5
488	Type C	45 Miles	176.9
489	Type C	33 Miles	135.5
490	Type C	23 Miles	55.5
491	Type C	42 Miles	168.3
492	Type C	31 Miles	129.5
493	Type C	42 Miles	163.8
494	Type C	41 Miles	165.5
495	Type C	48 Miles	188.4
496	Type C	41 Miles	157.4
497	Type C	51 Miles	205.6
498	Type C	44 Miles	170.6
499	Type C	45 Miles	69.0
500	Type C	50 Miles	190.9
501	Type C	65 Miles	249.2
502	Type C	33 Miles	134.7
503	Type C	28 Miles	117.1
504	Type C	66 Miles	255.7
505	Type C	32 Miles	132.5
410 - Contracted	Type C	44 Miles	169.2
414 - Contracted	Type C	44 Miles	169.2
418 - Contracted	Type C	44 Miles	169.2
421 - Contracted	Type C	44 Miles	169.2
422 - Contracted	Type C	44 Miles	169.2
424 - Contracted	Type C	44 Miles	169.2
426- Contracted	Type C	44 Miles	169.2
427- Contracted	Type C	44 Miles	169.2
428- Contracted	Type C	44 Miles	169.2

Bus Number	Bus Type	Highest Route Distance (miles)	Highest Energy Usage (kWh)
429- Contracted	Type C	44 Miles	169.2
430- Contracted	Type C	44 Miles	169.2
431- Contracted	Type C	44 Miles	169.2
432- Contracted	Type C	44 Miles	169.2
435- Contracted	Type C	44 Miles	169.2
438- Contracted	Type C	44 Miles	169.2

Table 15 Max Energy Usage by Bus

Battery Electric Bus Selection

The recommendations in this report regarding bus battery capacities and charger sizes are based on minimum requirements, utilizing technology that is currently available as well as manufacturers recommendations. Each school bus manufacturer has a different bus battery and charge configuration that they offer. Wendel analyzed seven manufacturers and bus types based on the existing routes to determine performance of each bus configuration.

Wendel evaluated the following list of electric buses based on their available battery sizes, vehicle to grid capabilities, and existing relationship with the district.

- Blue Bird
- BYD
- Collins
- Greenpower
- IC
- Thomas

The district has stated that they currently utilize IC buses, thus, Wendel has utilized IC as the basis of the investigation for the proposed electric buses. IC currently does not offer electric Type-A buses. Thus, Bluebird was utilized for the buses requiring Type-A buses, though none of the Type-A's routes were able to be completed given the current technology. Table 16 below shows the BEB models and their OEM rated ranges as of the date of this report.

Bus Type	Manufacturer	Model	kWh	OEM rated Range (miles)	Seats
Type A	Bluebird	Bluebird Micro Bird G5e	140	150	29
Type A	Bluebird	Bluebird Micro Bird G5e	175	200	26
Type C	Bluebird	Bluebird vision	155	120	77
Type D	Bluebird	BlueBird All American RE	155	120	84
Type A	BYD	BYD Type A	156	105	30
Type D	BYD	BYD Type D	300	155	84
Type A	Collins	Collins Bus Magellan	127	105	24
Type A	Greenpower	Greenpower Nano Beast	118	150	24

Bus Type	Manufacturer	Model	kWh	OEM rated Range (miles)	Seats
Type D	Greenpower	Greenpower BEAST	194	140	91
Type D	Greenpower	MegaBeast	387	300	84
Type C	IC	IC eCE	210	135	78
Type C	IC	IC eCE	315	200	78
Type A	Thomas	Minotour	113	113	30
Type C	Thomas	Thomas Saf-T-Liner C2 Jouley	246	150	81
Type D	Thomas	Thomas Saf-T-Liner C2 Jouley	244	150	81

Table 16 BEB Models and OEM Rated Ranges as of this Report Date

The route analysis utilizes the received route distances to develop the anticipated energy requirements per route and then uses those energy requirements to determines the minimum BEB battery size requirements. The minimum BEB battery size requirements do not take into account extracurricular trips which may occur immediately before or after the routes. The proposed minimum bus size may not be able to meet the energy requirements of routes that have an additional extracurricular trip before or after. The route analysis also does not consider emergency closings, power outages, or any other unforeseen circumstances. Table 17 below shows the minimum bus size required based on the maximum energy usage calculated by the route analysis.

Bus Number	Bus Type	Max Route Mileage (Miles)	Minimum Bus Size based on Max Energy Usage (kWh)	Minimum Bus Size Available	Proposed Bus Size and Type Based on Current Manufacturer
409	Type C	44	235	246 kWh - Thomas	315 kWh - IC
412	Type C	61	329	No Current Replacement	No Current Replacement
415	Type C	53	281	282 kWh - BYD	315 kWh - IC
433	Type C	77	406	No Current Replacement	No Current Replacement
434	Type C	111	586	No Current Replacement	No Current Replacement
436	Type C	65	360	No Current Replacement	No Current Replacement
437	Type C	71	380	No Current Replacement	No Current Replacement
439	Type C	50	266	282 kWh - BYD	315 kWh - IC
441	Type A	95	359	No Current Replacement	No Current Replacement
442	Type C	61	322	No Current Replacement	No Current Replacement
444	Type C	34	192	196 kWh - Bluebird	210 kWh - IC
445	Type C	43	237	246 kWh - Thomas	315 kWh - IC
448	Type C	40	222	246 kWh - Thomas	315 kWh - IC
449	Type C	62	333	No Current Replacement	No Current Replacement

Bus Number	Bus Type	Max Route Mileage (Miles)	Minimum Bus Size based on Max Energy Usage (kWh)	Minimum Bus Size Available	Proposed Bus Size and Type Based on Current Manufacturer
450	Type C	53	287	315 kWh - IC	315 kWh - IC
451	Type C	66	348	No Current Replacement	No Current Replacement
453	Type C	68	378	No Current Replacement	No Current Replacement
455	Type C	38	210	No Current Replacement	315 kWh - IC
456	Type C	64	349	No Current Replacement	No Current Replacement
457	Type C	59	324	No Current Replacement	No Current Replacement
458	Type A	53	204	No Current Replacement	No Current Replacement
459	Type C	34	186	196 kWh - Bluebird	210 kWh - IC
460	Type C	41	226	246 kWh - Thomas	315 kWh - IC
461	Type C	35	198	210 kWh - IC	210 kWh - IC
462	Type C	40	213	246 kWh - Thomas	315 kWh - IC
463	Type C	33	189	196 kWh - Bluebird	210 kWh - IC
464	Type C	31	172	196 kWh - Bluebird	210 kWh - IC
465	Type C	33	186	196 kWh - Bluebird	210 kWh - IC
466	Type C	43	239	246 kWh - Thomas	315 kWh - IC
467	Type C	32	182	196 kWh - Bluebird	210 kWh - IC
469	Type C	89	477	No Current Replacement	No Current Replacement
470	Type C	40	222	246 kWh - Thomas	315 kWh - IC
471	Type C	37	208	210 kWh - IC	210 kWh - IC
472	Type C	42	235	246 kWh - Thomas	315 kWh - IC
473	Type C	30	166	196 kWh - Bluebird	210 kWh - IC
474	Type C	38	212	246 kWh - Thomas	315 kWh - IC
475	Type C	33	186	196 kWh - Bluebird	210 kWh - IC
476	Type C	43	236	246 kWh - Thomas	315 kWh - IC
477	Type C	35	197	210 kWh - IC	210 kWh - IC
478	Type C	57	309	315 kWh - IC	315 kWh - IC
479	Type C	25	140	155 kWh - Bluebird	210 kWh - IC
480	Type C	40	225	246 kWh - Thomas	315 kWh - IC
481	Type C	27	148	155 kWh - Bluebird	210 kWh - IC
482	Type C	37	198	210 kWh - IC	210 kWh - IC
483	Type C	46	254	282 kWh - BYD	315 kWh - IC
484	Type C	43	235	246 kWh - Thomas	315 kWh - IC
485	Type C	24	135	155 kWh - Bluebird	210 kWh - IC
486	Type C	34	194	196 kWh - Bluebird	210 kWh - IC
487	Type C	60	317	No Current Replacement	No Current Replacement
488	Type C	45	246	246 kWh - Thomas	315 kWh - IC

Bus Number	Bus Type	Max Route Mileage (Miles)	Minimum Bus Size based on Max Energy Usage (kWh)	Minimum Bus Size Available	Proposed Bus Size and Type Based on Current Manufacturer
489	Type C	33	188	196 kWh - Bluebird	210 kWh - IC
490	Type C	26	145	155 kWh - Bluebird	210 kWh - IC
491	Type C	42	234	246 kWh - Thomas	315 kWh - IC
492	Type C	31	180	196 kWh - Bluebird	210 kWh - IC
493	Type C	42	227	246 kWh - Thomas	315 kWh - IC
494	Type C	41	230	246 kWh - Thomas	315 kWh - IC
495	Type C	48	262	282 kWh - BYD	315 kWh - IC
496	Type C	41	219	246 kWh - Thomas	315 kWh - IC
497	Type C	51	286	315 kWh - IC	315 kWh - IC
498	Type C	44	237	246 kWh - Thomas	315 kWh - IC
499	Type C	45	241	246 kWh - Thomas	315 kWh - IC
500	Type C	50	265	282 kWh - BYD	315 kWh - IC
501	Type C	65	346	No Current Replacement	No Current Replacement
502	Type C	33	187	196 kWh - Bluebird	210 kWh - IC
503	Type C	28	163	196 kWh - Bluebird	210 kWh - IC
504	Type C	66	355	No Current Replacement	No Current Replacement
505	Type C	32	184	196 kWh - Bluebird	210 kWh - IC
410 - Contracted	Type C	44	235	246 kWh - Thomas	315 kWh - IC
414 - Contracted	Type C	44	235	246 kWh - Thomas	315 kWh - IC
418 - Contracted	Type C	44	235	246 kWh - Thomas	315 kWh - IC
421 - Contracted	Type C	44	235	246 kWh - Thomas	315 kWh - IC
422 - Contracted	Type C	44	235	246 kWh - Thomas	315 kWh - IC
424 - Contracted	Type C	44	235	246 kWh - Thomas	315 kWh - IC
426- Contracted	Type C	44	235	246 kWh - Thomas	315 kWh - IC
427- Contracted	Type C	44	235	246 kWh - Thomas	315 kWh - IC
428- Contracted	Type C	44	235	246 kWh - Thomas	315 kWh - IC
429- Contracted	Type C	44	235	246 kWh - Thomas	315 kWh - IC
430- Contracted	Type C	44	235	246 kWh - Thomas	315 kWh - IC
431- Contracted	Type C	44	235	246 kWh - Thomas	315 kWh - IC

Bus Number	Bus Type	Max Route Mileage (Miles)	Minimum Bus Size based on Max Energy Usage (kWh)	Minimum Bus Size Available	Proposed Bus Size and Type Based on Current Manufacturer
432-Contracted	Type C	44	235	246 kWh - Thomas	315 kWh - IC
435-Contracted	Type C	44	235	246 kWh - Thomas	315 kWh - IC
438-Contracted	Type C	44	235	246 kWh - Thomas	315 kWh - IC

Table 17 Minimum Bus Size Required by Bus

Proposed Bus Size	Bus Type	Route Buses	Spare Buses	Total Proposed Buses
210 kWh - IC	Type C	22	0	**22**
315 kWh - IC	Type C	43	7	**50**
No Current Replacement	Type A & Type C	17	0	**17**
		82	**7**	**89**

Table 18 Proposed Bus Battery Sizes Summary

The route analysis shows that the maximum energy usage of any one route would be 422 kWh which was associated with a Type C bus. Based on today's BEB technology, there is not currently a battery large enough to be able to perform this route. Among the routes for the (82) buses examined, it was determined that the routes for (17) of the buses cannot currently be performed by a BEB as BEBs do not currently have adequate battery capacity at the existing bus size to meet these route demands. Wendel recommends that these buses be converted to BEBs towards the end of the transition plan. This will allow for the development of larger battery capacities and/or improved technology which may enable the district to implement BEBs without splitting the routes in the future. Table 19 below shows the minimum BEB sizes needed to perform the routes as they currently are for these (17) buses.

Bus Number	Bus Type	Minimum Bus Size based on Maximum Energy Usage (kWh)	Notes
434	Type C	586	Bus size does not currently exist
469	Type C	477	Bus size does not currently exist
433	Type C	406	Bus size does not currently exist
437	Type C	380	Bus size does not currently exist
453	Type C	378	Bus size does not currently exist
436	Type C	360	Bus size does not currently exist
441	Type A	359	Bus size does not currently exist
504	Type C	355	Bus size does not currently exist
456	Type C	349	Bus size does not currently exist
451	Type C	348	Bus size does not currently exist

Bus Number	Bus Type	Minimum Bus Size based on Maximum Energy Usage (kWh)	Notes
501	Type C	346	Bus size does not currently exist
449	Type C	333	Bus size does not currently exist
412	Type C	329	Bus size does not currently exist
457	Type C	324	Bus size does not currently exist
442	Type C	322	Bus size does not currently exist
487	Type C	317	Bus size does not currently exist

Table 19 Buses with BEB Transition Issues

The analysis shows that the maximum energy usage per route within current battery capacity constraints is 309 kWh which would require a 315 kW BEB. The anticipated energy usage for each route can be found in Appendix B.3 – Final Calculations and Models.

Extracurricular Trips

Extracurricular bus runs such as field trips and sports trips, though included in this study, were not included in the route analysis due to the unpredictable nature of these trips. The actual buses that perform these trips vary as well as the start and end times and the mileage associated with them. It is recommended that the district use Table 20 below to determine whether their proposed electric buses will be able to complete the trips. The ranges listed in Table 20 assume BEBs are fully charged to their recommended capacity (90%), this table should be used to determine if an extracurricular trip can be completed by a BEB of today's technology. An analysis of extracurricular trips received from Lancaster can be found below in Table 21.

In order to ensure extracurricular trips can be performed, it is recommended the district ensure there are enough buses within their fleet that can perform these extracurricular trips.

It should be noted that unlike the student pick up / drop off routes, the buses performing extracurricular trips would have the ability to charge at either another school (assuming they have spare chargers) or public charging stations during the sporting / field trip event itself which can increase this range. The amount of additional range provided by these public charging stations would depend on the charger itself and cannot be estimated by Wendel.

The ranges listed in Table 20 were calculated using the assumptions listed for each case. The EPA and the Joint Office of Energy and Transportation states that BEBs may experience at or within 40%-60% of OEM rated efficiency on a "Worst Day" and at or within 10%-15% of OEM rated efficiency on an "Average Day." Thus it was assumed a battery would experience 50% of OEM rated efficiency for the "Worst Case" and 15% of OEM rated efficiency for the "Average Case".

Worst Case

- Full Bus
- Extreme Cold or Heat
- HVAC use during rest
- Bus has degraded to 90%
- Battery does not go below 10%
- Battery does not charge above 90%
- 11% Safety factor on efficiency

Average case

- Full Bus
- Moderate OA Temps
- No HVAC Use
- Bus has degraded to 90%
- Battery does not go below 10%
- Battery does not charge above 90%
- 11% Safety factor on efficiency

Bus Type	Bus Size and Manufacturer	Worst Case Range (Miles)	Average Case Range (Miles)
Type A	88 kWh - Bluebird	28	52
Type A	156 kWh - BYD	31	54
Type A	127 kWh - Collins	31	54
Type A	118 kWh - Greenpower	44	78
Type A	168 kWh - Lion	45	78
Type C	155 kWh - Bluebird	36	59
Type C	196 kWh - Bluebird	36	59
Type C	282 kWh - BYD	53	88
Type C	210 kWh - IC	40	67
Type C	315 kWh - IC	61	101
Type C	210 kWh - Lion	46	78
Type C	246 kWh - Thomas	45	75
Type D	155 kWh - Bluebird	35	59
Type D	255 kWh - BYD	47	78
Type D	194 kWh - Greenpower	42	70
Type D	387 kWh - Greenpower	91	142
Type D	210 kWh - Lion	46	78
Type D	244 kWh - Thomas	45	75

Table 20 Allowable Range by Bus Size

Based on the mileage of the extracurricular trips provided by the district, 36% of the extracurricular trips could be performed by fully charged (up to 90% capacity) BEB buses.

Table 21 below summarizes the feasibility of using the proposed battery electric school buses to drive sports trips and field trips for Lancaster CSD.

Trip Type	Total Number of Trips Received	Number of trips not feasible by BEBs being proposed by this study	Percent of trips not feasible by BEBs being proposed by this study
Extracurricular	760	483	64%

Table 21 Extracurricular Trips Feasibility Summary

Charging Requirements

Four charger sizes were reviewed and include a 24 kW DC charger, 60 kW DC charger (fast charger), 120 kW DC charger (fast charger), and a 180 kW DC charger (fast charger). Proposed charger sizes are based on utilizing one charger per route bus to remain conservative. The district may choose to utilize higher kW chargers of at least twice the proposed size which would allow for the charging of two school buses per charger. This would decrease installation and overall charger costs. Another advantage of this approach would be if only one school bus is utilizing the two-port charger at any time, that BEB's required charging time would decrease as it would be able to take advantage of the full charger output.

Based on the route analysis, the proposed charging duration between AM and PM routes ranges from 50 minutes to 4 hours and 27 minutes. The largest charger size proposed is 180 kW. The charging durations for each route can be found in Appendix B.3 – Final Calculations and Models. Wendel has determined that the routes the district has provided will require (1) 180 kW charger, (12) 120 kW chargers, (69) 60 kW chargers and (5) 24 kW chargers. Of the proposed chargers (3) of the 24 kW chargers and (2) of the 120 kW are for spare buses. The (2) 120 kW spare chargers are proposed to be used as a 2:1. It is assumed that spare buses are used only to replace out of service route buses or for extracurricular trips. The contracted buses would require (15) 60 kW chargers and are included in the proposed charger quantities. The specific charger sizes and durations needed to charge by charger size can be found in Table 22 below for each of the (89) route buses.

Charger Size	Route Bus Chargers	Spare Bus Chargers	Total Proposed Chargers	Total Proposed Charging Positions
24 kW	2	3	5	5
60 kW	69	0	69	69
120 kW	10	2*	12	14
180 kW	1	0	1	1
	82	5	87	89

Table 22 Proposed Charger Quantities

Bus Number	Time Between AM and PM Shifts	Minimum Charging Time Needed to Perform PM Route - 120 kW	Minimum Charging Time Needed to Perform PM Route - 60 kW	Minimum Charging Time Needed to Perform PM Route - 24 kW	Proposed Charger Size (kW)
409	5:09	1:32	3:05	7:44	60
412	1:57	1:42	3:24	8:30	120
415	3:43	1:48	3:37	9:03	60
433	3:12	1:36	3:13	8:02	120
434	3:51	1:52	3:45	9:23	120
436	2:18	1:59	3:59	9:58	120

Bus Number	Time Between AM and PM Shifts	Minimum Charging Time Needed to Perform PM Route - 120 kW	Minimum Charging Time Needed to Perform PM Route - 60 kW	Minimum Charging Time Needed to Perform PM Route - 24 kW	Proposed Charger Size (kW)
437	3:57	2:16	4:32	11:20	120
439	3:45	1:37	3:15	8:07	60
441	2:57	1:18	2:36	6:32	60
442	3:57	1:18	2:36	6:31	60
444	3:33	1:15	2:31	6:17	60
445	3:33	1:22	2:45	6:53	60
448	3:43	1:21	2:42	6:46	60
449	4:05	1:45	3:30	8:46	60
450	4:21	1:36	3:12	8:02	60
451	3:27	2:05	4:11	10:28	120
453	2:45	1:49	3:38	9:07	120
455	1:39	0:25	0:50	2:07	120
456	2:03	1:18	2:36	6:30	120
457	3:21	1:34	3:08	7:51	60
458	3:33	1:18	2:36	6:30	60
459	4:03	1:07	2:15	5:37	60
460	3:45	1:24	2:49	7:03	60
461	4:03	0:51	1:43	4:18	60
462	4:03	1:09	2:19	5:49	60
463	4:15	1:11	2:23	5:57	60
464	4:33	1:05	2:10	5:26	60
465	3:33	1:11	2:22	5:57	60
466	4:39	0:50	1:40	4:12	60
467	4:03	1:10	2:20	5:50	60
469	1:27	1:45	3:31	8:49	180
470	3:33	1:08	2:17	5:43	60
471	4:33	1:10	2:20	5:51	60
472	4:21	1:03	2:06	5:15	60
473	4:33	1:04	2:09	5:23	60
474	4:45	1:11	2:22	5:57	60
475	4:09	1:13	2:26	6:05	60
476	4:33	1:11	2:23	5:57	60
477	4:33	1:03	2:07	5:18	60
478	3:03	0:59	1:58	4:55	60
479	4:39	0:53	1:47	4:27	24
480	3:57	1:10	2:20	5:51	60

Bus Number	Time Between AM and PM Shifts	Minimum Charging Time Needed to Perform PM Route - 120 kW	Minimum Charging Time Needed to Perform PM Route - 60 kW	Minimum Charging Time Needed to Perform PM Route - 24 kW	Proposed Charger Size (kW)
481	4:09	0:51	1:42	4:15	60
482	4:09	1:13	2:26	6:05	60
483	4:21	0:57	1:54	4:47	60
484	4:27	1:06	2:12	5:32	60
485	-	0:53	1:47	4:29	24
486	3:45	1:01	2:03	5:08	60
487	4:33	1:21	2:43	6:48	60
488	3:45	1:29	2:58	7:25	60
489	3:51	1:15	2:30	6:15	60
490	4:03	0:51	1:43	4:18	60
491	3:39	1:09	2:19	5:49	60
492	3:38	1:10	2:21	5:54	60
493	4:15	1:17	2:34	6:25	60
494	3:39	1:22	2:44	6:52	60
495	4:35	1:05	2:11	5:28	60
496	4:32	1:16	2:33	6:23	60
497	3:45	1:06	2:13	5:33	60
498	4:03	1:27	2:54	7:17	60
499	4:03	1:13	2:26	6:07	60
500	4:33	1:07	2:15	5:37	60
501	2:21	1:19	2:38	6:37	120
502	4:21	0:53	1:47	4:28	60
503	3:51	1:01	2:02	5:05	60
504	3:21	1:11	2:23	5:58	60
505	3:51	1:02	2:04	5:11	60
410 - Contracted	5:09	1:32	3:05	7:44	60
414 - Contracted	5:09	1:32	3:05	7:44	60
418 - Contracted	5:09	1:32	3:05	7:44	60
421 - Contracted	5:09	1:32	3:05	7:44	60
422 - Contracted	5:09	1:32	3:05	7:44	60
424 - Contracted	5:09	1:32	3:05	7:44	60
426- Contracted	5:09	1:32	3:05	7:44	60

Bus Number	Time Between AM and PM Shifts	Minimum Charging Time Needed to Perform PM Route - 120 kW	Minimum Charging Time Needed to Perform PM Route - 60 kW	Minimum Charging Time Needed to Perform PM Route - 24 kW	Proposed Charger Size (kW)
427-Contracted	5:09	1:32	3:05	7:44	60
428-Contracted	5:09	1:32	3:05	7:44	60
429-Contracted	5:09	1:32	3:05	7:44	60
430-Contracted	5:09	1:32	3:05	7:44	60
431-Contracted	5:09	1:32	3:05	7:44	60
432-Contracted	5:09	1:32	3:05	7:44	60
435-Contracted	5:09	1:32	3:05	7:44	60
438-Contracted	5:09	1:32	3:05	7:44	60

Table 23 Minimum Charging Durations by Bus and Charger Size

These proposed charger sizes are based on selecting the smallest size charger needed out of the four charger sizes reviewed (24 kW, 60 kW, 120 kW, 180 kW). It is recommended that the district look into limiting the number of different chargers sized to ease operations and ordering. Charger sizes procured that vary from the Required Charging Size should be greater in kW.

Energy and Environmental Impact

Annual Savings		
Existing Bus Usage		
Diesel Fuel Usage	85,230.2	Gallons/Year
Gasoline Fuel Usage	72,801.4	Gallons/Year
Total Fossil Fuel Usage	158,031.6	Gallons/Year
Existing Energy Usage	20,921.6	MMBtus
Proposed BEB Usage		
Electricity Usage	3,641,274.0	kWh/year
Proposed Energy Usage	12,424.0	MMBtus/year
Energy Savings		
Total Energy Savings	8,497.6	MMBtus/year
Total CO2 Savings	1,059.7	Metric Tons/year

Table 24 Annual Savings Summary

A total annual fuel usage of 158,031.6 gallons for Lancaster CSD's bus was provided by Lancaster Central School District. This fuel usage equates to approximately 20,921.6 MMBtus of associated existing energy usage per year. Proposed energy usage was based on a yearly fleet mileage of 1,227,344 per school year. Based on the route modeling analysis and a review of the existing diesel bus performance, the switch to BEBs from diesel buses would save approximately 8,497.6MMBtus of energy per year or a 41% reduction in energy consumption. This is equivalent to 1,059.7 Metric Tons of CO2 emissions per year.

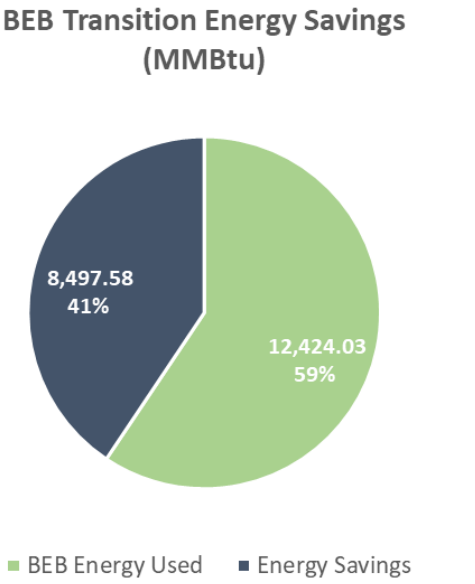


Figure 5 BEB Transition Energy Savings (MMbtu)

Section 5 Conceptual Charging Strategy

CONCEPTUAL CHARGING STRATEGY

Wendel developed a conceptual charging strategy for the fleet based on the bus route data collected and the route analyses developed in previous tasks. The goal of the conceptual charging strategy is to determine the smallest available battery size that meets the district's route needs and the associated electrical impact. The charging strategy identified the following items:

- Optimum charger size – assuming a 1 to 1 charger to dispenser configuration
- Anticipated peak demand
- Number, types, and sizes of chargers required to charge the fleet in the allotted time frames – assuming a battery degradation of 10%, a lower limit of 10% state of charge, and an upper limit of 90% state of charge. This is illustrated in Figure 6 below.

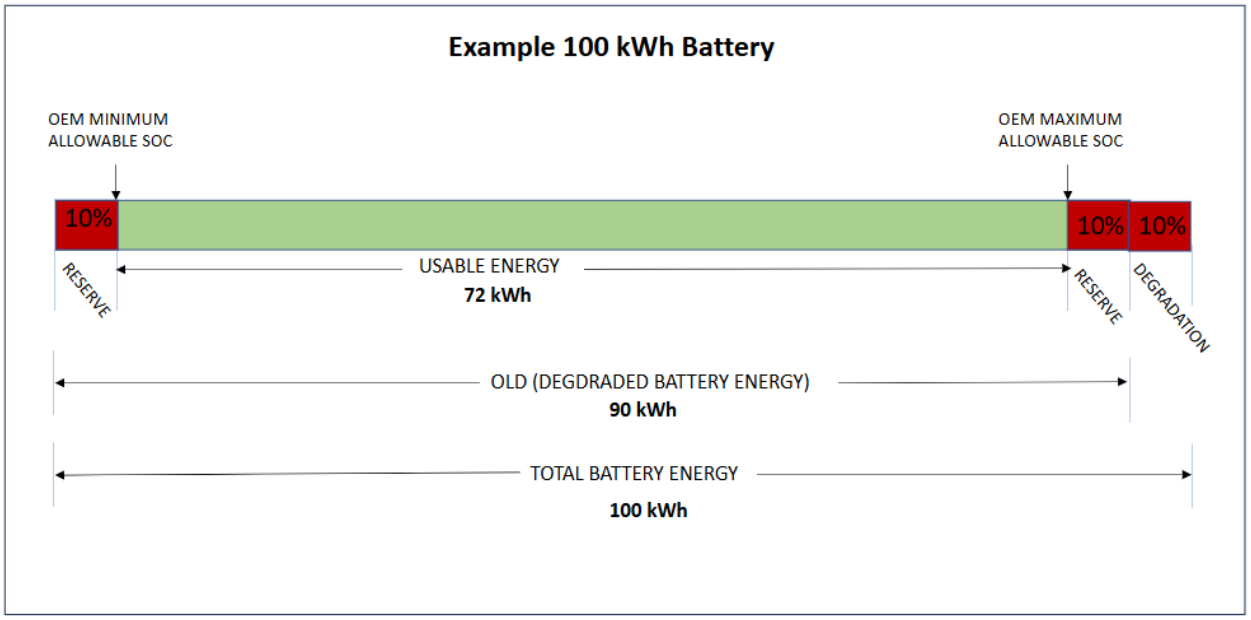


Figure 6 Illustration of Usable Battery

Charging Model Development Process:

An overview of the process Wendel utilized for the charging strategy modeling process is shown below:

Step 1 Analyze the route data and organize the data into numerical values that represent the times at which each bus that serves the associated route would depart and arrive at Lancaster CSD for a standard week.

Step 2 Develop a model reflecting when all (82) route buses **arrive and depart** Lancaster CSD over a winter month with an additional 15 minutes added to route durations representing the time after the bus is removed from the charger and before it leaves to begin each route.

Step 3 Develop a model reflecting bus **charge hours** for each hour of a 1-month period. This shows how many hours the bus has left to charge at any hour.

Step 4 Develop a weekly model reflecting the **battery state of charge** throughout the month. The 1-month period utilizes TMY3 (typical meteorological year) weather data based on region 8 for January – which is considered the coldest month of the year in NYS to simulate a representative year's coldest month.

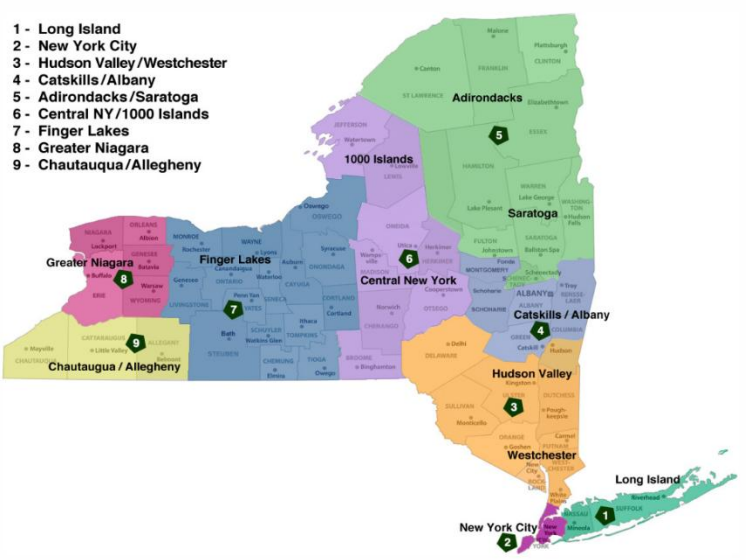


Figure 7 NYS Weather Regions

Step 5 Develop a 1-month model utilizing the state of charge model to reflect the charging of the battery throughout the week. This model shows the charging **impact on the battery** each hour throughout the 1-month period.

Step 6 Develop a 1-month model utilizing the impact on battery model to reflect the **impact on the facility (Facility Demand)** while charging. This model utilized an assumed charging efficiency to convert the impact on the battery to the actual impact on Lancaster CSD usage.

Battery Electric Bus Requirements

As stated by Lancaster CSD, all routes provided by the district are driven by (82) buses (Route Buses) (67) are district owned and (15) are contracted buses to be reintroduced into their fleet. The district also has (7) additional buses that are used as spares (Spare Buses) for a total fleet of (89) district buses. Using the route information provided and energy usage rates calculated in the route analysis, Wendel performed a charging analysis of all district owned buses (excluding spare buses and contracted buses). This information can be found in Section 5 Conceptual Charging Strategy - Basis of Design.

The charging analysis consisted of modeling battery life at each hour throughout the month of January to model conditions during the coldest month on average. This was done as low temperatures have been shown to impact the efficiency of BEB batteries negatively. These models also determined the amount of charge delivered to the bus batteries for each hour throughout the month and the amount of charge delivered from the district for each hour throughout the month.

From these models, Wendel was able to confirm the quantity and sizes of buses required, assuming all buses would remain the same Type (Type A, Type C, etc.). Wendel utilized IC buses as the basis of the investigation for the proposed electric buses per the district's request.

Charger Requirements

The charging strategy focuses on charging for long periods of time at low charging speeds. The model shows the batteries' charging rate based on the duration of time to charge. The maximum single bus charging rate for any hour throughout the winter month was modeled to be 122 kW. A breakdown of the charging requirements is shown below:

- 3 Buses require a charger size between 60 kW and 80 kW
- 7 Buses require a charger size between 40 kW and 60 kW
- 23 Buses require a charger size between 20 kW and 40 kW
- 48 Buses require a charger size less than 20 kW

The breakdown above shows the variety of chargers that could be utilized by Lancaster CSD to charge the school bus fleet. Wendel only used (4) charger sizes to reduce the operational impact on the school district when transitioning to BEBs.

Basis of Design

To provide a complete demand profile for all buses, the charging model assumes that the battery capacities needed for routes that are currently too long will become available in the future and that the largest charger size needed for that bus size would be used. Buses with route distances or charging requirements that are not feasible were excluded from this study. For this analysis, it was assumed that the maximum number of buses charging during peak time (mid-day) is (82) buses, this does not include the (7) spare buses. This approach assumes that spare buses would be charged outside of mid-day peak hours.

The information in Table 25 below was calculated during the route analysis was used as the basis for the conceptual charging strategy model.

Bus	Bus Size (kWh)	Charger Size (kW)	Max AM Usage Rate (kWh / hr)	Max PM Usage Rate (kWh / hr)	Max PM2 Usage Rate (kWh / hr)	PM Route Usage (kWh)	PM2 Route Usage (kWh)
409	315	60	61.11	49.78	-	169.25	-
412	330*	120	37.93	51.78	-	183.81	-
415	315	60	54.26	46.01	-	195.55	-
433	410*	120	63.61	45.76	-	173.87	-
434	590*	120	69.91	68.65	-	422.19	-
436	370*	120	44.34	53.22	-	215.54	-
437	380*	120	64.37	57.60	-	244.82	-
439	315	60	49.15	48.75	-	175.50	-

Bus	Bus Size (kWh)	Charger Size (kW)	Max AM Usage Rate (kWh / hr)	Max PM Usage Rate (kWh / hr)	Max PM2 Usage Rate (kWh / hr)	PM Route Usage (kWh)	PM2 Route Usage (kWh)
441	360*	60	48.38	47.87	-	141.21	-
442	330*	60	36.15	59.36	-	231.51	-
444	210	60	31.24	35.08	-	138.58	-
445	315	60	37.58	36.74	-	148.80	-
448	315	60	35.85	41.47	-	159.65	-
449	340*	60	56.05	54.06	-	239.65	-
450	315	60	55.02	47.35	-	173.63	-
451	350*	120	58.00	58.32	-	250.77	-
453	380*	120	45.79	59.68	-	196.93	-
455	315	120	35.64	35.74	34.61	45.87	140.17
456	350*	120	41.32	42.53	-	250.94	-
457	330*	60	49.59	39.94	-	169.73	-
458	210*	60	38.03	34.93	-	146.72	-
459	210	60	38.17	33.31	-	121.59	-
460	315	60	38.26	42.71	-	152.35	-
461	210	60	27.37	34.40	-	142.77	-
462	315	60	37.04	45.07	-	153.24	-
463	210	60	35.76	34.36	-	135.72	-
464	210	60	36.73	38.75	-	124.00	-
465	210	60	30.24	33.96	-	134.13	-
466	315	60	27.49	48.46	-	172.04	-
467	210	60	32.73	32.17	-	130.81	-
469	480*	180	51.55	52.03	-	343.37	-
470	315	60	37.63	32.13	-	123.69	-
471	210	60	36.18	37.84	-	149.45	-
472	315	60	35.48	43.93	-	169.11	-
473	210	60	36.15	37.53	-	116.34	-
474	315	60	49.47	41.89	-	152.89	-
475	210	60	33.91	37.11	-	131.75	-
476	315	60	39.01	42.99	-	169.80	-
477	210	60	35.86	35.91	-	141.83	-
478	315	60	45.85	30.38	-	106.33	-
479	210	24	32.44	23.88	-	96.32	-
480	315	60	38.04	34.67	-	126.54	-
481	210	60	27.03	32.26	-	106.44	-
482	210	60	39.92	44.53	-	142.51	-
483	315	60	33.36	47.48	-	182.81	-

Bus	Bus Size (kWh)	Charger Size (kW)	Max AM Usage Rate (kWh / hr)	Max PM Usage Rate (kWh / hr)	Max PM2 Usage Rate (kWh / hr)	PM Route Usage (kWh)	PM2 Route Usage (kWh)
484	315	60	42.88	38.56	-	119.52	-
485	210	24	30.28	0	-	0.00	-
486	210	60	32.83	30.39	-	110.93	-
487	320*	60	43.28	58.59	-	228.51	-
488	315	60	42.63	47.45	-	160.55	-
489	210	60	31.88	39.13	-	135.00	-
490	210	60	29.00	29.13	-	93.22	-
491	315	60	31.10	41.55	-	168.28	-
492	210	60	31.85	33.14	-	127.59	-
493	315	60	38.56	48.16	-	163.75	-
494	315	60	35.75	41.89	-	165.46	-
495	315	60	38.50	43.32	-	188.45	-
496	315	60	44.75	44.52	-	138.03	-
497	315	60	42.83	32.93	-	120.18	-
498	315	60	46.11	43.71	-	157.36	-
499	315	60	37.79	45.66	-	173.51	-
500	315	60	38.02	59.65	-	190.89	-
501	350*	120	45.72	40.88	-	143.08	-
502	210	60	34.98	32.17	-	96.50	-
503	210	60	27.11	32.08	-	117.08	-
504	360*	60	41.62	47.79	-	255.66	-
505	210	60	31.93	29.94	-	112.27	-
410 - Contracted	315	60	57.60	49.78	-	169.25	-
414 - Contracted	315	60	57.60	49.78	-	169.25	-
418 - Contracted	315	60	57.60	49.78	-	169.25	-
421 - Contracted	315	60	57.60	49.78	-	169.25	-
422 - Contracted	315	60	57.60	49.78	-	169.25	-
424 - Contracted	315	60	57.60	49.78	-	169.25	-
426- Contracted	315	60	57.60	49.78	-	169.25	-
427- Contracted	315	60	57.60	49.78	-	169.25	-
428- Contracted	315	60	57.60	49.78	-	169.25	-

Bus	Bus Size (kWh)	Charger Size (kW)	Max AM Usage Rate (kWh / hr)	Max PM Usage Rate (kWh / hr)	Max PM2 Usage Rate (kWh / hr)	PM Route Usage (kWh)	PM2 Route Usage (kWh)
429-Contracted	315	60	57.60	49.78	-	169.25	-
430-Contracted	315	60	57.60	49.78	-	169.25	-
431-Contracted	315	60	57.60	49.78	-	169.25	-
432-Contracted	315	60	57.60	49.78	-	169.25	-
435-Contracted	315	60	57.60	49.78	-	169.25	-
438-Contracted	315	60	57.60	49.78	-	169.25	-

Table 25 Charging Strategy Inputs
*Bus size does not currently exist

State of Charge

Wendel assumed a battery degradation of 10%, a lower limit of 10% state of charge, and an upper limit of 90% state of charge. A weekly model reflecting the **battery state of charge** throughout the 5 weeks was completed based on these assumptions. As seen in Figure 8 below, none of the proposed bus battery's state of charge ever goes below 9% or above 81%.

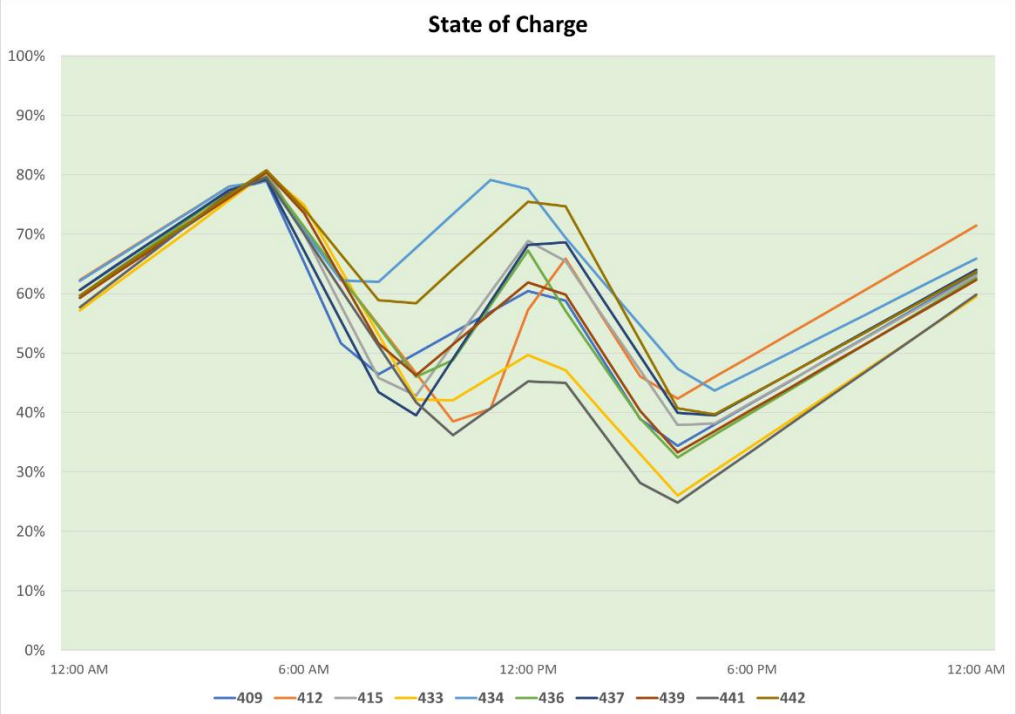


Figure 8 State of Charge on a Sample Week Day with Demand Reduction Implemented

Demand Impact

Demand is the power drawn from the utility at any one point in time, measured in kW. Peak demand is the maximum demand required from the utility, during the utilities peak demand period, over a one-month period and is also measured in kW. The peak demand is the cumulative demand of all loads connected to the utility transformer.

Not all buses will need a maximum charge rate from the charger to reach a full charge in the available time frame. Charging a bus at a reduced charge rate increases the life of the battery and reduces overall demand on the utility system. Demand reduction is evaluating the state of charge when the bus arrives back at the garage and determining the minimum charge level required to charge the bus in the allotted time, to ensure the bus is adequately charged when it needs to begin a new route. A charge management system should implement demand reduction, further details can be found in the Charge Management section below. If demand reduction is implemented in every bus in the fleet, the overall utility demand will be greatly reduced, reducing utility demand charges, and extending the life of the batteries. The goal of demand reduction is to flatten demand as much as possible, especially during peak hours. A model of what this might look like in terms of daily demand for Lancaster CSD can be seen in Figure 9 below.

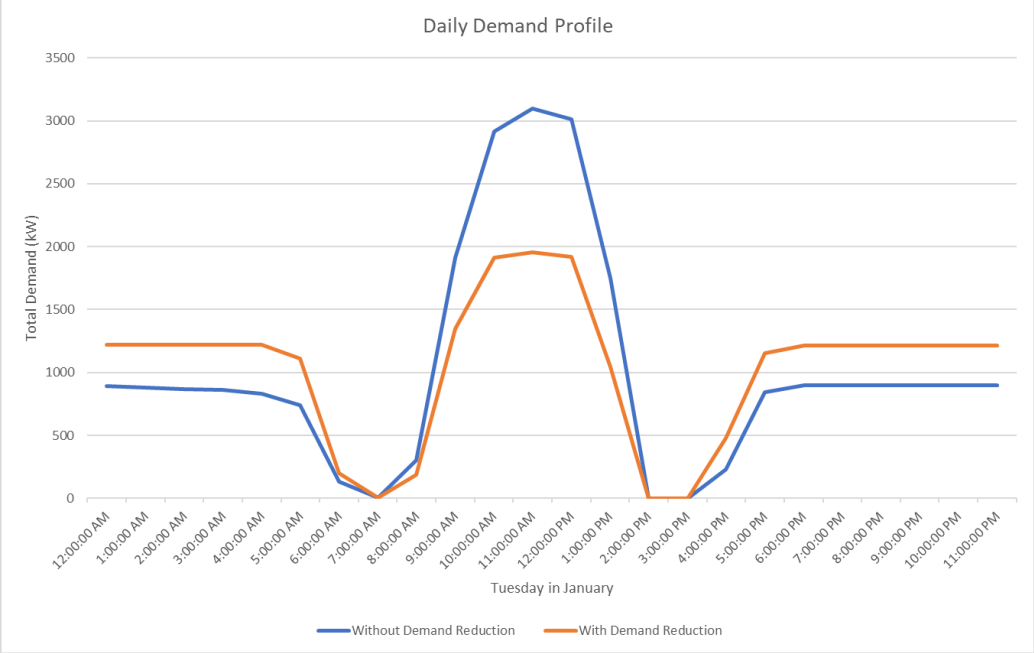


Figure 9 Daily Demand Profile at Maximum Peak Demand

*This demand profile represents the maximum daily demand based on the charging model. Demand Peaks fluctuate per day and may be lower than the above.

The maximum combined bus electrical demand when all (82) route buses are converted to BEBs and utilize demand reduction strategies during a winter month was calculated to be 3,095.5 which occurs between 11 AM and 12 PM on Mondays. Before the demand reduction strategy was implemented, the peak demand was 1,957.6 kW which would occur at 11 AM and 12 PM on Mondays.

Based on the state of charge when the buses arrive back at the garage and the minimum charge level required to charge the bus in between AM and PM routes, Wendel modeled how demand reduction strategies would impact the district's proposed demand profile if implemented. It was determined that the implementation of this demand reduction strategy could yield savings of 1,137.9 kW of peak daily demand or 37%, resulting in utility cost savings of up to 20%. This highlights the importance of implementing a charge controller optimization strategy or a charge management system (CMS).

Before Demand Reduction		
Maximum combined bus electrical demand	3,095.5	kW
Day of Week Max Demand Occurs	Tuesday	
Time Max Demand Occurs Between	11:00 AM	12:00 PM
After Demand Reduction		
Maximum combined bus electrical demand	1,957.6	kW
Day of Week Max Demand Occurs	Tuesday	
Time Max Demand Occurs Between	11:00 AM	12:00 PM
Savings		
Demand Reduction	1,137.9	kW
Percent Demand Reduction	37%	

Table 26 Demand Summary

Figure 10 below shows the demand profile over a sample week in January with demand reduction strategies being implemented.

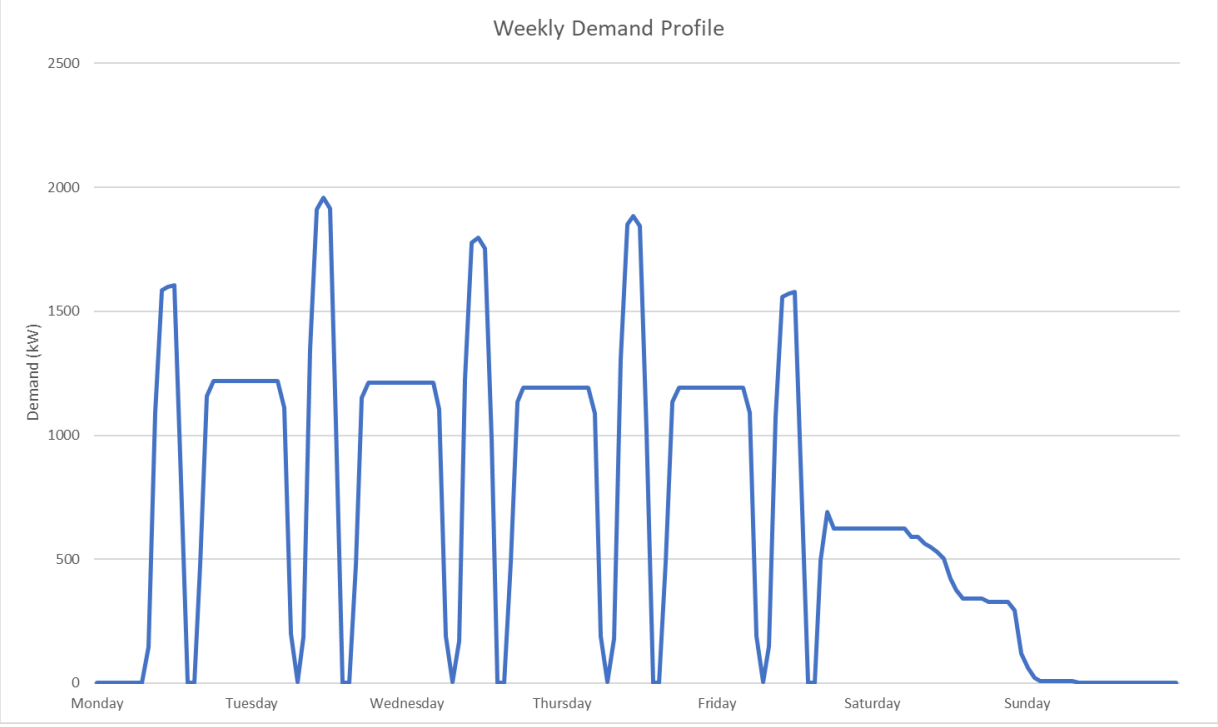


Figure 10 Weekly Demand Profile

Charge Management

Charge management[4] is an essential part of a successful BEB transition plan. Charge management will manage charging operations and energy management. An ideal charging strategy focuses on charging for long periods of time at low charging speeds while ensuring the buses are sufficiently charged to complete their routes. Lower charging rates help to keep a more consistent demand profile, a lower peak demand and extend battery life. Additional strategies like "on" and "off" peak charging can be added to the charging strategy as well to minimize the cost impact on the district.

A charge management system (CMS) is a software system that provides real time demand reduction analysis and automatically manages the fleet of chargers based on each of the BEB's needs. Charge management systems utilize bus telemetric data, route data, and battery data to perform their analysis. Today's systems can limit the overall utility demand to preset limits, based on the power distribution systems designed for charging.

Charge management systems are available through independent third-party suppliers, such as Mobility House, SYNOP, and BP Pulse. Some bus manufacturers also sell charge management systems.

Wendel strongly recommends implementing a charge management system for managing charging operations and energy management. An optimized charge management system which includes demand reduction strategies will also minimize the need for utility side infrastructure upgrades and facility electrical infrastructure upgrades. A peak demand reduction has been incorporated into the analyses and results of this study which mimics an optimized charge management system.

Recommendations and Alternatives

Charging Ports

Wendel's basis of design utilized a 1:1 ratio of chargers to buses, primarily for operational efficiency and flexibility. An alternative to the base charging strategy would be to utilize 2:1 charging for applicable buses. The district may choose to utilize higher kW chargers of at least twice the proposed size which would allow for the charging of two school buses per charger. This would decrease the number of chargers required and associated overall costs. Some disadvantages of utilizing a 2:1 charging strategy are that charger failures affect two buses instead of one and the operational challenges of specific buses to be parked in specific spots for charging. It is also important to note that many 2:1 chargers require both buses to be charged at the same rate simultaneously.

Limiting Unique Bus Models and Charger Sizes

The proposed BEBs are based on the smallest available sizes that meet the requirements determined by the route analysis and charging strategy. Though the district's current manufacturer is used as the basis of design, if the current manufacturer does not offer a bus with the necessary battery size and a different manufacturer does, that manufacturer's bus model is proposed. For example, Lancaster

[4] Charge Management System – end to end software solution to manage EV charging operations & energy management.

CSD's current manufacturer is IC, however IC does not offer a Type A BEB at this time so Bluebird was used as the proposed manufacturer for Type A BEBs.

Many manufacturers have a limited number of battery sizes available today which will likely change as technology becomes more readily available. It is recommended that the district try to limit the number of different manufacturers / models in its fleet to ease operations and ordering. This may be done by waiting for IC to come out with a Type A BEB meeting the criteria discussed in the next section and by selecting the largest proposed BEB sizes for each bus type instead of the smallest available size proposed in this study. Choosing a larger bus size may increase bus costs and increase peak demand. This should be taken into consideration during design.

Proposed charger sizes are based on selecting the smallest size charger needed out of the four charger sizes reviewed (24 kW, 60 kW, 120 kW, 180 kW). It is recommended that the district investigate limiting the number of different charger sizes to ease operations and ordering. Charger sizes procured that vary from the Proposed Charger Size should be greater in kW than proposed.

Selecting a Bus varying from Proposed Bus Size

It is recommended that the district utilize Table 27 below when procuring their BEBs and to try to limit the number of different manufacturers / models in their fleet to ease operations and ordering. Buses procured that vary from the Proposed Bus Size should meet the following criteria:

1. Be greater in kWh than the Minimum Bus Size column.
2. Have an OEM rated efficiency less than or equal to the Maximum OEM Rated Efficiency column. This is equivalent to the bus size in kWh divided by the OEM stated range in miles.
3. Be able to accept a charge equal to or greater than the Minimum Charger Size column.

Bus Number	Bus Type	Minimum Bus Size (kWh)	Minimum Charger Size (kW)	Maximum OEM Rated Efficiency
409	Type C	235	36	1.58
412	Type C	329	105	1.58
415	Type C	281	58	1.58
433	Type C	406	60	1.58
434	Type C	586	67	1.58
436	Type C	360	104	1.58
437	Type C	380	69	1.58
439	Type C	266	52	1.58
441	Type A	359	53	1.12
442	Type C	322	40	1.58
444	Type C	192	43	1.58
445	Type C	237	47	1.58
448	Type C	222	44	1.58
449	Type C	333	52	1.58
450	Type C	287	44	1.58
451	Type C	348	73	1.58

Bus Number	Bus Type	Minimum Bus Size (kWh)	Minimum Charger Size (kW)	Maximum OEM Rated Efficiency
453	Type C	378	80	1.58
455	Type C	210	92	1.58
456	Type C	349	76	1.58
457	Type C	324	56	1.58
458	Type A	204	44	1.12
459	Type C	186	33	1.58
460	Type C	226	45	1.58
461	Type C	198	26	1.58
462	Type C	213	35	1.58
463	Type C	189	34	1.58
464	Type C	172	29	1.58
465	Type C	186	40	1.58
466	Type C	239	25	1.58
467	Type C	182	35	1.58
469	Type C	477	146	1.58
470	Type C	222	39	1.58
471	Type C	208	31	1.58
472	Type C	235	29	1.58
473	Type C	166	28	1.58
474	Type C	212	30	1.58
475	Type C	186	35	1.58
476	Type C	236	31	1.58
477	Type C	197	28	1.58
478	Type C	309	39	1.58
479	Type C	140	23	1.58
480	Type C	225	36	1.58
481	Type C	148	25	1.58
482	Type C	198	35	1.58
483	Type C	254	26	1.58
484	Type C	235	30	1.58
485	Type C	135	9	1.58
486	Type C	194	33	1.58
487	Type C	317	36	1.58
488	Type C	246	48	1.58
489	Type C	188	39	1.58
490	Type C	145	26	1.58

Bus Number	Bus Type	Minimum Bus Size (kWh)	Minimum Charger Size (kW)	Maximum OEM Rated Efficiency
491	Type C	234	38	1.58
492	Type C	180	39	1.58
493	Type C	227	36	1.58
494	Type C	230	45	1.58
495	Type C	262	29	1.58
496	Type C	219	34	1.58
497	Type C	286	36	1.58
498	Type C	237	43	1.58
499	Type C	241	36	1.58
500	Type C	265	30	1.58
501	Type C	346	68	1.58
502	Type C	187	25	1.58
503	Type C	163	32	1.58
504	Type C	355	43	1.58
505	Type C	184	32	1.58
410 - Contracted	Type C	235	36	1.58
414 - Contracted	Type C	235	36	1.58
418 - Contracted	Type C	235	36	1.58
421 - Contracted	Type C	235	36	1.58
422 - Contracted	Type C	235	36	1.58
424 - Contracted	Type C	235	36	1.58
426- Contracted	Type C	235	36	1.58
427- Contracted	Type C	235	36	1.58
428- Contracted	Type C	235	36	1.58
429- Contracted	Type C	235	36	1.58
430- Contracted	Type C	235	36	1.58
431- Contracted	Type C	235	36	1.58
432- Contracted	Type C	235	36	1.58

Bus Number	Bus Type	Minimum Bus Size (kWh)	Minimum Charger Size (kW)	Maximum OEM Rated Efficiency
435-Contracted	Type C	235	36	1.58
438-Contracted	Type C	235	36	1.58

Table 27 Bus and Charger Selection Criteria

Section 6 Electric Utility Analysis

ELECTRIC UTILITY ANALYSIS

Wendel has engaged with the District's electric utility provider, NYSEG, to get a better understanding of the utility's ability to provide the required power for the proposed transition to a BEB fleet. Wendel has provided NYSEG with the future load information the district will incur once the BEBs are implemented. Based on the developed energy requirements and charging strategy, Wendel has worked with the NYSEG to determine options for obtaining power.

A load projection analysis was performed by Wendel to determine the anticipated peak load of the BEBs. The following assumptions were used during this analysis.

- Anticipated peak charger load assume a load factor of 49% based on results of charging model with demand reduction implemented.
- Anticipated charger loads do not include the charging of spare buses which are assumed to charge outside of peak hours.
- Anticipated charger loads include a safety factor of 10%.
- Anticipated charger loads assume the district has added (15) contracted bus's routes back in house, increasing the number of their buses performing routes from (67) to (82)

The following BEB charging load data has been produced for the anticipated peak load of the BEB chargers to be installed:

- Fully Connected Load – 6,181 kVA
- **Anticipated Peak BEB Charger Load – 2,736 kVA**

Total Anticipated Peak Student Transportation Charger Load – 2,376 kVA

The utility, NYSEG, has been asked to provide information regarding their availability to supply the required power. Figure 11 below shows the available capacity of 9.83 MVA from the substation feeding Lancaster CSD.

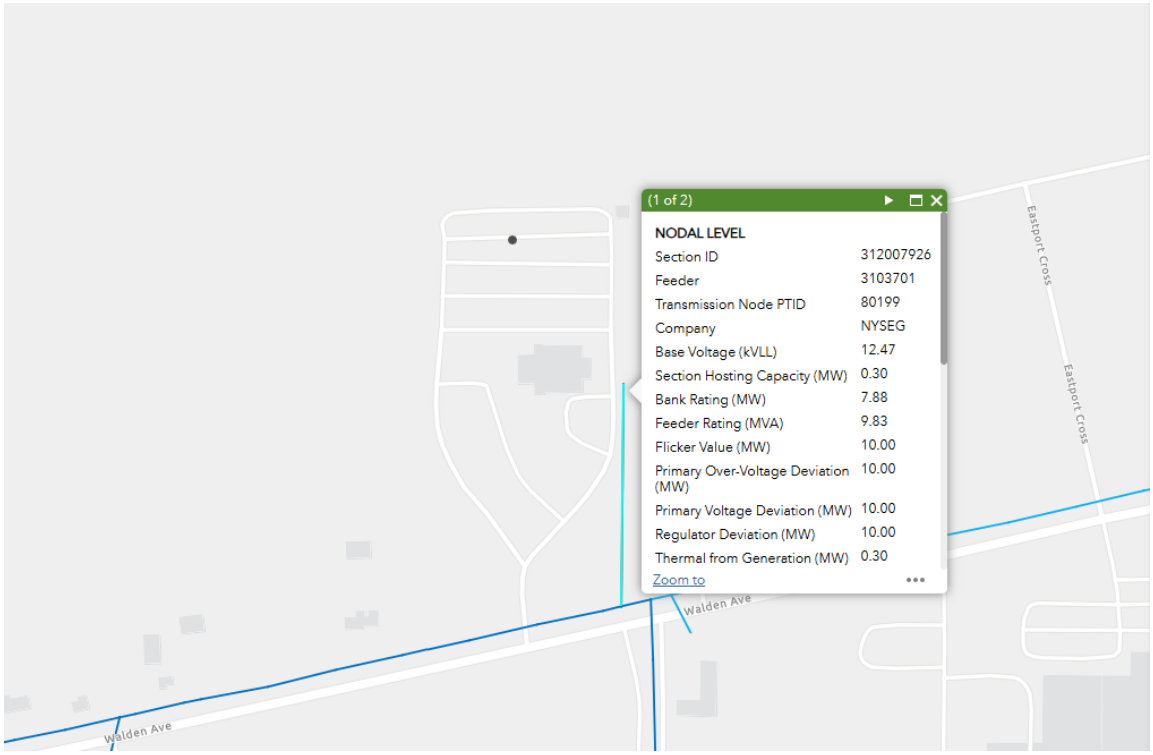


Figure 11 NYSEG Electrification Map

Figure 11 above has been gathered from the NYSEG online electrification map. According to this there is sufficient power available for the new 2800kW service feed that is required for this effort.

Anticipated peak loads including the non-school bus vehicle charger loads were submitted to NYSEG and an assessment of the utility's ability to provide this power was requested. According to the tables provided by NYSEG, the transformer will be overloaded but the feeder will not be.

Medium Voltage Service

School districts normally receive power from their local utility at a nominal voltage of 120/208 volts, 120/240 volts or 277/480 volts. This is categorized as low voltage. The utility utilizes a step-down transformer that steps down the utility's distribution line voltage from the medium voltage used to distribute power across the utility systems to the low voltage for customer usage. Utility distribution medium voltage systems range from 2,300 volts to 39,000 volts depending on the loading on the power system.

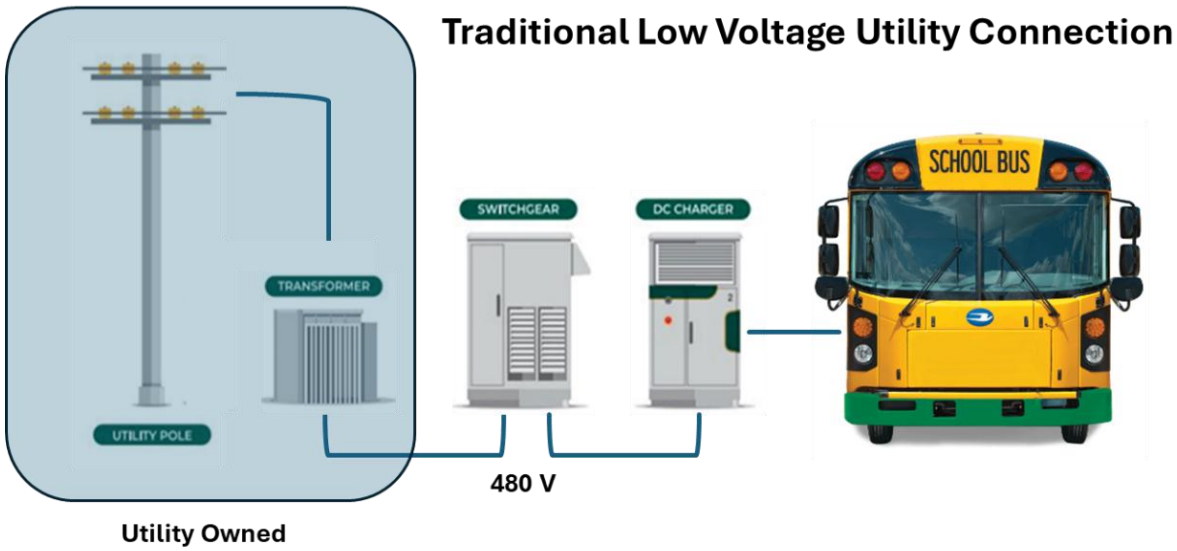


Figure 12 Traditional Low Voltage Utility Connection

The electrification of a school bus fleet requires upgrades to the utility service and the larger the fleet the more power will be required. Utilities will usually only allow up to two utility services to any single address. As part of the electrification studies, a second service is usually required to power the charging systems for the bus fleet due to the amount of power required. Most utilities have a maximum load per service of either 2,000 kVA or 2,500 kVA, depending on the utility. Lancaster CSD is anticipated to have a load of **3,162** kVA, exceeding this maximum load threshold.

Once a school district load exceeds the maximum load per service, the utility may require the district to move to medium voltage service. The school district would then be taking the power from the utility at the distribution level, rather than through a step-down transformer. This requires additional equipment on the part of the school district. Medium voltage (MV) switchgear will be required to interface with the utility. The medium voltage switchgear would then feed into one or more transformers to reduce the distribution voltage down to 480 volts for use by the charging equipment. Low voltage (LV) switchgear will be required to feed the individual chargers that charge the school bus fleet. The medium voltage switchgear and transformer would be owned by the school district under this scenario as seen in Figure 13 below.

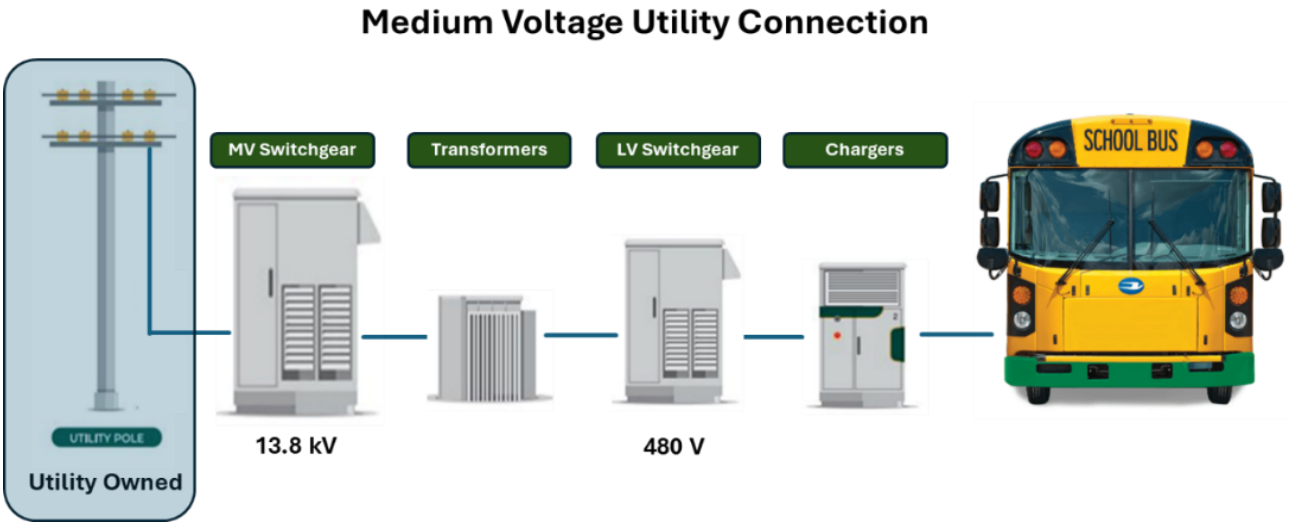


Figure 13 Medium Voltage Utility Connection

NYSEG has not stated whether or not the district will require a medium voltage service. NYSEG has stated that a Capacity Study does not reserve such capacity or approval for a new load until a Load Interconnection Request is submitted, assessed, and mitigations are made. A request to Transmission Planning is made if the load exceeds 1MVA. The Capacity Assessment does not include the requested amount; it only shows the available Capacity they have on the circuit and transformer.

It should also be noted that the available capacity to charge EVs could change over time if new customers bring additional load onto the grid near this site. New loads from other customers could impact this site's future capacity to charge.

NYSEG has also stated the overall costs of the utility upgrades cannot be calculated until the utility performs a design which will occur when Lancaster CSD is ready to install infrastructure and bring additional power to the site. The Utility has stated upgrades may take up to two years, dependent on what upgrades are needed.

Section 7 Concept Development & Phasing Plan

CONCEPT DEVELOPMENT & PHASING PLAN

The concept development and phasing plan is the culmination of the previous tasks in the study. The phasing plan incorporates several components and include:

1. Deadlines issued as part of the state mandate including:
    a. By July 1, 2027, all new school buses purchased and or leased must be zero-emission
    b. By July 1, 2035, all school buses on the road must be zero-emission
2. Lancaster CSD preferred BEB procurement schedule
3. On-site electrical distribution/charger equipment procurement and construction lead times
4. Utility service upgrade equipment and construction lead times
5. Availability of capital funding including state aid, school capital programs and grant funds

For the purposes of this report, it is assumed funding will be available when required for capital improvements and bus purchases.

Existing Conditions

Maintenance and Indoor Bus Storage Facilities

Wendel also performed a walkthrough of the facility to evaluate the maintenance and storage areas as they relate to bus lift capacities, HVAC equipment, and fire protection sprinkler systems. It was observed that the Lancaster CSD bus facility was comprised of indoor maintenance and outdoor bus storage.

This facility has 70,000 lbs. lift capacity with 35,000 lbs. per post. This exceeds the current heaviest Type C BEB school bus of 35,000 lbs. Weights of BEBs are based on manufacturer spec sheets available as of the date of this report and the listed Gross Vehicle Weight Rating (GVWR). The exact weight of the district's electric bus fleet will be determined during design and should be re-evaluated against the current lift capacities during Phase 1 design. As of the date of this report and current manufacturer specifications, the existing lift style and capacity appear to be adequate for the proposed BEBs.

Bus Type	Bus Size and Manufacturer	Gross Vehicle Weight Rating (lbs.)
Type A	140 kWh - Bluebird	14,500
Type A	175 kWh - Bluebird	14,500
Type A	156 kWh - BYD	21,500
Type A	127 kWh - Collins	14,500

Bus Type	Bus Size and Manufacturer	Gross Vehicle Weight Rating (lbs.)
Type A	118 kWh - Greenpower	14,330
Type A	113 - Thomas	14,500
Type C	155 kWh - Bluebird	33,000
Type C	196 kWh - Bluebird	33,000
Type C	282 kWh - BYD	34,788
Type C	210 kWh - IC	35,000
Type C	315 kWh - IC	35,000
Type C	246 kWh - Thomas	33,000
Type D	155 kWh - Bluebird	36,000
Type D	255 kWh - BYD	39,153
Type D	194 kWh - Greenpower	42,900
Type D	387 kWh - Greenpower	42,900
Type D	244 kWh - Thomas	33,000

Table 28 BEB Gross Vehicle Weight Rating

When adding indoor chargers, the addition of heat to the space becomes a consideration. With no proposed indoor charging at this facility, the HVAC system was not evaluated.

The current New York State Mechanical Code requires that mechanical exhaust be provided for indoor repair garages. This equipment is required to be sized to provide a continuous exhaust rate of 0.75 CFM/SF. In cases where gasoline vehicle maintenance is performed, this rate is required to be increased to 1 CFM/SF, or the bottom 18 inches of the space is required to be an electrically classified area with requirements of a Class 1, Division 2 environment. If charging is proposed to occur within some maintenance bays, the required cooling airflow can be determined in the same manner.

This facility does have an existing sprinkler system, but it would be inadequate to provide the recommended protection for Lithium-Ion battery vehicles. While codes do not currently exist specific to this application, the industry has found the greatest risks occur with charging and maintenance of these vehicles. Wendel recommends a sprinkler system capable of 0.7 GPM/SF for all indoor charging and maintenance areas. Where outdoor charging occurs, we recommend providing strategically located fire hydrants for fire department use. Wendel also recommends identifying a dedicated parking space, with 15ft clearance on all sides, where a bus that may have an issue can be parked and evaluated. This location should be within a reasonable proximity to one or more of the provided fire hydrants in case an event was to occur. Refer to Fire protection approach for more detail.

Bus Procurement Schedule

Lancaster CSD currently has (89) school buses in its fleet. The projected BEB procurement schedule for Lancaster CSD can be found in Table 29 below.

Bus Number / Name	Proposed New Bus Size (kWh)	Proposed New Charger Size (kW)	Notes on Conversion Timing	Year Bus Procured (age)	Next Bus Replacement Year*	Proposed Conversion Year
409	315	60		2013	2025	2027
412	330	120	Bus size does not currently exist	2013	2025	2035
415	315	60		2014	2025	2027
433	410	120	Bus size does not currently exist	2016	2028	2028
434	590	120	Bus size does not currently exist	2016	2028	2028
436	370	120	Bus size does not currently exist	2016	2028	2028
437	380	120	Bus size does not currently exist	2016	2028	2028
439	315	60		2016	2028	2028
441	360	60	Bus size does not currently exist	2016	2028	2028
442	330	60	Bus size does not currently exist	2017	2029	2029
444	210	60		2017	2029	2029
445	315	60		2017	2029	2029
448	315	60		2017	2029	2029
449	340	60	Bus size does not currently exist	2017	2029	2029
450	315	60		2018	2030	2030
451	350	120	Bus size does not currently exist	2018	2030	2030
453	380	120	Bus size does not currently exist	2018	2030	2030
455	315	120		2018	2030	2030

Bus Number / Name	Proposed New Bus Size (kWh)	Proposed New Charger Size (kW)	Notes on Conversion Timing	Year Bus Procured (age)	Next Bus Replacement Year*	Proposed Conversion Year
456	350	120	Bus size does not currently exist	2018	2030	2030
457	330	60	Bus size does not currently exist	2018	2030	2030
458	210	60	Bus size does not currently exist	2017	2029	2029
459	210	60		2019	2031	2031
460	315	60		2019	2031	2031
461	210	60		2019	2031	2031
462	315	60		2019	2031	2031
463	210	60		2019	2031	2031
464	210	60		2019	2031	2031
465	210	60		2019	2031	2031
466	315	60		2019	2031	2031
467	210	60		2020	2032	2032
469	480	180	Bus size does not currently exist	2020	2032	2032
470	315	60		2020	2032	2032
471	210	60		2020	2032	2032
472	315	60		2020	2032	2032
473	210	60		2020	2032	2032
474	315	60		2020	2032	2032
475	210	60		2020	2032	2032
476	315	60		2021	2033	2033
477	210	60		2021	2033	2033
478	315	60		2021	2033	2033
479	210	24		2021	2033	2033
480	315	60		2021	2033	2033
481	210	60		2021	2033	2033
482	210	60		2021	2033	2033
483	315	60		2021	2033	2033
484	315	60		2021	2033	2033
485	210	24		2022	2034	2034
486	210	60		2022	2034	2034

Bus Number / Name	Proposed New Bus Size (kWh)	Proposed New Charger Size (kW)	Notes on Conversion Timing	Year Bus Procured (age)	Next Bus Replacement Year*	Proposed Conversion Year
487	320	60	Bus size does not currently exist	2022	2034	2034
488	315	60		2022	2034	2034
489	210	60		2022	2034	2034
490	210	60		2022	2034	2034
491	315	60		2023	2035	2034
492	210	60		2023	2035	2034
493	315	60		2023	2035	2034
494	315	60		2023	2035	2034
495	315	60		2023	2035	2034
496	315	60		2023	2035	2035
497	315	60		2023	2035	2035
498	315	60		2024	2036	2035
499	315	60		2024	2036	2035
500	315	60		2024	2036	2035
501	350	120	Bus size does not currently exist	2024	2036	2035
502	210	60		2024	2036	2035
503	210	60		2024	2036	2035
504	360	60	Bus size does not currently exist	2024	2036	2035
505	210	60		2024	2036	2035
410 - Contracted	315	60		2014	2025	2035
414 - Contracted	315	60		2014	2026	2035
418 - Contracted	315	60		2014	2026	2035
421 - Contracted	315	60		2014	2026	2035
422 - Contracted	315	60		2015	2027	2027
424 - Contracted	315	60		2015	2027	2027
426- Contracted	315	60		2015	2027	2027
427- Contracted	315	60		2015	2027	2027

Bus Number / Name	Proposed New Bus Size (kWh)	Proposed New Charger Size (kW)	Notes on Conversion Timing	Year Bus Procured (age)	Next Bus Replacement Year*	Proposed Conversion Year
428-Contracted	315	60		2015	2027	2027
429-Contracted	315	60		2015	2027	2027
430-Contracted	315	60		2015	2027	2027
431-Contracted	315	60		2016	2028	2028
432-Contracted	315	60		2016	2028	2028
435-Contracted	315	60		2016	2028	2028
438-Contracted	315	60		2016	2028	2028
Spare - 440	315	120	2:1 with bus 443	2016	2028	2028
Spare - 443	315		2:1 with bus 440	2017	2029	2029
Spare - 446	315	120	2:1 with bus 447	2017	2029	2029
Spare - 447	315		2:1 with bus 446	2017	2029	2029
Spare - 452	315	24		2018	2030	2030
Spare - 454	315	24		2018	2030	2030
Spare - 468	315	24		2019	2031	2031

Table 29 BEB Procurement Schedule

**Next Bus replacement year is the year the district would typically replace the associated bus, these years were provided to Wendel by the district for reference. If next bus replacement year is before 2027, it is assumed the bus will be replaced with a diesel bus. Any buses with a replacement year after 2027 cannot be replaced with a new diesel bus per NYS Mandate.*

***This proposed BEB procurement schedule is subject to change based on client procurement.*

Based on the proposed procurement schedule, the route analysis, and the charging strategy developed for Lancaster CSD, the projected charger load growth over time assuming demand reduction strategies are implemented can be found in Figure 14 below.

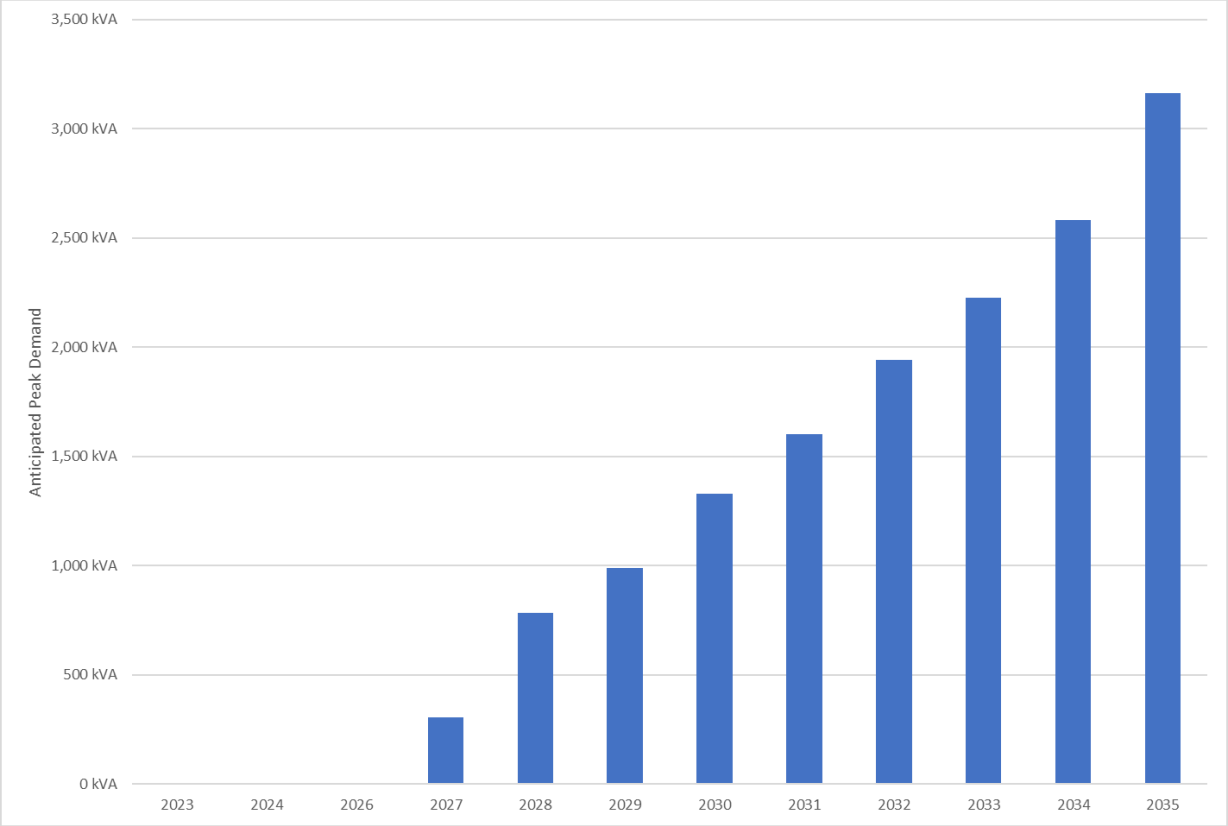


Figure 14 Total Anticipated Charger Peak Load

Phasing Plan

The proposed phasing plan for Lancaster CSD consists of (3) phases. The district can add buses at their preferred rate and the infrastructure will be available and ready to charge BEBs. The proposed equipment layout is included in Appendix C - Concept Development & Phasing Plan Drawings of this report. Lancaster CSD should also note that early permitting and utility coordination is necessary to starting these anticipated phase dates. The district should look to begin this process simultaneously with Phase 1 design. These plans assume the district has added (15) contracted bus's routes back in house, increasing the number of their buses performing routes from (67) to (82) and that the anticipated load of the chargers will be greater than NYSEG's maximum load per service which would require the district to move to medium voltage service. Refer to Section 6 Electric Utility Analysis for more information.

Should the district not bring the additional (15) contracted bus's routes back in house and only have the (67) route buses charging mid-day, the anticipated load of the chargers would be within NYSEG's maximum load per service and the district would not need to move to medium voltage service. This would reduce the amount of infrastructure upgrades and lower estimated costs. Options to lower the district's anticipated load should be explored during design including charge management and demand reduction as well as leaving contracted bus routes contracted.

Phase 1 (2027 – 2029)

Phase 1 incorporates several components necessary for the overall site development.

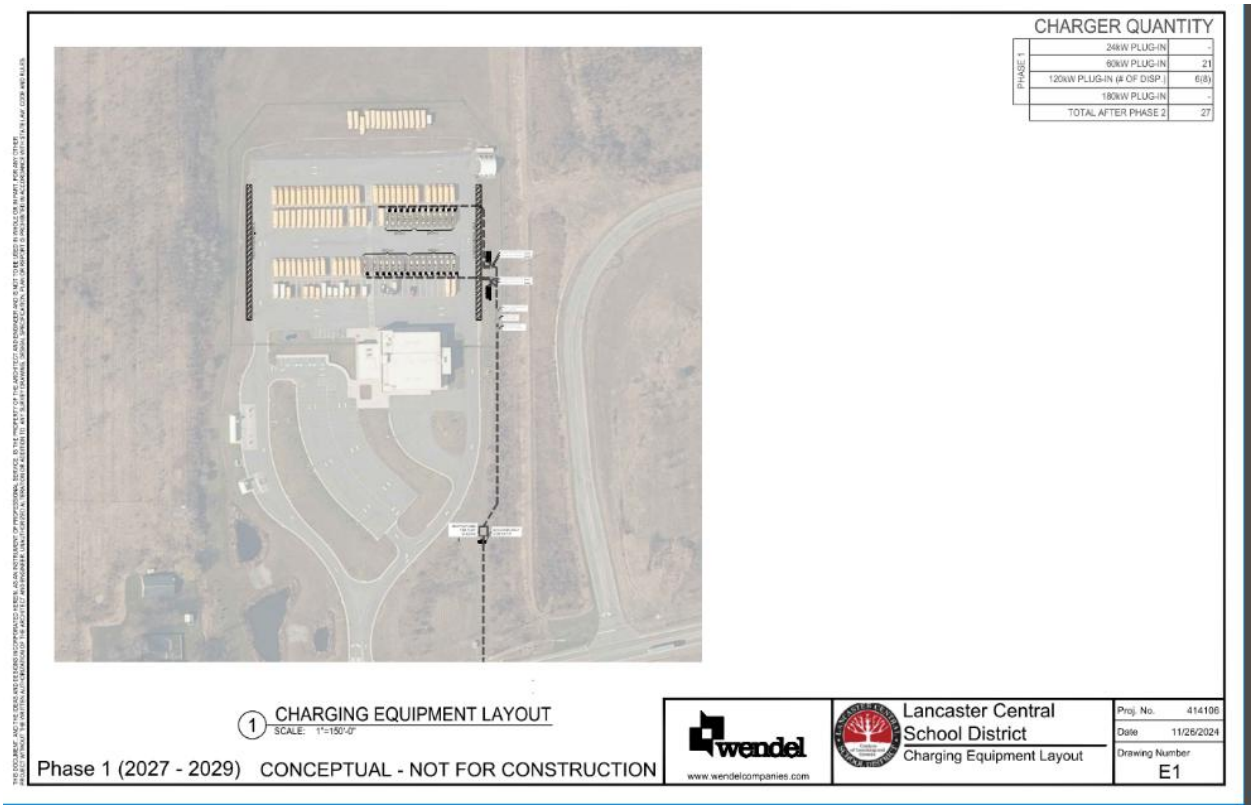


Figure 15 Phase 1 Site Layout

New utility transformer – The electric school bus charging infrastructure for Lancaster School District should be powered through a new utility service feed from the overhead primary distribution. This will feed a medium voltage switchgear that will be owned by Lancaster CSD. This switchgear will feed a new pad mounted 3750 kVA transformer is located outside in existing lawn area as seen on the Phase 1 Implementation layout in Appendix C - Concept Development & Phasing Plan Drawings of this report. There will be a 5000A main switchboard to feed the chargers and additional distribution panelboard(s).

Ductbank from new service to power distribution equipment – An underground ductbank should be installed from the new transformer to the new electrical distribution equipment.

Power feeds and charging equipment for up to (27) new chargers – New power feeds should be installed underground to the charging equipment proposed for installation outside and above ground, suspended from roof structure, for charging equipment proposed for installation on the interior of bus storage building. (21) 60 kW chargers, and (6) 120 kW charger with (2) connected dispensers. Proposed 24kW chargers require 480V connection is provided directly to the charging equipment. The 60kW and 120kW charging systems consist of a charger cabinet and remote mounted dispensers

which take 480V connections at the chargers and require high voltage DC interconnection to the dispensers.

Fire protection system – Upgrades to the fire protection system in the maintenance facility and bus wash should be provided to increase protection against battery electric bus fires. This system will require a fire pump and for all heads and branch piping to be replaced in this area. The fire pump building will be approximately 15' x 13' and is being proposed to be in the grassy area south-east of the facility. This fire pump building will intercept the existing 6" water service from the street. Water will pass up into this building, through a 6" backflow preventer, through the pump, and back underground to the facility. This pumped supply will utilize the existing 6" water main to enter the building. The existing 4" backflow preventer in the building and 4" main serving the maintenance area will need to be removed and reworked. Branches serving offices and other adjacent spaces can be reconnected to the new piping and reutilized. The fire pump building location can shift during design if Lancaster CSD has a different preference, and security should also be considered during design since the building is outside of the fence line.

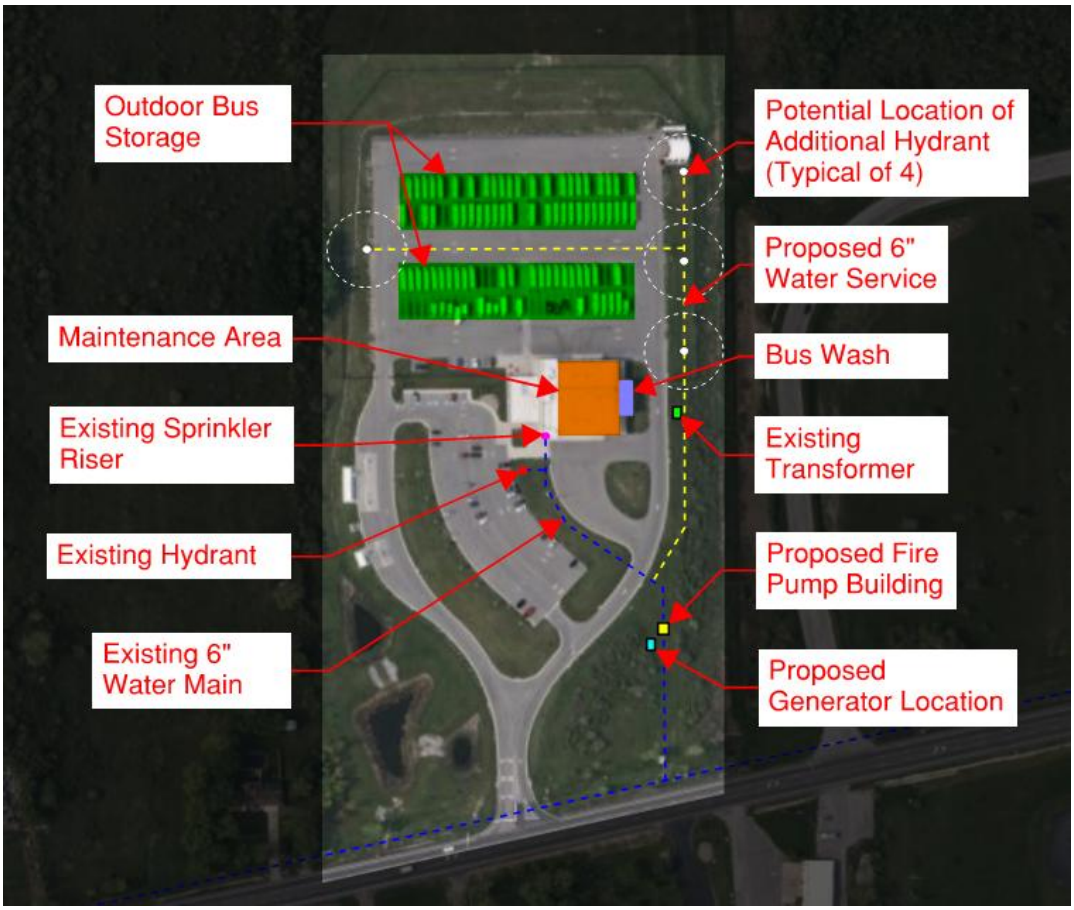


Figure 16 Fire Protection System

In the design phase, head locations will need to be closely coordinated with existing equipment and systems to ensure full sprinkler coverage without obstructions. Head spacing will become tighter to

achieve the desired coverage. The mains and branch pipes in the maintenance areas will likely need to increase in size, but any piping that can be reused will remain. Where the room is larger than the area that needs to be protected, this system will be designed to protect 15 feet in all directions beyond the hazard. The area of the new sprinkler system is approximately 10,200 square feet total for the maintenance area.

Since this facility has only external parking, the design described for maintenance areas would not apply to exterior charging. In this case we would recommend installing fire hydrants every 100 - 250 feet, approximately, throughout the parking area. This would aid the fire department in supplying large amounts of water if a bus were to catch fire. The proximity of hydrants may allow for the use of multiple hydrants to contain the fire if needed. The water service required to serve the fire hydrants could be upstream or downstream of the fire pump. In this case we are proposing them to be downstream and fed from the pump. At this location, this would result in roughly four (4) additional hydrants and about 1,150 feet of 6-inch pipe. Based on available budget during design, this approach could be scaled to whatever is deemed reasonable by the district. Due to these hydrants being located within snow removal areas, it is suggested that bollards be installed to protect them. During winter and heavy snow accumulation, areas around these hydrants should be kept free of snow to allow for easy access by the fire department if needed.

Electric fire pumps require an alternate source of power in case the primary (typically the utility) is lost. This alternate source of power is typically an emergency generator that would provide necessary backup power for the fire pump. The generator could be diesel, or potentially natural gas if preferred by Lancaster and approved by the local AHJ. The generator would be sized only to handle the fire pump. A new fire pump electrical service would also be required to feed the fire pump building.

The actual size of the fire pump will be confirmed during the design but at this time, we expect the pump would likely be around 1250 gpm, 100 psi, and 60 hp.

If space is available, best practice is to have a dedicated location outside for a bus that may have a maintenance or battery concern and needs to be evaluated. We would recommend that this dedicated area have clearance of at least 15ft on each side of the bus from any other combustibles. If it catches on fire, it would be isolated and minimize risk. We also recommend having a fire hydrant nearby, so the responding fire department has easy access to water. With the hydrants already proposed above, the dedication space could be anywhere in the existing lot.

Costs

- Charging system infrastructure for Phase 1: **$9,940,000**
- Fire Protection infrastructure: **$1,741,000**
- Total Phase 1 estimated cost: **$11,681,000**

Detailed cost estimates are included in Section 8 Transition Plan Cost Estimates. Refer to this section for information regarding items included and excluded from these costs.

Phase 2 (2030 – 2032)

Phase 2 incorporates several additional components necessary to provide charging equipment for the proposed electrical bus fleet size.

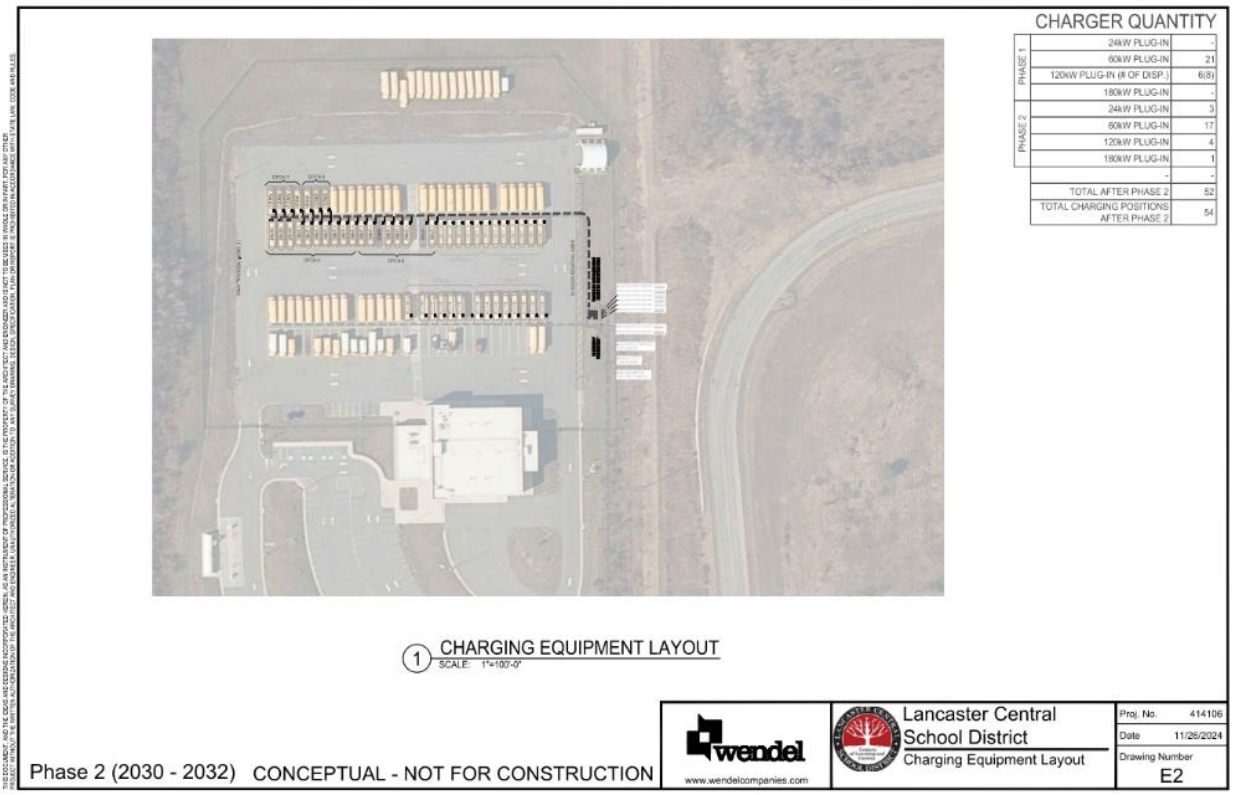


Figure 17 Phase 2 Site Layout

New power distribution equipment – There will be an (3) 800A switchboards, and (1) 600A switchboard to feed the proposed chargers. It will be supplied from the main distribution switchboard provided under phase 1 scope.

Power feeds and charging equipment for up to (25) new chargers – New power feeds should be installed underground to the charging equipment proposed for installation outside and above ground, suspended from roof structure, for charging equipment proposed for installation on the interior of bus storage building. (3) 24 kW chargers, (17) 60 kW chargers, and (4) 120 kW chargers. These will be same or similar chargers provided under the previous phase, requiring same electrical interconnections.

Costs

- Charging system infrastructure for Phase 2: **$5,681,000**
- Total Phase 2 estimated cost: **$5,681,000**
  Detailed cost estimates are included in Section 8 Transition Plan Cost Estimates. Refer to this section for information regarding items included and excluded from these costs.

Phase 3 (2033 – 2035)

Phase 3 incorporates several additional components necessary to provide charging equipment for the proposed electrical bus fleet size.

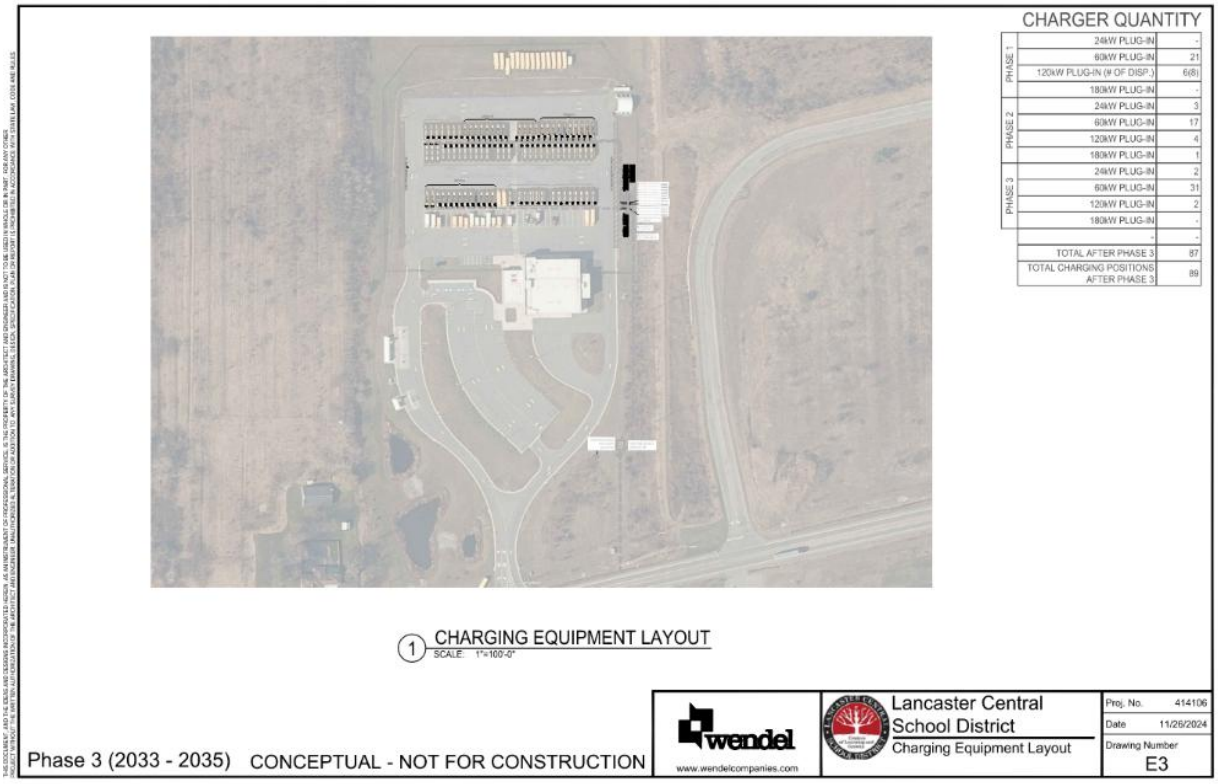


Figure 18 Phase 3 Site Layout

New power distribution equipment – There will be (3) 1200A switchboards to feed the proposed chargers. It will be supplied from the main distribution switchboard provided under phase 1 scope.

Power feeds and charging equipment for up to (35) new chargers – New power feeds should be installed underground to the charging equipment proposed for installation outside and above ground, suspended from roof structure, for charging equipment proposed for installation on the interior of bus storage building. (2) 24 kW chargers, (31) 60 kW chargers, and (2) 120 kW chargers. These will be same or similar chargers provided under the previous phase, requiring same electrical interconnections.

Costs

- Charging system infrastructure for Phase 3: **$8,578,000**
- Total Phase 3 estimated cost: **$8,578,000**
  Detailed cost estimates are included in Section 8 Transition Plan Cost Estimates. Refer to this section for information regarding items included and excluded from these costs.

The total estimated cost of the transition construction is **$23,468,000 to $25,938,000**

Fire protection approach

It is common industry belief that standard sprinkler protection for parking garages and maintenance areas is inadequate for battery electric school buses, and we agree. Since there are not currently code requirements for sprinkler protection of this scenario, we have developed a custom approach. Our approach on the Transit bus side has currently been reviewed and accepted by FM Global, State Fire Marshal's in CT, MA, and NY, CTDOT, and a variety of insurance companies. On the school bus side this approach has been recommended at several different districts as they move forward to BEB. Typically, the exterior shell of a school bus does contain a bit more metal than a transit bus, but many exterior parts like bumper, moldings, side mirror covers, and mud flaps are still made of plastic, which are quicker to catch if an adjacent bus is on fire. Additionally, to extend battery range, more and more buses are being constructed of lighter weight, alternative materials. We strongly recommend the same fire protection approach for all battery powered buses until NFPA releases specific code requirements. Due to the chemistry of lithium-ion batteries, it is nearly impossible to completely extinguish them once the chemical reaction has started. They can reignite for up to 24 hours in most cases. The current recommendation from NFPA for Lithium-Ion fires is large amounts of water to suppress the fire.

When buses are indicating warnings, damaged, or have problems, they are typically brought to maintenance. Although a bus may be left outside if the battery is a concern, maintenance is still a likely location for problems to occur. Additionally, maintenance areas are often equipped with portable chargers. This enhanced sprinkler coverage will allow the flexibility of locally charging any of the buses as well.

In all areas where battery electric school buses will be charged or maintained, we recommend providing a sprinkler system capable of 0.7 gallons per minute, per square foot (gpm/sf). Utilizing Control Mode Specific Application (CMSA) type sprinkler heads will require calculating the most remote 15 heads, to ensure the remaining system has adequate capacity. The shell of the bus prevents water from getting directly to the source of the fire. Additionally, batteries are usually located within a compartment that also prevents water from reaching. This sprinkler design approach has been developed to suppress an electric bus fire and prevent the fire from spreading to adjacent buses. This helps to protect the building and buy time for people to get out safely. It is also in place to contain the fire long enough for fire department to respond and take the proper measures from there.

The existing facility has a sprinkler system that serves the maintenance area and bus wash. Although the water pressure from the street was observed at roughly 75 psig, the existing water service will be inadequate to provide sufficient pressure and flow required for an electric bus application. A fire pump will be required to achieve the system demand necessary and does not appear to be able to fit indoors, so an outdoor pump house will be utilized. Locating this pump house in the grassy area south-east of the building will position it well to intercept the existing water service while providing the least amount of disturbance to the facility.

Maintenance of the fire protection system is critical to ensure longevity and performance during time of need. Ongoing compliance with NFPA 25 will be essential for the entire sprinkler system.

Schedule

A preliminary schedule was developed as a guide for the implementation of Phase 1 of the transition plan. This preliminary schedule is heavily impacted by current supply chain issues associated with electrical equipment, particularly electrical switchgear. The current lead time for switchgears is estimated to be 15 months.

Phase 1 Preliminary Schedule

Milestone description	Months	1 Year												2 Years												3 Years											
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Utility Service																																					
Utility Design	2																																				
Transformer Delivery	12																																				
Utility Distribution Construction	6																																				
Site Design and Construction																																					
Phase 1 Detailed Design & SED Review	5																																				
Bid and Award Construction Package	1.5																																				
Order Main Switchgear, Switch Boards, and Chargers	1																																				
Switch Boards and Chargers Delivery	12																																				
Switchgear Delivery	15																																				
Construction	14																																				
Testing																																					
Commission Chargers Switchgear and Switch Boards	1																																				

Figure 19 Phase 1 Preliminary Construction Schedule

Section 8 Transition Plan Cost Estimates

Transition Plan Cost Estimates

Wendel has developed a high-level opinion of probable costs to implement the transition plan described in the previous section. Estimates from previous studies were utilized as the basis of the transition plan cost estimate and scaled for Lancaster CSD. The estimates include the phased implementation costs of the following major items:

1. Electrical equipment and installation costs for the utility interface
2. Bus charging system distribution equipment and installation costs including switchgear, panelboards, wiring
3. Charger and dispenser and installation costs
4. Associated sitework and civil costs
5. Other costs associated with a transition, an addition, renovations, etc.

The following items were excluded from the estimates:

7. School District portion of any estimated charges for the utility to upgrade the system to provide the power required to the site for bus charging
8. Utility fees
9. Construction Management (CM) fees
10. Phasing costs within each phase
11. Costs of the BEBs themselves
12. Chargers, equipment, and all other costs associated with the charging of the district's non school bus vehicles

The estimated costs for the proposed BEBs themselves can be found in Table 30 below. These costs were acquired in the Spring of 2024 and may vary based on region, bus supplier, warranty option selected, and bus customization / add-ons. These costs do not include escalation.

Make	Bus Type	Bus Size (kWh)	Estimated Base Cost per Bus
Blue Bird	Type A	140	$350,000
Blue Bird	Type A	175	$400,000
BYD	Type A	156	$343,000
Greenpower	Type A	118	$273,000
Thomas	Type A	113	$305,000
Blue Bird	Type C	155	$428,000
BYD	Type C	282	$464,000
IC Bus	Type C	210	$405,000
IC Bus	Type C	315	$475,000
Thomas Built	Type C	246	$425,000
Blue Bird	Type D	155	$454,000
BYD	Type D	255	$465,000

Make	Bus Type	Bus Size (kWh)	Estimated Base Cost per Bus
Greenpower	Type D	194	$424,000

Table 30 Estimated BEB Costs

Incentives and Grants

Leveraging financial incentives to fund BEBs and charging infrastructure can help with the transition of diesel or gasoline powered buses to BEBs. Grants, rebates, vouchers, and tax credits can help mitigate the higher upfront vehicle costs and infrastructure investments. Several State and federal programs offer funding opportunities for both BEBs and chargers. The below incentives are not guaranteed and are only applicable as of the date of this report. All information is from NYSERDA's Electric School Bus Guidebook[5], an online resource available to the public. Please contact your NYSERDA representative for more information including eligibility, program requirements, and application process.

New York School Bus Incentive Program – School Bus Voucher

School Bus Type Base	Base Voucher	Priority District Bonus	Scrappage Bonus	V2G Add-on	Wheelchair Add-on
New Type A	$114,000	$28,500	$47,500	$9,500	$8,000
New Type C	$147,000	$36,750	$61,250	$12,250	$8,000
New Type D	$156,000	$39,000	$65,000	$13,000	$8,000
Repowered A	$105,000	$21,000	N/A	$7,000	N/A
Repowered C	$135,000	$27,000	N/A	$9,000	N/A

Table 31 NYSBIP School Bus Voucher from NYSERDA's School Bus Guidebook

Joint Utilities of New York Medium- and Heavy-Duty EV Make-Ready Pilot

Utilities may provide incentives up to 90% of the utility-side infrastructure costs and up to 50% of customer-side costs to qualifying projects. Customer-side incentives are subject to dollar per kW caps, which vary by utility.

Utility	Customer-Side Incentive Cap
Central Hudson	$658.36/kW
Con Edison	$980.76/kW

[5]NYSERDA. (2024, June). Retrieved from Electric School Bus Guidebook Guide 4: Financial Incentives: https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Programs/Electric-School-Bus/Financial-Incentives-for-Electric-School-Buses-and-Chargers.pdf

Utility	Customer-Side Incentive Cap
National Grid	$440.96/kW
NYSEG	$409.07/kW
Orange and Rockland	$592.77/kW
RG&E	$712.08/kW

Table 32 Make-Ready Pilot Incentives from NYSERDA's School Bus Guidebook

New York School Bus Incentive Program – Charging Voucher

Type	Base Voucher Amount	With Fleet Electrification Plan
Non-Priority District	$25,000	$55,000
Priority District	$35,000	$65,000

Table 33 NYSBIP Charging Voucher from NYSERDA's School Bus Guidebook

Opinion of Probable Construction Cost

Project Name: Lancaster BEB Study
Project Owner: Lancaster CSD
Project Location: Lancaster, NY
Wendel Project Number: 414106
Phase: SD
Date: January 23, 2025

Division	Description	Total			
	Phase 1 Total	$ 9,466,337			
		Range $ 8,993,021	to	$	9,939,654
	Phase 2 Total	$ 5,410,081			
		Range $ 5,139,577	to	$	5,680,585
	Phase 3 Total	$ 8,168,573			
		Range $ 7,760,145	to	$	8,577,002
	Fire Protection	$ 1,657,803			
		Range $ 1,574,913	to	$	1,740,694
	Project Total	$24,702,796			
	Project Total Range	$23,467,656	to	$	25,937,935

Assumptions/Exclusions:

Lead time for the medium voltage equipment is currently a minimum of 52 weeks.
The switchboards for this project currently have a 40 week lead time.
Excludes utility fees. (national Grid, NYSEG, Verizon, etc.)
Excludes any CM fees.
Includes pads for each EVD.
Assumes the 24kW units to be complete units. These will be mounted on a support structure and fed with AC power and data.
All primary, secondary and power/data runs to the EVD are concrete encased.
Includes CAT6 cable and 6-strand fiber from the BCS to each EVD. All will be terminated and tested.
Includes pavement removal and repair.
Excludes any phasing costs within each phase.
Each phase is escalated based on the approximate date of construction.

Opinion of Probable Construction Cost

Project Name: Lancaster BEB Study
Project Owner: Lancaster CSD
Project Location: Rochester, NY
Wendel Project Number: 414106
Phase: Phase 1 - BEB
Date: January 23, 2025

DIVISION	DESCRIPTION	QTY	UNIT	UNIT COST	UNIT OF MEASURE	SUBTOTAL	DIVISION SUBTOTAL
26 00 00	**Electrical**						
	Primary to MSWBD-1						**$370,058**
	5" GRC	30	LNFT	$ 10,733.28	C	$ 3,220	
	4" PVC	360	LNFT	$ 1,600.80	C	$ 5,763	
	5" PVC	1,520	LNFT	$ 1,972.51	C	$ 29,982	
	4" Locknut	24	EA	$ 2,798.76	C	$ 672	
	5" Locknut	24	EA	$ 3,715.57	C	$ 892	
	5" Plastic Bushing	4	EA	$ 2,882.46	C	$ 115	
	5" Cut & Thread	2	EA	$ 314.81	E	$ 6	
	5" Galvanized Coup	2	EA	$ 7,369.92	C	$ 147	
	4" PVC Term Adpt	24	EA	$ 3,778.73	C	$ 907	
	5" PVC Term Adpt	16	EA	$ 4,520.99	C	$ 723	
	4" PVC Coup	24	EA	$ 3,070.90	C	$ 737	
	5" PVC Coup	12	EA	$ 3,911.84	C	$ 469	
	4" PVC-40 Elbow	24	EA	$ 18,867.76	C	$ 4,528	
	5" PVC 90D Sweep-48" Radius	8	EA	$ 28,622.35	C	$ 2,290	
	4"x3" Base Spacer	45	EA	$ 1,411.15	C	$ 635	
	5"x3" Base Spacer	194	EA	$ 1,760.97	C	$ 3,412	
	#1/0 THHN CU Stranded Wire	160	LNFT	$ 5,019.82	M	$ 803	
	#500MCM THHN CU Stranded Wire	1,320	LNFT	$ 18,503.18	M	$ 24,424	
	#600MCM THHN CU Stranded Wire	2,640	LNFT	$ 22,480.03	M	$ 59,347	
	#1/0 15KV CU Grd EP/PVC Wire	480	LNFT	$ 11,267.70	M	$ 5,408	
	1/8" Poly Pull Line	1,639	LNFT	$ 509.79	M	$ 836	
	#4/0 Stranded Bare Copper Wire	300	LNFT	$ 18,221.28	M	$ 5,466	
	3/4"x10' Copper Ground Rod	12	EA	$ 135.42	E	$ 1,625	
	5" GRC 90D Elbow-48" Radius	6	EA	$ 894.69	E	$ 5,368	
	Cadweld	12	EA	$ 66.13	E	$ 794	
	Switchgear Pad	2	EA	$ 4,456.25	E	$ 8,913	
	Pipe Bollard	32	EA	$ 1,000.00	E	$ 32,000	
	Power Manhole	1	EA	$ 4,025.00	E	$ 4,025	
	Concrete Ductbank (per ft)	720	EA	$ 169.63	E	$ 122,134	
	5/15kV Termination	6	EA	$ 802.13	E	$ 4,813	
	5/15 kV 3750kVA Transformer (install)	1	EA	$ 6,900.00	E	$ 6,900	
	MSGR-1 15kV Switchboard (install)	1	EA	$ 15,093.75	E	$ 15,094	
	MSWBD-1 5000 amp switchboard (install)	1	EA	$ 17,609.38	E	$ 17,609	
	MSWBD-1 to DPCH						**$184,682**
	3" PVC	240	LNFT	$ 1,249.13	C	$ 2,998	
	3-1/2" PVC	600	EA	$ 1,428.51	C	$ 8,571	
	3" Locknut	6	EA	$ 1,959.62	C	$ 118	
	3-1/2" Locknut	12	EA	$ 2,427.49	C	$ 291	
	3" PVC Term Adpt	6	EA	$ 3,005.75	C	$ 180	
	3-1/2" PVC Term Adpt	12	EA	$ 3,379.28	C	$ 406	
	3" PVC Coup	9	EA	$ 2,520.11	C	$ 227	
	3-1/2" PVC Coup	18	EA	$ 2,835.44	C	$ 510	
	3" PVC-40 Elbow	9	EA	$ 14,892.50	C	$ 1,340	
	3-1/2" PVC-40 Elbow	18	EA	$ 18,538.00	C	$ 3,337	
	3"x3" Base Spacer	30	EA	$ 1,403.69	C	$ 421	
	4"x3" Base Spacer	75	EA	$ 1,411.15	C	$ 1,058	
	#1/0 THHN CU Stranded Wire	720	LNFT	$ 5,019.82	M	$ 3,614	
	#2/0 THHN CU Stranded Wire	300	LNFT	$ 5,804.54	M	$ 1,741	
	#500MCM THHN CU Stranded Wire	1200	LNFT	$ 18,503.18	M	$ 22,204	
	#600MCM THHN CU Stranded Wire	2880	LNFT	$ 22,480.03	M	$ 64,742	
	#4/0 Stranded Bare Copper Wire	200	LNFT	$ 18,221.28	M	$ 3,644	
	3/4"x10' Copper Ground Rod	24	EA	$ 135.42	E	$ 3,250	
	Cadweld	24	EA	$ 66.13	E	$ 1,587	
	Switchgear Pad	4	EA	$ 4,456.25	E	$ 17,825	

Opinion of Probable Construction Cost

Project Name: Lancaster BEB Study
Project Owner: Lancaster CSD
Project Location: Rochester, NY
Wendel Project Number: 414106
Phase: Phase 1 - BEB
Date: January 23, 2025

DIVISION	DESCRIPTION	QTY	UNIT	UNIT COST	UNIT OF MEASURE	SUBTOTAL	DIVISION SUBTOTAL
	Concrete Ductbank (per ft)	110	LF	$ 169.63	E	$ 18,659	
	DPCH-1 800A Distribution Board (install)	1	EA	$ 6,514.75	E	$ 6,515	
	DPCH-2 1000A Distribution Board (install)	1	EA	$ 8,412.25	E	$ 8,412	
	DPCH-3 800A Distribution Board (install)	1	EA	$ 6,514.75	E	$ 6,515	
	DPCH-4 800A Distribution Board (install)	1	EA	$ 6,514.75	E	$ 6,515	
	DPCH to BCS						**$89,209**
	1-1/2" PVC	1,310	LNFT	$ 746.96	C	$ 9,785	
	2-1/2" PVC	350	LNFT	$ 1,107.72	C	$ 3,877	
	1-1/2" Locknut	42	EA	$ 624.89	C	$ 262	
	2-1/2" Locknut	12	EA	$ 1,477.93	C	$ 177	
	1-1/2" PVC Term Adpt	42	EA	$ 2,090.30	C	$ 878	
	2-1/2" PVC Term Adpt	12	EA	$ 2,776.62	C	$ 333	
	1-1/2" PVC Coup	63	EA	$ 1,641.34	C	$ 1,034	
	2-1/2" PVC Coup	18	EA	$ 2,151.02	C	$ 387	
	1-1/2" PVC-40 Elbow	63	EA	$ 6,835.60	C	$ 4,306	
	2-1/2" PVC-40 Elbow	18	EA	$ 11,516.10	C	$ 2,073	
	2"x3" Base Spacer	164	EA	$ 1,389.30	C	$ 2,275	
	3"x3" Base Spacer	44	EA	$ 1,403.69	C	$ 614	
	#8 THHN CU Stranded Wire	1,441	LNFT	$ 1,720.69	M	$ 2,480	
	#6 THHN CU Stranded Wire	385	LNFT	$ 2,094.37	M	$ 806	
	#2 THHN CU Stranded Wire	6,080	LNFT	$ 3,743.22	M	$ 22,759	
	#3/0 THHN CU Stranded Wire	1,640	LNFT	$ 7,646.87	M	$ 12,541	
	Concrete Equipment Pad	17	CY	$ 650.00	E	$ 11,050	
	Concrete Ductbank (per ft)	80	LNFT	$ 169.63	E	$ 13,570	
	BCS to EVD DC Power						**$883,492**
	2" PVC	170	LNFT	$ 854.87	C	$ 1,453	
	3" PVC	7,540	LNFT	$ 1,249.13	C	$ 94,184	
	2" Locknut	2	EA	$ 794.49	C	$ 16	
	3" Locknut	56	EA	$ 1,959.62	C	$ 1,097	
	2" PVC Term Adpt	2	EA	$ 2,411.95	C	$ 48	
	3" PVC Term Adpt	56	EA	$ 3,005.75	C	$ 1,683	
	2" PVC Coup	3	EA	$ 1,803.43	C	$ 54	
	3" PVC Coup	84	EA	$ 2,520.11	C	$ 2,117	
	2" PVC-40 Elbow	3	EA	$ 8,482.40	C	$ 254	
	3" PVC-40 Elbow	84	EA	$ 14,892.50	C	$ 12,510	
	2"x3" Base Spacer	21	EA	$ 1,389.30	C	$ 295	
	3"x3" Base Spacer	943	EA	$ 1,403.69	C	$ 13,230	
	Concrete Ductbank (per ft)	600	LNFT	$ 169.63	E	$ 101,778	
	4/0 2kV DLO RHW Cable	9,538	LNFT	$ 16,299.81	M	$ 155,468	
	3/0 2kV DLO RHW Cable	215	LNFT	$ 13,449.61	M	$ 2,892	
	373kcmil 2kV DLO RHW Cable	19,100	LNFT	$ 25,515.63	M	$ 487,349	
	350kcmil 2kV DLO RHW Cable	430	LNFT	$ 21,079.27	M	$ 9,064	
	BCS to EVD Aux. Power						**$125,471**
	1" PVC	7,710	LNFT	$ 826.91	C	$ 63,755	
	1" Locknut	58	EA	$ 602.37	C	$ 349	
	1" PVC Term Adpt	58	EA	$ 1,631.22	C	$ 946	
	1" PVC Coup	84	EA	$ 1,038.51	C	$ 872	
	1" PVC-40 Elbow	84	EA	$ 2,832.45	C	$ 2,379	
	2"x3" Base Spacer	964	EA	$ 1,389.30	C	$ 13,389	
	#8 THHN CU Stranded Wire	25,443	LNFT	$ 1,720.69	M	$ 43,780	
	BCS to EVD Data						**$258,084**
	3" PVC	7,710	LNFT	$ 1,249.13	C	$ 96,308	
	3" Locknut	58	EA	$ 1,959.62	C	$ 1,137	
	3" PVC Term Adpt	58	EA	$ 3,005.75	C	$ 1,743	
	3" PVC Coup	84	EA	$ 2,520.11	C	$ 2,117	
	3" PVC-40 Elbow	84	EA	$ 14,892.50	C	$ 12,510	
	3"x3" Base Spacer	964	EA	$ 1,403.69	C	$ 13,528	

Opinion of Probable Construction Cost

Project Name: Lancaster BEB Study
Project Owner: Lancaster CSD
Project Location: Rochester, NY
Wendel Project Number: 414106
Phase: Phase 1 - BEB
Date: January 23, 2025

DIVISION		DESCRIPTION	QTY	UNIT	UNIT COST	UNIT OF MEASURE	SUBTOTAL	DIVISION SUBTOTAL
		CAT6 Cable	9,000	LNFT	$ 931.50	M	$ 8,384	
		Terminate CAT6	58	EA	$ 27.31	E	$ 1,584	
		Fiber Termination	348	EA	$ 38.64	E	$ 13,447	
		Fiber Test	174	EA	$ 15.53	E	$ 2,702	
		Test CAT6	29	EA	$ 30.48	E	$ 884	
		6-Strand GOF MM OM3 Fiber	9,000	LNFT	$ 1,152.68	M	$ 103,741	
		BCS Equipment Install						**$326,888**
		60kW BCS(install)	21	EA	$ 6,325.00	E	$ 132,825	
		60kW EVD/pad/bollard (install)	21	EA	$ 5,462.50	E	$ 114,713	
		120kW BCS(install)	6	EA	$ 5,175.00	E	$ 31,050	
		120kW EVD/pad/bollard (install)	8	EA	$ 6,037.50	E	$ 48,300	
		BCS Equipment						**$1,539,900**
		60kW BCS Equipment	21	EA	$ 47,500.00	E	$ 997,500	
		120kW BCS Equipment	8	EA	$ 67,800.00	E	$ 542,400	
		Distribution Equipment Quote						**$2,124,485**
		Distribution Equipment Quote	1	LS	$ 2,124,485.00	LS	$ 2,124,485	
31	**00 00**	**Earthwork**						**$0**
		Ex/backfill included in ductbank line item	-	SF	$ 18.00	E	$ -	
32	**00 00**	**Site Improvements**						**$11,975**
		Pavement Repair (SY)	100	SY	$ 90.00	E	$ 9,000	
		HydroSeeding (SF)	850	SF	$ 3.50	E	$ 2,975	
		Subtotal Construction Cost						$5,914,243
	10%	General Conditions						$591,424
	15%	General Contractor OH&P						$887,136
	10%	Construction Contingency						$591,424
	10%	Design Contingency						$591,424
	6%	Escalation (to end of 2024)						$354,855
	0%	Phasing						$0
		Subtotal						$8,930,507
	6%	Soft Costs (A/E Fees)						$535,830
		Phase 1 Total						$9,466,337

Opinion of Probable Construction Cost

Project Name: Lancaster BEB Study
Project Owner: Lancaster CSD
Project Location: Lancaster, NY
Wendel Project Number: 414106
Phase: Phase 2 - BEB
Date: January 23, 2025

DIVISION	DESCRIPTION	QTY	UNIT	UNIT COST	UNIT OF MEASURE	SUBTOTAL	DIVISION SUBTOTAL
26 00 00	**Electrical**						
	MSWBD-1 to DPCH						**$144,027**
	3" PVC	160	LNFT	$ 1,249.13	C	$ 1,999	
	3-1/2" PVC	440	LNFT	$ 1,428.51	C	$ 6,285	
	3" Locknut	4	EA	$ 1,959.62	C	$ 78	
	3-1/2" Locknut	12	EA	$ 2,427.49	C	$ 291	
	3" PVC Term Adpt	4	EA	$ 3,005.75	C	$ 120	
	3-1/2" PVC Term Adpt	12	EA	$ 3,379.28	C	$ 406	
	3" PVC Coup	6	EA	$ 2,520.11	C	$ 151	
	3-1/2" PVC Coup	18	EA	$ 2,835.44	C	$ 510	
	3" PVC-40 Elbow	6	EA	$ 14,892.50	C	$ 894	
	3-1/2" PVC-40 Elbow	18	EA	$ 18,538.00	C	$ 3,337	
	3"x3" Base Spacer	20	EA	$ 1,403.69	C	$ 281	
	4"x3" Base Spacer	55	EA	$ 1,411.15	C	$ 776	
	#1 THHN CU Stranded Wire	180	LNFT	$ 4,195.58	M	$ 755	
	#1/0 THHN CU Stranded Wire	560	LNFT	$ 5,019.82	M	$ 2,811	
	#350MCM THHN CU Stranded Wire	720	LNFT	$ 13,097.30	M	$ 9,430	
	#600MCM THHN CU Stranded Wire	2,240	LNFT	$ 22,480.03	M	$ 50,355	
	#4/0 Stranded Bare Copper Wire	300	LNFT	$ 18,221.28	M	$ 5,466	
	3/4"x10' Copper Ground Rod	24	EA	$ 135.42	E	$ 3,250	
	Cadweld	24	EA	$ 66.13	E	$ 1,587	
	Switchgear Pad	4	EA	$ 4,456.25	E	$ 17,825	
	Concrete Ductbank (per ft)	80	LNFT	$ 169.63	E	$ 13,570	
	DPCH-5 600 Amp Distribution Board (install)	1	EA	$ 5,409.31	E	$ 5,409	
	DPCH-6 800A Distribution Board (install)	1	EA	$ 6,514.75	E	$ 6,515	
	DPCH-7 800A Distribution Board (install)	1	EA	$ 6,514.75	E	$ 6,515	
	DPCH-8 600 Amp Distribution Board (install)	1	EA	$ 5,409.31	E	$ 5,409	
	DPCH to BCS						**$78,097**
	1-1/2" PVC	1,270	LNFT	$ 746.96	C	$ 9,486	
	2-1/2" PVC	440	LNFT	$ 1,107.72	C	$ 4,874	
	3" PVC	80	LNFT	$ 1,249.13	C	$ 999	
	1-1/2" Locknut	34	EA	$ 624.89	C	$ 212	
	2-1/2" Locknut	8	EA	$ 1,477.93	C	$ 118	
	3" Locknut	2	EA	$ 1,959.62	C	$ 39	
	1-1/2" PVC Term Adpt	34	EA	$ 2,090.30	C	$ 711	
	2-1/2" PVC Term Adpt	8	EA	$ 2,776.62	C	$ 222	
	3" PVC Term Adpt	2	EA	$ 3,005.75	C	$ 60	
	1-1/2" PVC Coup	51	EA	$ 1,641.34	C	$ 837	
	2-1/2" PVC Coup	12	EA	$ 2,151.02	C	$ 258	
	3" PVC Coup	3	EA	$ 2,520.11	C	$ 76	
	1-1/2" PVC-40 Elbow	51	EA	$ 6,835.60	C	$ 3,486	
	2-1/2" PVC-40 Elbow	12	EA	$ 11,516.10	C	$ 1,382	
	3" PVC-40 Elbow	3	EA	$ 14,892.50	C	$ 447	
	2"x3" Base Spacer	159	EA	$ 1,389.30	C	$ 2,206	
	3"x3" Base Spacer	65	EA	$ 1,403.69	C	$ 912	
	#8 THHN CU Stranded Wire	1,397	LNFT	$ 1,720.69	M	$ 2,404	
	#6 THHN CU Stranded Wire	484	LNFT	$ 2,094.37	M	$ 1,014	
	#4 THHN CU Stranded Wire	90	LNFT	$ 2,730.20	M	$ 246	
	#2 THHN CU Stranded Wire	5,760	LNFT	$ 3,743.22	M	$ 21,561	
	#3/0 THHN CU Stranded Wire	1,920	LNFT	$ 7,646.87	M	$ 14,682	
	#350MCM THHN CU Stranded Wire	360	LNFT	$ 13,097.30	M	$ 4,715	
	Concrete Equipment Pad	11	CY	$ 650.00	E	$ 7,150	
	BCS to EVD DC Power						**$816,908**
	3" PVC	7,960	LNFT	$ 1,249.13	C	$ 99,431	
	3" Locknut	44	EA	$ 1,959.62	C	$ 862	

Opinion of Probable Construction Cost

Project Name: Lancaster BEB Study
Project Owner: Lancaster CSD
Project Location: Lancaster, NY
Wendel Project Number: 414106
Phase: Phase 2 - BEB
Date: January 23, 2025

DIVISION	DESCRIPTION	QTY	UNIT	UNIT COST	UNIT OF MEASURE	SUBTOTAL	DIVISION SUBTOTAL
	3" PVC Term Adpt	44	EA	$ 3,005.75	C	$ 1,323	
	3" PVC Coup	66	EA	$ 2,520.11	C	$ 1,663	
	3" PVC-40 Elbow	66	EA	$ 14,892.50	C	$ 9,829	
	3"x3" Base Spacer	995	EA	$ 1,403.69	C	$ 13,967	
	Power Manhole	3	EA	$ 4,025.00	E	$ 12,075	
	Concrete Ductbank (per ft)	520	LNFT	$ 169.63	E	$ 88,208	
	4/0 2kV DLO RHW Cable	8,756	LNFT	$ 16,299.81	M	$ 142,721	
	373kcmil 2kV DLO RHW Cable	17,512	LNFT	$ 25,515.63	M	$ 446,830	
	BCS to EVD Aux. Power						**$128,382**
	1" PVC	7,960	LNFT	$ 826.91	C	$ 65,822	
	1" Locknut	44	EA	$ 602.37	C	$ 265	
	1" PVC Term Adpt	44	EA	$ 1,631.22	C	$ 718	
	1" PVC Coup	66	EA	$ 1,038.51	C	$ 685	
	1" PVC-40 Elbow	66	EA	$ 2,832.45	C	$ 1,869	
	2"x3" Base Spacer	995	EA	$ 1,389.30	C	$ 13,824	
	#8 THHN CU Stranded Wire	26,268	LNFT	$ 1,720.69	M	$ 45,199	
	BCS to EVD Data						**$122,443**
	2" PVC	7,960	LNFT	$ 854.87	C	$ 68,048	
	2" Locknut	44	EA	$ 794.49	C	$ 350	
	2" PVC Term Adpt	44	EA	$ 2,411.95	C	$ 1,061	
	2" PVC Coup	66	EA	$ 1,803.43	C	$ 1,190	
	2" PVC-40 Elbow	66	EA	$ 8,482.40	C	$ 5,598	
	2"x3" Base Spacer	995	EA	$ 1,389.30	C	$ 13,824	
	CAT6 Cable	8,756	LNFT	$ 931.50	M	$ 8,156	
	Terminate CAT6	44	EA	$ 27.31	E	$ 1,202	
	Fiber Termination	264	EA	$ 38.64	E	$ 10,201	
	Fiber Test	132	EA	$ 15.53	E	$ 2,050	
	Test CAT6	22	EA	$ 30.48	E	$ 671	
	6-Strand GOF MM OM3 Fiber	8,756	LNFT	$ 1,152.68	M	$ 10,093	
	BCS Equipment Install						**$272,953**
	24kW BCS/bollard (install)	3	EA	$ 5,117.50	E	$ 15,353	
	60kW BCS(install)	17	EA	$ 6,325.00	E	$ 107,525	
	120kW BCS(install)	4	EA	$ 5,175.00	E	$ 20,700	
	180kW BCS (install)	1	EA	$ 5,750.00	E	$ 5,750	
	60kW EVD/pad/bollard (install)	17	EA	$ 5,462.50	E	$ 92,863	
	120kW EVD/pad/bollard (install)	4	EA	$ 6,037.50	E	$ 24,150	
	180kW EVD/pad/bollard (install)	1	EA	$ 6,612.50	E	$ 6,613	
	BCS Equipment						**$1,209,700**
	24kW BCS Equipment	3	EA	$ 18,000.00	E	$ 54,000	
	60kW BCS Equipment	17	EA	$ 47,500.00	E	$ 807,500	
	120kW BCS Equipment	4	EA	$ 67,800.00	E	$ 271,200	
	180kW BCS Equipment	1	EA	$ 77,000.00	E	$ 77,000	
	Distribution Equipment Quote						**$116,897**
	Distribution Equipment Quote	1	LS	$ 116,897.00	E	$ 116,897	
31 00 00	**Earthwork**						**$15,680**
	Incl in ductbank		SF	$ 32.00	E	$ -	
	Excavation (for Eq. Pad)	490	SF	$ 32.00	E	$ 15,680	
32 00 00	**Site Improvements**						**$11,399**
	HydroSeeding (SF)	400	SF	$ 3.50	E	$ 1,612	
	Pavement Repair (SY)	92	SY	$ 90.00	E	$ 9,787	
	Subtotal Construction Cost						$2,916,486
10%	General Conditions						$291,649
15%	General Contractor OH&P						$437,473
10%	Construction Contingency						$291,649
10%	Design Contingency						$291,649
30%	Escalation (to end of 2029)						$874,946

Opinion of Probable Construction Cost

Project Name: Lancaster BEB Study
Project Owner: Lancaster CSD
Project Location: Lancaster, NY
Wendel Project Number: 414106
Phase: Phase 2 - BEB
Date: January 23, 2025

DIVISION	DESCRIPTION	QTY	UNIT	UNIT COST	UNIT OF MEASURE	SUBTOTAL	DIVISION SUBTOTAL
	Subtotal						$5,103,850
6%	Soft Costs (A/E Fees)						$306,231
	Phase 2 Total						$5,410,081

Opinion of Probable Construction Cost

Project Name: Lancaster BEB Study
Project Owner: Lancaster CSD
Project Location: Lancaster, NY
Wendel Project Number: 414106
Phase: Phase 3 - BEB
Date: January 23, 2025

DIVISION	DESCRIPTION	QTY	UNIT	UNIT COST	Unit of Measure	SUBTOTAL	DIVISION SUBTOTAL
26 00 00	**Electrical**						
	MSWBD-1 to DPCH						**$151,425**
	4" PVC	360	LNFT	$ 1,600.80	C	$ 5,763	
	4" Locknut	18	EA	$ 2,798.76	C	$ 504	
	4" PVC Term Adpt	18	EA	$ 3,778.73	C	$ 680	
	4" PVC Coup	27	EA	$ 3,070.90	C	$ 829	
	4" PVC-40 Elbow	27	EA	$ 18,867.76	C	$ 5,094	
	4"x3" Base Spacer	45	EA	$ 1,411.15	C	$ 635	
	#3/0 THHN CU Stranded Wire	585	LNFT	$ 7,646.87	M	$ 4,473	
	#600MCM THHN CU Stranded Wire	2,340	LNFT	$ 22,480.03	M	$ 52,603	
	#4/0 Stranded Bare Copper Wire	150	LNFT	$ 18,221.28	M	$ 2,733	
	100A 3P Circuit Breaker	18	EA	$ 251.56	E	$ 4,528	
	225A 3P Circuit Breaker	18	EA	$ 389.56	E	$ 7,012	
	400A 3P Circuit Breaker	6	EA	$ 654.06	E	$ 3,924	
	3/4"x10' Copper Ground Rod	18	EA	$ 135.42	E	$ 2,438	
	Cadweld	18	EA	$ 66.13	E	$ 1,190	
	Switchgear Pad	3	EA	$ 4,456.25	E	$ 13,369	
	Concrete Ductbank (per ft)	50	LNFT	$ 169.63	E	$ 8,482	
	DPCH-9 1200A Distribution Board (install)	1	EA	$ 10,439.13	E	$ 10,439	
	DPCH-10 1200A Distribution Board (install)	1	EA	$ 10,439.13	E	$ 10,439	
	DPCH-11 1200A Distribution Board (install)	1	EA	$ 10,439.13	E	$ 10,439	
	Concrete Equipment Pad	9	CY	$ 650.00	E	$ 5,850	
	DPCH to BCS						**$72,797**
	1-1/2" PVC	1,870	LNFT	$ 746.96	C	$ 13,968	
	2-1/2" PVC	160	LNFT	$ 1,107.72	C	$ 1,772	
	1-1/2" Locknut	66	EA	$ 624.89	C	$ 412	
	2-1/2" Locknut	4	EA	$ 1,477.93	C	$ 59	
	1-1/2" PVC Term Adpt	66	EA	$ 2,090.30	C	$ 1,380	
	2-1/2" PVC Term Adpt	4	EA	$ 2,776.62	C	$ 111	
	1-1/2" PVC Coup	99	EA	$ 1,641.34	C	$ 1,625	
	2-1/2" PVC Coup	6	EA	$ 2,151.02	C	$ 129	
	1-1/2" PVC-40 Elbow	99	EA	$ 6,835.60	C	$ 6,767	
	2-1/2" PVC-40 Elbow	6	EA	$ 11,516.10	C	$ 691	
	2"x3" Base Spacer	234	EA	$ 1,389.30	C	$ 3,247	
	3"x3" Base Spacer	20	EA	$ 1,403.69	C	$ 281	
	#8 THHN CU Stranded Wire	2,057	LNFT	$ 1,720.69	M	$ 3,539	
	#6 THHN CU Stranded Wire	176	LNFT	$ 2,094.37	M	$ 369	
	#2 THHN CU Stranded Wire	8,800	LNFT	$ 3,743.22	M	$ 32,940	
	#3/0 THHN CU Stranded Wire	720	LNFT	$ 7,646.87	M	$ 5,506	
	BCS to EVD DC Power						**$936,615**
	3" PVC	9,130	LNFT	$ 1,249.13	C	$ 114,046	
	3" Locknut	66	EA	$ 1,959.62	C	$ 1,293	
	3" PVC Term Adpt	66	EA	$ 3,005.75	C	$ 1,984	
	3" PVC Coup	99	EA	$ 2,520.11	C	$ 2,495	
	3" PVC-40 Elbow	99	EA	$ 14,892.50	C	$ 14,744	
	3"x3" Base Spacer	1,141	EA	$ 1,403.69	C	$ 16,020	
	Power Manhole	2	EA	$ 4,025.00	E	$ 8,050	
	Concrete Ductbank (per ft)	600	LNFT	$ 169.63	E	$ 101,778	
	4/0 2kV DLO RHW Cable	10,043	LNFT	$ 16,299.81	M	$ 163,699	
	373kcmil 2kV DLO RHW Cable	20,086	LNFT	$ 25,515.63	M	$ 512,507	
	BCS to EVD Aux. Power						**$122,824**
	1" PVC	9,130	LNFT	$ 826.91	C	$ 75,497	
	1" Locknut	66	EA	$ 602.37	C	$ 398	

Opinion of Probable Construction Cost

Project Name: Lancaster BEB Study
Project Owner: Lancaster CSD
Project Location: Lancaster, NY
Wendel Project Number: 414106
Phase: Phase 3 - BEB
Date: January 23, 2025

DIVISION	DESCRIPTION	QTY	UNIT	UNIT COST	Unit of Measure	SUBTOTAL	DIVISION SUBTOTAL
	1" PVC Term Adpt	66	EA	$ 1,631.22	C	$ 1,077	
	1" PVC Coup	99	EA	$ 1,038.51	C	$ 1,028	
	1" PVC-40 Elbow	99	EA	$ 2,832.45	C	$ 2,804	
	2"x3" Base Spacer	1,141	EA	$ 1,389.30	C	$ 15,855	
	#12 THHN CU Stranded Wire	30,129	LNFT	$ 868.43	M	$ 26,165	
	BCS to EVD Data						**$148,231**
	2" PVC	9,130	LNFT	$ 854.87	C	$ 78,050	
	2" Locknut	66	EA	$ 794.49	C	$ 524	
	2" PVC Term Adpt	66	EA	$ 2,411.95	C	$ 1,592	
	2" PVC Coup	99	EA	$ 1,803.43	C	$ 1,785	
	2" PVC-40 Elbow	99	EA	$ 8,482.40	C	$ 8,398	
	2"x3" Base Spacer	1,141	EA	$ 1,389.30	C	$ 15,855	
	CAT6 Cable	10,000	LNFT	$ 931.50	M	$ 9,315	
	Terminate CAT6	66	EA	$ 27.31	E	$ 1,802	
	Fiber Termination	396	EA	$ 38.64	E	$ 15,301	
	Fiber Test	198	EA	$ 15.53	E	$ 3,075	
	Test CAT6	33	EA	$ 30.48	E	$ 1,006	
	6-Strand GOF MM OM3 Fiber	10,000	M	$ 1,152.68	M	$ 11,527	
	BCS Equipment Installation						**$398,073**
	24kW BCS/bollard (install)	2	EA	$ 5,117.50	E	$ 10,235	
	60kW BCS(install)	31	EA	$ 6,325.00	E	$ 196,075	
	120kW BCS(install)	2	EA	$ 5,175.00	E	$ 10,350	
	60kW EVD/pad/bollard (install)	31	EA	$ 5,462.50	E	$ 169,338	
	120kW EVD/pad/bollard (install)	2	EA	$ 6,037.50	E	$ 12,075	
	BCS Equipment						**$1,644,100**
	24kW BCS Equipment	2	EA	$ 18,000.00	E	$ 36,000	
	60kW BCS Equipment	31	EA	$ 47,500.00	E	$ 1,472,500	
	120kW BCS Equipment	2	EA	$ 67,800.00	E	$ 135,600	
	Distribution Equipment Quote						**$167,414**
	Distribution Equipment Quote	1	LS	$167,414.00	E	$ 167,414	
31 00 00	**Earthwork**						**$0**
	Included in Ductbank	-	SF	$ 18.00	E	$ -	
32 00 00	**Site Improvements**						**$10,750**
	HydroSeeding (SF)	500	SF	$ 3.50	E	$ 1,750	
	Pavement Repair (SY)	100	SY	$ 90.00	E	$ 9,000	
33 00 00	**Utilities**						**$0**

	Subtotal Construction Cost	$3,652,228
10%	General Conditions	$365,223
15%	General Contractor OH&P	$547,834
10%	Construction Contingency	$365,223
10%	Design Contingency	$365,223
66%	Escalation (to end of 2035)	$2,410,471
0%	Phasing	$0
	Subtotal	$7,706,201
6%	Soft Costs (A/E Fees)	$462,372
	Phase 3 Total	$8,168,573

Opinion of Probable Construction Cost

Project Name: Lancaster BEB Study
Project Owner: Lancaster CSD
Project Location: Lancaster, NY
Wendel Project Number: 414106
Phase: SD
Date: January 23, 2025

GSF 10200

DIVISION	DESCRIPTION	QTY	UNIT	UNIT COST	UNIT OF MEASURE	SUBTOTAL	DIVISION SUBTOTAL
03 00 00	**Concrete**						**$ 12,470**
	FP Building Footing	5	CY	$ 650.00	E	$ 3,250	
	8" FP Building SOG	240	SF	$ 28.00	E	$ 6,720	
	Fire Pump/Jockey Pump Base	1	LS	$ 2,500.00	E	$ 2,500	
07 00 00	**Thermal and Moisture Protection**						**$7,370**
	Gutter and downspout	1	LS	$ 650.00	E	$ 650	
	Roofing System	240	SF	$ 28.00	E	$ 6,720	
08 00 00	**Openings**						**$0**
	Double Door - HM w/hardware (incl in Lakelands quote)	-					
09 00 00	**Finishes**						**$20,160**
	Insulated FRP wall (FT ply, studs/rigid insulation)	750	SF	$ 20.00	E	$ 15,000	
	Insulated FRP Ceiling (FT ply, studs/rigid insulation)	240	SF	$ 21.50	E	$ 5,160	
12 00 00	**Special Construction**						**$88,680**
	Fire Pump Building (quoted by Lakelands, set and assembled)	1	EA	$ 78,680.00	E	$ 78,680	
	Earthwork For FP Building	1	LS	$ 10,000.00	E	$ 10,000	
21 00 00	**Fire Suppression**						**$418,500**
	RX System	10,200	SF	$ 1.50	E	$ 15,300	
	Fire Suppression System	10,200	SF	$ 11.00	E	$ 112,200	
	Backflow preventor,piping,valves,etc.	1	LS	$ 18,500.00	E	$ 18,500	
	Fire Pump	1	EA	$ 265,000.00	E	$ 265,000	
	Core/Sleeve/Seal	1	LS	$ 2,500.00	E	$ 2,500	
	Testing and certification	1	LS	$ 5,000.00	E	$ 5,000	
26 00 00	**Electrical**						**$302,521**
	3/4" GRC	40	LNFT	$ 873.76	C	$ 350	
	1/2" Steel Flex	18	LNFT	$ 535.67	C	$ 96	
	3/4" Plastic Bushing	6	EA	$ 217.21	C	$ 13	
	3/4" Cut & Thread	3	EA	$ 25.50	E	$ 77	
	3/4" 1-Hole Strap	5	EA	$ 521.48	C	$ 26	
	4" Sq Box/2-1/8"D/Comb KO	1	EA	$ 3,475.20	C	$ 35	
	#12 THHN CU Stranded Wire	222	LNFT	$ 692.80	M	$ 154	
	2-1/2" GRC	30	LNFT	$ 3,945.56	C	$ 1,184	
	2-1/2" PVC	600	LNFT	$ 1,107.72	C	$ 6,646	
	2-1/2" PVC Elbow	4	EA	$ 7,200.00	C	$ 288	
	2-1/2" Locknut	12	EA	$ 1,477.93	C	$ 177	
	2-1/2" Plastic Bushing	4	EA	$ 1,161.62	C	$ 46	
	2-1/2" Cut & Thread	2	EA	$ 150.94	E	$ 302	
	2-1/2" Galvanized Coup	4	EA	$ 4,162.76	C	$ 167	
	2-1/2" PVC Term Adpt	4	EA	$ 2,776.62	C	$ 111	
	2-1/2" PVC Coup	2	EA	$ 2,151.02	C	$ 43	
	2-1/2" PVC-40 Elbow	2	EA	$ 11,516.10	C	$ 230	
	2"x3" Base Spacer	72	EA	$ 1,389.30	C	$ 1,000	
	#6 THHN CU Stranded Wire	670	LNFT	$ 2,094.37	M	$ 1,403	
	#3/0 THHN CU Stranded Wire	2,760	LNFT	$ 7,646.87	M	$ 21,105	
	3-pole 1200A enclosed circuit breaker	1	EA	$ 22,500.00	E	$ 22,500	
	#10 THHN CU Stranded Wire	594	LNFT	$ 891.56	M	$ 530	
	#4 THHN CU Stranded Wire	30	LNFT	$ 2,418.86	M	$ 73	
	#2 THHN CU Stranded Wire	185	LNFT	$ 3,416.40	M	$ 632	
	#4/0 THHN CU Stranded Wire	120	LNFT	$ 8,581.72	M	$ 1,030	
	#4/0 Stranded Bare Copper Wire	75	LNFT	$ 15,537.50	M	$ 1,165	
	20A Spec Grade SP Toggle Switch	1	EA	$ 3,013.20	C	$ 30	
	4" Sq 1G Toggle Sw Raised Cover	1	EA	$ 1,364.77	C	$ 14	
	3/4"x10' Copper Ground Rod	4	EA	$ 110.10	E	$ 440	
	CT Cabinet/Meter Socket	1	EA	$ 3,312.00	E	$ 3,312	
	Jockey Pump Connection	1	EA	$ 498.53	E	$ 499	
	Fire Pump Connection	1	EA	$ 1,063.75	E	$ 1,064	
	EMGen 200kW (install)	1	EA	$ 4,848.00	E	$ 4,848	
	200kW Emergency Generator	1	EA	$ 113,850.00	E	$ 113,850	
	Red Scotchlok Wirenuts (#18-10)	18	EA	$ 3,339.78	M	$ 60	

Opinion of Probable Construction Cost

Project Name: Lancaster BEB Study
Project Owner: Lancaster CSD
Project Location: Lancaster, NY
Wendel Project Number: 414106
Phase: SD
Date: January 23, 2025

GSF 10200

DIVISION		DESCRIPTION	QTY	UNIT		UNIT COST	UNIT OF MEASURE		SUBTOTAL	DIVISION SUBTOTAL
		Cadweld	4	EA	$	49.80	E	$	199	
		Generator Pad	1	EA	$	2,202.00	E	$	2,202	
		Concrete Ductbank (per ft)	580	EA	$	176.04	E	$	102,103	
		Pipe Bollard	6	EA	$	1,000.00	E	$	6,000	
		Fixture Type SW4	2	EA	$	299.11	E	$	598	
		Fixture Type WP1	1	EA	$	1,419.17	E	$	1,419	
		100 Amp Surf Panel-Nema 1	1	EA	$	6,500.00	E	$	6,500	
31 00 00		**Earthwork**								$6,038
		Excavation (for fire loop)	1,150	LF	$	5.25	E	$	6,038	
32 00 00		**Site Improvements**								$20,400
		Hydroseeding	1,200	SF	$	3.50	E	$	4,200	
		Paving	180	SY	$	90.00	E	$	16,200	
33 00 00		**Utilities**								$159,600
		Fire Hydrant Loop	1	LS	$	159,600.00	E	$	159,600	
		Subtotal Construction Cost								$1,035,739
	10%	General Conditions							$103,574	
	15%	General Contractor OH&P							$155,361	
	10%	Construction Contingency							$103,574	
	10%	Design Contingency							$103,574	
	6%	Escalation (to end of 2025)							$62,144	
		Subtotal						$	528,227	$1,563,966
	6%	Soft Costs (A/E Fees)							$93,838	
		Maintenance Building Fire Suppression								$1,657,803

Section 9 Appendix

Appendix A – Abbreviations

ABBREVIATIONS

Abbreviation	Definition
AHJ	Authority Having Jurisdiction
BEB	Battery Electric Bus
CAD	Computer Aided Design
CSB	Clean School Bus
CSD	Central School District
DC	Direct Current
ECM	Energy Conservation Measure
EPA	Environmental Protection Agency
kV	Kilo Volt
kVA	Kilo Volt Ampere
kW	Kilo Watt
kWh	Kilo Watt hour
Li-NMC-G	Lithium Nickel Manganese Cobalt Oxides
MAX	Maximum
MIN	Minimum
MMBtu	One Million British Thermal Units
MPG	Miles Per Gallon
MT CO2e	Metric Tons of Carbon Dioxide Equivalent
MVA	Mega Volt Ampere
MW	Mega Watt
N/A	Not Applicable
NFPA	National Fire Protection Agency
NYS	New York State
NYSERDA	New York State Energy Research & Development
O&M	Operation & Maintenance
OAT	Outdoor Air Temperature
OEM	Original Equipment Manufacture
PON	Program Opportunity Notice
RFI	Request for Information
SOC	State of Charge
TVIP	Truck Voucher Program
V2G	Vehicle to Grid
V2V	Vehicle to Vehicle

Appendix B - Deliverables

Appendix B.1 - Minutes

Lancaster - BEB Transition Plan Client Kickoff

MINUTES

Date: October 24th, 2024
Time: 11:00 AM EST
Place: Virtual
Project: Lancaster ZEV Transition Plan NYSERDA P-12 Schools: Flexible Technical Assistance Program - PON #4192
Wendel Project #414106

TOPICS FOR DISCUSSION:

1. Introduction of Team Members
    a. Lancaster
        i. Jamie Phillips – Assistant Superintendent of Business
        ii. Judy Feldmeyer – Transportation Supervisor
    b. NYSERDA
        i. Did not Attend - Mike Bangert-Drowns – NYSERDA PM
    c. NYSEG
        i. Jim Kalivoda – NYSEG Rep
    d. Wendel
        i. Did not Attend - John Havrilla — Director of Alt Fuels
        ii. Katie Eckam — Project Manager and Main POC
        iii. Bradley Flanagan — Energy Engineer
        iv. Scott Kreuter — Support
        v. Did not Attend - Michael Hart — Electrical Engineer
        vi. Did not Attend - Carter Pisarski — Mechanical Engineer

2. Overview of NYSERDA FlexTech PON 4192
    a. Application – Wendel submitted the application to NYSERDA on behalf of Lancaster
        i. Approved
    b. Grant funding
        i. NYSERDA providing 75% cost share
        ii. Erie 1 BOCES will be billed for remaining 25%
    c. NYSERDA role
        i. NYSERDA is a third-party reviewer. Their role is to provide input, feedback on deliverables, and ensure program goals are met.

3. Goals and Objectives
    a. NYS requirements
        i. By 2027 all new school bus purchases and leases need to be zero-emissions
        ii. All school buses on the road must be zero-emissions by 2035
    b. Fleet transition plan – provide the district with roadmap to implementing battery electric buses
    c. Charging infrastructure options

Lancaster - BEB Transition Plan Client Kickoff

4. Review Task Work Order Plan
    a. Review scope
        i. 92 buses
            1. 88 Type C
            2. 4 Type A
            3. 22 Spares
            4. 70 Route Buses
        ii. Project Kickoff & Status Meetings
        iii. Data Collection
        iv. Route Analysis
            1. Determine energy requirements per route
            2. Determine basis of design for chargers, minimum battery requirements, and charging durations
        v. Conceptual Charging Strategy
            1. Identify anticipated peak demands based on smallest battery available
            2. Provide charging profile
        vi. Electric Utility Analysis
            1. Work with utility to determine ability to support the power
            2. What upgrades they need to make
        vii. Concept Development & Phasing
            1. Provide phasing concept plans
        viii. Estimates
            1. Provide estimates for each phase
            2. Excludes:
                a. Costs of Utility-side upgrades
        ix. Final Report
            1. Submit to district & NYSERDA for comments
    b. Review deliverables
        i. Review deliverables section of TWOP

5. Schedule
    a. Schedule is based on kickoff 10/24/2024
    b. Schedule may be impacted by quality of data received
    c. Any schedule impacts to be documented in writing

Kickoff	2 weeks	10/24/2024
Route Analysis	4 weeks	11/7/2025
Conceptual Charging Strategy	5 weeks	11/14/2025
Electrical Utility Analysis	14 weeks	1/16/2026

Lancaster - BEB Transition Plan Client Kickoff

Concept Dev	15 weeks	1/23/2026
Transition Plan Estimates	16 weeks	1/30/2026
Final Report	20 weeks	2/27/2026

6. Discuss Request for Information
    a. Information Still Needed:
        i. N/A
    b. Questions on Received Information
        i. Fueling
            1. Wendel asked about interpreting the fuel data excel that was sent over
                a. District clarified that the first number represents the building, and then the bus number follows
    c. Route and Bus Information:
        i. Wendel walked through bus 409 Route Data that was provided
            1. It was brought up that some of the buses do not return to the bus garage between their AM shifts or between their PM shifts
                a. District to mark down which routes return to bus garage upon completion
        ii. Deadhead Distance:
            1. Wendel and district concluded that deadhead distance is not currently combined under total mileage.
            2. Many of the deadhead distances were blank
            3. District to revise total milage to incorporate deadhead distance & fill out any blank deadhead distances.
        iii. Wendel explained that some routes driven by the same bus were overlapping by 10-15 minutes. To remedy this, Wendel will adjust the start and end times.
        iv. Bus 473 start & end times were incorrect
            1. District clarified a start time of 7:35am, and an end time of 9:00am
        v. Bus 479 has two overlapping PM routes
            1. District explained that one of them is new this year for picking up an out-of-district homeless child
            2. In order to remain conservative, this longer route will be included in the study, and the other route will be removed
        vi. Route Distance Flags
            1. 453 – Adjusted to 14.48 Miles
            2. 492 – Confirmed 9.33 Miles
        vii. Buses 506, 507, 508
            1. District marked these as "NOT DELIVERED YET"
                a. District confirmed these routes and buses should be excluded from the study
        viii. Contracted Routes
            1. District states that there are 20 contracted bus routes
                a. Owned, driven and stored by WNY Bus

2. Wendel to assume 15 of these buses get added back in.
    a. Assume that all 15 will have the same routes as bus 409
    b. Assume that 15 existing spare buses will be used for these routes in the calculations

ix. District stated they are okay with IC as their preferred manufacturer, but they would like to use whatever manufacturer would provide the best solution

x. Route Safety Factor of 5%
    1. Confirmed by district

xi. District stated that they would like to see the results of this study, and then determine if they would like to do a pilot, or start their transition prior to 2027
    1. Wendel will model the transition starting 2027 for the sake of this study

7. Administrative
    a. Site visit check-in protocol **October 28th, 2024** - Wendel to inform Lancaster of team members on site ahead of time.
    b. Progress meetings – Wendel to schedule meetings to review results of route analysis and conceptual charging strategy tasks, review concept development and estimate tasks, and provide final presentation.
    c. Monthly billing – Billed to NYSERDA and Erie 1 BOCES Directly

8. Open Forum
    a. District to NYSEG – Should a long lead time be factored in for equipment?
        i. NYSEG Response: Yes, this should be factored in but an estimated process time cannot be provided
    b. District to NYSEG – Does a Third-party company complete the load study?
        i. NYSEG Response: No, NYSEG does load study

9. Action Items
    a. District to mark down which routes do not return to bus garage upon completion – POST MEETING UPDATE - COMPLETE
    b. District to reach out to Transfinder to pull a new export of all the routes & their related data POST MEETING UPDATE – Received but working out details

Appendix B.2 – Task Memos

*** Please note that information within the Task Memos may differ from the report and Final Calculations / Models. This is part of the iterative process.**

MEMO

To:	Jamie Phillips, Judy Feldmeyer – Lancaster Central School District Mike Bangert-Drowns – New York State Energy Research Development Authority (NYSERDA)
From:	John Havrilla, Katie Eckam, Bradley Flanagan, Dante Bucci – Wendel
Date:	November 26, 2024
RE:	Lancaster Central School District Zero Emission Vehicle Study - Task 3: Route Analysis & Task 4: Conceptual Charging Strategy

Lancaster CSD and the New York State Energy Research Development Authority (NYSERDA) has contracted with Wendel to perform a Zero Emissions Vehicle (ZEV) study under NYSERDA's FlexTech program to evaluate the impact of a transition to a battery electric bus (BEB) fleet. The purpose of this memo is to report the preliminary results of the route analysis, and conceptual charging strategy model. This portion of the ZEV study is in fulfillment of Task 3 and Task 4.

Wendel reviewed the route information provided by the district. A copy of the route schedule as received has been included in this memo. The district currently has (20) contracted bus routes which are owned, driven and stored by WNY Bus. There is a possibility that these routes may be taken back over by the district if the drivers become available. In order to account for this scenario, it will be assumed throughout this report that (15) out of (22) of the district's spare buses will be used to drive (15) out of (20) these contracted routes. The start and end time and the route mileage of bus 409 were used for these (15) buses. This increases the district's quantity of route buses from (67) to (82) and decreases the district's quantity of spare buses from (22) to (7).The remaining (5) contracted buses have been excluded from this study.

Bus Data	
Route Buses	82
Spare Buses	7
Contracted Buses	5
AM Routes	202
PM Routes	199
PM2 Routes	3
Total Number of Routes	404

Wendel evaluated seven different bus manufacturers and five different charger sizes ranging from 24 kW to 360 kW. The district has stated that they would prefer to utilize IC buses wherever possible, though the use of Lion and is acceptable if necessary. IC currently does not offer electric Type-A buses; thus, Lion was used for Type-A buses.

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The route analysis shows that the maximum energy usage of any one route would be 422.2 kWh which was associated with a Type C bus. Based on today's BEB technology, there is not currently a battery large enough to be able to perform this route. Among the routes for the (82) route buses examined; it was determined that the routes for (17) of the buses cannot currently be performed by a BEB as BEBs do not currently have adequate battery capacity at the existing bus size to meet these route demands. Wendel recommends that these buses be converted to BEBs towards the end of the transition plan. This will allow for the development of larger battery capacities which may enable the district to implement BEBs without splitting the routes in the future. Among the (17) buses that cannot currently be performed by a BEB, it is anticipated that a BEB of the adequate battery size will become available within the mandate period for all the buses.

The *No BEB Replacement* table found below shows the minimum BEB sizes needed to perform the routes as they currently are for these (17) buses.

No BEB Replacement			
Bus Number	Bus Type	Minimum Bus Size based on Maximum Energy Usage (kWh)	Notes
412	Type C	329	Bus size does not currently exist
433	Type C	406	Bus size does not currently exist
434	Type C	586	Bus size does not currently exist
436	Type C	360	Bus size does not currently exist
437	Type C	380	Bus size does not currently exist
441	Type A	359	Bus size does not currently exist
442	Type C	322	Bus size does not currently exist
449	Type C	333	Bus size does not currently exist
451	Type C	348	Bus size does not currently exist
453	Type C	378	Bus size does not currently exist
456	Type C	349	Bus size does not currently exist
457	Type C	324	Bus size does not currently exist
458	Type A	204	Bus size does not currently exist
469	Type C	477	Bus size does not currently exist
487	Type C	317	Bus size does not currently exist
501	Type C	346	Bus size does not currently exist
504	Type C	355	Bus size does not currently exist

The analysis shows that the maximum energy usage per route within current battery capacity constraints is 222.4 kWh which, according to the district preferred manufacturer, would require a 315 kW BEB. The anticipated energy usage for each route can be found in the attached spreadsheet. A summary of the BEB sizes required to meet these energy usages can be found in the table below.

	Proposed Bus Battery Sizes				
Bus Size*	Bus Type	Route Buses	Contracted Route Buses	Spare Buses	Total Proposed BEBs
210 kWh - IC	Type C	22	0	0	**22**
315 kWh - IC	Type C	28	15	7	**50**
No Current Replacement	Type A & Type C	17	0	0	**17**
Total		67	15	7	**89**

**Based on District Preferred Manufacturer.*

The five charger sizes reviewed include the following:

- 24 kW DC charger
- 60 kW DC charger (fast charger)
- 120 kW DC charger (fast charger)
- 180 kW DC charger (fast charger)
- 360 kW DC charger (fast charger)

Charger quantity recommendations are based on utilizing a conservative 1:1 charging approach, or one charger per bus. Based on the route analysis, the proposed charging duration between AM and PM routes range from 50 minutes to 4 hours and 47 minutes. The largest charger size proposed is 180 kW. The charging durations for each route can be found in the attached spreadsheet. Wendel has determined that the routes the district has provided will require the following:

- (5) 24 kW chargers
- (69) 60 kW charger (fast charger)
- (12) 120 kW charger (fast charger)
- (1) 180 kW charger (fast charger)

Of the proposed chargers (3) of the 24 kW chargers are for spare buses. The (2) spare 120 kW chargers are proposed to be used as a 2:1, meaning two buses can be charged by this one charger. It is assumed that spare buses are used only to replace out of service route buses or for field trips and sports trips.

Proposed Charger Quantities			
Charger Size	Route Bus Chargers	Spare Bus Chargers	Total Proposed Chargers
24 kW	2	3	**5**
60 kW	69	0	**69**
120 kW	10	2*	**12**
180 kW	1	0	**1**
Total	82	5	**87**

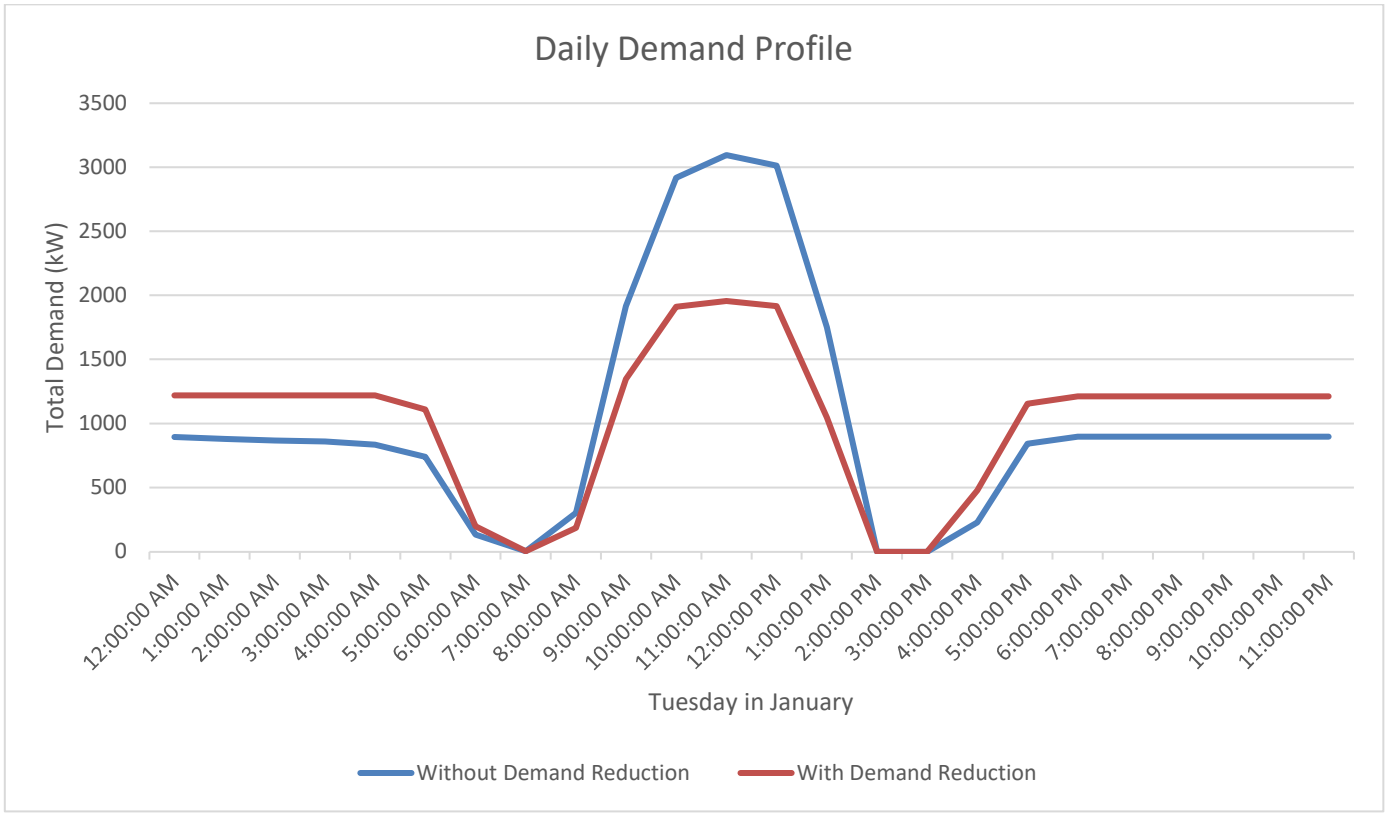
**This charger is proposed to be used as a 2:1 charger to charge (2) BEBs*

Wendel developed a 1 month, 24 hour charging model using the minimum bus size required, proposed charger sizes, and route energy requirements calculated during the route analysis. In order to provide a complete demand profile for all buses, the charging model assumes that the battery capacities needed for routes that are currently too long will become available in the future and that the largest charger size needed for that bus size would be used. The basis of the model utilized chargers which can charge from 24 kW to 360 kW. For this analysis, it was assumed that the maximum number of buses charging during peak time (mid-day) is (82) buses, this does not include the spare buses.

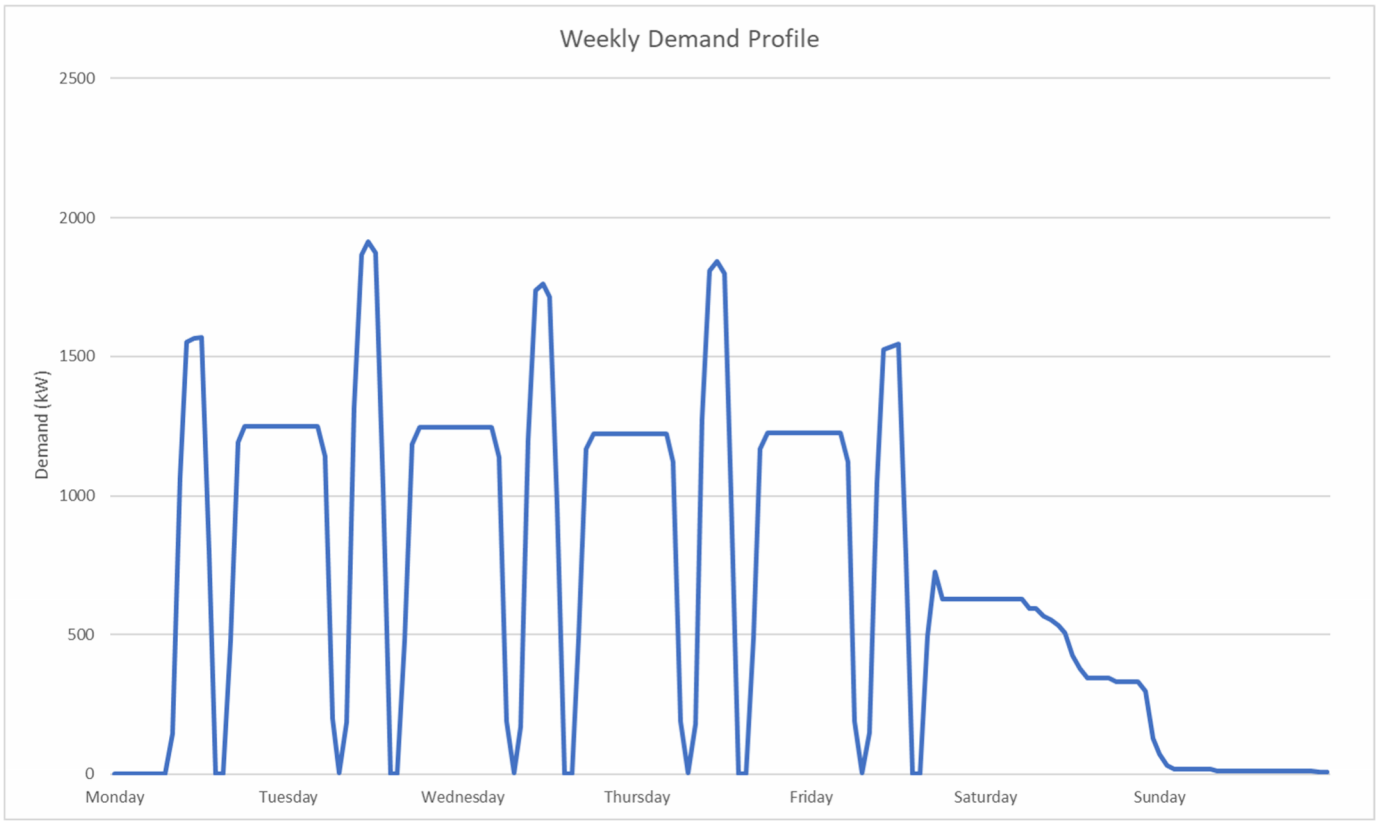
In order to represent worst case scenario, the model calculates the energy usage, battery capacity, and the amount of charge delivered to each bus for each hour throughout January, the coldest winter month. The charging strategy models charging for longer periods of time at lower charging speeds which extends battery life. An electrical demand reduction strategy model was also developed which limits the charge being delivered to the buses during peak hours (mid-day) to the amount of charge needed to perform the remaining routes. The electrical demand reduction strategy reduces peak demand and could result in energy cost savings for Lancaster CSD.

The maximum single bus charging rate for any hour throughout the winter month was calculated to be 122 kW. The maximum combined bus electrical demand when all (82) route buses are converted to BEB's during a winter month is 1,958 kW which occurs between 11:00 am and 12:00 pm on Tuesdays. Before a demand reduction strategy is implemented, the peak demand is 3,096 kW which would occur between 11:00 am and 12:00 pm on Tuesdays. This 1,138 kW demand reduction will yield utility cost savings over the year, which highlights the importance of utilizing a charge management system.

See charts below outlining the demand profiles and max single bus charging rates below:



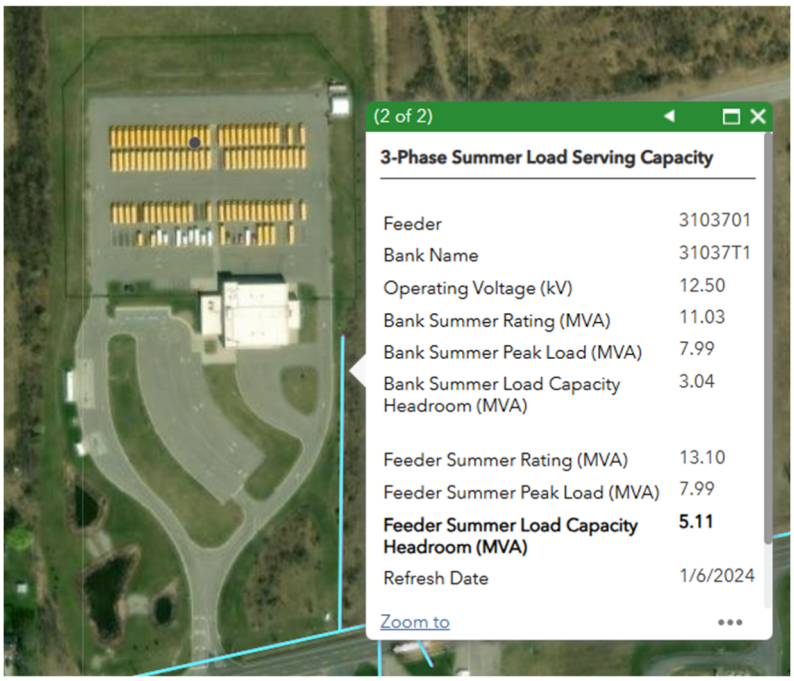
** Demand Peaks fluctuate per day and may be lower than the above.*



MEMO

To:	Jamie Phillips, Judy Feldmeyer – Lancaster Central School District Mike Bangert-Drowns – NYSERDA
From:	John Havrilla, Katherine Eckam, Dante Bucci, Bradley Flanagan - Wendel
Date:	July 22, 2025
RE:	Lancaster Central School District - Transition Plan – Electric Utility Analysis

Wendel has engaged with NYSEG to get a better understanding of the utility's ability to provide required power for the transition to the battery electric bus fleet at 4082 Walden Ave, Lancaster, NY 14086, Wendel has provided the utility with the future load information Lancaster Central School District will incur once the battery electric buses are implemented. Based upon the developed energy requirements, charging load profile, and anticipated peak demand, Wendel has worked with NYSEG to determine options for obtaining the power from the utility.



NYSEG's engineer reviewed the above site for electric vehicle charging. The site is served by Feeder 3103701. A total Anticipated Peak Charger Load of 3,096 kVA and a total Fully Connected Load of 6,181 kVA was provided to NYSEG who provided the below tables:

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Present Conditions

Location			Circuit						Transformer					
Address	**OPCO**	**FLOC**	**Circuit**	**Peak Season**	**Peak Load (MVA)**	**Rating (MVA)**	**% Loading**	**Available Capacity (MVA)**	**T#**	**Peak Season**	**5 year average load (MVA)**	**Rating (MVA)**	**% Loading**	**Available capacity**
4082 Walden Ave	NYSEG	9301-L0546-1544-0058-ED00210	3103701	S	7.126	13.1	54%	**5.974**	1	S	7.838	10	78%	**2.162**

Future Conditions (5 Year Forecast)

Location			Circuit						Transformer					
Address	**OPCO**	**Pole GISID**	**Circuit**	**Peak Season**	**Peak Load (MVA)**	**Rating (MVA)**	**% Loading**	**Available Capacity (MVA)**	**T#**	**Peak Season**	**5 year average load (MVA)**	**Rating (MVA)**	**% Loading**	**Available capacity (MVA)**
4082 Walden Ave	NYSEG	9301-L0546-1544-0058-ED00210	3103701	S	7.87	13.1	60%	**5.23**	1	S	8.65	10	87%	**1.35**

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According to these tables the transformer will be overloaded but the feeder will not be.

Low voltage service transformers typically distribute a maximum load per service of either 2,000 kVA or 2,500 kVA, depending on the utility. Utility distribution medium voltage systems range from 2,300 volts to 39,000 volts. Thus, a new voltage service will likely be required though it has not been stated by NYSEG. NYSEG has stated that a Capacity Study does not reserve such capacity or approval for a new load until a Load Interconnection Request is submitted, assessed, and mitigations are made. A request to Transmission Planning is made if the load exceeds 1MVA. The Capacity Assessment does not include the requested amount; it only shows the available Capacity they have on the circuit and transformer.

It should also be noted that the available capacity to charge EVs could change over time if new customers bring additional load onto the grid near this site. New loads from other customers could impact this site's future capacity to charge.

The projected peak demand per phase below was also provided to NYSEG.

	With Demand Reduction	Without Demand Reduction
Phase 1: 2027 – 2029	855 kW	968 kW
Phase 2: 2030 – 2032	1681 kW	1902 kW
Phase 3: 2033 – 2035	2736 kW	3096 kW

NYSEG utilized these anticipated peak demands to perform a rate analysis for Lancaster Central School District. For each phase, two efficiency scenarios were utilized, 1.5 kWh/mile and 2.5 kWh/mile. The results of the rate analysis have been attached to this memo.

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Lancaster Central School District Rate Analysis

Phase 1: 2027 – 2029								On peak charging		Off peak charging	
	# of vehicles	daily miles per bus	peak demand with demand reduction (kW)	peak demand w/o demand reduction (kW)	total mileage per day	total mileage per month	kWh per month (1.5 kWh/mi)	monthly bill with demand reduction	monthly bill w/o demand reduction	monthly bill with demand reduction	monthly bill w/o demand reduction
School bus	29	83	855	968	2,407	43,326	64,989	$ 15,519	$ 16,944	$ 13,895	$ 15,320
Month Demand Charge			$ 10,782	$ 12,206							

Phase 2: 2030 – 2032								On peak charging		Off peak charging	
	# of vehicles	daily miles per bus	peak demand with demand reduction (kW)	peak demand w/o demand reduction (kW)	total mileage per day	total mileage per month	kWh per month (1.5 kWh/mi)	monthly bill with demand reduction	monthly bill w/o demand reduction	monthly bill with demand reduction	monthly bill w/o demand reduction
School bus	54	83	1,681	1,902	4,482	80,676	121,014	$ 30,020	$ 32,806	$ 26,995	$ 29,782
Month Demand Charge			$ 21,197	$ 23,984							

Phase 3: 2033 – 2035								On peak charging		Off peak charging	
	# of vehicles	daily miles per bus	peak demand with demand reduction (kW)	peak demand w/o demand reduction (kW)	total mileage per day	total mileage per month	kWh per month (1.5 kWh/mi)	monthly bill with demand reduction	monthly bill w/o demand reduction	monthly bill with demand reduction	monthly bill w/o demand reduction
School bus	89	83	2,736	3,096	7,387	132,966	199,449	$ 49,041	$ 53,581	$ 44,057	$ 48,596
Month Demand Charge			$ 34,501	$ 39,041							

Notes:
1. kWh supply charges are based on 2024 annual daily average NYSEG charge
2. Estimated costs are based on 180 school days in a year, 10 months of operation per year, 18 operating days per month
3. Two scenarios for school bus kWh/mile are 1.5 kWh/mile and 2.5 kWh/mile.
4. kWh per mile for electric school buses is dependent on many factors including bus weight, terrain, driving conditions, weather, and other factors
5. Charges including monthly customer charge and other various charges are not included and generally make up a small percentage of overall monthly bills
6. Demand charges are based on current NYSEG rates for service classification 7

Internal Use

Phase 1: 2027 – 2029								On peak charging		Off peak charging	
	# of vehicles	daily miles per bus	peak demand with demand reduction (kW)	peak demand w/o demand reduction (kW)	total mileage per day	total mileage per month	kWh per month (2.5 kWh/mi)	monthly bill with demand reduction	monthly bill w/o demand reduction	monthly bill with demand reduction	monthly bill w/o demand reduction
School bus	29	83	855	968	2,407	43,326	108,315	$ 18,678	$ 20,103	$ 15,971	$ 17,396
Month Demand Charge			$ 10,782	$ 12,206							

Phase 2: 2030 – 2032								On peak charging		Off peak charging	
	# of vehicles	daily miles per bus	peak demand with demand reduction (kW)	peak demand w/o demand reduction (kW)	total mileage per day	total mileage per month	kWh per month (2.5 kWh/mi)	monthly bill with demand reduction	monthly bill w/o demand reduction	monthly bill with demand reduction	monthly bill w/o demand reduction
School bus	54	83	1,681	1,902	4,482	80,676	201,690	$ 35,901	$ 38,688	$ 30,860	$ 33,647
Month Demand Charge			$ 21,197	$ 23,984							

Phase 3: 2033 – 2035								On peak charging		Off peak charging	
	# of vehicles	daily miles per bus	peak demand with demand reduction (kW)	peak demand w/o demand reduction (kW)	total mileage per day	total mileage per month	kWh per month (2.5 kWh/mi)	monthly bill with demand reduction	monthly bill w/o demand reduction	monthly bill with demand reduction	monthly bill w/o demand reduction
School bus	89	83	2,736	3,096	7,387	132,966	332,415	$ 58,735	$ 63,274	$ 50,427	$ 54,967
Month Demand Charge			$ 34,501	$ 39,041							

Internal Use

Appendix B.3 – Final Calculations and Models

Lancaster Central School District

Route Analysis Calculation

Date. 2/27/25

Task Summary		
Bus Data		
Minutes before Bus Route Begins that Bus is removed from Charger	15	Minutes
Minutes after Bus Route ends that Bus is back on Charger	0	Minutes
District Preferred Manufacturer:	IC	
Number of AM Routes	201	
Number of PM Routes	200	
Number of PM2 Routes	3	
Total Number of Routes	404	
Duration Based		
Maximum Route Energy Usage	422.2	kWh
Maximum Proposed Bus Size	315.0	kW
Maximum Proposed Charger Size	180.0	kW
Minimum charging duration between AM and PM	0:50	Hours: Min
Maximum charging duration between AM and PM	4:27	Hours: Min
Proposed Charger Quantites[3]		
Quantity of 180 kW DC Chargers	1	
Quantity of 120 kW DC Chargers	12	
Quantity of 60 kW DC Chargers	69	
Quantity of 24 kW DC Chargers	5	
Proposed Route Bus Quantities[2]		
Quantity of IC Type C 210 kWh Buses	22	
Quantity of IC Type C 315 kWh Buses	43	
No Replacement	17	
Proposed Spare Bus Quantites[1]		
Quantity of IC Type C 315 kWh Buses	7	

1. Assumes Spare Buses will be replaced with largest EV bus size corresponding with Bus Type and district preferred manufacturers

2. Includes Routes that are performed by 15 of 20 Contracted Buses

3. Includes Chargers for 15 Contracted Buses

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Project Name: Lancaster Central School District
Task: Route Analysis Calculation
Date: 2/27/2025

BEB Efficiency Table					
	Type A	Type B	Type C	Type D	
OEM Rated Efficiency	1.12	0.00	1.58	1.35	
Low Battery Usage[1]	1.55	N/A	2.18	1.87	kWh per mile
Low Deadhead Battery Usage	1.24	N/A	1.74	1.50	kWh per mile
Resting Battery Usage (Heat only)	20.00	N/A	20.00	20.00	kWh per hour
High Battery Usage[2]	2.48	N/A	3.48	3.00	kWh per mile
High Deadhead Battery Usage	2.19	N/A	3.08	2.65	kWh per mile

Notes:
1. Best Case Usage with little/no HVAC usage at Moderate OA Temperatures.
2. Worst Case Usage with extreme cold/heat,traffic/ long stops

Manufacturer	Include?
Bluebird	No
BYD	No
Collins	No
Greenpower	No
IC	Yes
Lion	Yes
Thomas	No

Charging Variables	
Dead Head Miles	10%
Charging Rate Safety Factor	90%
Route Safety Factor	5%
Efficiency Safety Factor (Distance)	11%
Maximum Battery Level	90%
Anticipated Degradation	90%
Minimum Battery Level	10%
Low Temp Power Factor (kW)	0

			ROUTE INFORMATION																		
			AM									PM									
		AVG	0	138.65	36.77	15.41	31.45	36.90	4.10	15.85	4:03	0	156.32	37.04	17.37	13.30	38.02	4.22	14.40	0:37	0	164.70
		MAX	5	251.10	75.00	27.90	75.00	85.13	9.46	22.96	5:09	4	269.10	60.00	29.90	75.00	99.92	11.10	23.29	0:37	3	164.70
		MIN	0	99.90	30.00	11.10	0.00	19.98	2.22	9.20	1:27	0	55.80	15.00	6.20	0.00	10.12	1.12	7.05	0:37	0	164.70
Line #	Bus Type	Bus	Number of AM Routes	AM Active Run Time (Min)	AM Resting Time (Min)	AM Deadhead Run Time (Min)	AM Between Shift Not Charging / Not On (Min)	AM Active Distance (Miles)	AM Deadhead Distance (Miles)	AM Average Speed (mph)	Time Until Next Shift	Number of PM Routes	PM Active Run Time (Min)	PM Resting Time (Min)	PM Deadhead Run Time (Min)	PM Between Shift Not Charging / Not On (Min)	PM Active Distance (Miles)	PM Deadhead Distance (Miles)	PM Average Speed (mph)	Time Until Next Shift2	Number of PM2 Routes	PM2 Active Run Time (Min)
1	Type C	409	2	120.60	30.00	13.40	0.00	38.99	4.33	19.40	5:09	2	156.60	30.00	17.40	0.00	39.54	4.39	15.15	-	0	-
2	Type C	412	3	251.10	45.00	27.90	51.00	55.13	6.13	13.17	1:57	2	155.70	30.00	17.30	10.00	43.16	4.80	16.63	-	0	-
3	Type C	415	2	155.70	30.00	17.30	21.00	47.84	5.32	18.43	3:43	2	144.90	30.00	16.10	64.00	46.09	5.12	19.08	-	0	-
4	Type C	433	3	197.10	45.00	21.90	12.00	68.96	7.66	20.99	3:12	2	164.70	30.00	18.30	15.00	40.69	4.52	14.82	-	0	-
5	Type C	434	2	125.10	30.00	13.90	5.00	47.88	5.32	22.96	3:51	4	257.40	60.00	28.60	23.00	99.92	11.10	23.29	-	0	-
6	Type C	436	5	192.60	75.00	21.40	62.00	58.06	6.45	18.09	2:18	2	162.90	30.00	18.10	32.00	51.07	5.67	18.81	-	0	-
7	Type C	437	3	179.10	45.00	19.90	11.00	64.22	7.14	21.51	3:57	3	174.60	45.00	19.40	16.00	57.05	6.34	19.61	-	0	-
8	Type C	439	2	158.40	30.00	17.60	28.00	45.13	5.01	17.09	3:45	2	135.90	30.00	15.10	35.00	41.09	4.57	18.14	-	0	-
9	Type A	441	3	234.90	45.00	26.10	15.00	85.13	9.46	21.74	2:57	1	145.80	15.00	16.20	0.00	47.62	5.29	19.60	-	0	-
10	Type C	442	2	131.40	30.00	14.60	58.00	32.50	3.61	14.84	3:57	2	182.70	30.00	20.30	1.00	55.04	6.12	18.08	-	0	-
11	Type C	444	3	145.80	45.00	16.20	54.00	29.93	3.33	12.31	3:33	3	161.10	45.00	17.90	13.00	30.59	3.40	11.39	-	0	-
12	Type C	445	3	164.70	45.00	18.30	45.00	38.66	4.30	14.09	3:33	3	168.30	45.00	18.70	11.00	33.14	3.68	11.81	-	0	-
13	Type C	448	3	151.20	45.00	16.80	32.00	32.54	3.62	12.91	3:43	3	164.70	45.00	18.30	3.00	35.84	3.98	13.06	-	0	-
14	Type C	449	2	142.20	30.00	15.80	15.00	44.61	4.96	18.82	4:05	3	173.70	45.00	19.30	28.00	55.76	6.20	19.26	-	0	-
15	Type C	450	3	153.00	45.00	17.00	10.00	47.47	5.27	18.61	4:21	3	147.60	45.00	16.40	11.00	39.32	4.37	15.98	-	0	-
16	Type C	451	2	162.00	30.00	18.00	24.00	53.72	5.97	19.90	3:27	2	196.20	30.00	21.80	10.00	59.84	6.65	18.30	-	0	-
17	Type C	453	5	186.30	75.00	20.70	75.00	61.32	6.81	19.75	2:45	2	144.00	30.00	16.00	8.00	46.43	5.16	19.35	-	0	-
18	Type C	455	3	160.20	45.00	17.80	32.00	33.80	3.76	12.66	1:39	1	55.80	15.00	6.20	0.00	10.12	1.12	10.88	0:37	3	164.70
19	Type C	456	2	142.20	30.00	15.80	16.00	32.37	3.60	13.66	2:03	4	197.10	60.00	21.90	75.00	57.27	6.36	17.43	-	0	-
20	Type C	457	4	169.20	60.00	18.80	34.00	52.82	5.87	18.73	3:21	3	162.90	45.00	18.10	29.00	38.35	4.26	14.12	-	0	-
21	Type A	458	2	143.10	30.00	15.90	33.00	45.60	5.07	19.12	3:33	2	162.00	30.00	18.00	42.00	47.71	5.30	17.67	-	0	-
22	Type C	459	2	124.20	30.00	13.80	42.00	30.65	3.41	14.81	4:03	3	133.20	45.00	14.80	26.00	26.36	2.93	11.87	-	0	-
23	Type C	460	3	138.60	45.00	15.40	56.00	36.58	4.06	15.83	3:45	3	143.10	45.00	15.90	10.00	34.02	3.78	14.26	-	0	-
24	Type C	461	2	107.10	30.00	11.90	55.00	20.57	2.29	11.52	4:03	3	159.30	45.00	17.70	27.00	31.64	3.52	11.92	-	0	-
25	Type C	462	2	122.40	30.00	13.60	38.00	28.75	3.19	14.09	4:03	2	141.30	30.00	15.70	17.00	35.55	3.95	15.10	-	0	-
26	Type C	463	2	129.60	30.00	14.40	42.00	29.45	3.27	13.63	4:15	3	148.50	45.00	16.50	27.00	29.88	3.32	12.07	-	0	-
27	Type C	464	2	119.70	30.00	13.30	29.00	26.66	2.96	13.36	4:33	2	140.40	30.00	15.60	6.00	28.27	3.14	12.08	-	0	-
28	Type C	465	3	136.80	45.00	15.20	58.00	28.09	3.12	12.32	3:33	3	154.80	45.00	17.20	20.00	29.48	3.28	11.43	-	0	-
29	Type C	466	2	113.40	30.00	12.60	42.00	19.98	2.22	10.57	4:39	3	145.80	45.00	16.20	6.00	38.93	4.33	16.02	-	0	-
30	Type C	467	3	105.30	45.00	11.70	69.00	27.46	3.05	15.65	4:03	3	167.40	45.00	18.60	13.00	28.66	3.18	10.27	-	0	-
31	Type C	469	2	156.60	30.00	17.40	18.00	44.89	4.99	17.20	1:27	4	269.10	60.00	29.90	37.00	80.29	8.92	17.90	-	0	-
32	Type C	470	3	146.70	45.00	16.30	47.00	35.91	3.99	14.69	3:33	3	156.60	45.00	17.40	12.00	26.88	2.99	10.30	-	0	-
33	Type C	471	2	134.10	30.00	14.90	31.00	28.93	3.21	12.94	4:33	3	156.60	45.00	17.40	18.00	33.30	3.70	12.76	-	0	-
34	Type C	472	2	117.00	30.00	13.00	32.00	25.66	2.85	13.16	4:21	3	158.40	45.00	17.60	10.00	38.20	4.24	14.47	-	0	-
35	Type C	473	2	132.30	30.00	14.70	21.00	27.10	3.01	12.29	4:33	2	135.90	30.00	15.10	5.00	26.36	2.93	11.64	-	0	-
36	Type C	474	2	99.90	30.00	11.10	15.00	29.42	3.27	17.67	4:45	3	149.40	45.00	16.60	8.00	34.16	3.80	13.72	-	0	-
37	Type C	475	3	130.50	45.00	14.50	47.00	29.44	3.27	13.54	4:09	3	145.80	45.00	16.20	6.00	28.89	3.21	11.89	-	0	-
38	Type C	476	2	119.70	30.00	13.30	35.00	29.45	3.27	14.76	4:33	3	159.30	45.00	17.70	15.00	38.37	4.26	14.45	-	0	-
39	Type C	477	2	119.70	30.00	13.30	29.00	25.97	2.89	13.02	4:33	3	163.80	45.00	18.20	10.00	31.40	3.49	11.50	-	0	-
40	Type C	478	3	182.70	45.00	20.30	43.00	51.46	5.72	16.90	3:03	2	142.20	30.00	15.80	22.00	23.87	2.65	10.07	-	0	-
41	Type C	479	2	114.30	30.00	12.70	29.00	22.43	2.49	11.77	4:39	2	181.80	30.00	20.20	10.00	21.38	2.38	7.05	-	0	-
42	Type C	480	3	144.90	45.00	16.10	49.00	36.34	4.04	15.05	3:57	3	147.60	45.00	16.40	10.00	27.59	3.07	11.22	-	0	-
43	Type C	481	2	112.50	30.00	12.50	49.00	20.28	2.25	10.81	4:09	2	132.30	30.00	14.70	21.00	23.90	2.66	10.84	-	0	-
44	Type C	482	2	131.40	30.00	14.60	22.00	30.20	3.36	13.79	4:09	2	129.60	30.00	14.40	18.00	32.88	3.65	15.22	-	0	-
45	Type C	483	2	114.30	30.00	12.70	29.00	23.14	2.57	12.15	4:21	3	160.20	45.00	17.80	8.00	41.61	4.62	15.58	-	0	-
46	Type C	484	3	141.30	45.00	15.70	35.00	38.26	4.25	16.25	4:27	2	134.10	30.00	14.90	7.00	27.15	3.02	12.15	-	0	-
47	Type C	485	2	140.40	30.00	15.60	6.00	21.52	2.39	9.20	-	0	-	-	-	-	-	-	-	-	0	-
48	Type C	486	3	146.70	45.00	16.30	47.00	30.83	3.43	12.61	3:45	3	139.50	45.00	15.50	19.00	23.71	2.63	10.20	-	0	-
49	Type C	487	2	134.10	30.00	14.90	25.00	34.04	3.78	15.23	4:33	2	173.70	30.00	19.30	11.00	54.30	6.03	18.76	-	0	-
50	Type C	488	3	135.90	45.00	15.10	53.00	40.14	4.46	17.72	3:45	3	131.40	45.00	14.60	12.00	36.06	4.01	16.47	-	0	-
51	Type C	489	3	139.50	45.00	15.50	55.00	29.82	3.31	12.82	3:51	3	126.90	45.00	14.10	21.00	29.70	3.30	14.04	-	0	-
52	Type C	490	2	111.60	30.00	12.40	62.00	23.38	2.60	12.57	4:03	2	127.80	30.00	14.20	20.00	20.60	2.29	9.67	-	0	-
53	Type C	491	3	126.90	45.00	14.10	57.00	27.45	3.05	12.98	3:39	3	159.30	45.00	17.70	21.00	37.99	4.22	14.31	-	0	-
54	Type C	492	3	123.30	45.00	13.70	62.00	28.34	3.15	13.79	3:38	3	154.80	45.00	17.20	14.00	27.86	3.10	10.80	-	0	-
55	Type C	493	2	138.60	30.00	15.40	32.00	31.96	3.55	13.84	4:15	2	149.40	30.00	16.60	8.00	38.17	4.24	15.33	-	0	-
56	Type C	494	3	144.00	45.00	16.00	44.00	33.03	3.67	13.76	3:39	3	162.00	45.00	18.00	12.00	37.29	4.14	13.81	-	0	-
57	Type C	495	2	118.80	30.00	13.20	22.00	26.79	2.98	13.53	4:35	3	179.10	45.00	19.90	17.00	43.01	4.78	14.41	-	0	-
58	Type C	496	2	143.10	30.00	15.90	22.00	36.58	4.06	15.34	4:32	2	135.90	30.00	15.10	5.00	31.76	3.53	14.02	-	0	-
59	Type C	497	4	182.70	60.00	20.30	25.00	45.97	5.11	15.10	3:45	3	146.70	45.00	16.30	11.00	26.01	2.89	10.64	-	0	-
60	Type C	498	2	140.40	30.00	15.60	36.00	39.88	4.43	17.04	4:03	2	155.70	30.00	17.30	13.00	36.58	4.06	14.09	-	0	-
61	Type C	499	2	119.70	30.00	13.30	47.00	30.33	3.37	15.20	4:03	2	163.80	30.00	18.20	16.00	40.60	4.51	14.87	-	0	-
62	Type C	500	2	122.40	30.00	13.60	26.00	27.68	3.08	13.57	4:33	2	141.30	30.00	15.70	5.00	44.93	4.99	19.08	-	0	-
63	Type C	501	3	209.70	45.00	23.30	49.00	58.14	6.46	16.64	2:21	2	133.20	30.00	14.80	32.00	33.02	3.67	14.87	-	0	-
64	Type C	502	3	137.70	45.00	15.30	33.00	29.62	3.29	12.91	4:21	2	123.30	30.00	13.70	13.00	21.42	2.38	10.42	-	0	-
65	Type C	503	3	123.30	45.00	13.70	61.00	23.43	2.60	11.40	3:51	3	145.80	45.00	16.20	12.00	25.24	2.80	10.39	-	0	-
66	Type C	504	2	132.30	30.00	14.70	9.00	29.52	3.28	13.39	3:21	3	234.90	45.00	26.10	15.00	59.75	6.64	15.26	-	0	-

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Project Name: Lancaster Central School District
Task: Route Analysis Calculation
Date: 2/27/2025

BEB Efficiency Table					
	Type A	Type B	Type C	Type D	
OEM Rated Efficiency	1.12	0.00	1.58	1.35	
Low Battery Usage[1]	1.55	N/A	2.18	1.87	kWh per mile
Low Deadhead Battery Usage	1.24	N/A	1.74	1.50	kWh per mile
Resting Battery Usage (Heat only)	20.00	N/A	20.00	20.00	kWh per hour
High Battery Usage[2]	2.48	N/A	3.48	3.00	kWh per mile
High Deadhead Battery Usage	2.19	N/A	3.08	2.65	kWh per mile

Notes:
1. Best Case Usage with little/no HVAC usage at Moderate OA Temperatures.
2. Worst Case Usage with extreme cold/heat,traffic/ long stops

Manufacturer	Include?
Bluebird	No
BYD	No
Collins	No
Greenpower	No
IC	Yes
Lion	Yes
Thomas	No

Charging Variables	
Dead Head Miles	10%
Charging Rate Safety Factor	90%
Route Safety Factor	5%
Efficiency Safety Factor (Distance)	11%
Maximum Battery Level	90%
Anticipated Degradation	90%
Minimum Battery Level	10%
Low Temp Power Factor (kW)	0

			ROUTE INFORMATION																		
FORMULA INDEX			AM									PM									
AVG			0	138.65	36.77	15.41	31.45	36.90	4.10	15.85	4:03	0	156.32	37.04	17.37	13.30	38.02	4.22	14.40	0:37	0	164.70
MAX			5	251.10	75.00	27.90	75.00	85.13	9.46	22.96	5:09	4	269.10	60.00	29.90	75.00	99.92	11.10	23.29	0:37	3	164.70
MIN			0	99.90	30.00	11.10	0.00	19.98	2.22	9.20	1:27	0	55.80	15.00	6.20	0.00	10.12	1.12	7.05	0:37	0	164.70
Line #	Bus Type	Bus	Number of AM Routes	AM Active Run Time (Min)	AM Resting Time (Min)	AM Deadhead Run Time (Min)	AM Between Shift Not Charging / Not On (Min)	AM Active Distance (Miles)	AM Deadhead Distance (Miles)	AM Average Speed (mph)	Time Until Next Shift	Number of PM Routes	PM Active Run Time (Min)	PM Resting Time (Min)	PM Deadhead Run Time (Min)	PM Between Shift Not Charging / Not On (Min)	PM Active Distance (Miles)	PM Deadhead Distance (Miles)	PM Average Speed (mph)	Time Until Next Shift2	Number of PM2 Routes	PM2 Active Run Time (Min)
67	Type C	505	3	128.70	45.00	14.30	61.00	29.08	3.23	13.56	3:51	3	157.50	45.00	17.50	5.00	24.04	2.67	9.16	-	0	-
68	Type C	410 - Contracted	2	120.60	30.00	13.40	10.00	38.99	4.33	19.40	5:09	2	156.60	30.00	17.40	0.00	39.54	4.39	15.15	-	0	-
69	Type C	414 - Contracted	2	120.60	30.00	13.40	10.00	38.99	4.33	19.40	5:09	2	156.60	30.00	17.40	0.00	39.54	4.39	15.15	-	0	-
70	Type C	418 - Contracted	2	120.60	30.00	13.40	10.00	38.99	4.33	19.40	5:09	2	156.60	30.00	17.40	0.00	39.54	4.39	15.15	-	0	-
71	Type C	421 - Contracted	2	120.60	30.00	13.40	10.00	38.99	4.33	19.40	5:09	2	156.60	30.00	17.40	0.00	39.54	4.39	15.15	-	0	-
72	Type C	422 - Contracted	2	120.60	30.00	13.40	10.00	38.99	4.33	19.40	5:09	2	156.60	30.00	17.40	0.00	39.54	4.39	15.15	-	0	-
73	Type C	424 - Contracted	2	120.60	30.00	13.40	10.00	38.99	4.33	19.40	5:09	2	156.60	30.00	17.40	0.00	39.54	4.39	15.15	-	0	-
74	Type C	426- Contracted	2	120.60	30.00	13.40	10.00	38.99	4.33	19.40	5:09	2	156.60	30.00	17.40	0.00	39.54	4.39	15.15	-	0	-
75	Type C	427- Contracted	2	120.60	30.00	13.40	10.00	38.99	4.33	19.40	5:09	2	156.60	30.00	17.40	0.00	39.54	4.39	15.15	-	0	-
76	Type C	428- Contracted	2	120.60	30.00	13.40	10.00	38.99	4.33	19.40	5:09	2	156.60	30.00	17.40	0.00	39.54	4.39	15.15	-	0	-
77	Type C	429- Contracted	2	120.60	30.00	13.40	10.00	38.99	4.33	19.40	5:09	2	156.60	30.00	17.40	0.00	39.54	4.39	15.15	-	0	-
78	Type C	430- Contracted	2	120.60	30.00	13.40	10.00	38.99	4.33	19.40	5:09	2	156.60	30.00	17.40	0.00	39.54	4.39	15.15	-	0	-
79	Type C	431- Contracted	2	120.60	30.00	13.40	10.00	38.99	4.33	19.40	5:09	2	156.60	30.00	17.40	0.00	39.54	4.39	15.15	-	0	-
80	Type C	432- Contracted	2	120.60	30.00	13.40	10.00	38.99	4.33	19.40	5:09	2	156.60	30.00	17.40	0.00	39.54	4.39	15.15	-	0	-
81	Type C	435- Contracted	2	120.60	30.00	13.40	10.00	38.99	4.33	19.40	5:09	2	156.60	30.00	17.40	0.00	39.54	4.39	15.15	-	0	-
82	Type C	438- Contracted	2	120.60	30.00	13.40	10.00	38.99	4.33	19.40	5:09	2	156.60	30.00	17.40	0.00	39.54	4.39	15.15	-	0	-
83	Type C	Spare - 440	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-
84	Type C	Spare - 443	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-
85	Type C	Spare - 446	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-
86	Type C	Spare - 447	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-
87	Type C	Spare - 452	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-
88	Type C	Spare - 454	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-
89	Type C	Spare - 468	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-

wendel

Project Name: Lancaster Central School District
Task: Route Analysis Calculation
Date: 2/27/2025

Bus Manufacturer	Bus Type	Bus Battery Size (kWh)	Max Battery Usage (kWh)
Lion	Type A	168	120.96
Bluebird	0	0	0
BYD	0	0	0
Collins	0	0	0
Greenpower	0	0	0
IC	Type C	210	151.2
IC	Type C	315	226.8
Lion	Type C	210	151.2
Bluebird	0	0	0
Bluebird	0	0	0
BYD	0	0	0
Thomas	0	0	0
Bluebird	0	0	0
BYD	0	0	0
Greenpower	0	0	0
Greenpower	0	0	0
Lion	Type D	210	151.2
Thomas	0	0	0

Charger Size	Charger kW
X-Large	360
Large	180
Medium Large	120
Medium	60
Small	24

FORMULA INDEX			PM 2						AM									
		AVG	45.00	18.30	15.00	30.99	3.44	11.29	17.43	103.54	0:26	0:53	1:19	2:39	6:38		17.76	106.72
		MAX	45.00	18.30	15.00	30.99	3.44	11.29	292.63	187.32	0:45	1:30	2:16	4:32	11:20	180	422.19	269.60
		MIN	45.00	18.30	15.00	30.99	3.44	11.29	0.00	60.21	0:08	0:16	0:25	0:50	2:07	24	0.00	30.42
Line #	Bus Type	Bus	PM2 Resting Time (Min)	PM2 Deadhead Run Time (Min)	PM2 Between Shift Not Charging / Not On (Min)	PM2 Active Distance (Miles)	PM2 Deadhead Distance (Miles)	PM2 Average Speed (mph)	AM High Energy Usage (kWh)	AM Low Energy Usage (kWh)	AM Min Charging Duration Hrs Needed to Perform PM Route (360 kW)	AM Min Charging Duration Hrs Needed to Perform PM Route (180 kW)	AM Min Charging Duration Hrs Needed to Perform PM Route (120 kW)	AM Min Charging Duration Hrs Needed to Perform PM Route (60 kW)	AM Min Charging Duration Hrs Needed to Perform PM Route (24 kW)	Required Charging Size (kW)	PM High Energy Usage (kWh)	PM Low Energy Usage (kWh)
1	Type C	409	-	-	-	-	-	-	167.04	107.51	0:30	1:01	1:32	3:05	7:44	60	169.25	108.87
2	Type C	412	-	-	-	-	-	-	237.09	152.91	0:34	1:08	1:42	3:24	8:30	120	183.81	117.90
3	Type C	415	-	-	-	-	-	-	202.57	129.52	0:36	1:12	1:48	3:37	9:03	60	195.55	125.17
4	Type C	433	-	-	-	-	-	-	292.63	187.32	0:32	1:04	1:36	3:13	8:02	120	173.87	111.74
5	Type C	434	-	-	-	-	-	-	202.75	129.63	0:37	1:15	1:52	3:45	9:23	60	422.19	269.60
6	Type C	436	-	-	-	-	-	-	259.37	170.71	0:39	1:19	1:59	3:59	9:58	120	215.54	137.56
7	Type C	437	-	-	-	-	-	-	273.58	175.52	0:45	1:30	2:16	4:32	11:20	120	244.82	157.70
8	Type C	439	-	-	-	-	-	-	191.69	122.78	0:32	1:05	1:37	3:15	8:07	60	175.50	112.75
9	Type A	441	-	-	-	-	-	-	258.82	166.37	0:26	0:52	1:18	2:36	6:32	60	141.21	89.50
10	Type C	442	-	-	-	-	-	-	140.99	91.36	0:26	0:52	1:18	2:36	6:31	60	231.51	147.45
11	Type C	444	-	-	-	-	-	-	135.90	90.21	0:25	0:50	1:15	2:31	6:17	60	138.58	91.86
12	Type C	445	-	-	-	-	-	-	170.99	111.95	0:27	0:55	1:22	2:45	6:53	60	148.80	98.20
13	Type C	448	-	-	-	-	-	-	146.38	96.70	0:27	0:54	1:21	2:42	6:46	60	159.65	104.92
14	Type C	449	-	-	-	-	-	-	189.63	121.50	0:35	1:10	1:45	3:30	8:46	60	239.65	154.50
15	Type C	450	-	-	-	-	-	-	206.33	133.85	0:32	1:04	1:36	3:12	8:02	60	173.63	113.58
16	Type C	451	-	-	-	-	-	-	226.20	144.16	0:41	1:23	2:05	4:11	10:28	120	250.77	159.39
17	Type C	453	-	-	-	-	-	-	272.45	178.81	0:36	1:12	1:49	3:38	9:07	120	196.93	126.02
18	Type C	455	45.00	18.30	15.00	30.99	3.44	11.29	151.48	99.86	0:08	0:16	0:25	0:50	2:07	60	45.87	30.42
19	Type C	456	-	-	-	-	-	-	140.48	91.05	0:26	0:52	1:18	2:36	6:30	120	250.94	163.48
20	Type C	457	-	-	-	-	-	-	233.08	152.42	0:31	1:02	1:34	3:08	7:51	60	169.73	111.17
21	Type A	458	-	-	-	-	-	-	140.71	91.19	0:26	0:52	1:18	2:36	6:30	60	146.72	94.91
22	Type C	459	-	-	-	-	-	-	133.58	86.77	0:22	0:45	1:07	2:15	5:37	60	121.59	81.34
23	Type C	460	-	-	-	-	-	-	162.61	106.75	0:28	0:56	1:24	2:49	7:03	60	152.35	100.39
24	Type C	461	-	-	-	-	-	-	93.07	61.67	0:17	0:34	0:51	1:43	4:18	60	142.77	94.46
25	Type C	462	-	-	-	-	-	-	125.92	82.02	0:23	0:46	1:09	2:19	5:49	60	153.24	98.95
26	Type C	463	-	-	-	-	-	-	128.74	83.77	0:23	0:47	1:11	2:23	5:57	60	135.72	90.09
27	Type C	464	-	-	-	-	-	-	117.54	76.83	0:21	0:43	1:05	2:10	5:26	60	124.00	80.84
28	Type C	465	-	-	-	-	-	-	128.53	85.64	0:23	0:47	1:11	2:22	5:57	60	134.13	89.11
29	Type C	466	-	-	-	-	-	-	90.72	60.21	0:16	0:33	0:50	1:40	4:12	24	172.04	112.60
30	Type C	467	-	-	-	-	-	-	126.00	84.07	0:23	0:46	1:10	2:20	5:50	60	130.81	87.05
31	Type C	469	-	-	-	-	-	-	190.75	122.19	0:35	1:10	1:45	3:31	8:49	180	343.37	220.77
32	Type C	470	-	-	-	-	-	-	159.93	105.10	0:22	0:45	1:08	2:17	5:43	60	123.69	82.64
33	Type C	471	-	-	-	-	-	-	126.64	82.47	0:23	0:46	1:10	2:20	5:51	60	149.45	98.60
34	Type C	472	-	-	-	-	-	-	113.52	74.34	0:21	0:42	1:03	2:06	5:15	60	169.11	110.78
35	Type C	473	-	-	-	-	-	-	119.31	77.92	0:21	0:43	1:04	2:09	5:23	60	116.34	76.09
36	Type C	474	-	-	-	-	-	-	128.63	83.70	0:23	0:47	1:11	2:22	5:57	60	152.89	100.73
37	Type C	475	-	-	-	-	-	-	133.95	89.00	0:24	0:48	1:13	2:26	6:05	60	131.75	87.63
38	Type C	476	-	-	-	-	-	-	128.74	83.77	0:23	0:47	1:11	2:23	5:57	60	169.80	111.21
39	Type C	477	-	-	-	-	-	-	114.75	75.10	0:21	0:42	1:03	2:07	5:18	60	141.83	93.88
40	Type C	478	-	-	-	-	-	-	222.38	143.79	0:19	0:39	0:59	1:58	4:55	60	106.33	69.89
41	Type C	479	-	-	-	-	-	-	100.55	66.30	0:17	0:35	0:53	1:47	4:27	24	96.32	63.68
42	Type C	480	-	-	-	-	-	-	161.67	106.17	0:23	0:46	1:10	2:20	5:51	60	126.54	84.41
43	Type C	481	-	-	-	-	-	-	91.92	60.95	0:17	0:34	0:51	1:42	4:15	60	106.44	69.95
44	Type C	482	-	-	-	-	-	-	131.74	85.63	0:24	0:48	1:13	2:26	6:05	60	142.51	92.30
45	Type C	483	-	-	-	-	-	-	103.41	68.07	0:19	0:38	0:57	1:54	4:47	60	182.81	119.27
46	Type C	484	-	-	-	-	-	-	169.37	110.94	0:22	0:44	1:06	2:12	5:32	60	119.52	78.06
47	Type C	485	-	-	-	-	-	-	96.90	64.04	0:17	0:35	0:53	1:47	4:29	24	0.00	-
48	Type C	486	-	-	-	-	-	-	139.52	92.44	0:20	0:41	1:01	2:03	5:08	60	110.93	74.73
49	Type C	487	-	-	-	-	-	-	147.17	95.19	0:27	0:54	1:21	2:43	6:48	60	228.51	145.60
50	Type C	488	-	-	-	-	-	-	176.92	115.62	0:29	0:59	1:29	2:58	7:25	60	160.55	105.48
51	Type C	489	-	-	-	-	-	-	135.47	89.94	0:25	0:50	1:15	2:30	6:15	60	135.00	89.65
52	Type C	490	-	-	-	-	-	-	104.38	68.68	0:17	0:34	0:51	1:43	4:18	60	93.22	61.76
53	Type C	491	-	-	-	-	-	-	125.97	84.05	0:23	0:46	1:09	2:19	5:49	60	168.28	110.27
54	Type C	492	-	-	-	-	-	-	129.54	86.26	0:23	0:47	1:10	2:21	5:54	60	127.59	85.06
55	Type C	493	-	-	-	-	-	-	138.82	90.02	0:25	0:51	1:17	2:34	6:25	60	163.75	105.47
56	Type C	494	-	-	-	-	-	-	148.37	97.93	0:27	0:54	1:22	2:44	6:52	60	165.46	108.52
57	Type C	495	-	-	-	-	-	-	118.08	77.16	0:21	0:43	1:05	2:11	5:28	60	188.45	122.76
58	Type C	496	-	-	-	-	-	-	157.36	101.50	0:25	0:51	1:16	2:33	6:23	60	138.03	89.52
59	Type C	497	-	-	-	-	-	-	205.58	135.38	0:22	0:44	1:06	2:13	5:33	60	120.18	80.46
60	Type C	498	-	-	-	-	-	-	170.62	109.72	0:29	0:58	1:27	2:54	7:17	60	157.36	101.50
61	Type C	499	-	-	-	-	-	-	132.28	85.96	0:24	0:49	1:13	2:26	6:07	60	173.51	111.51
62	Type C	500	-	-	-	-	-	-	121.66	79.38	0:22	0:45	1:07	2:15	5:37	60	190.89	122.28
63	Type C	501	-	-	-	-	-	-	249.19	160.41	0:26	0:53	1:19	2:38	6:37	120	143.08	92.66
64	Type C	502	-	-	-	-	-	-	134.68	89.44	0:17	0:35	0:53	1:47	4:28	60	96.50	63.79
65	Type C	503	-	-	-	-	-	-	109.81	74.04	0:20	0:40	1:01	2:02	5:05	60	117.08	78.54
66	Type C	504	-	-	-	-	-	-	129.03	83.95	0:23	0:47	1:11	2:23	5:58	60	255.66	164.42

wendel

Project Name: Lancaster Central School District
Task: Route Analysis Calculation
Date: 2/27/2025

Bus Manufacturer	Bus Type	Bus Battery Size (kWh)	Max Battery Usage (kWh)
Lion	Type A	168	120.96
Bluebird	0	0	0
BYD	0	0	0
Collins	0	0	0
Greenpower	0	0	0
IC	Type C	210	151.2
IC	Type C	315	226.8
Lion	Type C	210	151.2
Bluebird	0	0	0
Bluebird	0	0	0
BYD	0	0	0
Thomas	0	0	0
Bluebird	0	0	0
BYD	0	0	0
Greenpower	0	0	0
Greenpower	0	0	0
Lion	Type D	210	151.2
Thomas	0	0	0

Charger Size	Charger kW
X-Large	360
Large	180
Medium Large	120
Medium	60
Small	24

FORMULA INDEX			PM 2						AM									
		AVG	45.00	18.30	15.00	30.99	3.44	11.29	17.43	103.54	0:26	0:53	1:19	2:39	6:38		17.76	106.72
		MAX	45.00	18.30	15.00	30.99	3.44	11.29	292.63	187.32	0:45	1:30	2:16	4:32	11:20	180	422.19	269.60
		MIN	45.00	18.30	15.00	30.99	3.44	11.29	0.00	60.21	0:08	0:16	0:25	0:50	2:07	24	0.00	30.42
Line #	Bus Type	Bus	PM2 Resting Time (Min)	PM2 Deadhead Run Time (Min)	PM2 Between Shift Not Charging / Not On (Min)	PM2 Active Distance (Miles)	PM2 Deadhead Distance (Miles)	PM2 Average Speed (mph)	AM High Energy Usage (kWh)	AM Low Energy Usage (kWh)	AM Min Charging Duration Hrs Needed to Perform PM Route (360 kW)	AM Min Charging Duration Hrs Needed to Perform PM Route (180 kW)	AM Min Charging Duration Hrs Needed to Perform PM Route (120 kW)	AM Min Charging Duration Hrs Needed to Perform PM Route (60 kW)	AM Min Charging Duration Hrs Needed to Perform PM Route (24 kW)	Required Charging Size (kW)	PM High Energy Usage (kWh)	PM Low Energy Usage (kWh)
67	Type C	505	-	-	-	-	-	-	132.51	88.10	0:20	0:41	1:02	2:04	5:11	60	112.27	75.56
68	Type C	410 - Contracted	-	-	-	-	-	-	167.04	107.51	0:30	1:01	1:32	3:05	7:44	60	169.25	108.87
69	Type C	414 - Contracted	-	-	-	-	-	-	167.04	107.51	0:30	1:01	1:32	3:05	7:44	60	169.25	108.87
70	Type C	418 - Contracted	-	-	-	-	-	-	167.04	107.51	0:30	1:01	1:32	3:05	7:44	60	169.25	108.87
71	Type C	421 - Contracted	-	-	-	-	-	-	167.04	107.51	0:30	1:01	1:32	3:05	7:44	60	169.25	108.87
72	Type C	422 - Contracted	-	-	-	-	-	-	167.04	107.51	0:30	1:01	1:32	3:05	7:44	60	169.25	108.87
73	Type C	424 - Contracted	-	-	-	-	-	-	167.04	107.51	0:30	1:01	1:32	3:05	7:44	60	169.25	108.87
74	Type C	426- Contracted	-	-	-	-	-	-	167.04	107.51	0:30	1:01	1:32	3:05	7:44	60	169.25	108.87
75	Type C	427- Contracted	-	-	-	-	-	-	167.04	107.51	0:30	1:01	1:32	3:05	7:44	60	169.25	108.87
76	Type C	428- Contracted	-	-	-	-	-	-	167.04	107.51	0:30	1:01	1:32	3:05	7:44	60	169.25	108.87
77	Type C	429- Contracted	-	-	-	-	-	-	167.04	107.51	0:30	1:01	1:32	3:05	7:44	60	169.25	108.87
78	Type C	430- Contracted	-	-	-	-	-	-	167.04	107.51	0:30	1:01	1:32	3:05	7:44	60	169.25	108.87
79	Type C	431- Contracted	-	-	-	-	-	-	167.04	107.51	0:30	1:01	1:32	3:05	7:44	60	169.25	108.87
80	Type C	432- Contracted	-	-	-	-	-	-	167.04	107.51	0:30	1:01	1:32	3:05	7:44	60	169.25	108.87
81	Type C	435- Contracted	-	-	-	-	-	-	167.04	107.51	0:30	1:01	1:32	3:05	7:44	60	169.25	108.87
82	Type C	438- Contracted	-	-	-	-	-	-	167.04	107.51	0:30	1:01	1:32	3:05	7:44	60	169.25	108.87
83	Type C	Spare - 440	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	0.00	-
84	Type C	Spare - 443	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	0.00	-
85	Type C	Spare - 446	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	0.00	-
86	Type C	Spare - 447	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	0.00	-
87	Type C	Spare - 452	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	0.00	-
88	Type C	Spare - 454	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	0.00	-
89	Type C	Spare - 468	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	0.00	-

wendel

Project Name: Lancaster Central School District
Task: Route Analysis Calculation
Date: 2/27/2025

FORMULA INDEX			PM						PM2		Results				
		AVG	0:30	1:01	1:31	3:03	7:39		0.19	92.85		2:31	19.62	282.92	
		MAX	1:18	2:36	3:54	7:49	19:32	360	140.17	92.85	180	4:27	422.19	315.00	
		MIN	0:17	0:34	0:51	1:43	4:18	24	0.00	92.85	0	0:50	0.00	210.00	
Line #	Bus Type	Bus	PM Min Charging Duration Hrs Needed to Perform PM Route (360 kW)	PM Min Charging Duration Hrs Needed to Perform PM Route (180 kW)	PM Min Charging Duration Hrs Needed to Perform PM Route (120 kW)	PM Min Charging Duration Hrs Needed to Perform PM Route (60 kW)	PM Min Charging Duration Hrs Needed to Perform PM Route (24 kW)	PM Required Charging Size (kW)	PM2 High Energy Usage (kWh)	PM2 Low Energy Usage (kWh)	Proposed Charger Size based on Maximum Usage (kW)	Mid-Day Charging Duration Needed based on Proposed Charger Size	Full Day High Energy Usage (kWh)	Proposed Battery Size based on Maximum Usage (kWh)	Proposed Bus Manufacturer / Size based on District Preferences
1	Type C	409	0:31	1:02	1:34	3:08	7:50	24	0.00	-	60	3:05	169.2	315	IC
2	Type C	412	0:34	1:08	1:42	3:24	8:30	24	0.00	-	120	1:42	237.1	#N/A	#N/A
3	Type C	415	0:36	1:12	1:48	3:37	9:03	24	0.00	-	60	3:37	202.6	315	IC
4	Type C	433	0:32	1:04	1:36	3:13	8:02	24	0.00	-	120	1:36	292.6	#N/A	#N/A
5	Type C	434	1:18	2:36	3:54	7:49	19:32	24	0.00	-	120	3:45	422.2	#N/A	#N/A
6	Type C	436	0:39	1:19	1:59	3:59	9:58	24	0.00	-	120	1:59	259.4	#N/A	#N/A
7	Type C	437	0:45	1:30	2:16	4:32	11:20	24	0.00	-	120	2:16	273.6	#N/A	#N/A
8	Type C	439	0:32	1:05	1:37	3:15	8:07	24	0.00	-	60	3:15	191.7	315	IC
9	Type A	441	0:26	0:52	1:18	2:36	6:32	24	0.00	-	60	2:36	258.8	#N/A	#N/A
10	Type C	442	0:42	1:25	2:08	4:17	10:43	24	0.00	-	60	2:36	231.5	#N/A	#N/A
11	Type C	444	0:25	0:51	1:16	2:33	6:24	24	0.00	-	60	2:31	138.6	210	IC
12	Type C	445	0:27	0:55	1:22	2:45	6:53	24	0.00	-	60	2:45	171.0	315	IC
13	Type C	448	0:29	0:59	1:28	2:57	7:23	24	0.00	-	60	2:42	159.6	315	IC
14	Type C	449	0:44	1:28	2:13	4:26	11:05	24	0.00	-	60	3:30	239.7	#N/A	#N/A
15	Type C	450	0:32	1:04	1:36	3:12	8:02	24	0.00	-	60	3:12	206.3	315	IC
16	Type C	451	0:46	1:32	2:19	4:38	11:36	24	0.00	-	120	2:05	250.8	#N/A	#N/A
17	Type C	453	0:36	1:12	1:49	3:38	9:07	24	0.00	-	120	1:49	272.4	#N/A	#N/A
18	Type C	455	0:25	0:51	1:17	2:35	6:29	360	140.17	92.85	120	0:50	151.5	315	IC
19	Type C	456	0:46	1:32	2:19	4:38	11:37	24	0.00	-	120	1:18	250.9	#N/A	#N/A
20	Type C	457	0:31	1:02	1:34	3:08	7:51	24	0.00	-	60	3:08	233.1	#N/A	#N/A
21	Type A	458	0:27	0:54	1:21	2:43	6:47	24	0.00	-	60	2:36	146.7	#N/A	#N/A
22	Type C	459	0:22	0:45	1:07	2:15	5:37	24	0.00	-	60	2:15	133.6	210	IC
23	Type C	460	0:28	0:56	1:24	2:49	7:03	24	0.00	-	60	2:49	162.6	315	IC
24	Type C	461	0:26	0:52	1:19	2:38	6:36	24	0.00	-	60	1:43	142.8	210	IC
25	Type C	462	0:28	0:56	1:25	2:50	7:05	24	0.00	-	60	2:19	153.2	315	IC
26	Type C	463	0:25	0:50	1:15	2:30	6:17	24	0.00	-	60	2:23	135.7	210	IC
27	Type C	464	0:22	0:45	1:08	2:17	5:44	24	0.00	-	60	2:10	124.0	210	IC
28	Type C	465	0:24	0:49	1:14	2:29	6:12	24	0.00	-	60	2:22	134.1	210	IC
29	Type C	466	0:31	1:03	1:35	3:11	7:57	24	0.00	-	60	4:12	172.0	315	IC
30	Type C	467	0:24	0:48	1:12	2:25	6:03	24	0.00	-	60	2:20	130.8	210	IC
31	Type C	469	1:03	2:07	3:10	6:21	15:53	24	0.00	-	180	1:10	343.4	#N/A	#N/A
32	Type C	470	0:22	0:45	1:08	2:17	5:43	24	0.00	-	60	2:17	159.9	315	IC
33	Type C	471	0:27	0:55	1:23	2:46	6:55	24	0.00	-	60	2:20	149.5	210	IC
34	Type C	472	0:31	1:02	1:33	3:07	7:49	24	0.00	-	60	2:06	169.1	315	IC
35	Type C	473	0:21	0:43	1:04	2:09	5:23	24	0.00	-	60	2:09	119.3	210	IC
36	Type C	474	0:28	0:56	1:24	2:49	7:04	24	0.00	-	60	2:22	152.9	315	IC
37	Type C	475	0:24	0:48	1:13	2:26	6:05	24	0.00	-	60	2:26	134.0	210	IC
38	Type C	476	0:31	1:02	1:34	3:08	7:51	24	0.00	-	60	2:23	169.8	315	IC
39	Type C	477	0:26	0:52	1:18	2:37	6:33	24	0.00	-	60	2:07	141.8	210	IC
40	Type C	478	0:19	0:39	0:59	1:58	4:55	24	0.00	-	60	1:58	222.4	315	IC
41	Type C	479	0:17	0:35	0:53	1:47	4:27	24	0.00	-	24	4:27	100.6	210	IC
42	Type C	480	0:23	0:46	1:10	2:20	5:51	24	0.00	-	60	2:20	161.7	315	IC
43	Type C	481	0:19	0:39	0:59	1:58	4:55	24	0.00	-	60	1:42	106.4	210	IC
44	Type C	482	0:26	0:52	1:19	2:38	6:35	24	0.00	-	60	2:26	142.5	210	IC
45	Type C	483	0:33	1:07	1:41	3:23	8:27	24	0.00	-	60	1:54	182.8	315	IC
46	Type C	484	0:22	0:44	1:06	2:12	5:32	24	0.00	-	60	2:12	169.4	315	IC
47	Type C	485	-	-	-	-	-	-	0.00	-	24	-	96.9	210	IC
48	Type C	486	0:20	0:41	1:01	2:03	5:08	24	0.00	-	60	2:03	139.5	210	IC
49	Type C	487	0:42	1:24	2:06	4:13	10:34	24	0.00	-	60	2:43	228.5	#N/A	#N/A
50	Type C	488	0:29	0:59	1:29	2:58	7:25	24	0.00	-	60	2:58	176.9	315	IC
51	Type C	489	0:25	0:50	1:15	2:30	6:15	24	0.00	-	60	2:30	135.5	210	IC
52	Type C	490	0:17	0:34	0:51	1:43	4:18	24	0.00	-	60	1:43	104.4	210	IC
53	Type C	491	0:31	1:02	1:33	3:06	7:47	24	0.00	-	60	2:19	168.3	315	IC
54	Type C	492	0:23	0:47	1:10	2:21	5:54	24	0.00	-	60	2:21	129.5	210	IC
55	Type C	493	0:30	1:00	1:30	3:01	7:34	24	0.00	-	60	2:34	163.8	315	IC
56	Type C	494	0:30	1:01	1:31	3:03	7:39	24	0.00	-	60	2:44	165.5	315	IC
57	Type C	495	0:34	1:09	1:44	3:29	8:43	24	0.00	-	60	2:11	188.4	315	IC
58	Type C	496	0:25	0:51	1:16	2:33	6:23	24	0.00	-	60	2:33	157.4	315	IC
59	Type C	497	0:22	0:44	1:06	2:13	5:33	24	0.00	-	60	2:13	205.6	315	IC
60	Type C	498	0:29	0:58	1:27	2:54	7:17	24	0.00	-	60	2:54	170.6	315	IC
61	Type C	499	0:32	1:04	1:36	3:12	8:01	24	0.00	-	60	2:26	173.5	315	IC
62	Type C	500	0:35	1:10	1:46	3:32	8:50	24	0.00	-	60	2:15	190.9	315	IC
63	Type C	501	0:26	0:53	1:19	2:38	6:37	24	0.00	-	120	1:19	249.2	#N/A	#N/A
64	Type C	502	0:17	0:35	0:53	1:47	4:28	24	0.00	-	60	1:47	134.7	210	IC
65	Type C	503	0:21	0:43	1:05	2:10	5:25	24	0.00	-	60	2:02	117.1	210	IC
66	Type C	504	0:47	1:34	2:22	4:44	11:50	24	0.00	-	60	2:23	255.7	#N/A	#N/A

wendel

Project Name: Lancaster Central School District
Task: Route Analysis Calculation
Date: 2/27/2025

FORMULA INDEX			PM						PM2		Results				
		AVG	0:30	1:01	1:31	3:03	7:39		0.19	92.85		2:31	19.62	282.92	
		MAX	1:18	2:36	3:54	7:49	19:32	360	140.17	92.85	180	4:27	422.19	315.00	
		MIN	0:17	0:34	0:51	1:43	4:18	24	0.00	92.85	0	0:50	0.00	210.00	
Line #	Bus Type	Bus	PM Min Charging Duration Hrs Needed to Perform PM Route (360 kW)	PM Min Charging Duration Hrs Needed to Perform PM Route (180 kW)	PM Min Charging Duration Hrs Needed to Perform PM Route (120 kW)	PM Min Charging Duration Hrs Needed to Perform PM Route (60 kW)	PM Min Charging Duration Hrs Needed to Perform PM Route (24 kW)	PM Required Charging Size (kW)	PM2 High Energy Usage (kWh)	PM2 Low Energy Usage (kWh)	Proposed Charger Size based on Maximum Usage (kW)	Mid-Day Charging Duration Needed based on Proposed Charger Size	Full Day High Energy Usage (kWh)	Proposed Battery Size based on Maximum Usage (kWh)	Proposed Bus Manufacturer / Size based on District Preferences
67	Type C	505	0:20	0:41	1:02	2:04	5:11	24	0.00	-	60	2:04	132.5	210	IC
68	Type C	410 - Contracted	0:31	1:02	1:34	3:08	7:50	24	0.00	-	60	3:05	169.2	315	IC
69	Type C	414 - Contracted	0:31	1:02	1:34	3:08	7:50	24	0.00	-	60	3:05	169.2	315	IC
70	Type C	418 - Contracted	0:31	1:02	1:34	3:08	7:50	24	0.00	-	60	3:05	169.2	315	IC
71	Type C	421 - Contracted	0:31	1:02	1:34	3:08	7:50	24	0.00	-	60	3:05	169.2	315	IC
72	Type C	422 - Contracted	0:31	1:02	1:34	3:08	7:50	24	0.00	-	60	3:05	169.2	315	IC
73	Type C	424 - Contracted	0:31	1:02	1:34	3:08	7:50	24	0.00	-	60	3:05	169.2	315	IC
74	Type C	426- Contracted	0:31	1:02	1:34	3:08	7:50	24	0.00	-	60	3:05	169.2	315	IC
75	Type C	427- Contracted	0:31	1:02	1:34	3:08	7:50	24	0.00	-	60	3:05	169.2	315	IC
76	Type C	428- Contracted	0:31	1:02	1:34	3:08	7:50	24	0.00	-	60	3:05	169.2	315	IC
77	Type C	429- Contracted	0:31	1:02	1:34	3:08	7:50	24	0.00	-	60	3:05	169.2	315	IC
78	Type C	430- Contracted	0:31	1:02	1:34	3:08	7:50	24	0.00	-	60	3:05	169.2	315	IC
79	Type C	431- Contracted	0:31	1:02	1:34	3:08	7:50	24	0.00	-	60	3:05	169.2	315	IC
80	Type C	432- Contracted	0:31	1:02	1:34	3:08	7:50	24	0.00	-	60	3:05	169.2	315	IC
81	Type C	435- Contracted	0:31	1:02	1:34	3:08	7:50	24	0.00	-	60	3:05	169.2	315	IC
82	Type C	438- Contracted	0:31	1:02	1:34	3:08	7:50	24	0.00	-	60	3:05	169.2	315	IC
83	Type C	Spare - 440	-	-	-	-	-	-	0.00	-	120	-	0.0	315	IC
84	Type C	Spare - 443	-	-	-	-	-	-	0.00	-	0	-	0.0	315	IC
85	Type C	Spare - 446	-	-	-	-	-	-	0.00	-	120	-	0.0	315	IC
86	Type C	Spare - 447	-	-	-	-	-	-	0.00	-	0	-	0.0	315	IC
87	Type C	Spare - 452	-	-	-	-	-	-	0.00	-	24	-	0.0	315	IC
88	Type C	Spare - 454	-	-	-	-	-	-	0.00	-	24	-	0.0	315	IC
89	Type C	Spare - 468	-	-	-	-	-	-	0.00	-	24	-	0.0	315	IC

Minimum Required Electric Bus Sizes

Bus Number	Bus Type	Maximum Route Energy Usage (kWh)	Minimum Bus Size based on Maximum Route Energy Usage (kWh)	Minimum Bus Size Available Based on Current Manufacturers	Proposed Bus Size and Type Based on District Preferences	Recommended Charger Size Based on Currently Available Technology	Charger Size Needed Based on Minimum Bus Size
409	Type C	169.25	235	315 kWh - IC	315 kWh - IC	60 kW	36 kW
410 - Contracted	Type C	169.25	235	315 kWh - IC	315 kWh - IC	60 kW	36 kW
412	Type C	237.09	329	#N/A	#N/A	120 kW	105 kW
414 - Contracted	Type C	169.25	235	315 kWh - IC	315 kWh - IC	60 kW	36 kW
415	Type C	202.57	281	315 kWh - IC	315 kWh - IC	60 kW	58 kW
418 - Contracted	Type C	169.25	235	315 kWh - IC	315 kWh - IC	60 kW	36 kW
421 - Contracted	Type C	169.25	235	315 kWh - IC	315 kWh - IC	60 kW	36 kW
422 - Contracted	Type C	169.25	235	315 kWh - IC	315 kWh - IC	60 kW	36 kW
424 - Contracted	Type C	169.25	235	315 kWh - IC	315 kWh - IC	60 kW	36 kW
426- Contracted	Type C	169.25	235	315 kWh - IC	315 kWh - IC	60 kW	36 kW
427- Contracted	Type C	169.25	235	315 kWh - IC	315 kWh - IC	60 kW	36 kW
428- Contracted	Type C	169.25	235	315 kWh - IC	315 kWh - IC	60 kW	36 kW
429- Contracted	Type C	169.25	235	315 kWh - IC	315 kWh - IC	60 kW	36 kW
430- Contracted	Type C	169.25	235	315 kWh - IC	315 kWh - IC	60 kW	36 kW
431- Contracted	Type C	169.25	235	315 kWh - IC	315 kWh - IC	60 kW	36 kW
432- Contracted	Type C	169.25	235	315 kWh - IC	315 kWh - IC	60 kW	36 kW
433	Type C	292.63	406	#N/A	#N/A	120 kW	60 kW
434	Type C	422.19	586	#N/A	#N/A	120 kW	67 kW
435- Contracted	Type C	169.25	235	315 kWh - IC	315 kWh - IC	60 kW	36 kW
436	Type C	259.37	360	#N/A	#N/A	120 kW	104 kW
437	Type C	273.58	380	#N/A	#N/A	120 kW	69 kW
438- Contracted	Type C	169.25	235	315 kWh - IC	315 kWh - IC	60 kW	36 kW
439	Type C	191.69	266	315 kWh - IC	315 kWh - IC	60 kW	52 kW
441	Type A	258.82	359	#N/A	#N/A	60 kW	53 kW
442	Type C	231.51	322	#N/A	#N/A	60 kW	40 kW
444	Type C	138.58	192	210 kWh - IC	210 kWh - IC	60 kW	43 kW
445	Type C	170.99	237	315 kWh - IC	315 kWh - IC	60 kW	47 kW
448	Type C	159.65	222	315 kWh - IC	315 kWh - IC	60 kW	44 kW
449	Type C	239.65	333	#N/A	#N/A	60 kW	52 kW
450	Type C	206.33	287	315 kWh - IC	315 kWh - IC	60 kW	44 kW
451	Type C	250.77	348	#N/A	#N/A	120 kW	73 kW
453	Type C	272.45	378	#N/A	#N/A	120 kW	80 kW
455	Type C	151.48	210	315 kWh - IC	315 kWh - IC	120 kW	92 kW
456	Type C	250.94	349	#N/A	#N/A	120 kW	76 kW
457	Type C	233.08	324	#N/A	#N/A	60 kW	56 kW
458	Type A	146.72	204	#N/A	#N/A	60 kW	44 kW
459	Type C	133.58	186	210 kWh - IC	210 kWh - IC	60 kW	33 kW
460	Type C	162.61	226	315 kWh - IC	315 kWh - IC	60 kW	45 kW
461	Type C	142.77	198	210 kWh - IC	210 kWh - IC	60 kW	26 kW
462	Type C	153.24	213	315 kWh - IC	315 kWh - IC	60 kW	35 kW
463	Type C	135.72	189	210 kWh - IC	210 kWh - IC	60 kW	34 kW

Minimum Required Electric Bus Sizes

Bus Number	Bus Type	Maximum Route Energy Usage (kWh)	Minimum Bus Size based on Maximum Route Energy Usage (kWh)	Minimum Bus Size Available Based on Current Manufacturers	Proposed Bus Size and Type Based on District Preferences	Recommended Charger Size Based on Currently Available Technology	Charger Size Needed Based on Minimum Bus Size
464	Type C	124.00	172	210 kWh - IC	210 kWh - IC	60 kW	29 kW
465	Type C	134.13	186	210 kWh - IC	210 kWh - IC	60 kW	40 kW
466	Type C	172.04	239	315 kWh - IC	315 kWh - IC	60 kW	25 kW
467	Type C	130.81	182	210 kWh - IC	210 kWh - IC	60 kW	35 kW
469	Type C	343.37	477	#N/A	#N/A	180 kW	146 kW
470	Type C	159.93	222	315 kWh - IC	315 kWh - IC	60 kW	39 kW
471	Type C	149.45	208	210 kWh - IC	210 kWh - IC	60 kW	31 kW
472	Type C	169.11	235	315 kWh - IC	315 kWh - IC	60 kW	29 kW
473	Type C	119.31	166	210 kWh - IC	210 kWh - IC	60 kW	28 kW
474	Type C	152.89	212	315 kWh - IC	315 kWh - IC	60 kW	30 kW
475	Type C	133.95	186	210 kWh - IC	210 kWh - IC	60 kW	35 kW
476	Type C	169.80	236	315 kWh - IC	315 kWh - IC	60 kW	31 kW
477	Type C	141.83	197	210 kWh - IC	210 kWh - IC	60 kW	28 kW
478	Type C	222.38	309	315 kWh - IC	315 kWh - IC	60 kW	39 kW
479	Type C	100.55	140	210 kWh - IC	210 kWh - IC	24 kW	23 kW
480	Type C	161.67	225	315 kWh - IC	315 kWh - IC	60 kW	36 kW
481	Type C	106.44	148	210 kWh - IC	210 kWh - IC	60 kW	25 kW
482	Type C	142.51	198	210 kWh - IC	210 kWh - IC	60 kW	35 kW
483	Type C	182.81	254	315 kWh - IC	315 kWh - IC	60 kW	26 kW
484	Type C	169.37	235	315 kWh - IC	315 kWh - IC	60 kW	30 kW
485	Type C	96.90	135	210 kWh - IC	210 kWh - IC	24 kW	9 kW
486	Type C	139.52	194	210 kWh - IC	210 kWh - IC	60 kW	33 kW
487	Type C	228.51	317	#N/A	#N/A	60 kW	36 kW
488	Type C	176.92	246	315 kWh - IC	315 kWh - IC	60 kW	48 kW
489	Type C	135.47	188	210 kWh - IC	210 kWh - IC	60 kW	39 kW
490	Type C	104.38	145	210 kWh - IC	210 kWh - IC	60 kW	26 kW
491	Type C	168.28	234	315 kWh - IC	315 kWh - IC	60 kW	38 kW
492	Type C	129.54	180	210 kWh - IC	210 kWh - IC	60 kW	39 kW
493	Type C	163.75	227	315 kWh - IC	315 kWh - IC	60 kW	36 kW
494	Type C	165.46	230	315 kWh - IC	315 kWh - IC	60 kW	45 kW
495	Type C	188.45	262	315 kWh - IC	315 kWh - IC	60 kW	29 kW
496	Type C	157.36	219	315 kWh - IC	315 kWh - IC	60 kW	34 kW
497	Type C	205.58	286	315 kWh - IC	315 kWh - IC	60 kW	36 kW
498	Type C	170.62	237	315 kWh - IC	315 kWh - IC	60 kW	43 kW
499	Type C	173.51	241	315 kWh - IC	315 kWh - IC	60 kW	36 kW
500	Type C	190.89	265	315 kWh - IC	315 kWh - IC	60 kW	30 kW
501	Type C	249.19	346	#N/A	#N/A	120 kW	68 kW
502	Type C	134.68	187	210 kWh - IC	210 kWh - IC	60 kW	25 kW
503	Type C	117.08	163	210 kWh - IC	210 kWh - IC	60 kW	32 kW
504	Type C	255.66	355	#N/A	#N/A	60 kW	43 kW
505	Type C	132.51	184	210 kWh - IC	210 kWh - IC	60 kW	32 kW

Minimum Required Electric Bus Sizes

Bus Number	Bus Type	Maximum Route Energy Usage (kWh)	Minimum Bus Size based on Maximum Route Energy Usage (kWh)	Minimum Bus Size Available Based on Current Manufacturers	Proposed Bus Size and Type Based on District Preferences	Recommended Charger Size Based on Currently Available Technology	Charger Size Needed Based on Minimum Bus Size
Spare - 440	Type C	0.00	0	210 kWh - IC	315 kWh - IC	120 kW	0 kW
Spare - 443	Type C	0.00	0	210 kWh - IC	315 kWh - IC		0 kW
Spare - 446	Type C	0.00	0	210 kWh - IC	315 kWh - IC	120 kW	0 kW
Spare - 447	Type C	0.00	0	210 kWh - IC	315 kWh - IC		0 kW
Spare - 452	Type C	0.00	0	210 kWh - IC	315 kWh - IC	24 kW	0 kW
Spare - 454	Type C	0.00	0	210 kWh - IC	315 kWh - IC	24 kW	0 kW
Spare - 468	Type C	0.00	0	210 kWh - IC	315 kWh - IC	24 kW	0 kW

Lancaster Central School District

BEB Charging Model

Date. 11/26/24

Task Summary[1]		
Bus Data		
Route Buses	67.0	Buses
Spare Buses	22.0	Buses
Contracted Buses	-	Buses
Type A Bus Basis of Design	Lion	
Type C/D Bus Basis of Design	IC	
Minimum Charger Size Used	24	kW
Maximum Charger Size Used	180	kW
Before Demand Reduction		
Maximum combined bus electrical demand	3,095.5	kW
Day of Week Max Demand Occurs	Tuesday	
Time Max Demand Occurs Between	11	12
Maximum single bus charging rate for any hour	122	kW
After Demand Reduction		
Maximum combined bus electrical demand	1,957.6	kW
Day of Week Max Demand Occurs	Tuesday	
Time Max Demand Occurs Between	11	12
Maximum single bus charging rate for any hour	122	kW
Route buses requiring between 60 kW and 80 kW of charge	3	
Route buses requiring between 40 kW and 60 kW of charge	6	
Route buses requiring between 20 kW and 40 kW of charge	24	
Route buses requiring less than 20 kW of charge	48	
Results		
Demand Reduction Savings	1,137.9	kW
Peak Load Factor	35%	
Overnight Load Factor	23%	
Proposed Charger Quantites		
Quantity of 180 kW DC Chargers	1	
Quantity of 120 kW DC Chargers	11	
Quantity of 60 kW DC Chargers	69	
Quantity of 24 kW DC Chargers	8	
Proposed Route Bus Quantities		
Quantity of IC Type C 210 kWh Buses	22	
Quantity of IC Type C 315 kWh Buses	42	
No Replacement	18	
Proposed Spare Bus Quantites		
Quantity of IC Type C 315 kWh Buses	7	

1. 15 Contracted Buses and routes have been included in this model

wendel

Project Name: Lancaster BEB Study
Building: Lancaster Central School District
Date: 11/26/2024

Bus Data	
Minutes before Bus Route Begins that Bus is removed from Charger	15 Min
Minutes after Bus Route ends that Bus is back on Charger	0 Min

		Charging Schedule											
FORMULA INDEX		First Route					Second Route				Third Route			
Line #	Bus	On Charger AM	Off Charger AM	Bus Leaves Station AM	Bus Arrives at Station AM	On Charger R1	Off Charger R2	Bus Leaves Station R2	Bus Arrives at Station R2	On Charger R2	Off Charger R3	Bus Leaves Station R3	Bus Arrives at Station R3	On Charger R3
1	409	12:00 AM	5:51 AM	6:06 AM	8:30 AM	8:30 AM	1:39 PM	1:54 PM	4:48 PM	4:48 PM	N/A	N/A	N/A	
2	410 - Contracted	12:00 AM	5:51 AM	6:06 AM	8:30 AM	8:30 AM	1:39 PM	1:54 PM	4:48 PM	4:48 PM	N/A	N/A	N/A	
3	412	12:00 AM	5:45 AM	6:00 AM	11:30 AM	11:30 AM	1:27 PM	1:42 PM	4:45 PM	4:45 PM	N/A	N/A	N/A	
4	414 - Contracted	12:00 AM	5:51 AM	6:06 AM	8:30 AM	8:30 AM	1:39 PM	1:54 PM	4:48 PM	4:48 PM	N/A	N/A	N/A	
5	415	12:00 AM	6:03 AM	6:18 AM	9:32 AM	9:32 AM	1:15 PM	1:30 PM	5:15 PM	5:15 PM	N/A	N/A	N/A	
6	418 - Contracted	12:00 AM	5:51 AM	6:06 AM	8:30 AM	8:30 AM	1:39 PM	1:54 PM	4:48 PM	4:48 PM	N/A	N/A	N/A	
7	421 - Contracted	12:00 AM	5:51 AM	6:06 AM	8:30 AM	8:30 AM	1:39 PM	1:54 PM	4:48 PM	4:48 PM	N/A	N/A	N/A	
8	422 - Contracted	12:00 AM	5:51 AM	6:06 AM	8:30 AM	8:30 AM	1:39 PM	1:54 PM	4:48 PM	4:48 PM	N/A	N/A	N/A	
9	424 - Contracted	12:00 AM	5:51 AM	6:06 AM	8:30 AM	8:30 AM	1:39 PM	1:54 PM	4:48 PM	4:48 PM	N/A	N/A	N/A	
10	426- Contracted	12:00 AM	5:51 AM	6:06 AM	8:30 AM	8:30 AM	1:39 PM	1:54 PM	4:48 PM	4:48 PM	N/A	N/A	N/A	
11	427- Contracted	12:00 AM	5:51 AM	6:06 AM	8:30 AM	8:30 AM	1:39 PM	1:54 PM	4:48 PM	4:48 PM	N/A	N/A	N/A	
12	428- Contracted	12:00 AM	5:51 AM	6:06 AM	8:30 AM	8:30 AM	1:39 PM	1:54 PM	4:48 PM	4:48 PM	N/A	N/A	N/A	
13	429- Contracted	12:00 AM	5:51 AM	6:06 AM	8:30 AM	8:30 AM	1:39 PM	1:54 PM	4:48 PM	4:48 PM	N/A	N/A	N/A	
14	430- Contracted	12:00 AM	5:51 AM	6:06 AM	8:30 AM	8:30 AM	1:39 PM	1:54 PM	4:48 PM	4:48 PM	N/A	N/A	N/A	
15	431- Contracted	12:00 AM	5:51 AM	6:06 AM	8:30 AM	8:30 AM	1:39 PM	1:54 PM	4:48 PM	4:48 PM	N/A	N/A	N/A	
16	432- Contracted	12:00 AM	5:51 AM	6:06 AM	8:30 AM	8:30 AM	1:39 PM	1:54 PM	4:48 PM	4:48 PM	N/A	N/A	N/A	
17	433	12:00 AM	6:09 AM	6:24 AM	10:15 AM	10:15 AM	1:27 PM	1:42 PM	5:00 PM	5:00 PM	N/A	N/A	N/A	
18	434	12:00 AM	5:45 AM	6:00 AM	8:24 AM	8:24 AM	12:15 PM	12:30 PM	5:39 PM	5:39 PM	N/A	N/A	N/A	
19	435- Contracted	12:00 AM	5:51 AM	6:06 AM	8:30 AM	8:30 AM	1:39 PM	1:54 PM	4:48 PM	4:48 PM	N/A	N/A	N/A	
20	436	12:00 AM	5:51 AM	6:06 AM	10:42 AM	10:42 AM	1:00 PM	1:15 PM	4:48 PM	4:48 PM	N/A	N/A	N/A	
21	437	12:00 AM	5:51 AM	6:06 AM	9:36 AM	9:36 AM	1:33 PM	1:48 PM	5:18 PM	5:18 PM	N/A	N/A	N/A	
22	438- Contracted	12:00 AM	5:51 AM	6:06 AM	8:30 AM	8:30 AM	1:39 PM	1:54 PM	4:48 PM	4:48 PM	N/A	N/A	N/A	
23	439	12:00 AM	6:09 AM	6:24 AM	9:48 AM	9:48 AM	1:33 PM	1:48 PM	4:54 PM	4:54 PM	N/A	N/A	N/A	
24	441	12:00 AM	5:51 AM	6:06 AM	10:42 AM	10:42 AM	1:39 PM	1:54 PM	4:36 PM	4:36 PM	N/A	N/A	N/A	
25	442	12:00 AM	6:03 AM	6:18 AM	9:42 AM	9:42 AM	1:39 PM	1:54 PM	5:18 PM	5:18 PM	N/A	N/A	N/A	
26	444	12:00 AM	5:57 AM	6:12 AM	9:48 AM	9:48 AM	1:21 PM	1:36 PM	4:48 PM	4:48 PM	N/A	N/A	N/A	
27	445	12:00 AM	5:45 AM	6:00 AM	9:48 AM	9:48 AM	1:21 PM	1:36 PM	4:54 PM	4:54 PM	N/A	N/A	N/A	
28	448	12:00 AM	6:15 AM	6:30 AM	9:50 AM	9:50 AM	1:33 PM	1:48 PM	4:54 PM	4:54 PM	N/A	N/A	N/A	
29	449	12:00 AM	5:57 AM	6:12 AM	9:05 AM	9:05 AM	1:10 PM	1:25 PM	5:06 PM	5:06 PM	N/A	N/A	N/A	
30	450	12:00 AM	5:57 AM	6:12 AM	9:12 AM	9:12 AM	1:33 PM	1:48 PM	4:43 PM	4:43 PM	N/A	N/A	N/A	
31	451	12:00 AM	6:03 AM	6:18 AM	9:42 AM	9:42 AM	1:09 PM	1:24 PM	5:12 PM	5:12 PM	N/A	N/A	N/A	
32	453	12:00 AM	5:51 AM	6:06 AM	10:48 AM	10:48 AM	1:33 PM	1:48 PM	4:36 PM	4:36 PM	N/A	N/A	N/A	
33	455	12:00 AM	6:03 AM	6:18 AM	9:48 AM	9:48 AM	11:27 AM	11:42 AM	12:44 PM	12:44 PM	1:21 PM	1:36 PM	4:54 PM	4:54 PM
34	456	12:00 AM	6:09 AM	6:24 AM	9:18 AM	9:18 AM	11:21 AM	11:36 AM	4:30 PM	4:30 PM	N/A	N/A	N/A	
35	457	12:00 AM	5:45 AM	6:00 AM	9:42 AM	9:42 AM	1:03 PM	1:18 PM	4:48 PM	4:48 PM	N/A	N/A	N/A	
36	458	12:00 AM	5:45 AM	6:00 AM	9:12 AM	9:12 AM	12:45 PM	1:00 PM	4:42 PM	4:42 PM	N/A	N/A	N/A	
37	459	12:00 AM	6:03 AM	6:18 AM	9:18 AM	9:18 AM	1:21 PM	1:36 PM	4:30 PM	4:30 PM	N/A	N/A	N/A	
38	460	12:00 AM	6:03 AM	6:18 AM	9:48 AM	9:48 AM	1:33 PM	1:48 PM	4:37 PM	4:37 PM	N/A	N/A	N/A	
39	461	12:00 AM	6:09 AM	6:24 AM	9:18 AM	9:18 AM	1:21 PM	1:36 PM	5:00 PM	5:00 PM	N/A	N/A	N/A	
40	462	12:00 AM	6:09 AM	6:24 AM	9:18 AM	9:18 AM	1:21 PM	1:36 PM	4:30 PM	4:30 PM	N/A	N/A	N/A	
41	463	12:00 AM	5:57 AM	6:12 AM	9:18 AM	9:18 AM	1:33 PM	1:48 PM	5:00 PM	5:00 PM	N/A	N/A	N/A	
42	464	12:00 AM	6:03 AM	6:18 AM	9:00 AM	9:00 AM	1:33 PM	1:48 PM	4:30 PM	4:30 PM	N/A	N/A	N/A	
43	465	12:00 AM	6:03 AM	6:18 AM	9:48 AM	9:48 AM	1:21 PM	1:36 PM	4:48 PM	4:48 PM	N/A	N/A	N/A	
44	466	12:00 AM	5:57 AM	6:12 AM	9:00 AM	9:00 AM	1:39 PM	1:54 PM	4:42 PM	4:42 PM	N/A	N/A	N/A	
45	467	12:00 AM	5:57 AM	6:12 AM	9:18 AM	9:18 AM	1:21 PM	1:36 PM	4:55 PM	4:55 PM	N/A	N/A	N/A	
46	469	12:00 AM	5:51 AM	6:06 AM	9:18 AM	9:18 AM	10:45 AM	11:00 AM	4:36 PM	4:36 PM	N/A	N/A	N/A	
47	470	12:00 AM	6:03 AM	6:18 AM	9:48 AM	9:48 AM	1:21 PM	1:36 PM	4:42 PM	4:42 PM	N/A	N/A	N/A	
48	471	12:00 AM	5:45 AM	6:00 AM	9:00 AM	9:00 AM	1:33 PM	1:48 PM	5:00 PM	5:00 PM	N/A	N/A	N/A	
49	472	12:00 AM	6:03 AM	6:18 AM	9:00 AM	9:00 AM	1:21 PM	1:36 PM	4:42 PM	4:42 PM	N/A	N/A	N/A	
50	473	12:00 AM	5:57 AM	6:12 AM	9:00 AM	9:00 AM	1:33 PM	1:48 PM	4:24 PM	4:24 PM	N/A	N/A	N/A	

Project Name: Lancaster BEB Study
Building: Lancaster Central School District
Date: 11/26/2024

Bus Data	
Minutes before Bus Route Begins that Bus is removed from Charger	15 Min
Minutes after Bus Route ends that Bus is back on Charger	0 Min

FORMULA INDEX		Charging Schedule											
		First Route					Second Route				Third Route			
Line #	Bus	On Charger AM	Off Charger AM	Bus Leaves Station AM	Bus Arrives at Station AM	On Charger R1	Off Charger R2	Bus Leaves Station R2	Bus Arrives at Station R2	On Charger R2	Off Charger R3	Bus Leaves Station R3	Bus Arrives at Station R3	On Charger R3
51	474	12:00 AM	6:27 AM	6:42 AM	8:48 AM	8:48 AM	1:33 PM	1:48 PM	4:42 PM	4:42 PM	N/A	N/A	N/A	
52	475	12:00 AM	5:45 AM	6:00 AM	9:12 AM	9:12 AM	1:21 PM	1:36 PM	4:24 PM	4:24 PM	N/A	N/A	N/A	
53	476	12:00 AM	5:57 AM	6:12 AM	9:00 AM	9:00 AM	1:33 PM	1:48 PM	5:00 PM	5:00 PM	N/A	N/A	N/A	
54	477	12:00 AM	6:03 AM	6:18 AM	9:00 AM	9:00 AM	1:33 PM	1:48 PM	5:00 PM	5:00 PM	N/A	N/A	N/A	
55	478	12:00 AM	5:57 AM	6:12 AM	10:18 AM	10:18 AM	1:21 PM	1:36 PM	4:36 PM	4:36 PM	N/A	N/A	N/A	
56	479	12:00 AM	6:03 AM	6:18 AM	8:54 AM	8:54 AM	1:33 PM	1:48 PM	5:20 PM	5:20 PM	N/A	N/A	N/A	
57	480	12:00 AM	6:03 AM	6:18 AM	9:48 AM	9:48 AM	1:45 PM	2:00 PM	4:54 PM	4:54 PM	N/A	N/A	N/A	
58	481	12:00 AM	6:03 AM	6:18 AM	9:12 AM	9:12 AM	1:21 PM	1:36 PM	4:24 PM	4:24 PM	N/A	N/A	N/A	
59	482	12:00 AM	6:15 AM	6:30 AM	9:18 AM	9:18 AM	1:27 PM	1:42 PM	4:24 PM	4:24 PM	N/A	N/A	N/A	
60	483	12:00 AM	6:27 AM	6:42 AM	9:18 AM	9:18 AM	1:39 PM	1:54 PM	5:00 PM	5:00 PM	N/A	N/A	N/A	
61	484	12:00 AM	5:45 AM	6:00 AM	9:12 AM	9:12 AM	1:39 PM	1:54 PM	4:30 PM	4:30 PM	N/A	N/A	N/A	
62	485	12:00 AM	1:21 PM	1:36 PM	4:18 PM	4:18 PM	N/A	N/A	N/A		N/A	N/A	N/A	
63	486	12:00 AM	6:03 AM	6:18 AM	9:48 AM	9:48 AM	1:33 PM	1:48 PM	4:42 PM	4:42 PM	N/A	N/A	N/A	
64	487	12:00 AM	5:51 AM	6:06 AM	9:00 AM	9:00 AM	1:33 PM	1:48 PM	5:12 PM	5:12 PM	N/A	N/A	N/A	
65	488	12:00 AM	6:03 AM	6:18 AM	9:42 AM	9:42 AM	1:27 PM	1:42 PM	4:20 PM	4:20 PM	N/A	N/A	N/A	
66	489	12:00 AM	5:57 AM	6:12 AM	9:42 AM	9:42 AM	1:33 PM	1:48 PM	4:30 PM	4:30 PM	N/A	N/A	N/A	
67	490	12:00 AM	5:57 AM	6:12 AM	9:18 AM	9:18 AM	1:21 PM	1:36 PM	4:18 PM	4:18 PM	N/A	N/A	N/A	
68	491	12:00 AM	6:09 AM	6:24 AM	9:42 AM	9:42 AM	1:21 PM	1:36 PM	4:54 PM	4:54 PM	N/A	N/A	N/A	
69	492	12:00 AM	6:09 AM	6:24 AM	9:43 AM	9:43 AM	1:21 PM	1:36 PM	4:42 PM	4:42 PM	N/A	N/A	N/A	
70	493	12:00 AM	5:57 AM	6:12 AM	9:18 AM	9:18 AM	1:33 PM	1:48 PM	4:42 PM	4:42 PM	N/A	N/A	N/A	
71	494	12:00 AM	6:03 AM	6:18 AM	9:42 AM	9:42 AM	1:21 PM	1:36 PM	4:48 PM	4:48 PM	N/A	N/A	N/A	
72	495	12:00 AM	6:09 AM	6:24 AM	8:58 AM	8:58 AM	1:33 PM	1:48 PM	5:24 PM	5:24 PM	N/A	N/A	N/A	
73	496	12:00 AM	5:45 AM	6:00 AM	9:01 AM	9:01 AM	1:33 PM	1:48 PM	4:24 PM	4:24 PM	N/A	N/A	N/A	
74	497	12:00 AM	5:45 AM	6:00 AM	9:48 AM	9:48 AM	1:33 PM	1:48 PM	4:42 PM	4:42 PM	N/A	N/A	N/A	
75	498	12:00 AM	5:51 AM	6:06 AM	9:18 AM	9:18 AM	1:21 PM	1:36 PM	4:42 PM	4:42 PM	N/A	N/A	N/A	
76	499	12:00 AM	6:03 AM	6:18 AM	9:18 AM	9:18 AM	1:21 PM	1:36 PM	4:54 PM	4:54 PM	N/A	N/A	N/A	
77	500	12:00 AM	6:03 AM	6:18 AM	9:00 AM	9:00 AM	1:33 PM	1:48 PM	4:30 PM	4:30 PM	N/A	N/A	N/A	
78	501	12:00 AM	6:03 AM	6:18 AM	11:00 AM	11:00 AM	1:21 PM	1:36 PM	4:36 PM	4:36 PM	N/A	N/A	N/A	
79	502	12:00 AM	5:51 AM	6:06 AM	9:12 AM	9:12 AM	1:33 PM	1:48 PM	4:18 PM	4:18 PM	N/A	N/A	N/A	
80	503	12:00 AM	6:09 AM	6:24 AM	9:42 AM	9:42 AM	1:33 PM	1:48 PM	4:42 PM	4:42 PM	N/A	N/A	N/A	
81	504	12:00 AM	6:09 AM	6:24 AM	9:00 AM	9:00 AM	12:21 PM	12:36 PM	5:12 PM	5:12 PM	N/A	N/A	N/A	
82	505	12:00 AM	6:03 AM	6:18 AM	9:42 AM	9:42 AM	1:33 PM	1:48 PM	4:48 PM	4:48 PM	N/A	N/A	N/A	
83	Spare - 440	12:00 AM	##########	12:00 AM	12:00 AM	12:00 AM	N/A	N/A	N/A		N/A	N/A	N/A	
84	Spare - 443	12:00 AM	##########	12:00 AM	12:00 AM	12:00 AM	N/A	N/A	N/A		N/A	N/A	N/A	
85	Spare - 446	12:00 AM	##########	12:00 AM	12:00 AM	12:00 AM	N/A	N/A	N/A		N/A	N/A	N/A	
86	Spare - 447	12:00 AM	##########	12:00 AM	12:00 AM	12:00 AM	N/A	N/A	N/A		N/A	N/A	N/A	
87	Spare - 452	12:00 AM	##########	12:00 AM	12:00 AM	12:00 AM	N/A	N/A	N/A		N/A	N/A	N/A	
88	Spare - 454	12:00 AM	##########	12:00 AM	12:00 AM	12:00 AM	N/A	N/A	N/A		N/A	N/A	N/A	
89	Spare - 468	12:00 AM	##########	12:00 AM	12:00 AM	12:00 AM	N/A	N/A	N/A		N/A	N/A	N/A	

wendel

Project Name: Lancaster BEB Study
Building: Lancaster Central School District
Date: 11/26/2024

NYS Region: Region 8

Route Info		
Deadhead Miles	10%	
Minutes before Bus Route Begins that Bus is removed from Charger	15	Minutes
Minutes after Bus Route ends that Bus is back on Charger	0	Minutes

Charging Rates		
Minimum Battery Level	10%	
Maximum Battery Level	90%	
Anticipated Degradation	90%	
Charging Rate Safety Factor	90%	
Low Temp Power Factor (kW)	0	

Charger Factors		
Preheating /Precooling in Bus Station Energy	0.5	kWh
Precooling Temp	70	Degrees F
Preheating Temp	40	Degrees F
Minimum Charging for Demand Reduction Safety Factor	10%	
Grid to Charger Efficiency	88%	

Route Analysis Results

Bus	Bus Size (kWh)	Charger Size (kW)	Max AM Usage Rate (kWh / hr)	Max PM Usage Rate (kWh / hr)	Max PM2 Usage Rate (kWh / hr)	PM Route Usage (kWh)	PM2 Route Usage (kWh)	Notes[1]
409	315	60	61.11	49.78	0.00	169.25	0.00	
412	330	120	37.93	51.78	0.00	183.81	0.00	Bus size does not currently exist
415	315	60	54.26	46.01	0.00	195.55	0.00	
433	410	120	63.61	45.76	0.00	173.87	0.00	Bus size does not currently exist
434	590	120	69.91	68.65	0.00	422.19	0.00	Bus size does not currently exist
436	370	120	44.34	53.22	0.00	215.54	0.00	Bus size does not currently exist
437	380	120	64.37	57.60	0.00	244.82	0.00	Bus size does not currently exist
439	315	60	49.15	48.75	0.00	175.50	0.00	
441	360	60	48.38	47.87	0.00	141.21	0.00	Bus size does not currently exist
442	330	60	36.15	59.36	0.00	231.51	0.00	Bus size does not currently exist
444	210	60	31.24	35.08	0.00	138.58	0.00	
445	315	60	37.58	36.74	0.00	148.80	0.00	
448	315	60	35.85	41.47	0.00	159.65	0.00	
449	340	60	56.05	54.06	0.00	239.65	0.00	Bus size does not currently exist
450	315	60	55.02	47.35	0.00	173.63	0.00	
451	350	120	58.00	58.32	0.00	250.77	0.00	Bus size does not currently exist
453	380	120	45.79	59.68	0.00	196.93	0.00	Bus size does not currently exist
455	315	120	35.64	35.74	34.61	45.87	140.17	
456	350	120	41.32	42.53	0.00	250.94	0.00	Bus size does not currently exist
457	330	60	49.59	39.94	0.00	169.73	0.00	Bus size does not currently exist
458	210	60	38.03	34.93	0.00	146.72	0.00	Bus size does not currently exist
459	210	60	38.17	33.31	0.00	121.59	0.00	
460	315	60	38.26	42.71	0.00	152.35	0.00	
461	210	60	27.37	34.40	0.00	142.77	0.00	
462	315	60	37.04	45.07	0.00	153.24	0.00	
463	210	60	35.76	34.36	0.00	135.72	0.00	
464	210	60	36.73	38.75	0.00	124.00	0.00	
465	210	60	30.24	33.96	0.00	134.13	0.00	
466	315	60	27.49	48.46	0.00	172.04	0.00	
467	210	60	32.73	32.17	0.00	130.81	0.00	
469	480	180	51.55	52.03	0.00	343.37	0.00	Bus size does not currently exist
470	315	60	37.63	32.13	0.00	123.69	0.00	
471	210	60	36.18	37.84	0.00	149.45	0.00	
472	315	60	35.48	43.93	0.00	169.11	0.00	
473	210	60	36.15	37.53	0.00	116.34	0.00	
474	315	60	49.47	41.89	0.00	152.89	0.00	
475	210	60	33.91	37.11	0.00	131.75	0.00	
476	315	60	39.01	42.99	0.00	169.80	0.00	
477	210	60	35.86	35.91	0.00	141.83	0.00	
478	315	60	45.85	30.38	0.00	106.33	0.00	
479	210	24	32.44	23.88	0.00	96.32	0.00	
480	315	60	38.04	34.67	0.00	126.54	0.00	
481	210	60	27.03	32.26	0.00	106.44	0.00	
482	210	60	39.92	44.53	0.00	142.51	0.00	
483	315	60	33.36	47.48	0.00	182.81	0.00	
484	315	60	42.88	38.56	0.00	119.52	0.00	
485	210	24	30.28	0.00	0.00	0.00	0.00	
486	210	60	32.83	30.39	0.00	110.93	0.00	
487	320	60	43.28	58.59	0.00	228.51	0.00	Bus size does not currently exist
488	315	60	42.63	47.45	0.00	160.55	0.00	
489	210	60	31.88	39.13	0.00	135.00	0.00	
490	210	60	29.00	29.13	0.00	93.22	0.00	
491	315	60	31.10	41.55	0.00	168.28	0.00	
492	210	60	31.85	33.14	0.00	127.59	0.00	
493	315	60	38.56	48.16	0.00	163.75	0.00	
494	315	60	35.75	41.89	0.00	165.46	0.00	
495	315	60	38.50	43.32	0.00	188.45	0.00	
496	315	60	44.75	44.52	0.00	138.03	0.00	
497	315	60	42.83	32.93	0.00	120.18	0.00	
498	315	60	46.11	43.71	0.00	157.36	0.00	
499	315	60	37.79	45.66	0.00	173.51	0.00	
500	315	60	38.02	59.65	0.00	190.89	0.00	
501	350	120	45.72	40.88	0.00	143.08	0.00	Bus size does not currently exist
502	210	60	34.98	32.17	0.00	96.50	0.00	
503	210	60	27.11	32.08	0.00	117.08	0.00	
504	360	60	41.62	47.79	0.00	255.66	0.00	Bus size does not currently exist
505	210	60	31.93	29.94	0.00	112.27	0.00	
410 - Contracted	315	60	57.60	49.78	0.00	169.25	0.00	
414 - Contracted	315	60	57.60	49.78	0.00	169.25	0.00	
418 - Contracted	315	60	57.60	49.78	0.00	169.25	0.00	
421 - Contracted	315	60	57.60	49.78	0.00	169.25	0.00	
422 - Contracted	315	60	57.60	49.78	0.00	169.25	0.00	
424 - Contracted	315	60	57.60	49.78	0.00	169.25	0.00	
426- Contracted	315	60	57.60	49.78	0.00	169.25	0.00	
427- Contracted	315	60	57.60	49.78	0.00	169.25	0.00	
428- Contracted	315	60	57.60	49.78	0.00	169.25	0.00	
429- Contracted	315	60	57.60	49.78	0.00	169.25	0.00	
430- Contracted	315	60	57.60	49.78	0.00	169.25	0.00	
431- Contracted	315	60	57.60	49.78	0.00	169.25	0.00	
432- Contracted	315	60	57.60	49.78	0.00	169.25	0.00	
435- Contracted	315	60	57.60	49.78	0.00	169.25	0.00	
438- Contracted	315	60	57.60	49.78	0.00	169.25	0.00	
Spare - 440	315	120	0.00	0.00	0.00	0.00	0.00	
Spare - 443	315		0.00	0.00	0.00	0.00	0.00	
Spare - 446	315	120	0.00	0.00	0.00	0.00	0.00	
Spare - 447	315		0.00	0.00	0.00	0.00	0.00	
Spare - 452	315	24	0.00	0.00	0.00	0.00	0.00	
Spare - 454	315	24	0.00	0.00	0.00	0.00	0.00	
Spare - 468	315	24	0.00	0.00	0.00	0.00	0.00	

1. This model assumes that the battery capacities needed for routes that are currently too large will become available and the largest charger size needed for that bus size would be used. Note that these bus sizes **do not** currently exist.

wendel

Project Name: Lancaster BEB Study

Building: Lancaster Central School District

Date: 11/26/2024

Description: Represents times when bus could be charging Mid-Day (1 or 2)

Days of Week to Exclude:
Saturday
Sunday

Hour Number	Timestamp	Outside dry-bulb temp (F)	Day of the Week	Hours (0-23)	Hours (1-24)	409	412	415	433	434	436	437	439	441	442	444	445	448	449	450	451	453	455	456	457	458	459	460
1	1/1 0:00	31	Saturday	0.0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1/1 1:00	31	Saturday	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	1/1 2:00	30	Saturday	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	1/1 3:00	30	Saturday	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1/1 4:00	30	Saturday	4	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	1/1 5:00	31	Saturday	5	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	1/1 6:00	31	Saturday	6	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	1/1 7:00	31	Saturday	7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1/1 8:00	30	Saturday	8	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1/1 9:00	31	Saturday	9	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1/1 10:00	32	Saturday	10	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	1/1 11:00	32	Saturday	11	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1/1 12:00	32	Saturday	12	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1/1 13:00	33	Saturday	13	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	1/1 14:00	33	Saturday	14	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	1/1 15:00	33	Saturday	15	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	1/1 16:00	33	Saturday	16	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	1/1 17:00	32	Saturday	17	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	1/1 18:00	31	Saturday	18	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	1/1 19:00	31	Saturday	19	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	1/1 20:00	30	Saturday	20	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	1/1 21:00	30	Saturday	21	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	1/1 22:00	30	Saturday	22	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	1/1 23:00	30	Saturday	23	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	1/2 0:00	29	Sunday	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	1/2 1:00	29	Sunday	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	1/2 2:00	29	Sunday	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	1/2 3:00	30	Sunday	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	1/2 4:00	31	Sunday	4	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	1/2 5:00	30	Sunday	5	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	1/2 6:00	30	Sunday	6	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	1/2 7:00	30	Sunday	7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	1/2 8:00	30	Sunday	8	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	1/2 9:00	31	Sunday	9	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	1/2 10:00	31	Sunday	10	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	1/2 11:00	32	Sunday	11	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	1/2 12:00	32	Sunday	12	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	1/2 13:00	32	Sunday	13	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	1/2 14:00	32	Sunday	14	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	1/2 15:00	32	Sunday	15	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	1/2 16:00	32	Sunday	16	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	1/2 17:00	31	Sunday	17	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43	1/2 18:00	31	Sunday	18	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	1/2 19:00	30	Sunday	19	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	1/2 20:00	29	Sunday	20	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	1/2 21:00	29	Sunday	21	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47	1/2 22:00	28	Sunday	22	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	1/2 23:00	28	Sunday	23	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49	1/3 0:00	27	Monday	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	1/3 1:00	27	Monday	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51	1/3 2:00	26	Monday	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52	1/3 3:00	26	Monday	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	1/3 4:00	25	Monday	4	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54	1/3 5:00	24	Monday	5	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55	1/3 6:00	24	Monday	6	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56	1/3 7:00	24	Monday	7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57	1/3 8:00	23	Monday	8	9	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	1/3 9:00	22	Monday	9	10	1	0	1	0	1	0	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1
59	1/3 10:00	23	Monday	10	11	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
60	1/3 11:00	23	Monday	11	12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
61	1/3 12:00	23	Monday	12	13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	0	1	1	1	1
62	1/3 13:00	22	Monday	13	14	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	2	0	1	0	1	1
63	1/3 14:00	21	Monday	14	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64	1/3 15:00	21	Monday	15	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	1/3 16:00	20	Monday	16	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66	1/3 17:00	19	Monday	17	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	1/3 18:00	19	Monday	18	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	1/3 19:00	18	Monday	19	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	1/3 20:00	18	Monday	20	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	1/3 21:00	16	Monday	21	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	1/3 22:00	17	Monday	22	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72	1/3 23:00	17	Monday	23	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73	1/4 0:00	17	Tuesday	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74	1/4 1:00	17	Tuesday	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	1/4 2:00	14	Tuesday	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76	1/4 3:00	13	Tuesday	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77	1/4 4:00	10	Tuesday	4	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	1/4 5:00	10	Tuesday	5	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
79	1/4 6:00	9	Tuesday	6	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	1/4 7:00	8	Tuesday	7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81	1/4 8:00	10	Tuesday	8	9	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
82	1/4 9:00	16	Tuesday	9	10	1	0	1	0	1	0	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1
83	1/4 10:00	20	Tuesday	10	11	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
84	1/4 11:00	22	Tuesday	11	12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
85	1/4 12:00	21	Tuesday	12	13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	0	1	1	1	1
86	1/4 13:00	23	Tuesday	13	14	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	2	0	1	0	1	1
87	1/4 14:00	22	Tuesday	14	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
88	1/4 15:00	21	Tuesday	15	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
89	1/4 16:00	20	Tuesday	16	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90	1/4 17:00	20	Tuesday	17	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
91	1/4 18:00	19	Tuesday	18	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
92	1/4 19:00	19	Tuesday	19	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
93	1/4 20:00	19	Tuesday	20	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
94	1/4 21:00	19	Tuesday	21	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
95	1/4 22:00	20	Tuesday	22	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
96	1/4 23:00	20	Tuesday	23	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
97	1/5 0:00	20	Wednesday	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
98	1/5 1:00	21	Wednesday	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
99	1/5 2:00	21	Wednesday	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	1/5 3:00	20	Wednesday	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

wendel

Project Name: Lancaster BEB Study

Building: Lancaster Central School District

Date: 11/26/2024

Description: Represents times when bus could be charging Mid-Day (1 or 2)

Days of Week to Exclude:
Saturday
Sunday

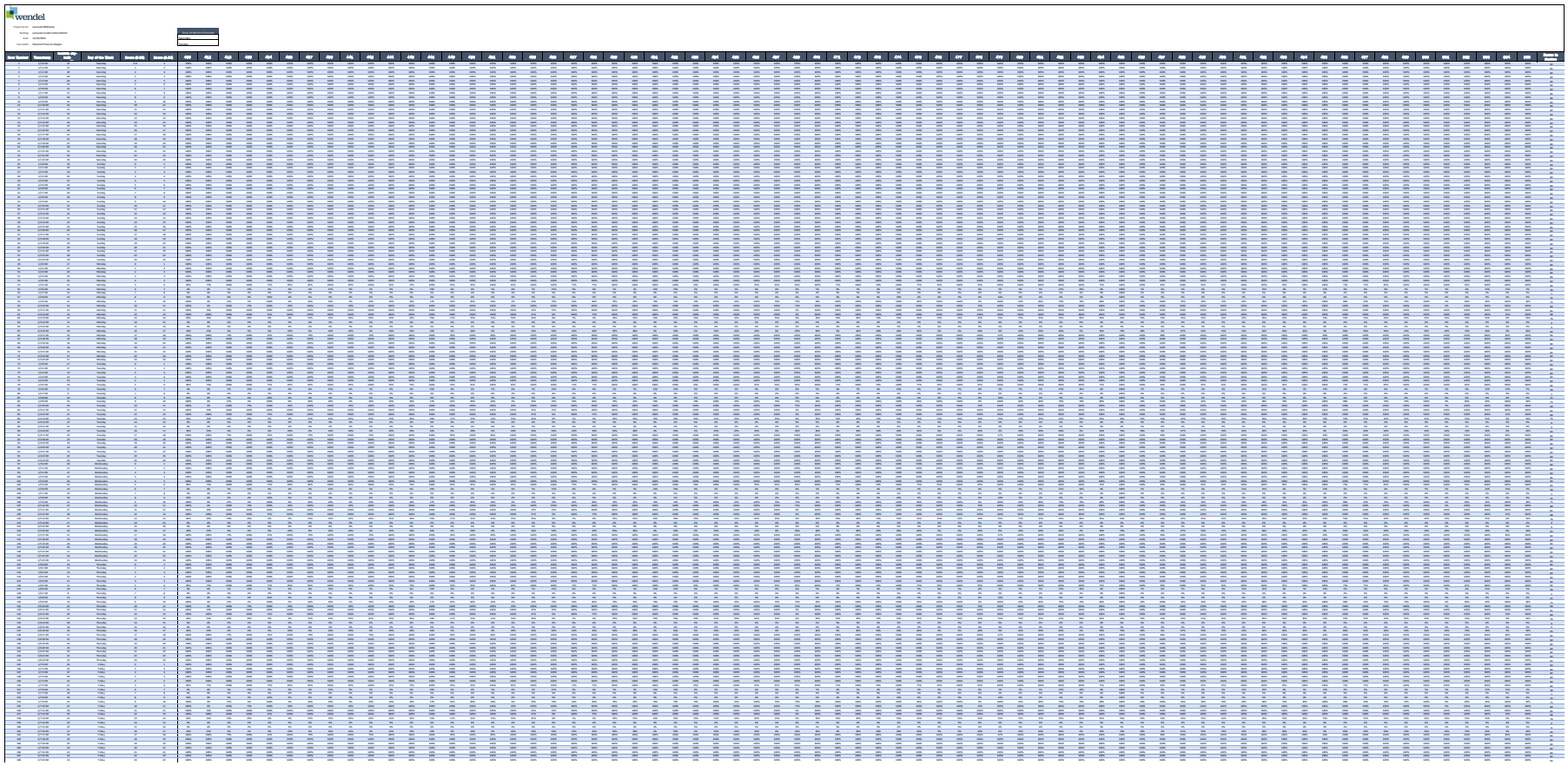
Hour Number	Timestamp	Outside dry-bulb temp (F)	Day of the Week	Hours (0-23)	Hours (1-24)	409	412	415	433	434	436	437	439	441	442	444	445	448	449	450	451	453	455	456	457	458	459	460
101	1/5 4:00	20	Wednesday	4	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
102	1/5 5:00	19	Wednesday	5	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
103	1/5 6:00	19	Wednesday	6	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
104	1/5 7:00	20	Wednesday	7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
105	1/5 8:00	20	Wednesday	8	9	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
106	1/5 9:00	22	Wednesday	9	10	1	0	1	0	1	0	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1
107	1/5 10:00	25	Wednesday	10	11	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
108	1/5 11:00	27	Wednesday	11	12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
109	1/5 12:00	28	Wednesday	12	13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	0	1	1	1	1
110	1/5 13:00	27	Wednesday	13	14	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	2	0	1	0	1	1
111	1/5 14:00	27	Wednesday	14	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
112	1/5 15:00	25	Wednesday	15	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
113	1/5 16:00	23	Wednesday	16	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
114	1/5 17:00	21	Wednesday	17	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115	1/5 18:00	19	Wednesday	18	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
116	1/5 19:00	18	Wednesday	19	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
117	1/5 20:00	20	Wednesday	20	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
118	1/5 21:00	17	Wednesday	21	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
119	1/5 22:00	16	Wednesday	22	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
120	1/5 23:00	14	Wednesday	23	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
121	1/6 0:00	14	Thursday	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
122	1/6 1:00	13	Thursday	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
123	1/6 2:00	13	Thursday	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
124	1/6 3:00	12	Thursday	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
125	1/6 4:00	11	Thursday	4	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
126	1/6 5:00	11	Thursday	5	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
127	1/6 6:00	10	Thursday	6	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
128	1/6 7:00	8	Thursday	7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
129	1/6 8:00	13	Thursday	8	9	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
130	1/6 9:00	19	Thursday	9	10	1	0	1	0	1	0	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1
131	1/6 10:00	22	Thursday	10	11	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
132	1/6 11:00	25	Thursday	11	12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
133	1/6 12:00	26	Thursday	12	13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	0	1	1	1	1
134	1/6 13:00	27	Thursday	13	14	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	2	0	1	0	1	1
135	1/6 14:00	28	Thursday	14	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
136	1/6 15:00	28	Thursday	15	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
137	1/6 16:00	26	Thursday	16	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
138	1/6 17:00	25	Thursday	17	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
139	1/6 18:00	25	Thursday	18	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
140	1/6 19:00	26	Thursday	19	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
141	1/6 20:00	29	Thursday	20	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
142	1/6 21:00	29	Thursday	21	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
143	1/6 22:00	31	Thursday	22	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
144	1/6 23:00	33	Thursday	23	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
145	1/7 0:00	34	Friday	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
146	1/7 1:00	35	Friday	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
147	1/7 2:00	37	Friday	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
148	1/7 3:00	36	Friday	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
149	1/7 4:00	32	Friday	4	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
150	1/7 5:00	32	Friday	5	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
151	1/7 6:00	35	Friday	6	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
152	1/7 7:00	36	Friday	7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
153	1/7 8:00	36	Friday	8	9	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
154	1/7 9:00	33	Friday	9	10	1	0	1	0	1	0	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1
155	1/7 10:00	32	Friday	10	11	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
156	1/7 11:00	30	Friday	11	12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
157	1/7 12:00	30	Friday	12	13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	0	1	1	1	1
158	1/7 13:00	31	Friday	13	14	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	2	0	1	0	1	1
159	1/7 14:00	29	Friday	14	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
160	1/7 15:00	29	Friday	15	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
161	1/7 16:00	27	Friday	16	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
162	1/7 17:00	28	Friday	17	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
163	1/7 18:00	29	Friday	18	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
164	1/7 19:00	26	Friday	19	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
165	1/7 20:00	24	Friday	20	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
166	1/7 21:00	23	Friday	21	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
167	1/7 22:00	23	Friday	22	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
168	1/7 23:00	23	Friday	23	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

461	462	463	464	465	466	467	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

461	462	463	464	465	466	467	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

493	494	495	496	497	498	499	500	501	502	503	504	505	410 - Contracted	414 - Contracted	418 - Contracted	421 - Contracted	422 - Contracted	424 - Contracted	426- Contracted	427- Contracted	428- Contracted	429- Contracted	430- Contracted	431- Contracted	432- Contracted	435- Contracted	438- Contracted	Buses in Station
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

493	494	495	496	497	498	499	500	501	502	503	504	505	410 - Contracted	414 - Contracted	418 - Contracted	421 - Contracted	422 - Contracted	424 - Contracted	426- Contracted	427- Contracted	428- Contracted	429- Contracted	430- Contracted	431- Contracted	432- Contracted	435- Contracted	438- Contracted	Buses in Station
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



wendel

Project Name: Lancaster Mill Walk

Address: Lancaster County Farm Preserve

Date: 03/09/2020

Area Inspect: Mechanical Rooms and Plenums

Room Temperature Requirements

Minimum: 68

Maximum: 72

| Date Started | Time Started | Day of the Week | Room (1-10) | Room (11-20) | 400 | 401 | 402 | 403 | 404 | 405 | 406 | 407 | 408 | 409 | 410 | 411 | 412 | 413 | 414 | 415 | 416 | 417 | 418 | 419 | 420 | 421 | 422 | 423 | 424 | 425 | 426 | 427 | 428 | 429 | 430 | 431 | 432 | 433 | 434 | 435 | 436 | 437 | 438 | 439 | 440 | 441 | 442 | 443 | 444 | 445 | 446 | 447 | 448 | 449 | 450 | 451 | 452 | 453 | 454 | 455 | 456 | 457 | 458 | 459 | 460 | 461 | 462 | 463 | 464 | 465 | 466 | 467 | 468 | 469 | 470 | 471 | 472 | 473 | 474 | 475 | 476 | 477 | 478 | 479 | 480 | 481 | 482 | 483 | 484 | 485 | 486 | 487 | 488 | 489 | 490 | 491 | 492 | 493 | 494 | 495 | 496 | 497 | 498 | 499 | 500 | 501 | 502 | 503 | 504 | 505 | 506 | 507 | 508 | 509 | 510 | 511 | 512 | 513 | 514 | 515 | 516 | 517 | 518 | 519 | 520 | Rooms in Compliance |
|---|---|---

wendel

Project Name: Lancaster BEB Study

Building: Lancaster Central School District

Date: 11/26/2024

Description: Energy Used Per Bus per hour (kWh)

Hour Number	Timestamp	Outside dry-bulb temp (F)	Day of the Week	Hours (0-23)	Hours (1-24)	409	412	415	433	434	436	437	439	441	442	444	445	448	449	450	451	453	455	456	457	458	459	460	461	462	463	464	465	466	467	469	470	471	472	473	474	475	476
1	1/1 0:00	31	Saturday	0.0	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	1/1 1:00	31	Saturday	1	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	1/1 2:00	30	Saturday	2	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	1/1 3:00	30	Saturday	3	4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	1/1 4:00	30	Saturday	4	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	1/1 5:00	31	Saturday	5	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	1/1 6:00	31	Saturday	6	7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	1/1 7:00	31	Saturday	7	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	1/1 8:00	30	Saturday	8	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	1/1 9:00	31	Saturday	9	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	1/1 10:00	32	Saturday	10	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	1/1 11:00	32	Saturday	11	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	1/1 12:00	32	Saturday	12	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	1/1 13:00	33	Saturday	13	14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	1/1 14:00	33	Saturday	14	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	1/1 15:00	33	Saturday	15	16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	1/1 16:00	33	Saturday	16	17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	1/1 17:00	32	Saturday	17	18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	1/1 18:00	31	Saturday	18	19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	1/1 19:00	31	Saturday	19	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	1/1 20:00	30	Saturday	20	21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	1/1 21:00	30	Saturday	21	22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	1/1 22:00	30	Saturday	22	23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	1/1 23:00	30	Saturday	23	24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	1/2 0:00	29	Sunday	0	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	1/2 1:00	29	Sunday	1	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	1/2 2:00	29	Sunday	2	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	1/2 3:00	30	Sunday	3	4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	1/2 4:00	31	Sunday	4	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	1/2 5:00	30	Sunday	5	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	1/2 6:00	30	Sunday	6	7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	1/2 7:00	30	Sunday	7	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	1/2 8:00	30	Sunday	8	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	1/2 9:00	31	Sunday	9	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	1/2 10:00	31	Sunday	10	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36	1/2 11:00	32	Sunday	11	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
37	1/2 12:00	32	Sunday	12	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
38	1/2 13:00	32	Sunday	13	14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39	1/2 14:00	32	Sunday	14	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40	1/2 15:00	32	Sunday	15	16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41	1/2 16:00	32	Sunday	16	17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
42	1/2 17:00	31	Sunday	17	18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
43	1/2 18:00	31	Sunday	18	19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
44	1/2 19:00	30	Sunday	19	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45	1/2 20:00	29	Sunday	20	21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46	1/2 21:00	29	Sunday	21	22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33	8.00	0.00	2.39	2.34	0.00	5.85	0.00	0.00	10.56	8.10	0.00	0.00	0.00	0.00	1.52	0.00	0.00	0.00	1.17	1.39	6.59	0.00	7.71	0.00	1.54	0.00	7.22	1.66	
47	1/2 22:00	28	Sunday	22	23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
48	1/2 23:00	28	Sunday	23	24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49	1/3 0:00	27	Monday	0	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50	1/3 1:00	27	Monday	1	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
51	1/3 2:00	26	Monday	2	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
52	1/3 3:00	26	Monday	3	4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
53	1/3 4:00	25	Monday	4	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
54	1/3 5:00	24	Monday	5	6	7.81	8.08	0.00	0.00	14.89	5.67	8.23	0.00	6.18	0.00	1.33	8.00	0.00	2.39	2.34	0.00	5.85	0.00	0.00	10.56	8.10	0.00	0.00	0.00	0.00	1.52	0.00	0.00	1.17	1.39	6.59	0.00	7.71	0.00	1.54	0.00	7.22	1.66
55	1/3 6:00	24	Monday	6	7	52.07	32.32	43.92	46.07	59.57	37.77	54.85	35.60	41.22	29.26	26.62	32.02	22.91	47.75	46.88	46.94	39.01	28.85	29.92	42.25	32.40	30.89	30.97	19.82	26.82	30.47	29.73	24.48	23.42	27.88	43.92	30.46	30.83	28.71	30.80	23.18	28.89	33.24
56	1/3 7:00	24	Monday	7	8	52.07	32.32	46.23	54.20	59.57	37.77	54.85	41.88	41.22	30.80	26.62	32.02	30.54	47.75	46.88	49.42	39.01	30.37	35.20	42.25	32.40	32.52	32.60	23.32	31.55	30.47	31.29	25.77	23.42	27.88	43.92	32.06	30.83	30.23	30.80	42.15	28.89	33.24
57	1/3 8:00	23	Monday	8	9	26.03	32.32	46.23	54.20	23.83	37.77	54.85	41.88	41.22	30.80	26.62	32.02	30.54	47.75	46.88	49.42	39.01	30.37	35.20	42.25	32.40	32.52	32.60	23.32	31.55	30.47	31.29	25.77	23.42	27.88	43.92	32.06	30.83	30.23	30.80	33.72	28.89	33.24
58	1/3 9:00	22	Monday	9	10	0.00	32.32	24.66	54.20	0.00	37.77	32.91	33.50	41.22	21.56	21.29	25.62	25.45	3.98	9.38	34.59	39.01	24.29	10.56	29.58	6.48	9.76	26.08	7.00	9.47	9.14	0.00	20.61	0.00	8.37	13.18	25.65	0.00	0.00	0.00	5.78	0.00	
59	1/3 10:00	23	Monday	10	11	0.00	32.32	0.00	13.55	0.00	26.44	0.00	0.00	28.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60	1/3 11:00	23	Monday	11	12	0.00	16.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.75	23.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	44.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00

wendel

Project Name: Lancaster BEB Study

Building: Lancaster Central School District

Date: 11/26/2024

Description: Energy Used Per Bus per hour (kWh)

Hour Number	Timestamp	Outside dry-bulb temp (F)	Day of the Week	Hours (0-23)	Hours (1-24)	409	412	415	433	434	436	437	439	441	442	444	445	448	449	450	451	453	455	456	457	458	459	460	461	462	463	464	465	466	467	469	470	471	472	473	474	475	476
126	1/6 5:00	11	Thursday	5	6	8.49	8.78	0.00	0.00	16.18	6.16	8.94	0.00	6.72	0.00	1.45	8.70	0.00	2.60	2.55	0.00	6.36	0.00	0.00	11.48	8.80	0.00	0.00	0.00	0.00	1.66	0.00	0.00	1.27	1.52	7.16	0.00	8.38	0.00	1.67	0.00	7.85	1.81
127	1/6 6:00	10	Thursday	6	7	56.59	35.13	47.73	50.07	64.74	41.06	59.61	38.69	44.80	31.80	28.93	34.80	24.90	51.90	50.95	51.02	42.40	31.35	32.52	45.92	35.21	33.57	33.66	21.55	29.15	33.11	32.31	26.60	25.46	30.31	47.74	33.10	33.51	31.21	33.48	25.20	31.40	36.12
128	1/6 7:00	8	Thursday	7	8	61.11	37.93	54.26	63.61	69.91	44.34	64.37	49.15	48.38	36.15	31.24	37.58	35.85	56.05	55.02	58.00	45.79	35.64	41.32	49.59	38.03	38.17	38.26	27.37	37.04	35.76	36.73	30.24	27.49	32.73	51.55	37.63	36.18	35.48	36.15	49.47	33.91	39.01
129	1/6 8:00	13	Thursday	8	9	28.30	35.13	50.24	58.91	25.90	41.06	59.61	45.51	44.80	33.48	28.93	34.80	33.20	51.90	50.95	53.71	42.40	33.00	38.26	45.92	35.21	35.34	35.43	25.35	34.29	33.11	34.01	28.00	25.46	30.31	47.74	34.85	33.51	32.85	33.48	36.65	31.40	36.12
130	1/6 9:00	19	Thursday	9	10	0.00	35.13	26.80	58.91	0.00	41.06	35.77	36.41	44.80	23.43	23.14	27.84	27.66	4.33	10.19	37.60	42.40	26.40	11.48	32.15	7.04	10.60	28.34	7.60	10.29	9.93	0.00	22.40	0.00	9.09	14.32	27.88	0.00	0.00	0.00	6.28	0.00
131	1/6 10:00	22	Thursday	10	11	0.00	32.32	0.00	13.55	0.00	26.44	0.00	0.00	28.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
132	1/6 11:00	25	Thursday	11	12	0.00	16.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.75	23.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	44.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00
133	1/6 12:00	26	Thursday	12	13	0.00	0.00	0.00	0.00	43.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.33	36.24	0.00	7.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	44.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00
134	1/6 13:00	27	Thursday	13	14	14.84	24.26	29.40	21.44	58.49	45.34	22.09	18.69	14.27	17.70	19.43	20.35	15.90	38.38	18.16	42.23	22.88	19.17	36.24	32.32	29.76	18.45	16.38	19.05	24.96	13.17	14.86	18.81	14.45	17.81	44.33	17.79	14.51	24.33	14.39	16.06	20.55	16.48
135	1/6 14:00	28	Thursday	14	15	42.41	44.11	39.20	38.98	58.49	45.34	49.08	41.53	40.78	50.58	29.89	31.30	35.33	46.06	40.35	49.69	50.84	29.49	36.24	34.03	29.76	28.38	36.39	29.31	38.40	29.27	33.02	28.93	41.29	27.41	44.33	27.37	32.24	37.42	31.98	35.69	31.62	36.63
136	1/6 15:00	28	Thursday	15	16	42.41	44.11	39.20	38.98	58.49	45.34	49.08	41.53	40.78	50.58	29.89	31.30	35.33	46.06	40.35	49.69	50.84	29.49	36.24	34.03	29.76	28.38	36.39	29.31	38.40	29.27	33.02	28.93	41.29	27.41	44.33	27.37	32.24	37.42	31.98	35.69	31.62	36.63
137	1/6 16:00	26	Thursday	16	17	33.93	33.09	39.20	38.98	58.49	36.27	49.08	37.38	24.47	50.58	23.91	28.17	31.80	46.06	28.91	49.69	30.51	26.54	18.12	27.22	20.83	14.19	22.44	29.31	19.20	29.27	16.51	23.15	28.90	25.12	26.60	19.16	32.24	26.20	12.79	24.98	12.65	36.63
138	1/6 17:00	25	Thursday	17	18	0.00	0.00	9.80	0.00	38.02	0.00	14.72	0.00	0.00	15.17	0.00	0.00	0.00	4.61	0.00	9.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
139	1/6 18:00	25	Thursday	18	19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
140	1/6 19:00	26	Thursday	19	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
141	1/6 20:00	29	Thursday	20	21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
142	1/6 21:00	29	Thursday	21	22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
143	1/6 22:00	31	Thursday	22	23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
144	1/6 23:00	33	Thursday	23	24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
145	1/7 0:00	34	Friday	0	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
146	1/7 1:00	35	Friday	1	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
147	1/7 2:00	37	Friday	2	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
148	1/7 3:00	36	Friday	3	4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
149	1/7 4:00	32	Friday	4	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
150	1/7 5:00	32	Friday	5	6	7.81	8.08	0.00	0.00	14.89	5.67	8.23	0.00	6.18	0.00	1.33	8.00	0.00	2.39	2.34	0.00	5.85	0.00	0.00	10.56	8.10	0.00	0.00	0.00	0.00	1.52	0.00	0.00	1.17	1.39	6.59	0.00	7.71	0.00	1.54	0.00	7.22	1.66
151	1/7 6:00	35	Friday	6	7	52.07	32.32	43.92	46.07	59.57	37.77	54.85	35.60	41.22	29.26	26.62	32.02	22.91	47.75	46.88	46.94	39.01	28.85	29.92	42.25	32.40	30.89	30.97	19.82	26.82	30.47	29.73	24.48	23.42	27.88	43.92	30.46	30.83	28.71	30.80	23.18	28.89	33.24
152	1/7 7:00	36	Friday	7	8	52.07	32.32	46.23	54.20	59.57	37.77	54.85	41.88	41.22	30.80	26.62	32.02	30.54	47.75	46.88	49.42	39.01	30.37	35.20	42.25	32.40	32.52	32.60	23.32	31.55	30.47	31.29	25.77	23.42	27.88	43.92	32.06	30.83	30.23	30.80	42.15	28.89	33.24
153	1/7 8:00	36	Friday	8	9	26.03	32.32	46.23	54.20	23.83	37.77	54.85	41.88	41.22	30.80	26.62	32.02	30.54	47.75	46.88	49.42	39.01	30.37	35.20	42.25	32.40	32.52	32.60	23.32	31.55	30.47	31.29	25.77	23.42	27.88	43.92	32.06	30.83	30.23	30.80	33.72	28.89	33.24
154	1/7 9:00	33	Friday	9	10	0.00	32.32	24.66	54.20	0.00	37.77	32.91	33.50	41.22	21.56	21.29	25.62	25.45	3.98	9.38	34.59	39.01	24.29	10.56	29.58	6.48	9.76	26.08	7.00	9.47	9.14	0.00	20.61	0.00	8.37	13.18	25.65	0.00	0.00	0.00	5.78	0.00
155	1/7 10:00	32	Friday	10	11	0.00	32.32	0.00	13.55	0.00	26.44	0.00	0.00	28.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
156	1/7 11:00	30	Friday	11	12	0.00	16.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.29	21.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00
157	1/7 12:00	30	Friday	12	13	0.00	0.00	0.00	0.00	40.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.39	33.09	0.00	6.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00
158	1/7 13:00	31	Friday	13	14	13.55	22.16	26.85	19.58	53.41	41.40	20.17	17.07	13.03	16.16	17.74	18.58	14.52	35.05	16.58	38.57	20.89	17.50	33.09	29.52	27.18	16.85	14.95	17.40	22.79	12.03	13.57	17.17	13.20	16.27	40.48	16.25	13.25	22.21	13.14	14.66	18.77	15.05
159	1/7 14:00	29	Friday	14	15	42.41	44.11	39.20	38.98	58.49	45.34	49.08	41.53	40.78	50.58	29.89	31.30	35.33	46.06	40.35	49.69	50.84	29.49	36.24	34.03	29.76	28.38	36.39	29.31	38.40	29.27	33.02	28.93	41.29	27.41	44.33	27.37	32.24	37.42	31.98	35.69	31.62	36.63
160	1/7 15:00	29	Friday	15	16	42.41	44.11	39.20	38.98	58.49	45.34	49.08	41.53	40.78	50.58	29.89	31.30	35.33	46.06	40.35	49.69	50.84	29.49	36.24	34.03	29.76	28.38	36.39	29.31	38.40	29.27	33.02	28.93	41.29	27.41	44.33	27.37	32.24	37.42	31.98	35.69	31.62	36.63
161	1/7 16:00	27	Friday	16	17	33.93	33.09	39.20	38.98	58.49	36.27	49.08	37.38	24.47	50.58	23.91	28.17	31.80	46.06	28.91	49.69	30.51	26.54	18.12	27.22	20.83	14.19	22.44	29.31	19.20	29.27	16.51	23.15	28.90	25.12	26.60	19.16	32.24	26.20	12.79	24.98	12.65	36.63
162	1/7 17:00	28	Friday	17	18	0.00	0.00	9.80	0.00	38.02	0.00	14.72	0.00	0.00	15.17	0.00	0.00	0.00	4.61	0.00	9.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
163	1/7 18:00	29	Friday	18	19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
164	1/7 19:00	26	Friday	19	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
165	1/7 20:00	24	Friday	20	21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
166	1/7 21:00	23	Friday	21	22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
167	1/7 22:00	23	Friday	22	23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
168	1/7 23:00	23	Friday	23	24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	410 - Contracted	414 - Contracted	418 - Contracted	421 - Contracted	422 - Contracted	424 - Contracted	426- Contracted	427- Contracted	428- Contracted	429- Contracted	430- Contracted	431- Contracted	432- Contracted	435- Contracted	438- Contracted	Average Energy Usage Hours
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	410 - Contracted	414 - Contracted	418 - Contracted	421 - Contracted	422 - Contracted	424 - Contracted	426- Contracted	427- Contracted	428- Contracted	429- Contracted	430- Contracted	431- Contracted	432- Contracted	435- Contracted	438- Contracted	Average Energy Usage Hours
0.00	2.12	0.00	0.00	0.00	0.00	0.00	9.93	0.00	0.00	6.01	0.00	1.48	1.34	0.00	0.00	1.79	0.00	0.00	10.36	9.92	6.41	0.00	0.00	0.00	4.86	0.00	0.00	0.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	6.58
31.55	42.46	28.53	33.46	23.78	27.72	16.99	39.70	0.00	28.88	40.08	37.50	29.52	26.85	24.48	25.07	35.71	31.45	30.31	41.44	39.66	42.70	33.25	33.44	40.22	32.39	21.34	32.76	28.09	53.34	53.34	53.34	53.34	53.34	53.34	53.34	53.34	53.34	53.34	53.34	53.34	53.34	53.34	53.34	38.73
35.86	45.85	32.44	38.04	27.03	39.92	33.36	42.88	0.00	32.83	43.28	42.63	31.88	29.00	31.10	31.85	38.56	35.75	38.50	44.75	42.83	46.11	37.79	38.02	45.72	34.98	27.11	41.62	31.93	57.60	57.60	57.60	57.60	57.60	57.60	57.60	57.60	57.60	57.60	57.60	57.60	57.60	57.60	57.60	43.71
33.21	42.46	27.03	35.22	25.03	36.97	30.89	39.70	0.00	30.40	40.08	39.48	29.52	26.85	28.80	29.50	35.71	33.11	34.47	41.44	39.66	42.70	35.00	35.20	42.34	32.39	25.11	38.54	29.57	26.67	26.67	26.67	26.67	26.67	26.67	26.67	26.67	26.67	26.67	26.67	26.67	26.67	26.67	26.67	34.56
0.00	42.46	0.00	28.18	5.01	11.09	9.27	7.94	0.00	24.32	0.00	27.63	20.66	8.05	20.16	21.14	10.71	23.17	0.00	0.69	31.73	12.81	10.50	0.00	42.34	6.48	17.58	0.00	20.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.61
0.00	11.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	38.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.27
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.20
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.11
13.77	16.83	9.16	7.38	17.86	20.87	14.16	11.50	16.77	11.65	22.46	22.24	15.00	16.13	23.01	18.35	18.47	23.20	16.61	17.07	12.62	24.21	25.29	22.87	22.64	12.33	12.30	40.71	11.48	14.84	14.84	14.84	14.84	14.84	14.84	14.84	14.84	14.84	14.84	14.84	14.84	14.84	14.84	14.84	19.85
30.59	25.88	20.35	29.54	27.48	37.94	40.46	32.85	25.80	25.89	49.92	40.43	33.34	24.82	35.40	28.24	41.03	35.69	36.91	37.93	28.05	37.24	38.90	50.83	34.83	27.41	27.33	40.71	25.51	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	37.08
30.59	25.88	20.35	29.54	27.48	37.94	40.46	32.85	25.80	25.89	49.92	40.43	33.34	24.82	35.40	28.24	41.03	35.69	36.91	37.93	28.05	37.24	38.90	50.83	34.83	27.41	27.33	40.71	25.51	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	37.08
30.59	15.53	20.35	26.58	10.99	15.18	40.46	16.42	7.74	18.13	49.92	13.48	16.67	7.45	31.86	19.77	28.72	28.55	36.91	15.17	19.64	26.07	35.01	25.41	20.90	8.22	19.13	40.71	20.41	33.93	33.93	33.93	33.93	33.93	33.93	33.93	33.93	33.93	33.93	33.93	33.93	33.93	33.93	33.93	28.14
0.00	0.00	6.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.19
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1.95	0.00	0.00	0.00	0.00	0.00	9.13	0.00	0.00	5.53	0.00	1.36	1.24	0.00	0.00	1.64	0.00	0.00	9.53	9.12	5.89	0.00	0.00	0.00	4.47	0.00	0.00	0.00	7.36	7.36	7.36	7.36	7.36	7.36	7.36	7.36	7.36	7.36	7.36	7.36	7.36	7.36	7.36	6.06
29.03	39.07	26.25	30.79	21.88	25.51	15.63	36.53	0.00	26.57	36.88	34.51	27.16	24.70	22.52	23.07	32.85	28.94	27.88	38.12	36.49	39.29	30.59	30.77	37.01	29.80	19.64	30.14	25.84	49.08	49.08	49.08	49.08	49.08	49.08	49.08	49.08	49.08	49.08	49.08	49.08	49.08	49.08	49.08	35.63
30.55	39.07	27.64	32.41	23.03	34.01	28.42	36.53	0.00	27.97	36.88	36.32	27.16	24.70	26.50	27.14	32.85	30.46	32.81	38.12	36.49	39.29	32.20	32.39	38.96	29.80	23.10	35.46	27.20	49.08	49.08	49.08	49.08	49.08	49.08	49.08	49.08	49.08	49.08	49.08	49.08	49.08	49.08	49.08	37.26
30.55	39.07	24.87	32.41	23.03	34.01	28.42	36.53	0.00	27.97	36.88	36.32	27.16	24.70	26.50	27.14	32.85	30.46	31.71	38.12	36.49	39.29	32.20	32.39	38.96	29.80	23.10	35.46	27.20	24.54	24.54	24.54	24.54	24.54	24.54	24.54	24.54	24.54	24.54	24.54	24.54	24.54	24.54	24.54	31.80
0.00	39.07	0.00	25.93	4.61	10.20	8.53	7.31	0.00	22.38	0.00	25.43	19.01	7.41	18.55	19.45	9.86	21.32	0.00	0.64	29.19	11.79	9.66	0.00	38.96	5.96	16.17	0.00	19.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.88
0.00	11.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	38.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.15
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.36
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27.50
12.57	15.36	8.36	6.74	16.31	19.06	12.93	10.50	16.77	10.64	20.51	20.31	13.70	14.73	21.01	16.76	16.86	21.18	15.17	15.59	11.53	22.10	23.09	20.88	20.67	11.26	11.23	37.18	10.48	13.55	13.55	13.55	13.55	13.55	13.55	13.55	13.55	13.55	13.55	13.55	13.55	13.55	13.55	13.55	18.14
30.59	25.88	20.35	29.54	27.48	37.94	40.46	32.85	25.80	25.89	49.92	40.43	33.34	24.82	35.40	28.24	41.03	35.69	36.91	37.93	28.05	37.24	38.90	50.83	34.83	27.41	27.33	40.71	25.51	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	37.08
30.59	25.88	20.35	29.54	27.48	37.94	40.46	32.85	25.80	25.89	49.92	40.43	33.34	24.82	35.40	28.24	41.03	35.69	36.91	37.93	28.05	37.24	38.90	50.83	34.83	27.41	27.33	40.71	25.51	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	42.41	37.08
30.59	15.53	20.35	26.58	10.99	15.18	40.46	16.42	7.74	18.13	49.92	13.48	16.67	7.45	31.86	19.77	28.72	28.55	36.91	15.17	19.64	26.07	35.01	25.41	20.90	8.22	19.13	40.71	20.41	33.93	33.93	33.93	33.93	33.93	33.93	33.93	33.93	33.93	33.93	33.93	33.93	33.93	33.93	33.93	28.14
0.00	0.00	6.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.19
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

wendel

Project Name: Lancaster BEB Study
Building: Lancaster Central School District
Date: 11/26/2024
Description Charge Being Delivered to the Battery (kWh) with Demand Reduction

| | | |

wendel

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Description Charge Being Delivered to the Battery (kWh) with Demand Reduction

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15.02	9.97	26.68	14.22	15.80	3.93	18.43	28.74	19.06	23.38	10.09	14.43	20.49	15.38	17.41	15.14	15.47	15.55	21.22	16.01	15.70	43.70	13.70	14.47	31.73	18.78	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	1747.83			
0.03	1.10	1.69	3.45	2.77	0.96	1.94	6.00	2.70	3.23	0.91	0.90	1.06	3.45	1.96	1.80	1.72	0.68	3.55	2.70	2.70	5.35	3.55	1.10	6.00	1.44	4.42	4.42	4.42	4.42	4.42	4.42	4.42	4.42	4.42	4.42	4.42	4.42	4.42	4.42	2.40			
480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	410 - Contracted	414 - Contracted	418 - Contracted	421 - Contracted	422 - Contracted	424 - Contracted	426- Contracted	427- Contracted	428- Contracted	429- Contracted	430- Contracted	431- Contracted	432- Contracted	435- Contracted	438- Contracted	Impact on Battery Total	# of Buses Charging	Average Charge to Battery	Max Charge to Battery
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

15.02	9.97	26.68	14.22	15.80	3.93	18.43	28.74	19.06	23.38	10.09	14.43	20.49	15.38	17.41	15.14	15.47	15.55	21.22	16.01	15.70	43.70	13.70	14.47	31.73	18.78	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	18.10	1747.83			
0.03	1.10	1.69	3.45	2.77	0.96	1.94	6.00	2.70	3.23	0.91	0.90	1.06	3.45	1.96	1.80	1.72	0.68	3.55	2.70	2.70	5.35	3.55	1.10	6.00	1.44	4.42	4.42	4.42	4.42	4.42	4.42	4.42	4.42	4.42	4.42	4.42	4.42	4.42	4.42	2.40			
480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	410 - Contracted	414 - Contracted	418 - Contracted	421 - Contracted	422 - Contracted	424 - Contracted	426- Contracted	427- Contracted	428- Contracted	429- Contracted	430- Contracted	431- Contracted	432- Contracted	435- Contracted	438- Contracted	Impact on Battery Total	# of Buses Charging	Average Charge to Battery	Max Charge to Battery
2.7	2.7	1.9	6.0	0.0	3.6	2.7	0.0	2.7	0.0	0.0	8.1	1.2	0.0	2.7	8.1	0.0	0.0	0.0	2.7	2.7	5.4	0.0	8.1	8.1	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	170.3	36.0	4.7	16.2
0.0	0.0	0.0	0.0	0.0	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	1.0	3.6	3.6
0.0	0.0	0.0	0.0	0.0	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	159.0	21.0	7.6	24.6
1.4	6.2	16.8	7.0	5.7	3.6	10.8	28.0	16.2	16.2	5.5	2.8	15.3	9.1	4.1	12.6	10.8	10.8	13.1	9.9	15.1	0.0	9.9	3.3	30.9	4.6	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	1165.8	74.0	15.8	65.0
8.3	8.3	26.1	10.8	7.5	3.6	17.8	28.0	18.2	22.7	8.5	11.1	20.5	14.2	16.7	12.6	11.0	13.1	20.4	15.3	15.1	0.0	13.1	13.2	30.9	18.2	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	1652.9	79.0	20.9	121.5
8.3	8.3	26.1	10.8	7.5	3.6	17.8	28.0	18.2	22.7	8.5	11.1	20.5	14.2	16.7	12.6	11.0	13.1	20.4	15.3	15.1	40.9	13.1	13.2	30.9	18.2	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	1684.1	80.0	21.1	58.4
8.3	8.3	26.1	10.8	7.5	3.6	17.8	28.0	18.2	22.7	8.5	11.1	20.5	14.2	16.7	12.6	11.0	13.1	20.4	15.3	15.1	40.9	13.1	13.2	18.9	18.2	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	1645.5	80.0	20.6	64.0
6.3	2.9	24.3	7.0	4.8	1.3	9.8	15.4	8.2	12.5	3.0	3.9	18.9	7.8	5.8	6.9	6.1	7.2	18.9	5.4	8.3	37.8	7.2	7.3	0.0	10.0	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	908.1	76.0	11.9	48.6
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5.4	5.5	4.6	0.0	7.3	2.5	2.6	0.0	8.7	4.1	6.6	5.4	2.3	4.1	10.8	0.0	8.6	4.3	4.0	5.4	6.6	5.7	6.6	2.5	0.0	1.7	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	435.3	65.0	6.7	18.0
14.4	9.4	7.8	13.3	15.2	3.6	9.1	11.5	13.3	8.5	9.6	13.6	7.9	14.5	13.3	8.2	14.8	15.0	13.9	14.3	13.7	14.8	9.6	8.9	11.7	9.2	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	1012.9	82.0	12.4	19.8
14.4	9.4	7.8	13.3	15.2	3.6	9.1	14.6	13.3	8.5	9.6	13.6	7.9	14.5	13.3	14.2	14.8	15.0	13.9	14.3	13.7	14.8	9.6	8.9	14.9	9.2	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	1064.3	82.0	13.0	25.1
14.4	9.4	7.8	13.3	15.2	3.6	9.1	14.6	13.3	8.5	9.6	13.6	7.9	14.5	13.3	14.2	14.8	15.0	13.9	14.3	13.7	14.8	9.6	8.9	14.9	9.2	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	1064.3	82.0	13.0	25.1
14.4	9.4	7.8	13.3	15.2	3.6	9.1	14.6	13.3	8.5	9.6	13.6	7.9	14.5	13.3	14.2	14.8	15.0	13.9	14.3	13.7	14.8	9.6	8.9	14.9	9.2	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	1064.3	82.0	13.0	25.1
14.4	9.4	7.8	13.3	15.2	3.6	9.1	14.6	13.3	8.5	9.6	13.6	7.9	14.5	13.3	14.2	14.8	15.0	13.9	14.3	13.7	14.8	9.6	8.9	14.9	9.2	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	1064.3	82.0	13.0	25.1
14.4	9.4	7.8	13.3	15.2	3.6	9.1	14.6	13.3	8.5	9.6	13.6	7.9	14.5	13.3	14.2	14.8	15.0	13.9	14.3	13.7	14.8	9.6	8.9	14.9	9.2	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	1064.3	82.0	13.0	25.1
14.4	9.4	7.8	13.3	15.2	3.6	9.1	14.6	13.3	8.5	9.6	13.6	7.9	14.5	13.3	14.2	14.8	15.0	13.9	14.3	13.7	14.8	9.6	8.9	14.9	9.2	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	1064.3	82.0	13.0	25.1
14.4	9.4	7.8	13.3	15.2	3.6	9.1	14.6	13.3	8.5	9.6	13.6	7.9	14.5	13.3	14.2	14.8	15.0	13.9	14.3	13.7	14.8	9.6	8.9	14.9	9.2	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	1064.3	82.0	13.0	25.1
14.4	9.4	7.8	13.3	15.2	3.6	9.1	14.6	13.3	8.5	9.6	13.6	7.9	14.5	13.3	14.2	14.8	15.0	13.9	14.3	13.7	14.8	9.6	8.9	14.9	9.2	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	1064.3	82.0	13.0	25.1
14.4	9.4	7.8	13.3	15.2	3.6	9.1	14.6	13.3	8.5	9.6	13.6	7.9	14.5	13.3	14.2	14.8	15.0	13.9	14.3	13.7	14.8	9.6	8.9	14.9	9.2	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	1064.3	82.0	13.0	25.1
2.7	2.7	2.0	6.0	0.0	3.6	2.7	0.0	2.7	0.0	0.0	8.1	1.2	0.0	2.7	8.1	0.0	0.0	0.0	2.7	2.7	5.4	0.0	8.1	8.1	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	170.3	36.0	4.7	16.2
0.0	0.0	0.0	0.0	0.0	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	1.0	3.6	3.6
0.0	0.0	0.0	0.0	0.0	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	133.8	21.0	6.4	21.9
0.8	4.7	15.0	5.6	3.2	3.6	10.8	25.1	4.3	16.2	4.0	2.0	15.3	7.2	3.3	10.2	7.7	1.8	10.6	7.9	12.7	0.0	7.9	2.7	27.4	3.8	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	959.7	74.0	13.0	58.2
4.9	6.2	23.2	8.6	4.3	3.6	14.5	25.1	17.4	19.6	6.2	8.2	17.3	11.2	13.3	10.2	7.9	11.1	16.6	12.4	12.7	0.0	10.5	10.8	27.4	15.3	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	1392.3	79.0	17.6	87.3
4.9	6.2	23.2	8.6	4.3	3.6	14.5	25.1	17.4	19.6	6.2	8.2	17.3	11.2	13.3	10.2	7.9	11.1	16.6	12.4	12.7	33.7	10.5	10.8	27.4	15.3	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	1403.3	80.0	17.5	50.0
4.9	6.2	23.2	8.6	4.3	3.6	14.5	25.1	17.4	19.6	6.2	8.2	17.3	11.2	13.3	10.2	7.9	11.1	16.6	12.4	12.7	33.7	10.5	10.8	18.9	15.3	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	1409.7	80.0	17.6	72.5
3.7	2.2	10.4	5.6	2.8	1.3	8.0	13.8	7.8	10.8	2.2	2.9	6.0	6.2	4.7	5.6	4.3	6.1	5.8	4.3	7.0	11.8	5.8	6.0	0.0	8.4	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	708.2	76.0	9.3	48.6
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5.4	5.4	5.0	0.0	7.3	2.5	2.6	0.0	8.6	4.1	6.5	5.4	2.5	4.1	10.8	0.0	8.5	4.2	4.2	5.4	6.5	6.3	6.5	2.5	0.0	1.7	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	442.0	65.0	6.8	18.0
6.0	6.0	6.0	13.3	6.0	2.4	6.0	11.3	6.0	6.0	6.0	6.0	6.0	6.0	6.0	8.2	6.0	6.0	6.0	6.0	6.0	12.0	6.0	6.0	11.3	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	618.0	82.0	7.5	19.6
6.0	6.0	6.0	6.0	6.0	2.4	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	12.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	556.8	82.0	6.8	18.0
6.0	6.0	6.0	6.0	6.0	2.4	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	12.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	556.8	82.0	6.8	18.0
6.0	6.0	6.0	6.0	6.0	2.4	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	12.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	556.8	82.0	6.8	18.0
6.0	6.0	6.0	6.0	6.0	2.4	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	12.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	556.8	82.0	6.8	18.0
6.0	6.0	6.0	6.0	6.0	2.4	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	12.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	556.8	82.0	6.8	18.0

wendel

Project Name: Lancaster BEB Study
Building: Lancaster Central School District
Date: 11/26/2024
Description Remaining Charge (kWh) in the Battery with Demand Reduction

Hour Number	Timestamp	Outside dry-bulb temp (F)	Day of the Week	Hours (0-23)	Hours (1-24)	409	412	415	433	434	436	437	439	441	442	444	445	448	449	450	451	453	455	456	457	458	459	460
1	1/1 0:00	31	Saturday	0	1	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
2	1/1 1:00	31	Saturday	1	2	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
3	1/1 2:00	30	Saturday	2	3	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
4	1/1 3:00	30	Saturday	3	4	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
5	1/1 4:00	30	Saturday	4	5	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
6	1/1 5:00	31	Saturday	5	6	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
7	1/1 6:00	31	Saturday	6	7	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
8	1/1 7:00	31	Saturday	7	8	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
9	1/1 8:00	30	Saturday	8	9	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
10	1/1 9:00	31	Saturday	9	10	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
11	1/1 10:00	32	Saturday	10	11	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
12	1/1 11:00	32	Saturday	11	12	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
13	1/1 12:00	32	Saturday	12	13	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
14	1/1 13:00	33	Saturday	13	14	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
15	1/1 14:00	33	Saturday	14	15	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
16	1/1 15:00	33	Saturday	15	16	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
17	1/1 16:00	33	Saturday	16	17	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
18	1/1 17:00	32	Saturday	17	18	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
19	1/1 18:00	31	Saturday	18	19	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
20	1/1 19:00	31	Saturday	19	20	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
21	1/1 20:00	30	Saturday	20	21	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
22	1/1 21:00	30	Saturday	21	22	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
23	1/1 22:00	30	Saturday	22	23	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
24	1/1 23:00	30	Saturday	23	24	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
25	1/2 0:00	29	Sunday	0	1	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
26	1/2 1:00	29	Sunday	1	2	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
27	1/2 2:00	29	Sunday	2	3	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
28	1/2 3:00	30	Sunday	3	4	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
29	1/2 4:00	31	Sunday	4	5	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
30	1/2 5:00	30	Sunday	5	6	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
31	1/2 6:00	30	Sunday	6	7	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
32	1/2 7:00	30	Sunday	7	8	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
33	1/2 8:00	30	Sunday	8	9	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
34	1/2 9:00	31	Sunday	9	10	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
35	1/2 10:00	31	Sunday	10	11	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
36	1/2 11:00	32	Sunday	11	12	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
37	1/2 12:00	32	Sunday	12	13	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
38	1/2 13:00	32	Sunday	13	14	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
39	1/2 14:00	32	Sunday	14	15	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
40	1/2 15:00	32	Sunday	15	16	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
41	1/2 16:00	32	Sunday	16	17	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
42	1/2 17:00	31	Sunday	17	18	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
43	1/2 18:00	31	Sunday	18	19	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
44	1/2 19:00	30	Sunday	19	20	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
45	1/2 20:00	29	Sunday	20	21	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
46	1/2 21:00	29	Sunday	21	22	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
47	1/2 22:00	28	Sunday	22	23	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
48	1/2 23:00	28	Sunday	23	24	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
49	1/3 0:00	27	Monday	0	1	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
50	1/3 1:00	27	Monday	1	2	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
51	1/3 2:00	26	Monday	2	3	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
52	1/3 3:00	26	Monday	3	4	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
53	1/3 4:00	25	Monday	4	5	255.2	267.3	255.2	332.1	477.9	299.7	307.8	255.2	291.6	267.3	170.1	255.2	255.2	275.4	255.2	283.5	307.8	255.2	283.5	267.3	170.1	170.1	255.2
54	1/3 5:00	24	Monday	5	6	247.3	259.2	255.2	332.1	463.0	294.0	299.6	255.2	285.4	267.3	168.8	247.1	255.2	273.0	252.8	283.5	301.9	255.2	283.5	256.7	162.0	170.1	255.2
55	1/3 6:00	24	Monday	6	7	195.3	226.9	211.2	286.0	403.4	256.3	244.7	219.6	244.2	238.0	142.2	215.1	232.2	225.3	205.9	236.6	262.9	226.3	253.6	214.5	129.6	139.2	224.2
56	1/3 7:00	24	Monday	7	8	143.2	194.6	165.0	231.8	343.9	218.5	189.9	177.7	203.0	207.2	115.5	183.1	201.7	177.5	159.0	187.1	223.9	195.9	218.4	172.2	97.2	106.7	191.6
57	1/3 8:00	23	Monday	8	9	124.3	162.3	118.8	177.6	342.0	180.7	135.0	135.8	161.8	176.4	88.9	151.1	171.2	129.8	112.2	137.7	184.9	165.6	183.2	130.0	64.8	74.2	159.0
58	1/3 9:00	22	Monday	9	10	140.1	129.9	119.3	123.4	383.0	142.9	117.7	113.1	120.5	171.1	78.4	136.3	154.7	157.6	120.2	135.5	145.9	141.3	205.3	116.6	81.2	76.7	135.0
59	1/3 10:00	23	Monday	10	11	155.8	97.6	151.5	131.8	424.0	148.9	163.1	138.7	107.9	195.8	102.0	148.5	164.1	193.1	143.3	182.1	136.3	141.3	262.4	143.8	111.9	95.7	147.9
60	1/3 11:00	23	Monday	11	12	171.6	108.4	183.7	164.0	465.0	198.9	208.6	164.2	132.7	220.5	125.6	160.7	173.5	228.7	166.3	228.7	173.5	124.5	276.7	170.9	142.6	114.8	160.7
61	1/3 12:00	23	Monday	12	13	187.3	180.9	215.9	196.3	448.2	248.8	254.0	189.8	157.5	245.2	149.2	172.9	182.8	264.3	189.3	275.3	210.7	131.0	240.5	198.1	158.2	133.8	173.6
62	1/3 13:00	22	Monday	13	14	182.8	205.2	200.0	189.3	389.7	203.5	256.9	185.2	159.3	243.5	148.7	156.8	172.1	234.9	183.8	249.2	208.2	149.6	204.2	168.4	128.4	134.3	164.3
63	1/3 14:00	21	Monday	14	15	140.3	161.1	160.8	150.3	331.2	158.2	207.9	143.6	118.6	192.9	118.8	125.5	136.8	188.9	143.5	199.6	157.4	120.1	168.0	134.4	98.7	105.9	127.9
64	1/3 15:00	21	Monday	15	16	97.9	117.0	121.6	111.4	272.7	112.8	158.8	102.1	77.8	142.4	88.9	94.2	101.4	142.8	103.1	149.9	106.6	90.7	131.7	100.4	68.9	77.5	91.5
65	1/3 16:00	20	Monday	16	17	71.9	84.4	78.9	69.0	209.1	76.7	105.4	66.9	58.1	87.4	64.5	69.0	72.3	92.8	75.4	95.9	80.2	72.6	118.1	81.6	48.9	65.9	72.3
66	1/3 17:00	19	Monday	17	18	86.1	98.8	79.0	89.0	176.3	94.0	101.3	81.2	76.3	81.4	72.6	83.6	86.1	100.8	89.3	97.2	97.9	86.6	130.7	96.2	58.5	73.9	86.3
67	1/3 18:00	19	Monday	18	19	100.4	113.1	93.6	109.0	202.0	111.4	118.8	95.5	94.5	96.9	80.8	98.2	99.9	115.4	103.2	112.7	115.6	100.6	143.3	110.7	68.0	81.9	100.3
68	1/3 19:00	18	Monday	19	20	114.6	127.5	108.3	129.0	227.7	128.7	136.2	109.8	112.6	112.3	88.9	112.8	113.7	130.0	117.1	128.1	133.3	114.6	155.8	125.3	77.5	89.9	114.3
69	1/3 20:00	18	Monday	20	21	128.9	141.8	122.9	149.0	253.3	146.1	153.6	124.1	130.8	127.7	97.1	127.4	127.5	144.6	130.9	143.6	151.0	128.6	168.4	139.9	87.0	97.9	128.3
70	1/3 21:00	16	Monday	21	22	143.2	156.1	137.5	169.0	279.0	163.4	171.0	138.5	149.0	143.1	105.2	142.0	141.3	159.2	144.8	159.1	168.7	142.5	181.0	154.4	96.5	105.8	142.3
71	1/3 22:00	17	Monday	22	23	157.4	170.5	152.1	189.0	304.7	180.8	188.4	152.8	167.1	158.6	113.4	156.6	155.1	173.9	158.7	174.5	186.5	156.5	193.6	169.0	106.0	113.8	156.4
72	1/3 23:00	17	Monday	23	24	171.7	184.8	166.7	209.1	330.3	198.2	205.9	167.1	185.3	174.0	121.6	171.2	168.9	188.5	172.6	190.0	204.2	170.5	206.1	183.6	115.5	121.8	170.4
73	1/4 0:00	17	Tuesday	0	1	186.0	199.2	181.3	229.1	356.0	215.5	223.3	181.4	203.5	189.4	129.7	185.8	182.7	203.1	186.5	205.4	221.9	184.5	218.7	198.1	125.0	129.8	184.4
74	1/4 1:00	17	Tuesday	1	2	200.2	213.5	196.0	249.1	381.7	232.9	240.7	195.7	221.6	204.8	137.9	200.4	196.5	217.7	200.3	220.9	239.6	198.5	231.3	212.7	134.5	137.8	198.4
75	1/4 2:00	14	Tuesday	2	3	214.5	227.9	210.6	269.1	407.3	250.2	258.1	210.0	239.8	220.3	146.0	215.0	210.3	232.3	214.2	236.4	257.3	212.5	243.9	227.2	144.0	145.8	212.4
76	1/4 3:00	13	Tuesday	3	4	228.8	242.2	225.2	289.1	433.0	267.6	275.6	224.4	258.0	235.7	154.2	229.6	224.1	246.9	228.1	251.8	275.0	226.5	256.5	241.8	153.5	153.7	226.4
77	1/4 4:00	10	Tuesday	4	5	243.0	256.5	239.8	309.1	458.7	284.9	293.0	238.7	276.2	251.1	162.3	244.2	237.9	261.5	242.0	267.3	292.7	240.5	269.0	256.4	163.0	161.7	240.4
78	1/4 5:00	10	Tuesday	5	6	246.7	258.5	254.4	329.1	461.7	293.5	298.9	253.0	284.9	266.5	168.7	246.5	251.7	272.8	252.6	282.7	301.4	254.5	281.6	255.8	161.3	169.7	254.4
79	1/4 6:00	9	Tuesday	6	7	185.5	220.6	205.6	291.2	391.8	249.2	234.5	219.3	236.5	234.9	137.4	208.9	238.3	216.8	197.6	233.0	255.7	226.0	248.4	206.2	123.3	136.1	220.8
80	1/4 7:00	8	Tuesday	7	8	124.4	182.7	151.3	227.6	321.9	204.9	170.1	170.2	188.1	198.7	106.2	171.3	202.5	160.7	142.6	175.0	209.9	190.3	207.1	156.6	85.2	98.0	182.5
81	1/4 8:00	10	Tuesday	8	9	105.1	147.5	101.1	168.7	321.3	163.8	110.5	124.7	143.3	165.3	77.2	136.5	169.3	108.8	91.6	121.3	167.5	157.3	168.8	110.7	50.0	62.6	147.1
82	1/4 9:00	16	Tuesday	9	10	125.0	112.4	99.5	109.8	368.7	122.8	117.9	99.0	98.5	158.0	64.9	119.4	150.6	141.0	102.6	116.1	125.1	130.9	194.6	94.8	69.1	66.3	129.6
83	1/4 10:00	20	Tuesday	10	11	144.9	77.3	137.8	120.2	416.1	126.4	163.3	128.6	83.4	186.3	92.5	136.7	161.1	181.8	130.6	168.9	112.7	130.9	259.7	129.1	104.2	88.4	144.0
84	1/4 11:00	22	Tuesday	11	12	164.8	115.1	176.0	157.2	463.4	187.6	208.7	158.1	117.4	214.6	120.2	153.9	171.7	222.6	158.6	221.6	159.2	114.2	273.9	163.4	139.3	110.6	158.4
85	1/4 12:00	21	Tuesday	12	13	184.7	183.0	214.3	194.1	446.6	248.8	254.1	187.6	151.5	242.8	147.8	171.1	182.2	263.4	186.6	274.4	205.6	120.7	237.7	197.7	158.2	132.7	172.8
86	1/4 13:00	23	Tuesday	13	14	182.8	207.3	198.4	189.3	388.1	203.5	256.9	185.2	159.3	243.5	147.3	156.8	172.1	234.1	183.8	248.3	208.2	139.3	201.4	168.1	128.4	133.2	164.3
87	1/4 14:00	22	Tuesday	14	15	140.3	163.2	159.2	150.3	329.6	158.2	207.9	143.6	118.6	192.9	117.4	125.5	136.8	188.0	143.5	198.6	157.4	109.8	165.2	134.1	98.7	104.8	127.9
88	1/4 15:00	21	Tuesday	15	16	97.9	119.1	120.0	111.4	271.1	112.8	158.8	102.1	77.8	142.4	87.5	94.2	101.4	142.0	103.1	148.9	106.6	80.3	129.0	100.0	68.9	76.4	91.5
89	1/4 16:00	20	Tuesday	16	17	71.9	86.5	77.4	69.0	207.5	76.7	105.4	66.9	58.1	87.4	63.1	69.0	72.3	91.9	75.4	94.9	80.2	62.3	115.4	81.3	48.9	64.9	72.3
90	1/4 17:00	20	Tuesday	17	18	86.1	100.7	77.6	89.0	174.8	94.0	101.3	81.2	76.3	81.4	71.3	83.6	86.1	100.0	89.3	96.4	97.9	77.1	128.2	95.8	58.5	72.9	86.3
91	1/4 18:00	19	Tuesday	18	19	100.4	114.8	92.3	109.0	200.6	111.4	118.8	95.5	94.5	96.9	79.6	98.2	99.9	114.7	103.2	111.9	115.6	91.8	141.0	110.4	68.0	81.0	100.3
92	1/4 19:00	19	Tuesday	19	20	114.6	129.0	107.1	129.0	226.4	128.7	136.2	109.8	112.6	112.3	87.9	112.8	113.7	129.3	117.1	127.4	133.3	106.6	153.8

wendel

Project Name: Lancaster BEB Study
Building: Lancaster Central School District
Date: 11/26/2024
Description Remaining Charge (kWh) in the Battery with Demand Reduction

Hour Number	Timestamp	Outside dry-bulb temp (F)	Day of the Week	Hours (0-23)	Hours (1-24)	409	412	415	433	434	436	437	439	441	442	444	445	448	449	450	451	453	455	456	457	458	459	460
94	1/4 21:00	19	Tuesday	21	22	143.2	157.4	136.5	169.0	278.0	163.4	171.0	138.5	149.0	143.1	104.4	142.0	141.3	158.7	144.8	158.5	168.7	136.2	179.3	154.2	96.5	105.2	142.3
95	1/4 22:00	20	Tuesday	22	23	157.4	171.6	151.3	189.0	303.8	180.8	188.4	152.8	167.1	158.6	112.7	156.6	155.1	173.4	158.7	174.0	186.5	151.0	192.1	168.8	106.0	113.3	156.4
96	1/4 23:00	20	Tuesday	23	24	171.7	185.7	166.0	209.1	329.6	198.2	205.9	167.1	185.3	174.0	120.9	171.2	168.9	188.1	172.6	189.5	204.2	165.7	204.9	183.4	115.5	121.3	170.4
97	1/5 0:00	20	Wednesday	0	1	186.0	199.9	180.7	229.1	355.4	215.5	223.3	181.4	203.5	189.4	129.2	185.8	182.7	202.7	186.5	205.1	221.9	180.5	217.7	198.0	125.0	129.4	184.4
98	1/5 1:00	21	Wednesday	1	2	200.2	214.1	195.5	249.1	381.2	232.9	240.7	195.7	221.6	204.8	137.5	200.4	196.5	217.4	200.3	220.6	239.6	195.3	230.5	212.6	134.5	137.4	198.4
99	1/5 2:00	21	Wednesday	2	3	214.5	228.3	210.2	269.1	407.0	250.2	258.1	210.0	239.8	220.3	145.7	215.0	210.3	232.1	214.2	236.1	257.3	210.1	243.2	227.2	144.0	145.5	212.4
100	1/5 3:00	20	Wednesday	3	4	228.8	242.5	224.9	289.1	432.8	267.6	275.6	224.4	258.0	235.7	154.0	229.6	224.1	246.8	228.1	251.7	275.0	224.9	256.0	241.8	153.5	153.6	226.4
101	1/5 4:00	20	Wednesday	4	5	243.0	256.7	239.7	309.1	458.6	284.9	293.0	238.7	276.2	251.1	162.2	244.2	237.9	261.5	242.0	267.2	292.7	239.6	268.8	256.4	163.0	161.6	240.4
102	1/5 5:00	19	Wednesday	5	6	246.7	258.5	254.4	329.1	461.7	293.5	298.9	253.0	284.9	266.5	168.7	246.5	251.7	272.8	252.6	282.7	301.4	254.4	281.6	255.8	161.3	169.7	254.4
103	1/5 6:00	19	Wednesday	6	7	190.1	223.4	209.4	295.2	397.0	252.5	239.2	222.4	240.1	237.4	139.7	211.7	240.3	220.9	201.7	237.1	259.0	228.5	251.0	209.9	126.1	138.8	223.5
104	1/5 7:00	20	Wednesday	7	8	133.5	188.3	159.1	236.3	332.2	211.4	179.6	176.9	195.3	204.0	110.8	176.9	207.1	169.0	150.7	183.4	216.6	195.5	212.7	164.0	90.9	103.5	188.1
105	1/5 8:00	20	Wednesday	8	9	113.4	153.1	108.9	177.4	330.2	170.4	120.0	131.4	150.5	170.5	81.9	142.1	173.9	117.1	99.8	129.7	174.2	162.4	174.5	118.1	55.7	68.1	152.6
106	1/5 9:00	22	Wednesday	9	10	131.5	120.8	109.4	123.2	374.8	132.6	104.0	108.7	109.3	165.1	71.4	127.2	149.9	147.7	110.0	127.5	135.2	138.2	199.2	104.7	74.0	71.6	137.4
107	1/5 10:00	25	Wednesday	10	11	149.6	88.5	144.7	131.6	419.5	138.6	153.3	135.5	96.6	191.4	97.1	142.1	160.6	186.4	135.9	176.6	125.6	138.2	260.9	135.7	107.3	92.2	149.6
108	1/5 11:00	27	Wednesday	11	12	167.7	126.3	179.9	163.9	464.1	193.7	202.6	162.3	125.7	217.8	122.8	157.0	171.4	225.1	161.8	225.8	167.0	121.4	275.1	166.8	140.6	112.7	161.8
109	1/5 12:00	28	Wednesday	12	13	185.8	186.5	215.1	196.2	447.3	248.8	251.9	189.1	154.7	244.1	148.5	171.9	182.1	263.8	187.7	274.9	208.4	127.9	238.9	197.9	158.2	133.3	174.0
110	1/5 13:00	27	Wednesday	13	14	182.8	210.8	199.2	189.3	388.8	203.5	256.9	185.2	159.3	243.5	148.0	156.8	172.1	234.4	183.8	248.9	208.2	146.5	202.6	168.2	128.4	133.7	164.3
111	1/5 14:00	27	Wednesday	14	15	140.3	166.7	160.0	150.3	330.3	158.2	207.9	143.6	118.6	192.9	118.1	125.5	136.8	188.4	143.5	199.2	157.4	117.0	166.4	134.2	98.7	105.4	127.9
112	1/5 15:00	25	Wednesday	15	16	97.9	122.6	120.8	111.4	271.8	112.8	158.8	102.1	77.8	142.4	88.2	94.2	101.4	142.3	103.1	149.5	106.6	87.5	130.2	100.2	68.9	77.0	91.5
113	1/5 16:00	23	Wednesday	16	17	74.8	92.7	81.6	72.4	213.3	79.8	109.7	70.1	60.2	91.8	65.8	71.4	75.0	96.3	77.9	99.8	82.7	71.8	118.1	83.8	50.7	66.6	74.2
114	1/5 17:00	21	Wednesday	17	18	88.8	106.4	82.3	92.1	183.6	96.9	106.6	84.2	78.2	86.8	73.8	85.8	88.6	104.4	91.6	101.7	100.3	85.8	130.7	98.2	60.1	74.5	88.0
115	1/5 18:00	19	Wednesday	18	19	102.9	120.1	96.7	111.9	208.6	114.0	123.5	98.3	96.2	101.8	81.9	100.2	102.2	118.7	105.3	116.8	117.8	99.9	143.3	112.6	69.4	82.5	101.9
116	1/5 19:00	18	Wednesday	19	20	116.9	133.8	111.0	131.6	233.7	131.1	140.5	112.3	114.2	116.8	89.9	114.7	115.8	133.0	119.0	131.9	135.3	113.9	155.8	127.0	78.8	90.4	115.8
117	1/5 20:00	20	Wednesday	20	21	130.9	147.5	125.4	151.4	258.7	148.2	157.5	126.4	132.2	131.8	98.0	129.1	129.4	147.3	132.6	147.0	152.8	128.0	168.4	141.4	88.2	98.3	129.6
118	1/5 21:00	17	Wednesday	21	22	145.0	161.2	139.7	171.1	283.8	165.3	174.5	140.5	150.2	146.7	106.1	143.5	143.0	161.6	146.3	162.1	170.3	142.0	181.0	155.7	97.5	106.3	143.5
119	1/5 22:00	16	Wednesday	22	23	159.0	174.9	154.0	190.9	308.8	182.5	191.5	154.5	168.2	161.7	114.1	157.9	156.6	176.0	160.0	177.2	187.8	156.1	193.6	170.1	106.9	114.2	157.4
120	1/5 23:00	14	Wednesday	23	24	173.0	188.6	168.4	210.6	333.9	199.6	208.5	168.6	186.2	176.7	122.2	172.3	170.2	190.3	173.7	192.2	205.3	170.1	206.1	184.5	116.3	122.1	171.2
121	1/6 0:00	14	Thursday	0	1	187.1	202.3	182.7	230.4	358.9	216.7	225.4	182.7	204.3	191.7	130.2	186.7	183.8	204.6	187.4	207.3	222.9	184.2	218.7	198.9	125.6	130.1	185.1
122	1/6 1:00	13	Thursday	1	2	201.1	216.0	197.1	250.1	384.0	233.8	242.4	196.8	222.3	206.6	138.3	201.1	197.4	218.9	201.1	222.4	240.4	198.2	231.3	213.3	135.0	138.0	199.0
123	1/6 2:00	13	Thursday	2	3	215.2	229.6	211.4	269.9	409.0	250.9	259.4	210.8	240.3	221.6	146.3	215.5	211.0	233.2	214.8	237.5	257.9	212.3	243.9	227.7	144.4	145.9	212.9
124	1/6 3:00	12	Thursday	3	4	229.2	243.3	225.7	289.6	434.1	268.0	276.4	224.9	258.3	236.6	154.4	229.9	224.6	247.5	228.5	252.6	275.4	226.3	256.5	242.1	153.7	153.8	226.7
125	1/6 4:00	11	Thursday	4	5	243.2	257.0	240.1	309.4	459.1	285.2	293.4	239.0	276.3	251.6	162.4	244.3	238.2	261.8	242.1	267.7	292.9	240.4	269.0	256.5	163.1	161.8	240.6
126	1/6 5:00	11	Thursday	5	6	246.7	258.5	254.4	329.1	461.7	293.5	298.9	253.0	284.9	266.6	168.7	246.5	251.8	272.8	252.6	282.7	301.4	254.4	281.6	255.8	161.3	169.7	254.5
127	1/6 6:00	10	Thursday	6	7	190.1	223.4	209.4	295.3	397.0	252.5	239.2	222.5	240.1	237.4	139.7	211.7	240.4	220.9	201.7	237.1	259.0	228.5	251.0	209.9	126.1	138.8	223.5
128	1/6 7:00	8	Thursday	7	8	129.0	185.5	155.1	231.7	327.1	208.2	174.9	173.3	191.7	201.3	108.5	174.1	204.5	164.9	146.6	179.1	213.2	192.9	209.7	160.3	88.1	100.7	185.2
129	1/6 8:00	13	Thursday	8	9	109.2	150.3	104.9	172.7	325.7	167.1	115.3	127.8	146.9	167.8	79.6	139.3	171.3	113.0	95.7	125.4	170.8	159.8	171.4	114.4	52.8	65.3	149.8
130	1/6 9:00	19	Thursday	9	10	128.2	115.2	103.3	113.8	371.8	126.0	122.7	102.2	102.1	160.6	67.2	122.2	152.6	144.2	106.0	120.2	128.4	133.4	196.4	98.4	71.4	68.5	132.3
131	1/6 10:00	22	Thursday	10	11	147.2	82.9	140.4	124.3	417.8	132.0	166.7	130.8	89.5	188.2	94.2	138.6	162.6	184.0	133.0	171.7	118.8	133.4	260.1	131.5	105.6	90.0	145.9
132	1/6 11:00	25	Thursday	11	12	166.2	120.7	177.5	159.6	463.8	190.4	210.8	159.5	121.2	215.7	121.1	155.0	172.6	223.8	160.1	223.1	162.9	116.7	274.4	164.7	139.9	111.5	159.5
133	1/6 12:00	26	Thursday	12	13	185.2	184.7	214.6	194.9	446.9	248.8	254.8	188.1	153.0	243.3	148.0	171.4	182.5	263.6	187.1	274.6	206.9	123.2	238.1	197.8	158.2	133.0	173.2
134	1/6 13:00	27	Thursday	13	14	182.8	209.1	198.7	189.3	388.4	203.5	256.9	185.2	159.3	243.5	147.5	156.8	172.1	234.2	183.8	248.5	208.2	141.8	201.9	168.1	128.4	133.4	164.3
135	1/6 14:00	28	Thursday	14	15	140.3	164.9	159.5	150.3	329.9	158.2	207.9	143.6	118.6	192.9	117.6	125.5	136.8	188.2	143.5	198.8	157.4	112.3	165.7	134.1	98.7	105.0	127.9
136	1/6 15:00	28	Thursday	15	16	97.9	120.8	120.3	111.4	271.5	112.8	158.8	102.1	77.8	142.4	87.7	94.2	101.4	142.1	103.1	149.1	106.6	82.8	129.4	100.1	68.9	76.7	91.5
137	1/6 16:00	26	Thursday	16	17	74.8	91.0	81.1	72.4	213.0	79.8	109.7	70.1	60.2	91.8	65.3	71.4	75.0	96.1	77.9	99.5	82.7	67.1	117.4	83.7	50.7	66.3	74.2
138	1/6 17:00	25	Thursday	17	18	88.8	104.8	81.9	92.1	183.3	96.9	106.6	84.2	78.2	86.8	73.4	85.8	88.6	104.2	91.6	101.4	100.3	81.5	130.0	98.1	60.1	74.3	88.0
139	1/6 18:00	25	Thursday	18	19	102.9	118.7	96.3	111.9	208.3	114.0	123.5	98.3	96.2	101.8	81.5	100.2	102.2	118.6	105.3	116.5	117.8	95.9	142.7	112.5	69.4	82.2	101.9
140	1/6 19:00	26	Thursday	19	20	116.9	132.5	110.6	131.6	233.4	131.1	140.5	112.3	114.2	116.8	89.6	114.7	115.8	132.9	119.0	131.6	135.3	110.3	155.3	126.9	78.8	90.2	115.8
141	1/6 20:00	29	Thursday	20	21	130.9	146.3	125.0	151.4	258.5	148.2	157.5	126.4	132.2	131.8	97.7	129.1	129.4	147.2	132.6	146.7	152.8	124.7	167.9	141.3	88.2	98.1	129.6
142	1/6 21:00	29	Thursday	21	22	145.0	160.1	139.4	171.1	283.6	165.3	174.5	140.5	150.2	146.7	105.8	143.5	143.0	161.5	146.3	161.9	170.3	139.1	180.6	155.7	97.5	106.1	143.5
143	1/6 22:00	31	Thursday	22	23	159.0	174.0	153.8	190.9	308.6	182.5	191.5	154.5	168.2	161.7	113.9	157.9	156.6	175.9	160.0	177.0	187.8	153.6	193.2	170.1	106.9	114.0	157.4
144	1/6 23:00	33	Thursday	23	24	173.0	187.8	168.2	210.6	333.7	199.6	208.5	168.6	186.2	176.7	122.0	172.3	170.2	190.2	173.7	192.1	205.3	168.0	205.8	184.5	116.3	122.0	171.2
145	1/7 0:00	34	Friday	0	1	187.1	201.6	182.5	230.4	358.8	216.7	225.4	182.7	204.3	191.7	130.1	186.7	183.8	204.5	187.4	207.2	222.9	182.4	218.4	198.9	125.6	129.9	185.1
146	1/7 1:00	35	Friday	1	2	201.1	215.4	196.9	250.1	383.9	233.8	242.4	196.8	222.3	206.6	138.1	201.1	197.4	218.8	201.1	222.3	240.4	196.8	231.1	213.3	135.0	137.9	199.0
147	1/7 2:00	37	Friday	2	3	215.2	229.3	211.3	269.9	408.9	250.9	259.4	210.8	240.3	221.6	146.2	215.5	211.0	233.1	214.8	237.4	257.9	211.2	243.7	227.7	144.4	145.8	212.9
148	1/7 3:00	36	Friday	3	4	229.2	243.1	225.7	289.6	434.0	268.0	276.4	224.9	258.3	236.6	154.3	229.9	224.6	247.5	228.5	252.5	275.4	225.6	256.3	242.1	153.7	153.8	226.7
149	1/7 4:00	32	Friday	4	5	243.2	256.9	240.1	309.4	459.1	285.2	293.4	239.0	276.3	251.6	162.4	244.3	238.2	261.8	242.1	267.6	292.9	240.0	269.0	256.5	163.1	161.7	240.6
150	1/7 5:00	32	Friday	5	6	247.3	259.2	254.4	329.1	463.0	294.0	299.6	253.0	285.4	266.6	168.8	247.1	251.8	273.0	252.8	282.7	301.9	254.4	281.6	256.7	162.0	169.7	254.5
151	1/7 6:00	35	Friday	6	7	195.3	226.9	213.2	299.3	403.4	256.3	244.7	225.5	244.2	240.0	142.2	215.1	242.3	225.3	205.9	241.2	262.9	231.0	253.6	214.5	129.6	141.5	226.2
152	1/7 7:00	36	Friday	7	8	143.2	194.6	167.0	245.1	343.9	218.5	189.9	183.7	203.0	209.2	115.5	183.1	211.8	177.5	159.0	191.8	223.9	200.6	218.4	172.2	97.2	109.0	193.6
153	1/7 8:00	36	Friday	8	9	124.3	162.3	120.8	190.9	342.0	180.7	135.0	141.8	161.8	178.4	88.9	151.1	181.3	129.8	112.2	142.4	184.9	170.2	183.2	130.0	64.8	76.5	161.0
154	1/7 9:00	33	Friday	9	10	140.1	129.9	121.3	136.7	383.0	142.9	117.7	119.1	120.5	173.0	78.4	136.3	157.0	157.6	120.2	140.2	145.9	146.0	205.3	116.6	81.2	78.6	136.9
155	1/7 10:00	32	Friday	10	11	155.8	97.6	152.9	142.2	424.0	148.9	163.1	143.0	107.9	197.2	102.0	148.5	165.7	193.1	143.3	185.3	136.3	146.0	262.4	143.8	111.9	97.1	149.3
156	1/7 11:00	30	Friday	11	12	171.6	108.4	184.4	170.2	465.0	198.9	208.6	166.8	132.7	221.3	125.6	160.7	174.5	228.7	166.3	230.4	173.5	130.7	278.7	170.9	142.6	115.5	161.6
157	1/7 12:00	30	Friday	12	13	187.3	180.9	216.0	198.2	452.0	248.8	254.0	190.7	157.5	245.5	149.2	172.9	183.2	264.3	189.3	275.5	210.7	139.1	245.6	198.1	158.8	134.0	173.9
158	1/7 13:00	31	Friday	13	14	184.0	207.3	202.7	191.2	398.6	207.4	258.9	186.8	160.6	245.0	150.4	158.6	173.5	238.3	185.4	253.1	210.2	159.4	212.6	171.3	131.6	123.6	165.7
159	1/7 14:00	29	Friday	14	15	141.6	163.2	163.5	152.2	340.1	162.1	209.8	145.2	119.8	194.5	120.5	127.3	138.1	192.2	145.1	203.5	159.4	129.9	176.3	137.2	101.9	95.3	129.3
160	1/7 15:00	29	Friday	15	16	99.2	119.1	124.3	113.2	281.6	116.7	160.7	103.7	79.0	143.9	90.6	96.0	102.8	146.2	104.7	153.8	108.5	100.4	140.1	103.2	72.1	66.9	93.0
161	1/7 16:00	27	Friday	16	17	76.1	89.3	85.1	74.2	223.1	83.6	111.6	71.7	61.4	93.3	68.2	73.2	76.4	100.1	79.4	104.1	84.7	84.7	134.0	86.8	53.9	56.9	75.6
162	1/7 17:00	28	Friday	17	18	82.1	101.3	85.6	93.9	193.1	95.6	108.4	77.7	67.4	88.3	74.2	79.2	82.4	108.0	85.4	105.7	96.7	96.7	146.0	92.8	59.9	62.9	81.6
163	1/7 18:00	29	Friday	18	19	88.1	113.3	91.6	105.9	205.1	107.6	120.4	83.7	73.4	94.3	80.2	85.2	88.4	114.0	91.4	117.7	108.7	108.7	158.0	98.8	65.9	68.9	87.6
164	1/7 19:00	26	Friday	19	20	94.1	125.3	97.6	117.9	217.1	119.6	132.4	89.7	79.4	100.3	86.2	91.2	94.4	120.0	97.4	129.7	120.7	120.7	170.0	104.8	71.9	74.9	93.6
165	1/7 20:00	24	Friday	20	21	100.1	137.3	103.6	129.9	229.1	131.6	144.4	95.7	85.4	106.3	92.2	97.2	100.4	126.0	103.4	141.7	132.7	132.7	182.0	110.8	77.9	80.9	99.6
166	1/7 21:00	23	Friday	21	22	106.1	149.3	109.6	141.9	241.1	143.6	156.4	101.7	91.4	112.3	98.2	103.2	106.4	132.0	109.4	153.7	144.7	144.7	194.0	116.8	83.9	86.9	105.6
167	1/7 22:00	23	Friday	22	23	112.1	161.3	115.6	153.9	253.1	155.6	168.4	107.7	97.4	118.3	104.2	109.2	112.4	138.0	115.4	165.7	156.7	156.7	206.0	122.8	89.9	92.9	111.6
168	1/7 23:00	23	Friday	23	24	118.1	173.3	121.6	165.9	265.1	167.6	180.4	113.7	103.4	124.3	110.2	115.2	118.4	144.0	121.4	177.7	168.7	168.7	218.0	128.8	95.9	98.9	117.6

461	462	463	464	465	466	467	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494
170.1	255.2	170.1	170.1	170.1	255.2	170.1	388.8	255.2	170.1	255.2	170.1	255.2	170.1	255.2	170.1	255.2	170.1	255.2	170.1	170.1	255.2	255.2	170.1	170.1	259.2	255.2	170.1	170.1	255.2	170.1	255.2	255.2

461	462	463	464	465	466	467	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494
97.0	137.9	97.0	95.1	104.3	145.1	106.0	240.2	136.5	99.7	143.3	95.4	139.2	108.4	140.6	97.6	138.6	85.0	137.8	93.6	104.7	140.2	136.6	114.1	95.6	141.6	147.0	101.4	93.2	142.6	104.8	138.1	146.5
106.0	152.2	106.2	104.4	112.4	158.9	114.0	259.1	151.3	108.8	157.2	104.8	152.9	116.4	155.0	106.6	153.3	95.6	152.4	103.1	112.6	153.8	151.9	117.7	104.9	156.6	160.5	110.1	102.9	156.4	112.8	152.9	160.0
114.9	166.6	115.4	113.8	120.6	172.8	122.1	278.0	166.0	117.9	171.1	114.2	166.6	124.3	169.4	115.6	167.9	106.2	167.0	112.6	120.6	167.4	167.2	121.4	114.1	171.6	173.9	118.7	112.6	170.2	120.8	167.6	173.5
123.9	181.0	124.6	123.1	128.8	186.6	130.2	297.0	180.7	127.0	185.0	123.6	180.4	132.3	183.8	124.6	182.6	116.7	181.5	122.1	128.5	181.0	182.5	125.0	123.4	186.5	187.3	127.4	122.2	184.0	128.8	182.3	187.0
132.9	195.4	133.8	132.4	137.0	200.5	138.2	315.9	195.5	136.1	198.9	133.0	194.1	140.3	198.3	133.6	197.3	127.3	196.1	131.6	136.4	194.6	197.8	128.7	132.6	201.5	200.8	136.0	131.9	197.9	136.8	197.0	200.5
141.8	209.8	143.0	141.7	145.2	214.3	146.3	334.8	210.2	145.1	212.8	142.4	207.8	148.2	212.7	142.6	211.9	137.9	210.7	141.1	144.3	208.2	213.1	132.3	141.9	216.5	214.2	144.6	141.6	211.7	144.9	211.7	214.0
150.8	224.2	152.2	151.0	153.3	228.2	154.4	353.8	224.9	154.2	226.7	151.8	221.5	156.2	227.1	151.6	226.6	148.4	225.3	150.6	152.3	221.8	228.4	136.0	151.1	231.5	227.6	153.3	151.2	225.5	152.9	226.4	227.5
159.8	238.6	161.4	160.3	161.5	242.0	162.4	372.7	239.7	163.3	240.6	161.2	235.3	164.1	241.5	160.6	241.2	159.0	239.8	160.1	160.2	235.4	243.7	139.6	160.4	246.5	241.0	161.9	160.9	239.3	160.9	241.2	241.0
168.8	253.0	168.4	169.6	169.7	253.9	168.6	381.6	254.4	161.7	254.5	168.4	249.0	162.2	253.3	169.6	253.0	169.6	254.4	169.6	168.1	249.0	245.2	143.3	169.6	253.2	254.5	168.6	168.8	253.1	168.9	253.4	254.5
155.3	231.9	135.3	140.0	145.8	228.4	138.3	333.9	224.0	128.2	225.9	134.9	230.0	130.8	217.2	140.8	210.6	142.1	223.7	148.5	142.4	238.2	205.5	146.9	143.5	213.1	219.7	139.1	141.9	236.7	145.0	217.7	225.7
130.0	197.6	102.2	106.0	117.8	203.0	108.0	286.2	189.2	94.7	193.1	101.5	184.1	99.4	181.1	107.6	168.1	112.1	188.4	123.5	105.4	207.3	165.8	150.6	113.1	173.0	180.2	109.6	115.1	207.9	115.5	181.9	192.6
104.6	163.4	69.1	72.0	89.8	177.5	77.7	238.4	154.3	61.2	160.2	68.0	148.7	68.0	145.0	74.4	125.7	87.2	153.2	98.5	68.4	176.4	126.1	154.2	82.7	132.9	140.7	80.1	88.2	179.1	86.0	146.2	159.5
107.9	158.3	74.5	87.6	80.0	182.4	82.2	289.8	129.7	84.8	168.8	82.8	155.9	78.5	156.7	93.4	86.6	93.4	128.4	99.7	74.5	174.4	123.8	157.9	71.1	160.3	131.5	77.3	85.8	163.0	81.9	145.0	142.0
124.0	165.3	97.1	103.2	101.8	187.3	102.4	388.8	136.4	108.3	177.4	97.6	163.0	100.0	168.3	112.3	87.4	99.5	135.5	107.3	99.7	184.5	130.4	161.5	87.6	187.6	148.1	98.9	93.7	173.1	101.2	158.2	157.5
140.0	172.2	119.7	118.7	123.6	192.3	122.5	344.5	143.1	131.9	185.9	112.3	170.2	121.6	180.0	131.3	107.5	105.7	142.6	115.0	124.9	194.5	137.0	165.2	104.2	214.9	164.8	120.4	101.5	183.1	120.5	171.5	172.9
156.1	179.2	142.2	134.3	145.4	197.2	142.7	300.1	149.7	155.4	194.5	127.1	177.3	143.1	191.7	150.3	127.6	111.8	149.6	122.7	150.1	204.6	143.6	168.8	120.7	242.3	181.4	142.0	109.4	193.1	139.7	184.8	188.4
142.6	156.6	141.4	128.0	145.5	185.9	143.7	255.8	134.2	153.8	173.1	120.9	165.2	141.5	181.7	147.0	129.7	106.1	147.5	107.5	153.5	197.0	136.4	153.3	118.2	234.8	166.7	138.9	96.0	173.6	140.3	173.6	170.6
113.3	118.2	112.2	95.0	116.6	144.6	116.3	211.5	106.9	121.6	135.7	88.9	129.5	109.8	145.0	116.4	103.8	85.7	118.0	80.0	115.6	156.5	103.5	127.5	92.3	184.9	126.2	105.6	71.2	138.2	112.1	132.6	134.9
84.0	79.8	82.9	62.0	87.6	103.4	88.9	167.2	79.5	89.4	98.3	56.9	93.8	78.2	108.4	85.8	77.9	65.4	88.4	52.5	77.6	116.1	70.7	101.7	66.4	135.0	85.8	72.2	46.3	102.8	83.8	91.6	99.2
54.7	67.5	53.6	49.9	66.0	78.3	68.3	158.6	64.5	57.1	76.0	49.5	72.7	70.1	71.8	55.2	67.9	45.0	67.2	47.0	67.0	75.6	61.6	96.5	50.9	85.1	81.0	59.7	45.5	76.4	66.3	67.0	81.5
63.5	81.8	62.6	59.1	74.0	92.0	76.2	176.6	79.1	66.0	89.7	58.8	86.3	78.0	86.0	64.0	82.4	45.0	81.6	56.4	74.8	89.0	76.7	100.1	60.0	86.6	94.3	68.2	55.1	90.0	74.2	81.5	94.8
72.2	96.0	71.6	68.4	81.9	105.6	84.0	194.6	93.7	74.9	103.5	68.2	99.8	85.8	100.1	72.8	96.9	55.4	96.0	65.9	82.5	102.3	91.9	103.7	69.1	101.1	107.7	76.7	64.7	103.5	82.1	96.0	108.1
81.0	110.3	80.6	77.6	89.9	119.3	91.9	212.6	108.3	83.7	117.2	77.5	113.4	93.7	114.3	81.6	111.3	65.7	110.4	75.3	90.3	115.7	107.1	107.3	78.3	115.7	121.0	85.2	74.4	117.1	90.0	110.6	121.4
89.8	124.6	89.6	86.8	97.9	133.0	99.8	230.6	122.9	92.6	130.9	86.8	127.0	101.5	128.4	90.4	125.8	76.1	124.8	84.7	98.1	129.0	122.3	111.0	87.4	130.3	134.4	93.8	84.0	130.7	97.9	125.1	134.7
98.6	138.9	98.6	96.0	105.9	146.6	107.6	248.6	137.5	101.4	144.6	96.1	140.5	109.3	142.6	99.2	140.2	86.5	139.2	94.2	105.9	142.4	137.5	114.6	96.6	144.8	147.7	102.3	93.6	144.3	105.8	139.6	148.0
107.3	153.1	107.6	105.2	113.9	160.3	115.5	266.6	152.2	110.3	158.4	105.4	154.1	117.2	156.7	108.0	154.7	96.9	153.6	103.6	113.7	155.7	152.7	118.2	105.7	159.4	161.1	110.8	103.2	157.9	113.7	154.2	161.3
116.1	167.4	116.6	114.4	121.8	173.9	123.3	284.6	166.8	119.2	172.1	114.7	167.7	125.0	170.9	116.8	169.1	107.3	168.0	113.0	121.5	169.1	167.8	121.8	114.8	174.0	174.4	119.4	112.8	171.5	121.6	168.7	174.6
124.9	181.7	125.6	123.6	129.8	187.6	131.2	302.6	181.4	128.0	185.8	124.0	181.2	132.9	185.1	125.6	183.6	117.7	182.4	122.5	129.2	182.4	183.0	125.4	124.0	188.5	187.8	127.9	122.5	185.1	129.4	183.2	187.9
133.7	195.9	134.6	132.8	137.8	201.2	139.1	320.6	196.0	136.9	199.6	133.3	194.8	140.7	199.2	134.4	198.0	128.0	196.8	131.9	137.0	195.8	198.2	129.0	133.1	203.1	201.1	136.4	132.1	198.7	137.3	197.8	201.3
142.5	210.2	143.6	142.0	145.8	214.9	146.9	338.6	210.6	145.7	213.3	142.6	208.3	148.5	213.4	143.2	212.5	138.4	211.2	141.3	144.8	209.1	213.4	132.7	142.2	217.7	214.4	144.9	141.7	212.3	145.2	212.3	214.6
151.2	224.5	152.6	151.2	153.7	228.5	154.8	356.6	225.2	154.6	227.0	151.9	221.9	156.4	227.5	152.0	227.0	148.8	225.6	150.8	152.6	222.4	228.6	136.3	151.4	232.2	227.8	153.5	151.3	225.9	153.1	226.8	227.9
160.0	238.7	161.6	160.4	161.7	242.2	162.6	374.6	239.8	163.5	240.7	161.3	235.5	164.2	241.7	160.9	241.4	159.2	240.0	160.2	160.4	235.8	243.8	139.9	160.5	246.8	241.1	162.0	161.0	239.5	161.0	241.3	241.2
168.8	253.0	168.4	169.6	169.7	253.9	168.6	385.4	254.4	161.7	254.5	168.4	249.0	162.2	253.3	169.7	253.0	169.6	254.4	169.6	168.2	249.1	245.2	143.5	169.6	253.2	254.5	168.6	168.8	253.1	168.9	253.4	254.5
155.3	232.0	135.3	140.0	145.8	228.4	138.3	337.7	224.0	128.2	226.0	134.9	230.0	130.8	217.2	140.8	210.6	142.1	223.7	148.5	142.4	238.2	205.5	147.1	143.5	213.1	219.7	139.1	141.9	236.7	145.0	217.7	225.7
128.0	194.9	99.6	103.3	115.6	200.9	105.6	286.1	186.4	92.0	190.5	98.8	180.5	96.9	178.2	105.0	164.7	109.7	185.6	121.5	102.5	204.8	162.6	150.7	110.6	169.8	177.0	107.2	112.9	205.6	113.2	179.1	190.0
102.6	160.6	66.5	69.3	87.5	175.5	75.2	238.4	151.5	58.5	157.6	65.3	145.2	65.5	142.1	71.7	122.3	84.8	150.4	96.5	65.5	173.9	122.9	154.4	80.2	129.7	137.6	77.7	86.1	176.8	83.7	143.4	156.9
105.7	155.4	71.6	85.5	75.9	180.8	79.6	289.1	125.0	82.7	166.8	80.7	153.1	76.1	154.4	91.3	79.8	91.5	123.6	97.7	71.2	171.7	120.7	158.0	66.7	157.8	126.1	73.3	83.5	159.4	77.8	141.8	137.8
122.4	163.2	95.0	101.6	99.0	186.2	100.5	388.8	133.0	106.8	175.9	96.1	161.0	98.3	166.7	110.9	82.0	98.2	131.9	106.0	97.4	182.5	128.1	161.6	84.5	185.8	144.3	96.0	92.0	170.5	98.3	156.0	154.6
139.1	171.0	118.4	117.8	122.0	191.5	121.5	344.5	141.1	130.9	185.1	111.4	169.0	120.6	179.0	130.4	104.4	104.9	140.3	114.2	123.5	193.3	135.6	165.2	102.3	213.9	162.5	118.7	100.6	181.6	118.8	170.1	171.3
155.8	178.8	141.8	134.0	145.0	196.9	142.4	300.1	149.2	155.1	194.3	126.8	176.9	142.9	191.4	150.0	126.8	111.5	148.6	122.5	149.6	204.1	143.0	168.8	120.1	241.9	180.7	141.4	109.1	192.7	139.3	184.3	188.0
142.6	156.6	141.4	128.0	145.1	185.9	143.5	255.8	134.2	153.8	173.1	120.9	165.2	141.2	181.7	147.0	128.9	106.1	147.5	107.5	153.1	197.0	136.4	153.3	118.2	234.8	166.7	138.9	96.0	173.6	139.9	173.6	170.6
113.3	118.2	112.2	95.0	116.1	144.6	116.1	211.5	106.9	121.6	135.7	88.9	129.5	109.6	145.0	116.4	103.0	85.7	118.0	80.0	115.1	156.5	103.5	127.5	92.3	184.9	126.2	105.6	71.2	138.2	111.6	132.6	134.9
84.0	79.8	82.9	62.0	87.2	103.4	88.7	167.2	79.5	89.4	98.3	56.9	93.8	78.0	108.4	85.8	77.1	65.4	88.4	52.5	77.2	116.1	70.7	101.7	66.4	135.0	85.8	72.2	46.3	102.8	83.4	91.6	99.2
54.7	67.5	53.6	49.9	65.6	78.3	68.0	158.6	64.5	57.1	76.0	49.5	72.7	69.9	71.8	55.2	67.2	45.0	67.2	47.0	66.6	75.6	61.6	96.5	50.9	85.1	81.0	59.7	45.5	76.4	65.9	67.0	81.5
63.5	81.8	62.6	59.1	73.6	92.0	75.9	176.6	79.1	66.0	89.7	58.8	86.3	77.7	86.0	64.0	81.7	45.0	81.6	56.4	74.4	89.0	76.7	100.1	60.0	86.6	94.3	68.2	55.1	90.0	73.8	81.5	94.8
72.2	96.0	71.6	68.4	81.6	105.6	83.8	194.6	93.7	74.9	103.5	68.2	99.8	85.6	100.1	72.8	96.2	55.4	96.0	65.9	82.2	102.3	91.9	103.7	69.1	101.1	107.7	76.7	64.7	103.5	81.7	96.0	108.1
81.0	110.3	80.6	77.6	89.6	119.3	91.7	212.6	108.3	83.7	117.2	77.5	113.4	93.5	114.3	81.6	110.7	65.7	110.4	75.3	90.0	115.7	107.1	107.3	78.3	115.7	121.0	85.2	74.4	117.1	89.7	110.6	121.4
89.8	124.6	89.6	86.8	97.6	133.0	99.6	230.6	122.9	92.6	130.9	86.8	127.0	101.3	128.4	90.4	125.2	76.1	124.8	84.7	97.8	129.0	122.3	111.0	87.4	130.3	134.4	93.8	84.0	130.7	97.6	125.1	134.7
98.6	138.9	98.6	96.0	105.6	146.6	107.4	248.6	137.5	101.4	144.6	96.1	140.5	109.2	142.6	99.2	139.7	86.5	139.2	94.2	105.6	142.4	137.5	114.6	96.6	144.8	147.7	102.3	93.6	144.3	105.5	139.6	148.0
107.3	153.1	107.6	105.2	113.6	160.3	115.3	266.6	152.2	110.3	158.4	105.4	154.1	117.0	156.7	108.0	154.3	96.9	153.6	103.6	113.4	155.7	152.7	118.2	105.7	159.4	161.1	110.8	103.2	157.9	113.4	154.2	161.3
116.1	167.4	116.6	114.4	121.6	173.9	123.2	284.6	166.8	119.2	172.1	114.7	167.7	124.9	170.9	116.8	168.8	107.3	168.0	113.0	121.3	169.1	167.8	121.8	114.8	174.0	174.4	119.4	112.8	171.5	121.4	168.7	174.6
124.9	181.7	125.6	123.6	129.7	187.6	131.1	302.6	181.4	128.0	185.8	124.0	181.2	132.8	185.1	125.6	183.3	117.7	182.4	122.5	129.1	182.4	183.0	125.4	124.0	188.5	187.8	127.9	122.5	185.1	129.3	183.2	187.9
133.7	195.9	134.6	132.8	137.7	201.2	139.0	320.6	196.0	136.9	199.6	133.3	194.8	140.6	199.2	134.4	197.8	128.0	196.8	131.9	136.9	195.8	198.2	129.0	133.1	203.1	201.1	136.4	132.1	198.7	137.2	197.8	201.3
142.5	210.2	143.6	142.0	145.7	214.9	146.9	338.6	210.6	145.7	213.3	142.6	208.3	148.5	213.4	143.2	212.3	138.4	211.2	141.3	144.7	209.1	213.4	132.7	142.2	217.7	214.4	144.9	141.7	212.3	145.1	212.3	214.6
151.2	224.5	152.6	151.2	153.7	228.5	154.7	356.6	225.2	154.6	227.0	151.9	221.9	156.3	227.5	152.0	226.8	148.8	225.6	150.8	152.5	222.4	228.6	136.3	151.4	232.2	227.8	153.5	151.3	225.9	153.1	226.8	227.9
160.0	238.7	161.6	160.4	161.7	242.2	162.6	374.6	239.8	163.5	240.7	161.3	235.5	164.2	241.7	160.9	241.4	159.2	240.0	160.2	160.3	235.8	243.8	139.9	160.5	246.8	241.1	162.0	161.0	239.5	161.0	241.3	241.2
168.8	253.0	168.6	169.6	169.7	254.0	168.7	386.0	254.4	162.4	254.5	168.6	249.0	162.9	253.5	169.7	253.2	169.6	254.4	169.6	168.1	249.1	246.0	143.5	169.6	253.7	254.5	168.7	168.9	253.1	168.9	253.5	254.5
157.1	234.3	138.1	142.6	147.9	230.6	140.8	342.1	226.7	131.6	228.4	137.8	232.0	134.0	220.3	143.3	214.1	144.4	226.3	150.4	144.6	239.5	209.5	147.1	145.8	216.8	222.7	141.6	144.2	238.7	147.0	220.7	228.2
133.7	202.7	107.6	111.3	122.2	207.1	112.9	298.1	194.6	100.7	198.2	107.0	189.8	105.1	187.0	112.8	175.1	116.8	193.9	127.4	110.6	211.1	173.0	150.7	117.8	179.9	186.4	114.4	119.5	212.2	119.9	187.8	197.8
110.4	171.2	77.2	80.0	96.4	183.7	85.1	254.2	162.5	69.9	168.0	76.2	157.0	76.2	153.8	82.2	136.0	94.1	161.5	104.4	76.6	182.7	136.4	154.4	89.8	143.0	150.0	87.3	94.8	185.7	92.7	154.9	167.3
112.8	164.9	81.4	93.8	86.6	187.3	88.4	299.3	137.6	91.5	174.8	89.1	162.3	85.2	163.5	99.5	96.9	98.7	136.4	104.5	81.3	179.7	132.3	158.0	78.3	168.1	128.9	84.5	91.3	169.2	88.6	152.3	149.3
127.4	169.9	102.0	107.7	106.4	190.9	106.7	376.5	141.9	113.2	181.5	102.1	167.7	104.7	173.3	116.7	95.6	103.4	141.3	110.7	104.5	188.3	136.6	161.6	92.8	193.3	146.3	104.0	97.5	177.4	105.9	163.5	162.6
142.0	174.9	122.6	121.5	126.3	194.5	125.0	336.0	146.2	134.8	188.3	115.1	173.0	124.3	183.0	134.0	112.2	108.0	146.3	116.9	127.7	196.9	140.9	165.2	107.3	218.4	163.7	123.6	103.7	185.6	123.2	174.7	175.9
156.6	179.8	143.3	135.3	146.1	198.1	143.3	295.5	150.5	156.5	195.1	128.1	178.3	143.8	192.8	151.2	128.9	112.7	151.2	123.2	151.0	205.6	145.1	168.8	121.8	243.5	181.1	143.1	109.9	193.8	140.4	185.9	189.2
144.3	158.8	142.6	129.3	147.8	187.2	133.4	255.0	135.8	155.1	175.2	122.1	166.6	143.9	183.1	148.2	119.3	106.9	148.2	109.0	142.4	198.2	137.4	153.3	119.2	236.8	168.6	140.2	97.4	175.6	129.7	175.2	172.6
115.0	120.4	113.3	96.3	118.9	145.9	106.0	210.7	108.4	122.9	137.8	90.1	130.9	112.3	146.5	117.6	93.4	86.5	118.6	81.5	104.4	157.8	104.5	127.5	93.3	186.9	128.2	106.9	72.6	140.2	101.5	134.2	136.9
85.7	82.0	84.0	63.3	90.0	104.6	78.6	166.4	81.0	90.6	100.4	58.2	95.2	80.7	109.8	87.0	67.6	66.2	89.1	54.1	66.5	117.3	71.7	101.7	67.4	137.0	87.7	73.5	47.7	104.8	73.3	93.2	101.3
56.3	69.6	54.8	51.2	68.3	79.6	58.0	157.8	66.0	58.4	78.1	50.7	74.1	72.5	73.2	56.4	57.8	45.8	67.9	48.5	56.3	76.9	62.5	96.5	51.9	87.0	82.8	60.9	46.8	78.4	56.0	68.5	83.5
65.0	75.6	63.7	57.2	74.3	85.6	64.0	175.8	72.0	67.2	84.1	56.7	80.1	78.5	87.3	65.1	63.8	45.7	73.9	54.5	62.3	90.1	68.5	98.9	57.9	88.4	88.8	66.9	52.8	84.4	62.0	74.5	89.5
71.0	81.6	69.7	63.2	80.3	91.6	70.0	193.8	78.0	73.2	90.1	62.7	86.1	84.5	93.3	71.1	69.8	48.1	79.9	60.5	68.3	96.1	74.5	101.3	63.9	94.4	94.8	72.9	58.8	90.4	68.0	80.5	95.5
77.0	87.6	75.7	69.2	86.3	97.6	76.0	211.8	84.0	79.2	96.1	68.7	92.1	90.5	99.3	77.1	75.8	50.5	85.9	66.5	74.3	102.1	80.5	103.7	69.9	100.4	100.8	78.9	64.8	96.4	74.0	86.5	101.5
83.0	93.6	81.7	75.2	92.3	103.6	82.0	229.8	90.0	85.2	102.1	74.7	98.1	96.5	105.3	83.1	81.8	52.9	91.9	72.5	80.3	108.1	86.5	106.1	75.9	106.4	106.8	84.9	70.8	102.4	80.0	92.5	107.5
89.0	99.6	87.7	81.2	98.3	109.6	88.0	247.8	96.0	91.2	108.1	80.7	104.1	102.5	111.3	89.1	87.8	55.3	97.9	78.5	86.3	114.1	92.5	108.5	81.9	112.4	112.8	90.9	76.8	108.4	86.0	98.5	113.5
95.0	105.6	93.7	87.2	104.3	115.6	94.0	265.8	102.0	97.2	114.1	86.7	110.1	108.5	117.3	95.1	93.8	57.7	103.9	84.5	92.3	120.1	98.5	110.9	87.9	118.4	118.8	96.9	82.8	114.4	92.0	104.5	119.5
101.0	111.6	99.7	93.2	110.3	121.6	100.0	283.8	108.0	103.2	120.1	92.7	116.1	114.5	123.3	101.1	99.8	60.1	109.9	90.5	98.3	126.1	104.5	113.3	93.9	124.4	124.8	102.9	88.8	120.4	98.0	110.5	125.5

495	496	497	498	499	500	501	502	503	504	505	410 - Contracted	414 - Contracted	418 - Contracted	421 - Contracted	422 - Contracted	424 - Contracted	426- Contracted	427- Contracted	428- Contracted	429- Contracted	430- Contracted	431- Contracted	432- Contracted	435- Contracted	438- Contracted	Total (All Buses)	Average Battery Charge
255.2	255.2	255.2	255.2	255.2	255.2	283.5	170.1	170.1	291.6	170.1	255.2	255.2	255.2	255.2	255.2	255.2	255.2	255.2	255.2	255.2	255.2	255.2	255.2	255.2	255.2	19768.05	241.1

495	496	497	498	499	500	501	502	503	504	505	410 - Contracted	414 - Contracted	418 - Contracted	421 - Contracted	422 - Contracted	424 - Contracted	426- Contracted	427- Contracted	428- Contracted	429- Contracted	430- Contracted	431- Contracted	432- Contracted	435- Contracted	438- Contracted	Total (All Buses)	Average Battery Charge
136.8	139.9	138.2	144.6	138.5	143.3	162.8	94.2	96.2	167.2	94.9	143.2	143.2	143.2	143.2	143.2	143.2	143.2	143.2	143.2	143.2	143.2	143.2	143.2	143.2	143.2	11130.43	135.7
151.3	154.8	153.3	158.7	153.0	157.2	177.8	103.9	105.2	182.5	104.3	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	12212.43	148.9
165.8	169.7	168.4	172.8	167.5	171.1	192.8	113.6	114.3	197.7	113.6	171.7	171.7	171.7	171.7	171.7	171.7	171.7	171.7	171.7	171.7	171.7	171.7	171.7	171.7	171.7	13294.43	162.1
180.3	184.5	183.5	186.8	182.0	185.0	207.8	123.2	123.4	213.0	123.0	186.0	186.0	186.0	186.0	186.0	186.0	186.0	186.0	186.0	186.0	186.0	186.0	186.0	186.0	186.0	14376.44	175.3
194.9	199.4	198.6	200.9	196.5	198.9	222.8	132.9	132.5	228.3	132.3	200.2	200.2	200.2	200.2	200.2	200.2	200.2	200.2	200.2	200.2	200.2	200.2	200.2	200.2	200.2	15458.44	188.5
209.4	214.3	213.7	215.0	211.0	212.8	237.8	142.6	141.5	243.5	141.6	214.5	214.5	214.5	214.5	214.5	214.5	214.5	214.5	214.5	214.5	214.5	214.5	214.5	214.5	214.5	16540.44	201.7
223.9	229.1	228.7	229.1	225.5	226.7	252.8	152.2	150.6	258.8	151.0	228.8	228.8	228.8	228.8	228.8	228.8	228.8	228.8	228.8	228.8	228.8	228.8	228.8	228.8	228.8	17622.45	214.9
238.4	244.0	243.8	243.2	239.9	240.6	267.8	161.9	159.7	274.0	160.3	243.0	243.0	243.0	243.0	243.0	243.0	243.0	243.0	243.0	243.0	243.0	243.0	243.0	243.0	243.0	18704.45	228.1
253.0	244.8	245.2	248.7	254.4	254.5	282.8	165.2	168.7	289.3	169.6	247.1	247.1	247.1	247.1	247.1	247.1	247.1	247.1	247.1	247.1	247.1	247.1	247.1	247.1	247.1	19388.03	236.4
230.8	203.4	205.6	206.0	223.9	223.7	247.9	132.8	155.5	264.7	144.2	193.8	193.8	193.8	193.8	193.8	193.8	193.8	193.8	193.8	193.8	193.8	193.8	193.8	193.8	193.8	16421.63	200.3
195.1	161.9	165.9	163.3	188.9	188.5	205.6	100.5	130.4	226.1	114.7	140.5	140.5	140.5	140.5	140.5	140.5	140.5	140.5	140.5	140.5	140.5	140.5	140.5	140.5	140.5	13145.23	160.3
162.4	120.5	126.3	120.6	153.9	153.3	163.2	68.1	105.3	187.6	85.1	121.2	121.2	121.2	121.2	121.2	121.2	121.2	121.2	121.2	121.2	121.2	121.2	121.2	121.2	121.2	10497.80	128.0
174.4	129.9	107.9	121.2	153.5	167.8	124.3	71.5	92.2	217.6	70.4	137.6	137.6	137.6	137.6	137.6	137.6	137.6	137.6	137.6	137.6	137.6	137.6	137.6	137.6	137.6	10578.28	129.0
186.3	140.2	119.3	140.5	167.9	182.3	85.3	83.9	104.5	247.6	87.5	154.1	154.1	154.1	154.1	154.1	154.1	154.1	154.1	154.1	154.1	154.1	154.1	154.1	154.1	154.1	11958.61	145.8
198.3	150.5	130.8	159.7	182.4	196.8	123.3	96.2	116.9	277.6	104.6	170.5	170.5	170.5	170.5	170.5	170.5	170.5	170.5	170.5	170.5	170.5	170.5	170.5	170.5	170.5	13463.62	164.2
210.2	160.7	142.2	179.0	196.8	211.3	161.3	108.6	129.2	270.0	121.7	186.9	186.9	186.9	186.9	186.9	186.9	186.9	186.9	186.9	186.9	186.9	186.9	186.9	186.9	186.9	14848.81	181.1
200.2	149.3	135.9	173.7	176.6	196.4	176.5	103.1	123.7	229.3	119.7	182.8	182.8	182.8	182.8	182.8	182.8	182.8	182.8	182.8	182.8	182.8	182.8	182.8	182.8	182.8	14101.66	172.0
163.3	111.4	107.9	136.4	137.7	145.5	141.6	75.7	96.4	188.6	94.2	140.3	140.3	140.3	140.3	140.3	140.3	140.3	140.3	140.3	140.3	140.3	140.3	140.3	140.3	140.3	11061.02	134.9
126.4	73.4	79.8	99.2	98.8	94.7	106.8	48.3	69.0	147.9	68.7	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	8020.37	97.8
89.5	66.9	64.4	77.1	69.2	75.9	91.5	46.6	52.4	107.1	50.0	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	6148.04	75.0
82.9	81.6	79.4	90.9	83.4	89.7	106.2	56.2	61.4	110.7	59.2	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	7028.05	85.7
97.1	96.4	94.3	104.8	97.7	103.4	120.9	65.8	70.3	125.6	68.4	102.9	102.9	102.9	102.9	102.9	102.9	102.9	102.9	102.9	102.9	102.9	102.9	102.9	102.9	102.9	8091.29	98.7
111.3	111.2	109.3	118.6	111.9	117.1	135.7	75.4	79.3	140.5	77.6	116.9	116.9	116.9	116.9	116.9	116.9	116.9	116.9	116.9	116.9	116.9	116.9	116.9	116.9	116.9	9154.53	111.6
125.5	125.9	124.3	132.5	126.2	130.9	150.4	85.0	88.2	155.4	86.8	130.9	130.9	130.9	130.9	130.9	130.9	130.9	130.9	130.9	130.9	130.9	130.9	130.9	130.9	130.9	10217.77	124.6
139.6	140.7	139.2	146.4	140.4	144.6	165.1	94.7	97.2	170.3	96.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	11281.01	137.6
153.8	155.5	154.2	160.2	154.7	158.3	179.8	104.3	106.1	185.2	105.2	159.0	159.0	159.0	159.0	159.0	159.0	159.0	159.0	159.0	159.0	159.0	159.0	159.0	159.0	159.0	12344.25	150.5
168.0	170.2	169.1	174.1	168.9	172.1	194.5	113.9	115.1	200.0	114.4	173.0	173.0	173.0	173.0	173.0	173.0	173.0	173.0	173.0	173.0	173.0	173.0	173.0	173.0	173.0	13407.49	163.5
182.2	185.0	184.1	187.9	183.2	185.8	209.2	123.5	124.0	214.9	123.6	187.1	187.1	187.1	187.1	187.1	187.1	187.1	187.1	187.1	187.1	187.1	187.1	187.1	187.1	187.1	14470.73	176.5
196.3	199.8	199.1	201.8	197.4	199.5	223.9	133.1	133.0	229.8	132.8	201.1	201.1	201.1	201.1	201.1	201.1	201.1	201.1	201.1	201.1	201.1	201.1	201.1	201.1	201.1	15533.97	189.4
210.5	214.5	214.0	215.7	211.7	213.3	238.6	142.7	141.9	244.7	142.0	215.2	215.2	215.2	215.2	215.2	215.2	215.2	215.2	215.2	215.2	215.2	215.2	215.2	215.2	215.2	16597.21	202.4
224.7	229.3	229.0	229.5	225.9	227.0	253.3	152.3	150.9	259.6	151.2	229.2	229.2	229.2	229.2	229.2	229.2	229.2	229.2	229.2	229.2	229.2	229.2	229.2	229.2	229.2	17660.45	215.4
238.8	244.1	243.9	243.4	240.2	240.7	268.1	161.9	159.8	274.5	160.4	243.2	243.2	243.2	243.2	243.2	243.2	243.2	243.2	243.2	243.2	243.2	243.2	243.2	243.2	243.2	18723.69	228.3
253.0	244.8	245.2	248.7	254.4	254.5	282.8	165.2	168.8	289.4	169.6	247.1	247.1	247.1	247.1	247.1	247.1	247.1	247.1	247.1	247.1	247.1	247.1	247.1	247.1	247.1	19392.88	236.5
230.8	203.4	205.6	206.0	223.9	223.7	247.9	132.8	155.5	264.7	144.3	193.8	193.8	193.8	193.8	193.8	193.8	193.8	193.8	193.8	193.8	193.8	193.8	193.8	193.8	193.8	16426.17	200.3
192.3	158.6	162.7	159.9	186.1	185.7	202.2	97.9	128.4	223.1	112.3	136.2	136.2	136.2	136.2	136.2	136.2	136.2	136.2	136.2	136.2	136.2	136.2	136.2	136.2	136.2	12887.62	157.2
159.6	117.2	123.1	117.2	151.1	150.5	159.9	65.5	103.3	184.5	82.8	117.3	117.3	117.3	117.3	117.3	117.3	117.3	117.3	117.3	117.3	117.3	117.3	117.3	117.3	117.3	10247.08	125.0
172.2	127.3	102.2	117.5	150.5	165.6	117.5	68.9	89.0	215.4	66.6	134.6	134.6	134.6	134.6	134.6	134.6	134.6	134.6	134.6	134.6	134.6	134.6	134.6	134.6	134.6	10310.99	125.7
184.8	138.3	115.2	137.9	165.8	180.7	78.6	82.0	102.3	246.3	84.8	151.9	151.9	151.9	151.9	151.9	151.9	151.9	151.9	151.9	151.9	151.9	151.9	151.9	151.9	151.9	11759.04	143.4
197.3	149.3	128.3	158.2	181.1	195.8	119.4	95.1	115.5	277.2	103.0	169.1	169.1	169.1	169.1	169.1	169.1	169.1	169.1	169.1	169.1	169.1	169.1	169.1	169.1	169.1	13342.34	162.7
209.9	160.3	141.3	178.6	196.5	210.9	160.3	108.2	128.7	269.7	121.2	186.4	186.4	186.4	186.4	186.4	186.4	186.4	186.4	186.4	186.4	186.4	186.4	186.4	186.4	186.4	14807.17	180.6
200.2	149.3	135.9	173.3	176.6	196.4	175.4	103.1	123.7	229.0	119.7	182.8	182.8	182.8	182.8	182.8	182.8	182.8	182.8	182.8	182.8	182.8	182.8	182.8	182.8	182.8	14087.98	171.8
163.3	111.4	107.9	136.0	137.7	145.5	140.6	75.7	96.4	188.3	94.2	140.3	140.3	140.3	140.3	140.3	140.3	140.3	140.3	140.3	140.3	140.3	140.3	140.3	140.3	140.3	11047.33	134.7
126.4	73.4	79.8	98.8	98.8	94.7	105.8	48.3	69.0	147.5	68.7	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	8006.69	97.6
89.5	66.9	64.4	76.7	69.2	75.9	90.5	46.6	52.4	106.8	50.0	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	74.8	6134.53	74.8
82.9	81.6	79.4	90.6	83.4	89.7	105.3	56.2	61.4	110.4	59.2	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	7015.54	85.6
97.1	96.4	94.3	104.5	97.7	103.4	120.1	65.8	70.3	125.3	68.4	102.9	102.9	102.9	102.9	102.9	102.9	102.9	102.9	102.9	102.9	102.9	102.9	102.9	102.9	102.9	8079.83	98.5
111.3	111.2	109.3	118.3	111.9	117.1	134.9	75.4	79.3	140.2	77.6	116.9	116.9	116.9	116.9	116.9	116.9	116.9	116.9	116.9	116.9	116.9	116.9	116.9	116.9	116.9	9144.11	111.5
125.5	125.9	124.3	132.2	126.2	130.9	149.7	85.0	88.2	155.2	86.8	130.9	130.9	130.9	130.9	130.9	130.9	130.9	130.9	130.9	130.9	130.9	130.9	130.9	130.9	130.9	10208.39	124.5
139.6	140.7	139.2	146.1	140.4	144.6	164.5	94.7	97.2	170.1	96.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	11272.68	137.5
153.8	155.5	154.2	160.0	154.7	158.3	179.3	104.3	106.1	185.0	105.2	159.0	159.0	159.0	159.0	159.0	159.0	159.0	159.0	159.0	159.0	159.0	159.0	159.0	159.0	159.0	12336.96	150.5
168.0	170.2	169.1	173.9	168.9	172.1	194.0	113.9	115.1	199.9	114.4	173.0	173.0	173.0	173.0	173.0	173.0	173.0	173.0	173.0	173.0	173.0	173.0	173.0	173.0	173.0	13401.24	163.4
182.2	185.0	184.1	187.8	183.2	185.8	208.8	123.5	124.0	214.8	123.6	187.1	187.1	187.1	187.1	187.1	187.1	187.1	187.1	187.1	187.1	187.1	187.1	187.1	187.1	187.1	14465.53	176.4
196.3	199.8	199.1	201.7	197.4	199.5	223.6	133.1	133.0	229.7	132.8	201.1	201.1	201.1	201.1	201.1	201.1	201.1	201.1	201.1	201.1	201.1	201.1	201.1	201.1	201.1		
210.5	214.5	214.0	215.6	211.7	213.3	238.4	142.7	141.9	244.6	142.0	215.2	215.2	215.2	215.2	215.2	215.2	215.2	215.2	215.2	215.2	215.2	215.2	215.2	215.2	215.2		
224.7	229.3	229.0	229.5	225.9	227.0	253.2	152.3	150.9	259.5	151.2	229.2	229.2	229.2	229.2	229.2	229.2	229.2	229.2	229.2	229.2	229.2	229.2	229.2	229.2	229.2		
238.8	244.1	243.9	243.3	240.2	240.7	268.0	161.9	159.8	274.5	160.4	243.2	243.2	243.2	243.2	243.2	243.2	243.2	243.2	243.2	243.2	243.2	243.2	243.2	243.2	243.2		
253.0	245.6	246.0	249.3	254.4	254.5	282.8	165.6	168.8	289.4	169.6	247.8	247.8	247.8	247.8	247.8	247.8	247.8	247.8	247.8	247.8	247.8	247.8	247.8	247.8	247.8		
233.2	207.5	209.5	210.0	226.5	226.4	251.2	135.8	157.2	267.3	146.5	198.7	198.7	198.7	198.7	198.7	198.7	198.7	198.7	198.7	198.7	198.7	198.7	198.7	198.7	198.7		
200.4	169.4	173.0	170.7	194.3	194.0	212.2	106.0	134.1	231.9	119.3	149.6	149.6	149.6	149.6	149.6	149.6	149.6	149.6	149.6	149.6	149.6	149.6	149.6	149.6	149.6		
170.5	131.2	136.6	131.4	162.1	161.6	173.2	76.2	111.0	196.4	92.1	131.5	131.5	131.5	131.5	131.5	131.5	131.5	131.5	131.5	131.5	131.5	131.5	131.5	131.5	131.5		
180.7	138.3	109.2	130.2	160.4	174.3	134.3	78.2	97.6	223.8	76.9	145.7	145.7	145.7	145.7	145.7	145.7	145.7	145.7	145.7	145.7	145.7	145.7	145.7	145.7	145.7		
190.9	146.2	120.3	146.8	172.8	186.9	95.3	88.7	108.4	251.1	92.2	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9	159.9		
201.0	154.1	131.3	163.4	185.2	199.6	129.1	99.2	119.2	278.5	107.5	174.1	174.1	174.1	174.1	174.1	174.1	174.1	174.1	174.1	174.1	174.1	174.1	174.1	174.1	174.1		
211.2	162.0	142.4	179.9	197.5	212.3	162.8	109.6	130.0	273.2	122.8	188.4	188.4	188.4	188.4	188.4	188.4	188.4	188.4	188.4	188.4	188.4	188.4	188.4	188.4	188.4		
201.6	150.8	137.0	163.6	178.8	198.4	153.9	104.1	124.7	236.0	120.7	184.0	184.0	184.0	184.0	184.0	184.0	184.0	184.0	184.0	184.0	184.0	184.0	184.0	184.0	184.0		
164.7	112.9	109.0	126.4	139.9	147.5	119.1	76.7	97.4	195.3	95.2	141.6	141.6	141.6	141.6	141.6	141.6	141.6	141.6	141.6	141.6	141.6	141.6	141.6	141.6	141.6		
127.8	74.9	80.9	89.1	101.0	96.7	84.2	49.3	70.1	154.6	69.7	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2		
90.9	68.3	65.5	67.2	71.4	77.8	69.6	47.6	53.5	113.9	51.0	76.1	76.1	76.1	76.1	76.1	76.1	76.1	76.1	76.1	76.1	76.1	76.1	76.1	76.1	76.1		
84.3	74.3	71.5	73.2	77.4	83.8	81.6	53.6	59.5	117.1	57.0	82.1	82.1	82.1	82.1	82.1	82.1	82.1	82.1	82.1	82.1	82.1	82.1	82.1	82.1	82.1		
90.3	80.3	77.5	79.2	83.4	89.8	93.6	59.6	65.5	123.1	63.0	88.1	88.1	88.1	88.1	88.1	88.1	88.1	88.1	88.1	88.1	88.1	88.1	88.1	88.1	88.1		
96.3	86.3	83.5	85.2	89.4	95.8	105.6	65.6	71.5	129.1	69.0	94.1	94.1	94.1	94.1	94.1	94.1	94.1	94.1	94.1	94.1	94.1	94.1	94.1	94.1	94.1		
102.3	92.3	89.5	91.2	95.4	101.8	117.6	71.6	77.5	135.1	75.0	100.1	100.1	100.1	100.1	100.1	100.1	100.1	100.1	100.1	100.1	100.1	100.1	100.1	100.1	100.1		
108.3	98.3	95.5	97.2	101.4	107.8	129.6	77.6	83.5	141.1	81.0	106.1	106.1	106.1	106.1	106.1	106.1	106.1	106.1	106.1	106.1	106.1	106.1	106.1	106.1	106.1		
114.3	104.3	101.5	103.2	107.4	113.8	141.6	83.6	89.5	147.1	87.0	112.1	112.1	112.1	112.1	112.1	112.1	112.1	112.1	112.1	112.1	112.1	112.1	112.1	112.1	112.1		
120.3	110.3	107.5	109.2	113.4	119.8	153.6	89.6	95.5	153.1	93.0	118.1	118.1	118.1	118.1	118.1	118.1	118.1	118.1	118.1	118.1	118.1	118.1	118.1	118.1	118.1		

wendel

Project Name: Lancaster BEB Study
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Description Charge Delivered From the Utility Grid (kW) with Demand Reduction

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11.16	29.88	15.93	17.69	4.40	20.64	32.19	21.35	26.19	11.30	16.16	22.95	17.22	19.50	16.96	17.33	17.41	23.76	17.93	17.58	48.95	15.34	16.21	35.54	21.03	20.27	20.27	20.27	20.27	20.27	20.27	20.27	20.27	20.27	20.27	20.27	20.27	20.27	20.27	20.27	20.27	Max	Max	Max	Max	Max	23%
1.24	1.89	3.87	3.10	1.08	2.17	6.72	3.02	3.62	1.02	1.01	1.19	3.86	2.20	2.02	1.92	0.76	3.97	3.02	3.02	5.99	3.98	1.24	6.72	1.61	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95	4.95	Min	Min	Min	Min	Min	35%
																																								1957.56	82	82	24.5	136.1	
481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	410 - Contracted	414 - Contracted	418 - Contracted	421 - Contracted	422 - Contracted	424 - Contracted	426- Contracted	427- Contracted	428- Contracted	429- Contracted	430- Contracted	431- Contracted	432- Contracted	435- Contracted	438- Contracted	Cumulative Charger Impact	# of Buses in Station	# of Buses Charging	Average Charge	Max Charge	Load Factor Determination
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	82.0	0.0	0.0	0.0	0.0

11.16 1.24	29.88 1.89	15.93 3.87	17.69 3.10	4.40 1.08	20.64 2.17	32.19 6.72	21.35 3.02	26.19 3.62	11.30 1.02	16.16 1.01	22.95 1.19	17.22 3.86	19.50 2.20	16.96 2.02	17.33 1.92	17.41 0.76	23.76 3.97	17.93 3.02	17.58 3.02	48.95 5.99	15.34 3.98	16.21 1.24	35.54 6.72	21.03 1.61	20.27 4.95	20.27 4.95	20.27 4.95	20.27 4.95	20.27 4.95	20.27 4.95	20.27 4.95	20.27 4.95	20.27 4.95	20.27 4.95	20.27 4.95	20.27 4.95	20.27 4.95	Max Min 1957.56 0.00	Max Min 82 0	Max Min 82 0	Max Min 24.5 0.0	Max Min 136.1 0.0	23% 35%
481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	410 - Contracted	414 - Contracted	418 - Contracted	421 - Contracted	422 - Contracted	424 - Contracted	426- Contracted	427- Contracted	428- Contracted	429- Contracted	430- Contracted	431- Contracted	432- Contracted	435- Contracted	438- Contracted	Cumulative Charger Impact	# of Buses In Station	# of Buses Charging	Average Charge	Max Charge	Load Factor Determination
10.6	8.7	14.9	17.0	4.1	10.2	16.3	14.9	9.6	10.8	15.2	8.8	16.3	14.9	15.9	16.5	16.8	15.5	16.0	15.4	16.5	10.8	10.0	16.7	10.3	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	1190.8	82.0	82.0	14.5	28.1	0.2
10.6	8.7	14.9	17.0	4.1	10.2	16.3	14.9	9.6	10.8	15.2	8.8	16.3	14.9	15.9	16.5	16.8	15.5	16.0	15.4	16.5	10.8	10.0	16.7	10.3	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	1190.8	82.0	82.0	14.5	28.1	0.2
10.6	8.7	14.9	17.0	4.1	10.2	16.3	14.9	9.6	10.8	15.2	8.8	16.3	14.9	15.9	16.5	16.8	15.5	16.0	15.4	16.5	10.8	10.0	16.7	10.3	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	1190.8	82.0	82.0	14.5	28.1	0.2
10.6	8.7	14.9	17.0	4.1	10.2	16.3	14.9	9.6	10.8	15.2	8.8	16.3	14.9	15.9	16.5	16.8	15.5	16.0	15.4	16.5	10.8	10.0	16.7	10.3	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	1190.8	82.0	82.0	14.5	28.1	0.2
3.0	2.2	6.7	0.0	4.1	3.0	0.0	0.0	0.0	0.0	9.1	1.3	0.0	3.0	9.1	0.0	0.0	0.0	3.0	3.0	6.0	0.0	9.1	9.1	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	190.8	36.0	36.0	5.3	18.1	0.0
0.0	0.0	0.0	0.0	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.1	1.0	1.0	4.1	4.1	0.0
0.0	0.0	0.0	0.0	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	178.1	21.0	21.0	8.5	27.5	0.0
7.0	18.9	7.8	6.3	4.1	12.1	31.4	18.1	18.1	6.1	3.1	17.1	10.2	4.6	14.1	12.1	12.1	14.7	11.0	16.9	0.0	11.1	3.7	34.6	5.1	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	1305.7	75.0	74.0	17.6	72.8	0.2
9.2	29.3	12.1	8.4	4.1	19.9	31.4	20.4	25.4	9.6	12.4	23.0	15.9	18.7	14.1	12.3	14.6	22.8	17.2	16.9	0.0	14.7	14.8	34.6	20.4	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	1851.2	80.0	79.0	23.4	136.1	0.3
9.2	29.3	12.1	8.4	4.1	19.9	31.4	20.4	25.4	9.6	12.4	23.0	15.9	18.7	14.1	12.3	14.6	22.8	17.2	16.9	45.8	14.7	14.8	34.6	20.4	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	1886.2	81.0	80.0	23.6	65.4	0.3
9.2	29.3	12.1	8.4	4.1	19.9	31.4	20.4	25.4	9.6	12.4	23.0	15.9	18.7	14.1	12.3	14.6	22.8	17.2	16.9	45.8	14.7	14.8	21.2	20.4	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	1843.0	80.0	80.0	23.0	71.7	0.3
3.2	27.2	7.9	5.4	1.4	11.0	17.3	9.2	14.0	3.3	4.4	21.2	8.7	6.5	7.7	6.8	8.0	21.2	6.0	9.3	42.3	8.1	8.1	0.0	11.2	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	1017.1	76.0	76.0	13.4	54.4	0.2
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.1	5.1	0.0	8.2	2.8	2.9	0.0	9.7	4.6	7.4	6.0	2.5	4.6	12.1	0.0	9.6	4.8	4.4	6.0	7.4	6.3	7.4	2.9	0.0	1.9	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	487.6	65.0	65.0	7.5	20.2	0.1
10.6	8.8	14.9	17.0	4.1	10.2	12.8	14.9	9.6	10.8	15.2	8.9	16.3	14.9	9.2	16.5	16.8	15.6	16.0	15.4	16.6	10.8	10.0	13.1	10.3	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	1134.5	82.0	82.0	13.8	22.1	0.2
10.6	8.8	14.9	17.0	4.1	10.2	16.3	14.9	9.6	10.8	15.2	8.9	16.3	14.9	15.9	16.5	16.8	15.6	16.0	15.4	16.6	10.8	10.0	16.7	10.3	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	1192.0	82.0	82.0	14.5	28.1	0.2
10.6	8.8	14.9	17.0	4.1	10.2	16.3	14.9	9.6	10.8	15.2	8.9	16.3	14.9	15.9	16.5	16.8	15.6	16.0	15.4	16.6	10.8	10.0	16.7	10.3	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	1192.0	82.0	82.0	14.5	28.1	0.2
10.6	8.8	14.9	17.0	4.1	10.2	16.3	14.9	9.6	10.8	15.2	8.9	16.3	14.9	15.9	16.5	16.8	15.6	16.0	15.4	16.6	10.8	10.0	16.7	10.3	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	1192.0	82.0	82.0	14.5	28.1	0.2
10.6	8.8	14.9	17.0	4.1	10.2	16.3	14.9	9.6	10.8	15.2	8.9	16.3	14.9	15.9	16.5	16.8	15.6	16.0	15.4	16.6	10.8	10.0	16.7	10.3	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	1192.0	82.0	82.0	14.5	28.1	0.2
10.6	8.8	14.9	17.0	4.1	10.2	16.3	14.9	9.6	10.8	15.2	8.9	16.3	14.9	15.9	16.5	16.8	15.6	16.0	15.4	16.6	10.8	10.0	16.7	10.3	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	1192.0	82.0	82.0	14.5	28.1	0.2
10.6	8.8	14.9	17.0	4.1	10.2	16.3	14.9	9.6	10.8	15.2	8.9	16.3	14.9	15.9	16.5	16.8	15.6	16.0	15.4	16.6	10.8	10.0	16.7	10.3	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	1192.0	82.0	82.0	14.5	28.1	0.2
10.6	8.8	14.9	17.0	4.1	10.2	16.3	14.9	9.6	10.8	15.2	8.9	16.3	14.9	15.9	16.5	16.8	15.6	16.0	15.4	16.6	10.8	10.0	16.7	10.3	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	1192.0	82.0	82.0	14.5	28.1	0.2
10.6	8.8	14.9	17.0	4.1	10.2	16.3	14.9	9.6	10.8	15.2	8.9	16.3	14.9	15.9	16.5	16.8	15.6	16.0	15.4	16.6	10.8	10.0	16.7	10.3	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	1192.0	82.0	82.0	14.5	28.1	0.2
10.6	8.8	14.9	12.8	4.1	10.2	13.9	14.9	9.1	10.2	15.2	8.9	15.5	14.9	15.9	12.4	12.6	13.2	16.0	15.4	16.6	9.1	10.0	16.7	10.3	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	1089.7	82.0	82.0	13.3	22.1	0.2
4.1	3.0	6.7	0.0	4.1	3.0	0.0	0.0	0.0	0.0	9.1	1.3	0.0	3.0	9.1	0.0	0.0	0.0	3.0	3.0	6.0	0.0	9.1	9.1	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	190.8	36.0	36.0	5.3	18.1	0.0
0.0	0.0	0.0	0.0	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.1	1.0	1.0	4.1	4.1	0.0
0.0	0.0	0.0	0.0	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	149.8	21.0	21.0	7.1	24.5	0.0
5.3	16.7	6.2	3.6	4.1	12.1	28.1	4.9	18.1	4.5	2.3	17.1	8.1	3.7	11.4	8.7	2.0	11.9	8.9	14.2	0.0	8.9	3.0	30.6	4.3	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	1074.9	75.0	74.0	14.5	65.2	0.2
7.0	26.0	9.6	4.8	4.1	16.3	28.1	19.5	21.9	6.9	9.2	19.4	12.6	14.9	11.4	8.8	12.4	18.5	13.9	14.2	0.0	11.7	12.1	30.6	17.1	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	1559.4	80.0	79.0	19.7	97.8	0.3
7.0	26.0	9.6	4.8	4.1	16.3	28.1	19.5	21.9	6.9	9.2	19.4	12.6	14.9	11.4	8.8	12.4	18.5	13.9	14.2	37.8	11.7	12.1	30.6	17.1	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	1571.7	81.0	80.0	19.6	56.0	0.3
7.0	26.0	9.6	4.8	4.1	16.3	28.1	19.5	21.9	6.9	9.2	19.4	12.6	14.9	11.4	8.8	12.4	18.5	13.9	14.2	37.8	11.7	12.1	21.2	17.1	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	1578.9	80.0	80.0	19.7	81.2	0.3
2.4	11.7	6.3	3.1	1.4	8.9	15.5	8.8	12.0	2.4	3.2	6.8	6.9	5.2	6.3	4.9	6.8	6.5	4.8	7.8	13.2	6.5	6.7	0.0	9.4	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	793.2	76.0	76.0	10.4	54.4	0.1
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.1	5.6	0.0	8.1	2.8	2.9	0.0	9.6	4.5	7.3	6.0	2.8	4.6	12.1	0.0	9.6	4.7	4.7	6.0	7.3	7.0	7.3	2.8	0.0	1.9	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	495.0	65.0	65.0	7.6	20.2	0.1
6.7	6.7	14.8	6.7	2.7	6.7	12.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	9.1	6.7	6.7	6.7	6.7	6.7	13.4	6.7	6.7	12.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	692.1	82.0	82.0	8.4	22.0	0.1
6.7	6.7	6.7	6.7	2.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	13.4	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	623.6	82.0	82.0	7.6	20.2	0.1
6.7	6.7	6.7	6.7	2.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	13.4	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	623.6	82.0	82.0	7.6	20.2	0.1
6.7	6.7	6.7	6.7	2.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	13.4	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	623.6	82.0	82.0	7.6	20.2	0.1
6.7	6.7	6.7	6.7	2.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	13.4	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	623.6	82.0	82.0	7.6	20.2	0.1

Lancaster Anticipated Battery Electric Bus Procurement by Year

	Existing	2027	2028	2029	2030	2031	2032	2033	2034	2035	Total
BEB Bus Procurement Schedule	0	9	11	9	8	9	8	9	11	15	89
210 kWh BEB	0	0	0	1	0	5	4	4	5	3	22
Cumulative 210 kWh BEBs	0	0	0	1	1	6	10	14	19	22	
315 kWh BEB	0	9	6	5	4	4	3	5	5	9	50
Cumulative 315 kWh BEBs	0	9	15	20	24	28	31	36	41	50	
Placeholder	0	0	5	3	4	0	1	0	1	3	17
Cumulative Placeholder BEBs	0	0	5	8	12	12	13	13	14	17	
Total Battery Electric Bus Fleet Size	0	9	20	29	37	46	54	63	74	89	89

Current Fleet Size	89
New Proposed Buses	0
Proposed Fleet Size	89

*Placeholder BEB represent buses with no current possible BEB replacements based on today's technology. The development of larger battery capacities may be possible in the future.

Lancaster Anticipated EV Charger Procurement by Year

	Existing	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	Total
BEB Charger Procurement Schedule	0	0	0	0	0	9	11	7	8	9	8	9	11	15	87
24 kW EV Charger	0	0	0	0	0	0	0	0	2	1	0	1	1	0	5
Cumulative 24 kW Chargers	0	0	0	0	0	0	0	0	2	3	3	4	5	5	
60 kW EV Charger	0	0	0	0	0	9	6	6	2	8	7	8	10	13	69
Cumulative 60 kW Chargers	0	0	0	0	0	9	15	21	23	31	38	46	56	69	
120 kW EV Charger	0	0	0	0	0	0	5	1	4	0	0	0	0	2	12
Cumulative 120 kW Chargers	0	0	0	0	0	0	5	6	10	10	10	10	10	12	
180 kW EV Charger	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Cumulative 180 kW Chargers	0	0	0	0	0	0	0	0	0	0	1	1	1	1	
Total BEB Chargers	0	0	0	0	0	9	20	27	35	44	52	61	72	87	87

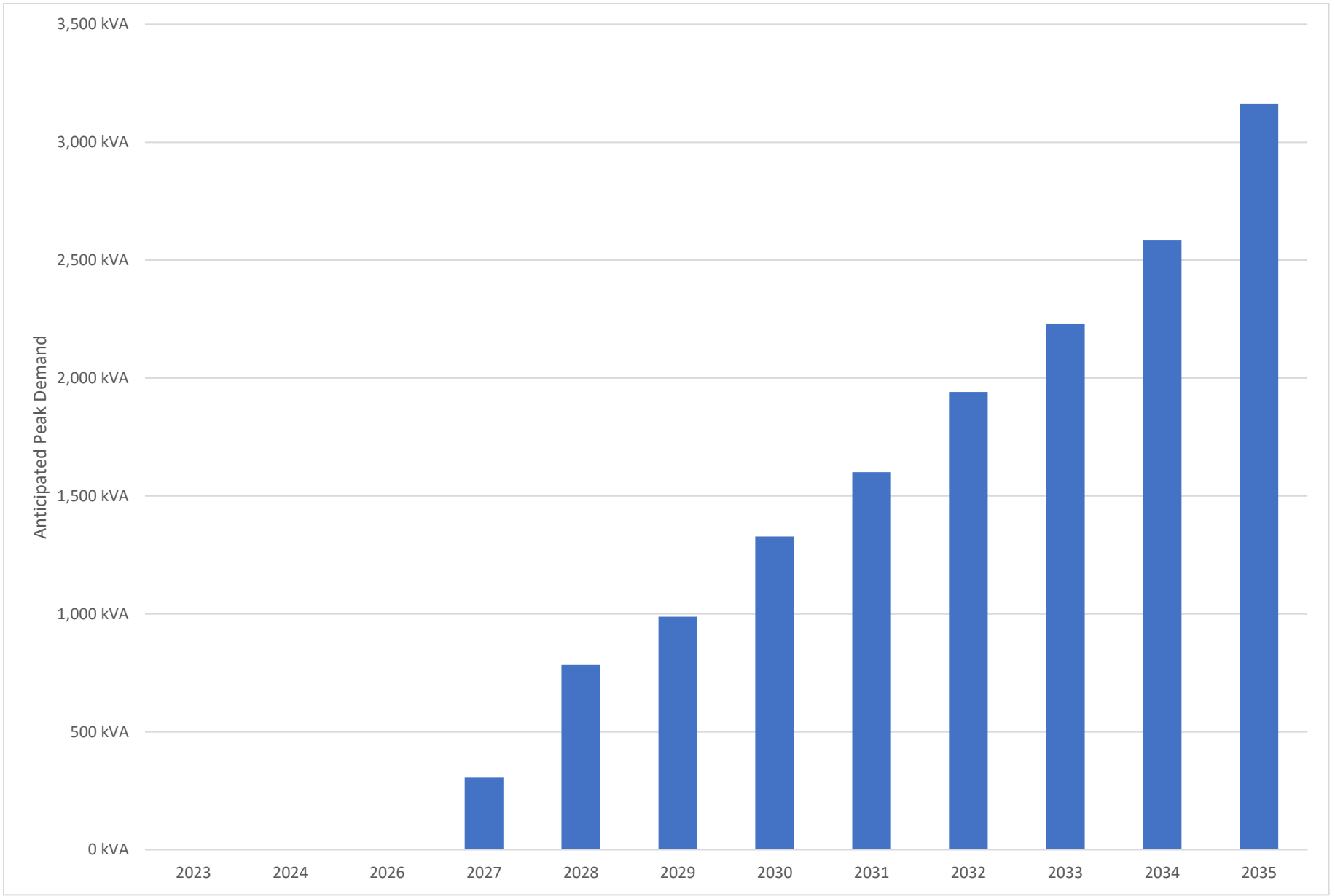
Current BEB Chargers	0
Proposed BEB Chargers	87

Note that 17 of the proposed chargers are associated with placeholder BEBs. Actual charger size required may vary based on BEB size procured.

Lancaster Anticipated Load Growth by Year

	Proposed	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BEB Bus Additions														
Projected BEB's added per year	89	0	0	0	0	9	11	9	8	9	8	9	11	15
Cumulative 210 kWh BEBs	22	0	0	0	0	0	0	1	1	6	10	14	19	22
Cumulative 315 kWh BEBs	50	0	0	0	0	9	15	20	24	28	31	36	41	50
Cumulative Placeholder BEBs	17	0	0	0	0	0	5	8	12	12	13	13	14	17
Cumulative 0 kWh BEBs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cumulative 0 kWh BEBs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cumualtive BEB's	89	0	0	0	0	9	20	29	37	46	54	63	74	89
24 kW EV Charger	5	0	0	0	0	0	0	0	2	1	0	1	1	0
Procured Route Bus Chargers		0	0	0	0	0	0	0	0	0	0	1	1	0
Procured Spare Bus Chargers		0	0	0	0	0	0	0	2	1	0	0	0	0
Cumulative Total Chargers		0	0	0	0	0	0	0	2	3	3	4	5	5
Cumulative Route Bus Chargers		0	0	0	0	0	0	0	0	0	0	1	2	2
Fully Connected Charger Load		0 kVA	0 kVA	0 kVA	0 kVA	0 kVA	0 kVA	0 kVA	53 kVA	80 kVA	80 kVA	106 kVA	133 kVA	133 kVA
Anticipated Overnight Charger Load		0 kVA	0 kVA	0 kVA	0 kVA	0 kVA	0 kVA	0 kVA	11 kVA	17 kVA	17 kVA	22 kVA	28 kVA	28 kVA
Anticipated Mid-day Charger Load	27 kVA	**0 kVA**	**0 kVA**	**0 kVA**	**0 kVA**	**0 kVA**	**0 kVA**	**0 kVA**	**0 kVA**	**0 kVA**	**0 kVA**	**14 kVA**	**29 kVA**	**29 kVA**
60 kW EV Charger	69	0	0	0	0	9	6	6	2	8	7	8	10	13
Procured Route Bus Chargers		0	0	0	0	9	6	6	2	8	7	8	10	13
Procured Spare Bus Chargers		0	0	0	0	0	0	0	0	0	0	0	0	0
Cumulative Total Chargers		0	0	0	0	9	15	21	23	31	38	46	56	69
Cumulative Route Bus Chargers		0	0	0	0	9	15	21	23	31	38	46	56	69
Fully Connected Charger Load		0 kVA	0 kVA	0 kVA	0 kVA	567 kVA	945 kVA	1,323 kVA	1,449 kVA	1,953 kVA	2,394 kVA	2,898 kVA	3,528 kVA	4,347 kVA
Anticipated Overnight Charger Load		0 kVA	0 kVA	0 kVA	0 kVA	117 kVA	196 kVA	274 kVA	300 kVA	405 kVA	496 kVA	600 kVA	731 kVA	900 kVA
Anticipated Mid-day Charger Load	63 kVA	**0 kVA**	**0 kVA**	**0 kVA**	**0 kVA**	**307 kVA**	**511 kVA**	**715 kVA**	**783 kVA**	**1,056 kVA**	**1,294 kVA**	**1,567 kVA**	**1,907 kVA**	**2,350 kVA**
120 kW EV Charger	12	0	0	0	0	0	5	1	4	0	0	0	0	2
Procured Route Bus Chargers		0	0	0	0	0	4	0	4	0	0	0	0	2
Procured Spare Bus Chargers		0	0	0	0	0	1	1	0	0	0	0	0	0
Cumulative Total Chargers		0	0	0	0	0	5	6	10	10	10	10	10	12
Cumulative Route Bus Chargers		0	0	0	0	0	4	4	8	8	8	8	8	10
Fully Connected Charger Load		0 kVA	0 kVA	0 kVA	0 kVA	0 kVA	630 kVA	756 kVA	1,260 kVA	1,260 kVA	1,260 kVA	1,260 kVA	1,260 kVA	1,512 kVA
Anticipated Overnight Charger Load		0 kVA	0 kVA	0 kVA	0 kVA	0 kVA	131 kVA	157 kVA	261 kVA	261 kVA	261 kVA	261 kVA	261 kVA	313 kVA
Anticipated Mid-day Charger Load	126 kVA	**0 kVA**	**0 kVA**	**0 kVA**	**0 kVA**	**0 kVA**	**272 kVA**	**272 kVA**	**545 kVA**	**545 kVA**	**545 kVA**	**545 kVA**	**545 kVA**	**681 kVA**
180 kW EV Charger	1	0	0	0	0	0	0	0	0	0	1	0	0	0
Procured Route Bus Chargers		0	0	0	0	0	0	0	0	0	1	0	0	0
Procured Spare Bus Chargers		0	0	0	0	0	0	0	0	0	0	0	0	0
Cumulative Total Chargers		0	0	0	0	0	0	0	0	0	1	1	1	1
Cumulative Route Bus Chargers		0	0	0	0	0	0	0	0	0	1	1	1	1
Fully Connected Charger Load		0 kVA	0 kVA	0 kVA	0 kVA	0 kVA	0 kVA	0 kVA	0 kVA	0 kVA	189 kVA	189 kVA	189 kVA	189 kVA
Anticipated Overnight Charger Load		0 kVA	0 kVA	0 kVA	0 kVA	0 kVA	0 kVA	0 kVA	0 kVA	0 kVA	39 kVA	39 kVA	39 kVA	39 kVA
Anticipated Mid-day Charger Load	189 kVA	**0 kVA**	**0 kVA**	**0 kVA**	**0 kVA**	**0 kVA**	**0 kVA**	**0 kVA**	**0 kVA**	**0 kVA**	**102 kVA**	**102 kVA**	**102 kVA**	**102 kVA**
Total Fully Connected Load		0 kVA	0 kVA	0 kVA	0 kVA	567 kVA	1,575 kVA	2,079 kVA	2,762 kVA	3,293 kVA	3,923 kVA	4,453 kVA	5,110 kVA	6,181 kVA
Total Anticipated Overnight Peak Charger Load		**0 kVA**	**0 kVA**	**0 kVA**	**0 kVA**	**117 kVA**	**326 kVA**	**431 kVA**	**572 kVA**	**682 kVA**	**813 kVA**	**923 kVA**	**1,059 kVA**	**1,280 kVA**
Total Anticipated Mid-day Peak Charger Load	87 Chgrs	**0 kVA**	**0 kVA**	**0 kVA**	**0 kVA**	**307 kVA**	**783 kVA**	**988 kVA**	**1,328 kVA**	**1,601 kVA**	**1,941 kVA**	**2,228 kVA**	**2,583 kVA**	**3,162 kVA**
Total Anticipated Mid-day Peak Demand						265 kW	678 kW	855 kW	1150 kW	1386 kW	1681 kW	1928 kW	2235 kW	2736 kW

1. Anticipated Charger Loads assume a Load Factor of 49% based on results of charging model with demand reduction implemented.
2. Anticipated Charger Loads dos not include the charging of spare buses which are assumed to charge outside of peak hours.
3. Anticipated Charger Loads include a Safety Factor of 10%


3,500 kVA
3,000 kVA
2,500 kVA
2,000 kVA
1,500 kVA
1,000 kVA
500 kVA
0 kVA
Anticipated Peak Demand
2023
2024
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035

Appendix C - Concept Development & Phasing Plan Drawings

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CHARGER QUANTITY

PHASE 1	24kW PLUG-IN	-
	60kW PLUG-IN	21
	120kW PLUG-IN (# OF DISP.)	6(8)
	180kW PLUG-IN	-
	TOTAL AFTER PHASE 2	27

1 CHARGING EQUIPMENT LAYOUT
SCALE: 1"=150'-0"

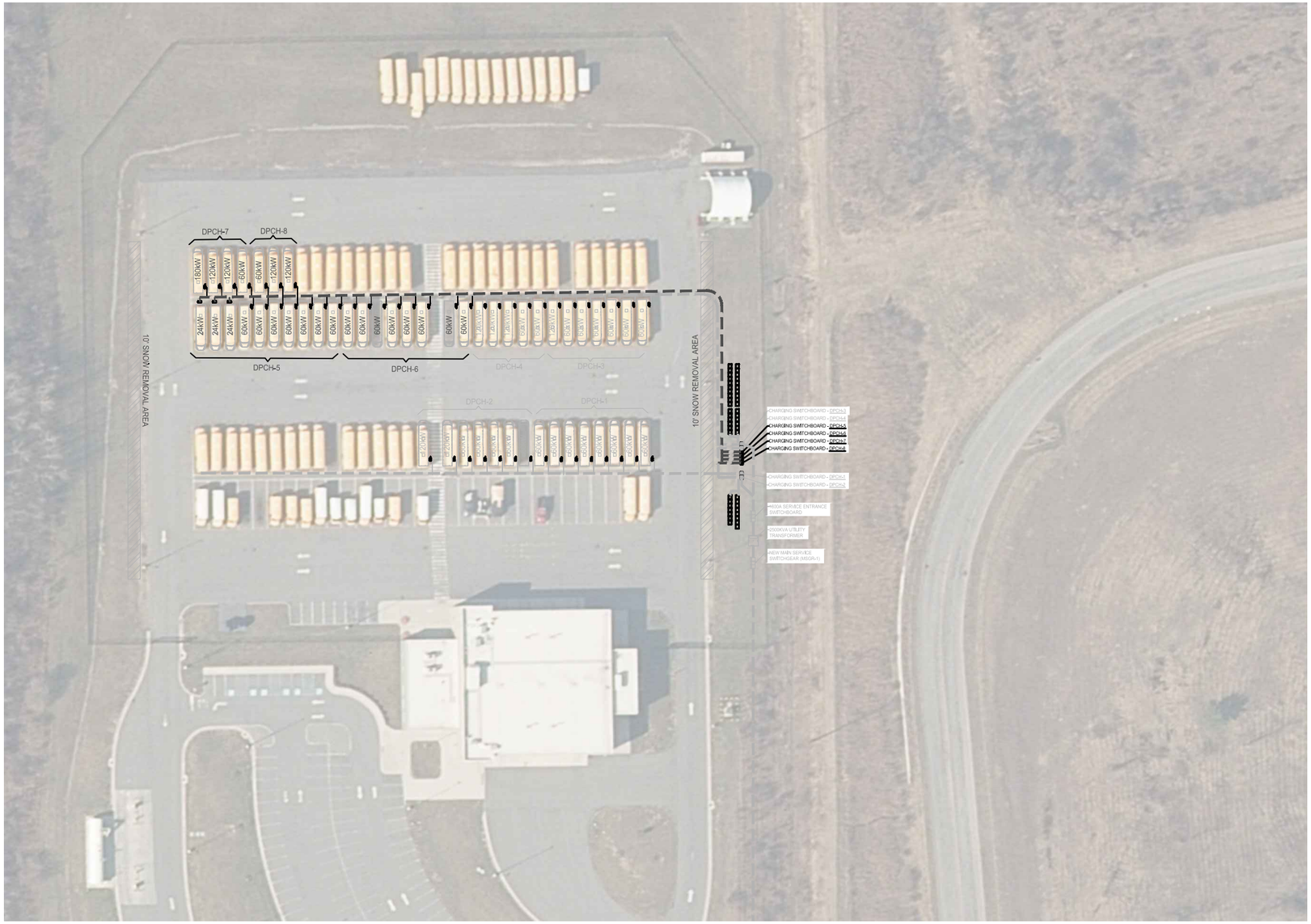
CONCEPTUAL - NOT FOR CONSTRUCTION

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Lancaster Central School District
Charging Equipment Layout

Proj. No.	414106
Date	11/26/2024
Drawing Number	E1

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CHARGER QUANTITY

PHASE 1	24kW PLUG-IN	-
	60kW PLUG-IN	21
	120kW PLUG-IN (# OF DISP.)	6(8)
	180kW PLUG-IN	-
PHASE 2	24kW PLUG-IN	3
	60kW PLUG-IN	17
	120kW PLUG-IN	4
	180kW PLUG-IN	1
	-	-
	TOTAL AFTER PHASE 2	52
	TOTAL CHARGING POSITIONS AFTER PHASE 2	54

1 CHARGING EQUIPMENT LAYOUT

SCALE: 1"=100'-0"

CONCEPTUAL - NOT FOR CONSTRUCTION

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Lancaster Central School District
Charging Equipment Layout

Proj. No.	414106
Date	11/26/2024
Drawing Number	E2

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CHARGER QUANTITY

PHASE 1	24kW PLUG-IN	-
	60kW PLUG-IN	21
	120kW PLUG-IN (# OF DISP.)	6(8)
	180kW PLUG-IN	-
PHASE 2	24kW PLUG-IN	3
	60kW PLUG-IN	17
	120kW PLUG-IN	4
	180kW PLUG-IN	1
PHASE 3	24kW PLUG-IN	2
	60kW PLUG-IN	31
	120kW PLUG-IN	2
	180kW PLUG-IN	-
	-	-
	TOTAL AFTER PHASE 3	87
	TOTAL CHARGING POSITIONS AFTER PHASE 3	89

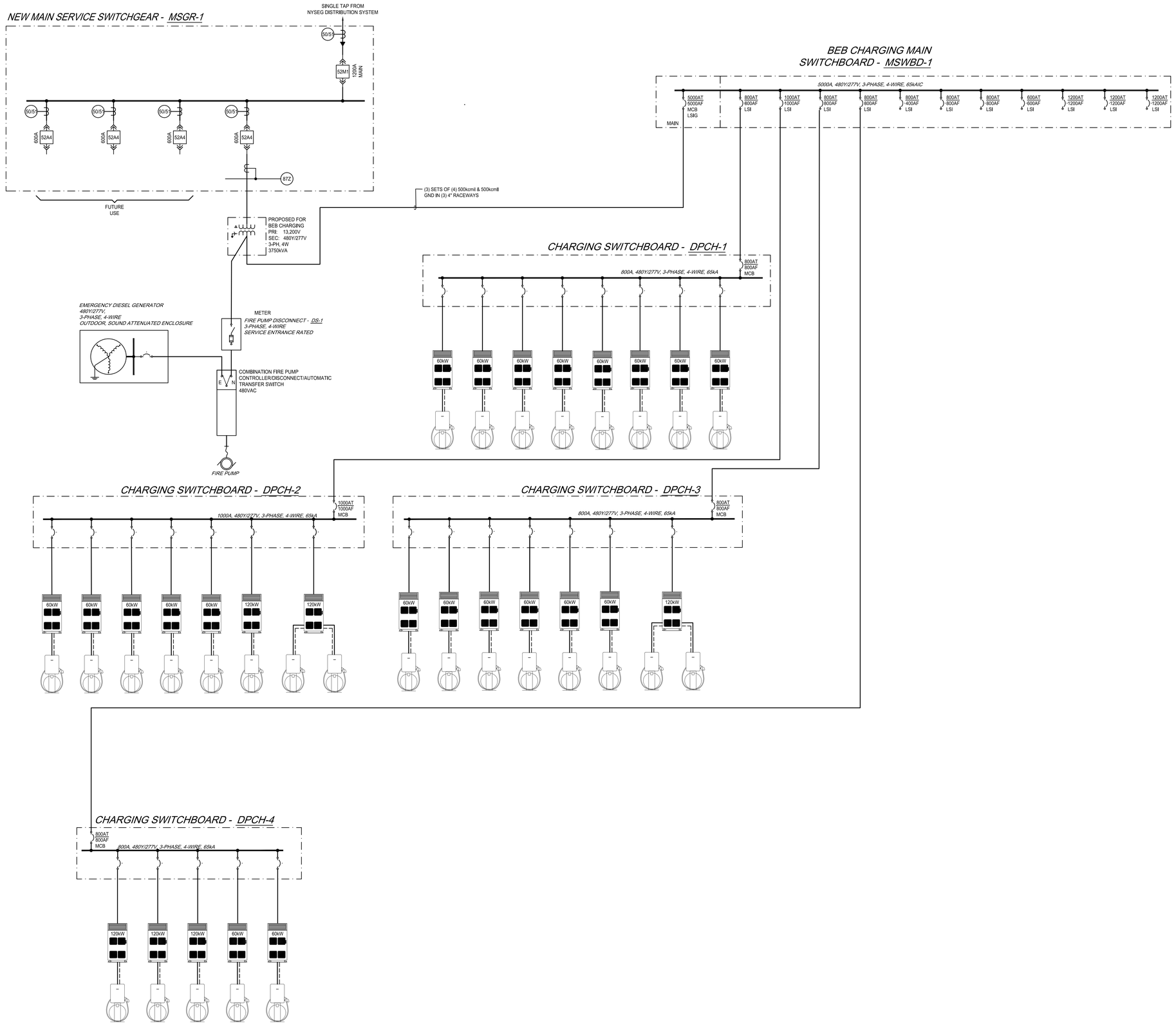
1 CHARGING EQUIPMENT LAYOUT
SCALE: 1"=100'-0"

CONCEPTUAL - NOT FOR CONSTRUCTION

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Lancaster Central School District
Charging Equipment Layout

Proj. No.	414106
Date	11/26/2024
Drawing Number	E3



CHARGER QUANTITY

24kW PLUG-IN	-
60kW PLUG-IN	21
120kW PLUG-IN	5
180kW PLUG-IN	-
-	-
TOTAL AFTER PHASE 1	27

1 BUS CHARGING SINGLE LINE DIAGRAM - PHASE 1 (2028-2030)
SCALE: NONE

CONCEPTUAL - NOT FOR CONSTRUCTION

Lancaster Central School District

wendel
Centerpointe Corporate Park
375 Essjay Road, Suite 200
Williamsville, NY 14221
www.wendelcompanies.com
p:716.688.0766 f:716.625.6825
WENDEL ENGINEERING P.C.

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NO.	REVISIONS	DATE

DWG. TITLE

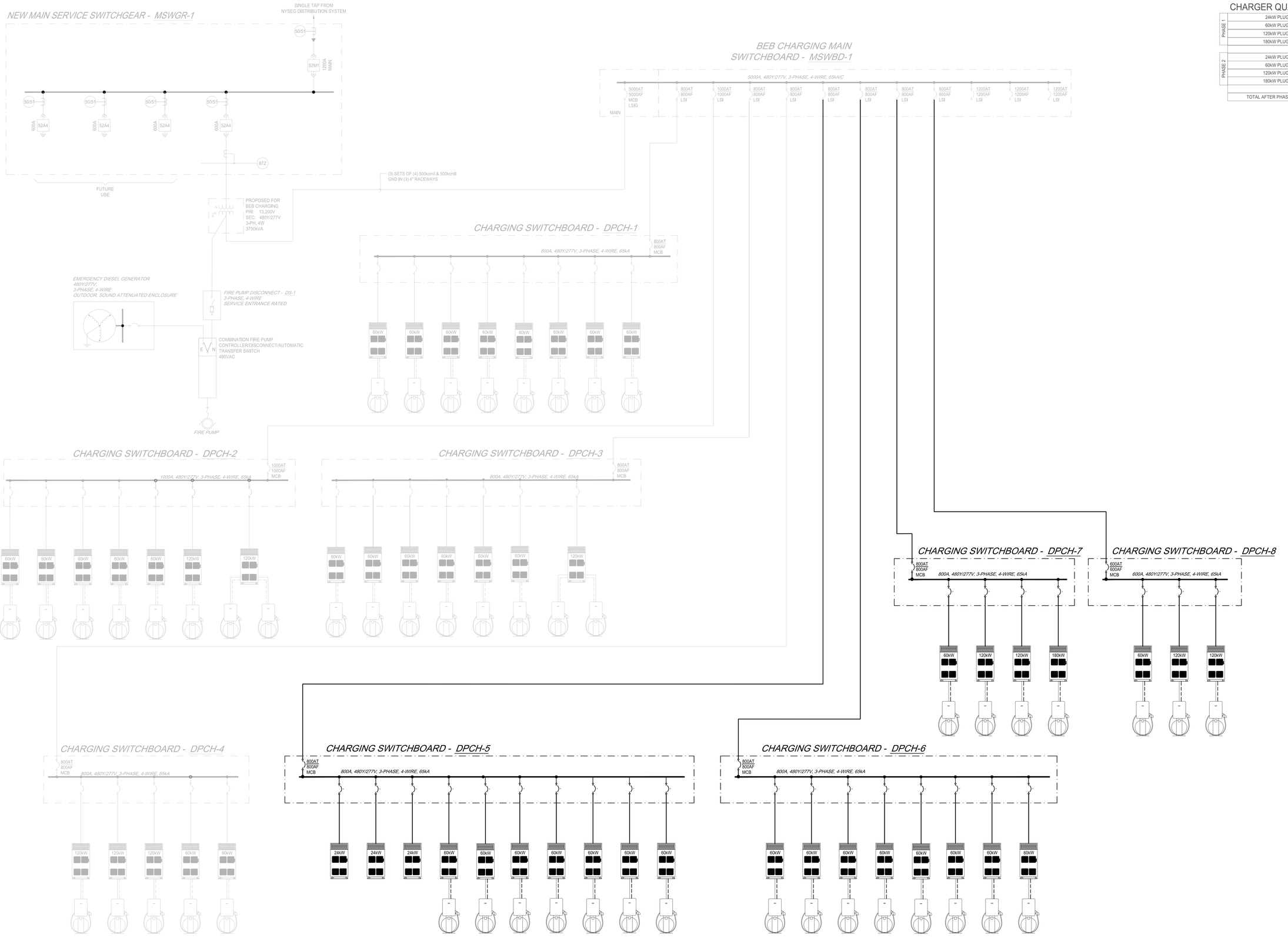
PHASE 1
BUS CHARGING SYSTEM
SINGLE LINE DIAGRAM

0 1" 2"
GENERIC SCALE BAR
SCALE BAR SHOWN IS TWO INCHES ON THE ORIGINAL DRAWING. IF NOT TWO INCHES ON THIS SHEET, ADJUST ACCORDINGLY.

DATE	06-10-2024
SCALE	AS NOTED
DWN.	MSH
CHK.	JFW
PROJ. No.	632101
DWG. No.	E4

CHARGER QUANTITY

PHASE 1	24kW PLUG-IN	-
	60kW PLUG-IN	21
	120kW PLUG-IN	6
	180kW PLUG-IN	-
	-	-
PHASE 2	24kW PLUG-IN	3
	60kW PLUG-IN	17
	120kW PLUG-IN	4
	180kW PLUG-IN	1
	-	-
	TOTAL AFTER PHASE 2	54



1 BUS CHARGING SINGLE LINE DIAGRAM - PHASE 2 (2031-2032)
SCALE: NONE

CONCEPTUAL - NOT FOR CONSTRUCTION

Lancaster Central School District

wendel
Centerpointe Corporate Park
375 Essjay Road, Suite 200
Williamsville, NY 14221
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p:716.688.0766 f:716.625.6825
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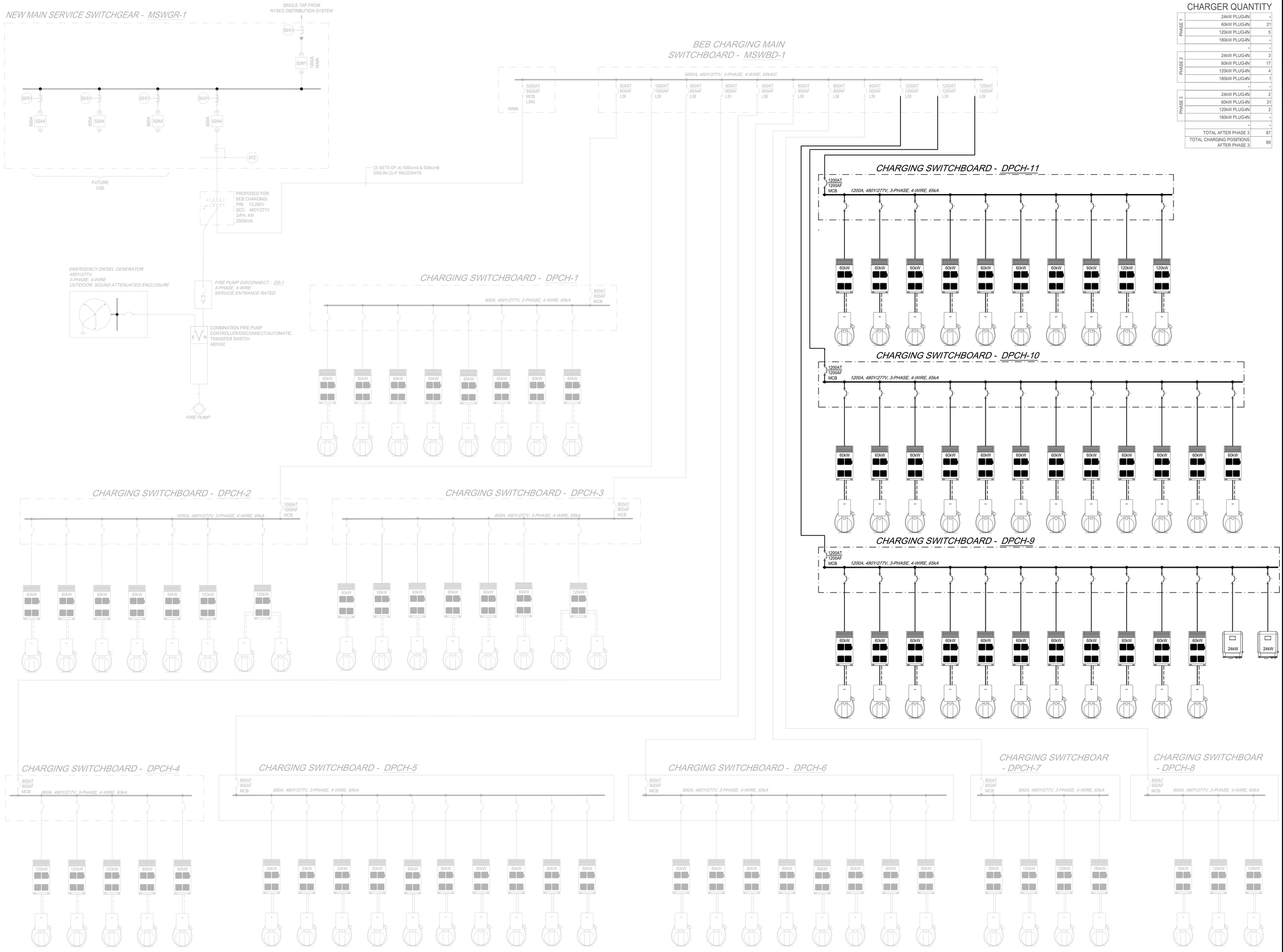
NO.	REVISIONS	DATE

DWG. TITLE

PHASE 2
BUS CHARGING SYSTEM
SINGLE LINE DIAGRAM

0 1" 2"
GENERIC SCALE BAR
SCALE BAR SHOWN IS TWO INCHES ON THE ORIGINAL DRAWING.
IF NOT TWO INCHES ON THIS SHEET, ADJUST ACCORDINGLY.

DATE	06-10-2024
SCALE	AS NOTED
DWN.	CHK.
PROJ. No.	632101
DWG. No.	E5



CHARGER QUANTITY

PHASE 1	24kW PLUG-IN	-
	60kW PLUG-IN	21
	120kW PLUG-IN	5
	180kW PLUG-IN	-
	-	-
PHASE 2	24kW PLUG-IN	3
	60kW PLUG-IN	17
	120kW PLUG-IN	4
	180kW PLUG-IN	1
	-	-
PHASE 3	24kW PLUG-IN	2
	60kW PLUG-IN	31
	120kW PLUG-IN	2
	180kW PLUG-IN	-
	-	-
TOTAL AFTER PHASE 3		87
TOTAL CHARGING POSITIONS AFTER PHASE 3		89

1 BUS CHARGING SINGLE LINE DIAGRAM - PHASE 3 (2033-2035)
SCALE: NONE

CONCEPTUAL - NOT FOR CONSTRUCTION

Lancaster Central School District

wendel
Centerpointe Corporate Park
375 Essjay Road, Suite 200
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NO.	REVISIONS	DATE

DWG. TITLE

PHASE 3
BUS CHARGING SYSTEM
SINGLE LINE DIAGRAM

0 1" 2"
GENERIC SCALE BAR
SCALE BAR SHOWN IS TWO INCHES ON THE ORIGINAL DRAWING. IF NOT TWO INCHES ON THIS SHEET, ADJUST ACCORDINGLY.

DATE	06-10-2024
SCALE	AS NOTED
DWN.	CHK.
PROJ. No.	632101
DWG. No.	E6

Appendix D - Original Scope of Work

EXHIBIT A-1: SCOPE OF WORK, SCHEDULE & BUDGET
Agreement No. 120138
(For FlexTech Consultants: Task Work Order ID: 000000000000000000000233663)
Flexible Technical Assistance

ERIE 1, ERIE 2 & ORLEANS-NIAGARA BOCES

FLEXIBLE TECHNICAL ASSISTANCE PROGRAM PON 4192

PROJECT DESCRIPTION

Goal of the Study

ERIE 1 / Orleans-Niagara BOCES is interested in utilizing NYSERDA's Flexible Technical (FlexTech) Assistance Program to evaluate the impact of a transition to zero emission school buses for the districts they support.

Erie 1 BOCES

- Alden Central School
- Clarence Central School
- Depew Union Free School District
- Frontier Central School District
- Lancaster Central School District

Erie 2 BOCES

- Eden Central School District

Orleans-Niagara BOCES

- North Tonawanda City Schools

ERIE 1, ERIE 2, & Orleans-Niagara BOCES has been observing the nationwide transition to battery electric vehicles, and more recently has been reviewing New York State's requirements for the transition of school bus fleets to zero emission vehicles by 2035. The districts are interested in developing a transition plan that provides a path towards a zero-emission bus fleet by 2035.

Consultant Information

The districts seek to utilize the services of Wendel Energy Services, LLC, hereafter referred to as "the applicant," a long tenured NYSERDA Program Consultant. Wendel's contact information is as follows:

Wendel Energy Services, LLC
375 Essjay Road, Suite 200
Centerpointe Corporate Park
Williamsville, New York 14221

Wendel's NYSERDA Program Manager; Keith L. Krug, CEM kkrug@wendelcompanies.com

District and Facility Description & Utility Information

Erie 1 BOCES serves more than 19 school districts in Erie County and encompasses 435 square miles. It provides public educational services to 620 students. The following participating Districts are designated as an average-need school districts by the New York State Education Department.

ERIE 1 BOCES

District	Bus Fleet	Bus Storage Address	Annual Energy Costs	SBC
Alden Central School	47	1648 Crittenden Road, Alden, NY 14004	$21,281 – Bus Garage Only $392,322 – Entire District	Yes
Clarence Central School	86	9825 County Road, Clarence, NY 14032	$533,607	No
Depew Union Free School District	48	5261 S. Transit Road, Depew, NY 14043	$178,156	Yes
Frontier Central School District	79	4432 Bayview Road, Hamburg, NY 14075	$575,000	No
Lancaster CSD	113	4432 Bayview Road, Hamburg, NY 14075	$575,000	No

The Erie 2-Chautauqua-Cattaraugus BOCES (E2CCB) is one of 37 BOCES in New York State. E2CCB represents all the school districts in Chautauqua County, southern Erie County, and part of Cattaraugus County, a geographical area of 1,791 square miles. During the 2021-22 school year, E2CCB provided more than $100 million in services to its 27 component school districts. The following participating Districts are designated as an average-need school districts by the New York State Education Department.

ERIE 2 BOCES

District	Bus Fleet	Bus Storage Address	Annual Energy Costs	SBC
Eden Central School District	40	2902 Schoolview Road, Eden, NY 14057	$329,126	Yes

Orleans-Niagara BOCES serves 13 school districts in Orleans, and Niagara Counties and encompasses 81 square miles. It provides public educational services to 465 students. The

following participating Districts are designated as an average-need school districts by the New York State Education Department.

ORLEANS-NIAGARA BOCES

District	Bus Fleet	Bus Storage Address	Annual Energy Costs	SBC
North Tonawanda City Schools	45	100 Ridge Road, North Tonawanda, NY 14120	$400,253	No

Based on discussions between the District and Wendel personnel, the following will be evaluated to determine the transition to a zero-emission vehicle plan.

PROJECT TASKS

The steps necessary to develop a zero-emission transition plan for the school bus fleet are listed below:

Task 1–Project Kickoff and Status Meetings

- Kickoff with the District, NYSERDA, and Wendel
- Wendel assumes to meet on site one time for the kickoff and the site survey
- All other meetings will be virtual
- Wendel will meet with the client after the completion of tasks 4 & 7 to gain consensus after the submission of the memos, and a virtual meeting to present the final report (task 8)
- Deliverables for this task will be meeting minutes

Task 2 – Data Collection

- **Bus fleet information** – Fleet size (current and projected), bus replacement plan/schedule, bus types/size.
- **Bus schedules and route data** – Detailed bus routes, departure times, return times, operational hours, mileage, fuel consumption, and operational contingency/resiliency plans.
    - Data should be provided in Excel spreadsheet format with clear start and finish times, associated distances, and vehicle identifiers for each route.
- **Bus parking/storage arrangements** – Indoor/Outdoor, location
- **Fueling –** current operational requirements for fueling
- **Utility Data** – Name of local utility, existing service size (kVA) and voltage, Utility contact, Make-Ready Program information, water service flow test including static pressure, residual pressure, and water flow
- **Existing School Electrical Distribution information** – existing capacity, condition, expansion capability. Any as-built electrical site drawings (one-line distribution drawings)
- **Existing Site Plan** – CAD file of the overall site plan
- **Fire Protection Drawings** – any drawings available for the maintenance facility

The schedule and fee are dependent on the data format, quality, and accuracy of documentation received from the client.

Anticipated deliverables for this step would be:

A memorandum detailing the data request list/ inventory and data gaps.

Task 3 – Route Analysis

Wendel will analyze the available bus route data for each route to determine the time and distance required for a bus to complete the route. Fuel consumption data from the existing diesel fleet will also be incorporated into the analysis. This analysis along with assumptions from previous studies will be used to develop high level anticipated energy requirements per route. Wendel to determine the basis of design for buses and chargers, minimum battery size requirements, charging requirements, and charging durations necessary.

Anticipated deliverables for this step would be:

A memorandum detailing the results of the route analysis including bus and charger basis of design and minimum charging times.

Task 4 – Conceptual Charging Strategy

Based on the data collected in Task 2 and the route analysis developed in Task 3, Wendel will develop a conceptual charging strategy for the fleet utilizing assumptions derived from previous studies of battery electric buses. The charging strategy will be developed based on the smallest available battery size that meets the district's route needs. The charging strategy will identify the following items:

1. Anticipated peak demand during both on-peak and off-peak utility periods
2. Proposed charging profile for all buses on an hour-by-hour basis.
3. The Overall Energy impact of implementing Battery Electric Buses:
    - Gallons of diesel saved
    - Additional kWh utilized
    - Overall Metric Tons of CO2 saved

Anticipated deliverables for this step would be:

A memorandum detailing the results of the charging strategy.

Task 5 - Electric Utility Analysis

Once loads are identified, meetings with the local utility will be scheduled to discuss options to support the necessary loads, the overall costs of the utility upgrade, and responsibility for the costs.

Based on the developed energy requirements and charging strategy, Wendel will work with the local utility to determine the charging load profile, power demand, and options for obtaining power from the utility. Wendel will work with the utility and their Make-Ready Program to develop site requirements. Items included in this analysis include:

1. Utility's ability to supply the required power for bus charging
2. Preferred utility power interface:
    a. Upgrade existing service to supply all needs
    b. Provide a new service for just the bus charging requirements

c. Reliability of bus charging service feed

Anticipated deliverables for this step would be:

A memorandum identifying the utility's ability to provide the required power and the utility's preferred means of supply for the bus charging power to the site.

Task 6 – Concept Development and Phasing Plan

Working with the school district, Wendel will develop a conceptual plan for one site for the electrification of the fleet over time. This will be a phased approach based on available funding cycles, fleet replacement schedules, utility system build out schedules, and internal distribution system build out schedules. Phasing to allow for growth in infrastructure without replacing previous phase investments would be one of the goals of the phasing plan.

The existing internal electrical distribution system would be reviewed to determine the existing system's ability to handle additional load and to determine where new distribution equipment may be located, including new transformers, switchgear, and panelboards. Potential locations for charging equipment would be identified at this stage as well.

The concept plan will include the following items:

1. Preferred utility interface equipment (transformers, incoming switchgear, etc.)
2. On-site distribution equipment including distribution switchgear/panelboards, transformers, and wiring to the chargers
3. Charger types, sizes, locations, and number of dispensers
4. Dispenser connections to the bus fleet

Anticipated deliverables for this step would be:

a. A conceptual site plan showing preferred equipment locations
b. A conceptual one-line power diagram showing the incoming utility power and bus charging distribution
c. A phasing plan showing how the implementation plan would progress over time to meet the 2035 transition plan goal.

Task 7 – Transition Plan Cost Estimates

Working with the school district, Wendel will develop a high-level opinion of probable costs to implement the zero-emissions transition plan. Wendel will utilize estimates from previous studies as the basis of the transition plan cost estimate and scale for this specific district. The estimate will include the phased implementation costs of the following major items:

1. School District portion of any estimated charges for the utility to upgrade the system to provide the power required to the site for bus charging
2. Electrical equipment and installation costs for the utility interface
3. Bus charging system distribution equipment and installation costs including switchgear, panelboards, wiring

4. Charger and dispenser and installation costs
5. Associated site work and civil costs
6. Other costs associated with a transition, an addition, renovations, etc.
7. Wendel would be looking for the School District to provide estimated costs for the school buses for inclusion into the overall phased implementation costs

Anticipated deliverables for this step would be:

An opinion of probable cost estimate for each phase of the implementation phasing plan.

Task 8 – Final Report and Presentation

Wendel will prepare a draft report to summarize the overall recommendations and results of the study for concurrent review by NYSERDA and ERIE 1, ERIE 2 & Orleans-Niagara BOCES for one combined set of comments. The applicant shall update the report based on those comments and provide a final report to the satisfaction of NYSERDA and the district. Wendel will present the findings of the study. The report will meet the deliverable requirements listed in the Track I – Scope of Work Template. The applicant will submit the project summary sheet.

Overall Task Summary

Below is an itemized task list that is represented in the proposed budget attached.

1. Project Kickoff and Status Meetings
2. Data Collection
3. Route Analysis
4. Conceptual Charging Strategy
5. Electrical Utility Analysis
6. Concept Development and Phasing Plan
7. Transition Plan Cost Estimate
8. Final Report

DELIVERABLES

Wendel will provide the following deliverables:

- Task 1 Project Kickoff and Status Meetings: The applicant shall provide meeting minutes
- Task 2 Data Collection: The applicant shall provide a memo detailing data inventory and data gaps
- Task 3 Route Analysis: The applicant shall submit a memorandum detailing the results of the route analysis including bus and charger basis of design and minimum charging times.
- Task 4 Conceptual Charging Strategy: The applicant shall submit one memo detailing the results of the charging strategy
- Task 5 Electric Utility Analysis: The applicant shall submit one memo identifying the utility's ability to provide the required power and the utility's preferred means of supply for bus charging power to the site
- Task 6 Concept Development and Phasing Plan: The applicant shall provide:
    - one conceptual site plan showing preferred equipment locations

    - one conceptual one-line power diagram showing the incoming power and bus charging distribution
    - one phasing plan showing how the implementation plan would progress over time to meet the 2035 transition plan goal
- Task 7 Transition Plan Cost Estimates: The applicant shall provide one opinion of probable cost estimate for each phase of the implementation phasing plan
- Task 8 Final Report: Wendel will prepare a draft report to summarize the overall recommendations and results of the study and the applicant shall address technical review comments until deemed satisfactory by NYSERDA.

ASSUMPTIONS

In preparing this proposal, Wendel has made the following assumptions regarding the Task Work Order:

- Access to electrical rooms
- Access to and accompaniment by facility staff to tenant spaces will be provided
- Access to building management software systems will be provided
- As built and survey, if available will be provided
- Access to site
- The owner will provide two years' worth of electric costs.
- A draft report will be reviewed by both the owner and NYSERDA simultaneously, with each party providing one set of review comments. Wendel will update the draft report based on the written comments. Comments from NYSERDA's project manager/technical reviewer will be coordinated, so that one combined set of comments will be addressed by Wendel.

SCHEDULE

Wendel will provide a schedule including start and end dates upon receiving a notice to proceed. Please note that the schedule below is per participating district and will be scheduled during the kickoff.

Milestone	Weeks from Notice to Proceed
Task 1: Project Kickoff and Status Meetings	2 weeks
Task 2: Data Collection	3 weeks
Task 3: Route Analysis	4 weeks
Task 4: Conceptual Charging Strategy	5 weeks
Task 5: Electrical Utility Analysis	14 weeks
Task 6: Concept Development and Phasing Plan	15 weeks
Task 7: Transition Plan Cost Estimates	16 weeks
Task 8: Final Report	20 weeks

Exhibit A-2
Attachment B-3 Program Terms & Conditions

Please refer to https://portal.nyserda.ny.gov/servlet/servlet.FileDownload?file=00P8z0000045AqXEAU for the current Program Terms & Conditions.

Exhibit A-3
Attachment B-1: Study Report Requirements

Please refer to https://www.nyserda.ny.gov/All-Programs/Programs/FlexTech-Program/FlexTech-Documents-and-Resources for the current Final Report Requirements.

Exhibit A-4
Attachment B-2: Project Summary Sheet

Please refer to https://www.nyserda.ny.gov/All-Programs/Programs/FlexTech-Program/FlexTech-Documents-and-Resources for the current Project Summary Sheet.

Appendix E - Cutsheets



IC BUS® ECE SERIES SCHOOL BUS

THE NEXT-GENERATION IC BUS® CE SERIES SCHOOL BUS

PUTTING SAFETY FIRST

- Standard electronic stability control
- Bendix® Intellipark® electronic parking brake standard
- No Student Left Behind® child monitor system
- Single-panel glass on entrance door for improved driver visibility
- IC Bus® Full View Camera Technology™ by Rosco® (optional)
- Entrance Door Alerts integrated into Dash Cluster; providing door ajar alerts if vehicle in motion & door is not properly closed

DRIVERFIRST™ ENVIRONMENT

- Standard 'wing' style instrument panel, angled toward driver
- State of the Art digital instrument cluster, including visibility to state-of-charge, estimated range and more!
- Standard Driver HVAC system with adjustable controls for driver comfort
- Standard stalk shifter for transmission control; optional push button shifter
- Steering wheel switches/controls are integrated, backlit, and color-coded
- USB-A and USB-C charging ports standard
- Driver cup holder
- LED interior dome & stepwell lights, available dimmer option

DURABILITY & SERVICEABILITY

- Meets or exceeds FMVSS/CMVSS
- 16-gauge steel, 90G/90G galvanized coating on steel body for enhanced corrosion resistance
- 14 gauge steel threaded body bows with continuous runners connecting all roof bows for superior strength
- Spot-welded body construction & framer assembled front end
- Optional Naviflex coating available on the bumpers — for optimal corrosion resistance
- Improved accessibility to routine maintenance items
- 'Hood assist' dual spring struts – wide opening for serviceability

CONNECTIVITY FOR ON-TIME PERFORMANCE

- All vehicles include factory-installed telematics with 5-year connectivity subscription
- OnCommand® Connection
  - 24/7 diagnostics and predictive maintenance tools
  - Real-time tracking and monitoring
- IC Bus® 360
  - Seamless communications with dealers and up-to-date repair status
  - Complete VIN-based information with specs, complete parts catalog, remote health data, and more
  - Online service request initiation and estimate approvals
  - Complete service history, up-to-date campaign information, and engine calibration status

- **GVWR**
  - Up to 35,000 lbs.
- **Capacity**
  - Up to 78 passengers
- **Wheelbase Options**
  - 217", 254", 276" or 289"
- **Single Rear Axle (4x2)**
  - Dana Spicer: 21,000 or 23,000 lbs.
- **Front Axle**
  - Meritor: 10,000 or 12,000 lbs.
- **Frame**
  - Heat-treated alloy steel (120,000 PSI)
- **Front Suspension**
  - Parabolic taper leaf: 10,000 or 12,000 lbs.
- **Rear Suspension**
  - International® Ride Optimized Suspension (IROS) Air: 21,000 or 23,000 lbs.
- **12V Electrical System**
  - Enersys Odyssey 12V 2300 CCA
- **Brakes**
  - Air disc brakes with ESC and ABS
  - Optional hydraulic brakes
- **Direct Drive Motor**
  - 650-volt, 6-phase permanent magnet motor
- **Tires**
  - 254", 276" & 289" wheelbase: 11R22.5 front and rear
  - 217" wheelbase: 255/70R22.5 front and rear
- **Rear Axle Ratio**
  - 5.57 or 6.83
- **Regenerative Braking**
  - Driver selectable, three levels
- **Peak Power**
  - 255 kW or 342 hp
- **Powertrain Batteries and Range Options**
  - 210 kWh (135 miles)
  - 315 kWh (200+ miles)
- **Charge Port**
  - Front standard or optional rear location
- **Charging**
  - Standard AC and DCFC charging ready
- **Fuel-Fired Heater**
  - Optional, left side
- **Kajeet SmartBus™ wifi available**
- **V2G Capability available**

www.ICBus.com

Note: The information and conclusions contained herein are believed to be correct at time of publication, but do not necessarily apply to similar vehicles with different specifications or with production dates after the production of this publication. Vehicles with different specifications or later dates of production may yield different results. Vehicle specifications are subject to change without notice. BAD 21001 01/2024

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Appendix F - Information Received from Client

Columns with asterisks are required

			*Time Bus **Leaves Bus Depot***	*Time Bus **Arrives Back to Bus Depot***		*What days of the week is this route in place? (M,T,W,TH,F,S,SU)*	*Distance Bus travels in route with only Driver on it (Can be assumed at 10% if not Available)*	*Maximum Number of Students on Bus at any time Not Including Driver*		*For District Use*	
	District Route Number / Route Name	*Bus Number / Name	*Route Start Time	*Route End Time	*Total Route Distance (Miles)	*Days of Week Route is in Use	Deadhead Distance (Miles)	Number of Students	Return to Bus Garage? (Y/N)	Notes	Wendel Notes
EX.	*H438-AM1*	*CB311*	*9:35:00 AM*	*9:50:00 AM*	*3.62*	*M-F*	*0.62*	*14*			
EX.	*H438-AM2*	*CB311*	*10:40:00 AM*	*10:52:00 AM*	*2.98*	*M-F*	*0.3*	*5*			
EX.	*E02APM*	*CB311*	*3:25:00 PM*	*4:48:00 PM*	*14.94*	*M-F*	*0.62*	*17*			
EX.	*S1102AM*	*CB304*	*6:36:00 AM*	*7:15:00 AM*	*9.42*	*T , TH*	*1.2*	*5*			
EX.	*S1102PM*	*CB304*	*3:25:00 PM*	*3:48:00 PM*	*9.42*	*T , TH*	*1.2*	*5*			
	COD003	409	6:06:00 AM	6:50:00 AM	10.09	M-F	9.4	2	NO		
	COD055	409	7:00:00 AM	8:30:00 AM	33.23	M-F	14.26	12	YES	BACK AT GARAGE	
	ODC101	409	1:54:00 PM	4:15:00 PM	34.6	M-F	14.24	18	NO		
	ODC103	409	4:15:00 PM	4:48:00 PM	9.33	M-F		3	YES	BACK @ GARAGE	
	LHSPHS001	412	6:00:00 AM	7:15:00 AM	18.44	M-F		11	NO		LHSP001
	WMSSP001	412	7:30:00 AM	8:54:00 AM	26.96	M-F	4.13	10	YES	BACK @ GARAGE	WSSP001
	ARM930	412	9:30:00 AM	11:30:00 AM	15.85	M-F		8	YES	BACK @ GARAGE	ARM9:302
	LHSP101	412	1:42:00 PM	3:00:00 PM	21.09	M-F	0.89	11	NO		
	WSSP101	412	3:10:00 PM	4:45:00 PM	26.87	M-F	5.93	12	YES	BACK AT GARAGE	
	CANT001	415	6:18:00 AM	7:55:00 AM	29.02	M-F	1.67	11	NO		
	COSP001	415	8:16:00 AM	9:32:00 AM	24.13	M-F	4.51	9	YES	BACK AT GARAGE	
	CANT101	415	1:30:00 PM	2:56:00 PM	28.73	M-F	5.73	8	NO		
	COSP101	415	4:00:00 PM	5:15:00 PM	22.48	M-F	5.7	9	YES	BACK @ GARAGE	
	COD056	433	6:24:00 AM	7:49:00 AM	24.09	M-F	3.63	9	NO		
	WSMKV	433	7:55:00 AM	8:54:00 AM	25.32	M-F	3.16	1	NO		WS MKV A
	PR102	433	9:00:00 AM	10:15:00 AM	27.21	M-F	10.63	13	YES	BACK @ GARAGE	
	OD102	433	1:42:00 PM	4:00:00 PM	35.21	M-F	6.17	10	NO		
	WS355LR	433	4:15:00 PM	5:00:00 PM	#N/A	W,TH	1.63	12	YES	BACK @ GARAGE	nothing matched in Total Mileage by Route
	COD006	434	6:00:00 AM	6:50:00 AM	13.09	M-F	3.24	2	NO		
	COD059	434	6:55:00 AM	8:24:00 AM	40.11	M-F	19.37	6	YES	BACK @ GARAGE	
	LAP003	434	12:30:00 PM	1:24:00 PM	14.5	M-F	4.39	6	NO		
	STFM101	434	1:38:00 PM	3:03:00 PM	39.52	M-F	5.18	7	NO		
	LHS358LR	434	3:10:00 PM	4:39:00 PM	38.33	M-F	7.49	32	NO		LHS358
	LAP104	434	4:41:00 PM	5:39:00 PM	18.67	M-TH	5	6	YES	BACK @ GARAGE	
	COD008	436	6:06:00 AM	6:51:00 AM	9.6	M-F		4	NO		
	COD058	436	6:59:00 AM	7:40:00 AM	16.59	M-F		4	NO		
	CO009	436	8:30:00 AM	9:30:00 AM	19.55	M-F		35	NO		
	HKMV	436	9:34:00 AM	10:12:00 AM	11.16	M-F		1	NO		HKTOMV
	HK102	436	9:56:00 AM	10:42:00 AM	7.61	M-F		33	YES	BACK @ GARAGE	HARK102
	PPWM101	436	1:15:00 PM	3:23:00 PM	48.06	M-F		9	NO		
	CO109	436	3:55:00 PM	4:48:00 PM	8.68	M-F		29	YES	BACK @ GARAGE	
	COD005	437	6:06:00 AM	6:50:00 AM	9.61	M-F		4	NO		
	COD054	437	6:56:00 AM	8:25:00 AM	34.11	M-F		7	NO		
	PR003	437	8:30:00 AM	9:36:00 AM	27.63	M-F		15	YES	BACK @ GARAGE	
	PRD101	437	1:48:00 PM	2:50:00 PM	27.38	M-F		10	NO		
	LHS356	437	3:05:00 PM	4:40:00 PM	26.95	M-F		29	NO		
	LAP105	437	4:41:00 PM	5:18:00 PM	9.06	M-TH		4	YES	BACK @ GARAGE	
	QWCN001	439	6:24:00 AM	8:00:00 AM	30.4	M-F		11	NO		
	CT003	439	8:28:00 AM	9:48:00 AM	19.74	M-F		32	YES	BACK @ GARAGE	
	QHSV101	439	1:48:00 PM	3:20:00 PM	33.12	M-F		6	NO		
	CT103	439	3:55:00 PM	4:54:00 PM	12.54	M-F		30	YES	BACK @ GARAGE	
	PRD001	441	6:06:00 AM	7:25:00 AM	24.15	M-F		18	NO		
	MVSB	441	7:36:00 AM	8:50:00 AM	22.86	M-F		2	NO		MV SB AM

PR003B	441	8:54:00 AM	10:42:00 AM	47.58	M-F		13	YES	BACK @ GARAGE	
BSMT1001	441	1:54:00 PM	4:36:00 PM	52.91	M-F		13	YES	BACK @ GARAGE	
LH022	442	6:18:00 AM	7:20:00 AM	11.76	M-F		75	NO		
CTSP001	442	8:18:00 AM	9:42:00 AM	24.35	M-F		16	YES	BACK @ GARAGE	
OD105	442	1:54:00 PM	3:54:00 PM	36.11	M-F		9	NO		
CTSP102	442	3:55:00 PM	5:18:00 PM	25.05	M-F		16	YES	BACK @ GARAGE	
LM017	444	6:12:00 AM	7:20:00 AM	13.28	M-F		47	NO		
WS003	444	7:55:00 AM	8:30:00 AM	7.43	M-F		40	NO		
CO004	444	8:49:00 AM	9:48:00 AM	12.54	M-F		27	YES	BACK @ GARAGE	
LM117	444	1:36:00 PM	3:10:00 PM	15.59	M-F		39	NO		
WS103	444	3:11:00 PM	3:48:00 PM	6.09	M-F		36	NO		
CO104	444	4:00:00 PM	4:48:00 PM	12.31	M-F		28	YES	BACK @ GARAGE	
LM021	445	6:00:00 AM	7:18:00 AM	18.05	M-F		36	NO		
WS023	445	7:45:00 AM	8:30:00 AM	14.89	M-F		38	NO		
CO002	445	8:48:00 AM	9:48:00 AM	10.02	M-F		37	YES	BACK @ GARAGE	
LM121	445	1:36:00 PM	3:06:00 AM	16.42	M-F		30	NO		
WS123	445	3:12:00 PM	3:55:00 PM	11.99	M-F		29	NO		
CO102	445	4:00:00 PM	4:54:00 PM	8.41	M-F		40	YES	BACK @ GARAGE	
STM001	448	6:30:00 AM	7:50:00 AM	19.44	M-F		25	NO		
WS012	448	8:00:00 AM	8:30:00 AM	7.47	M-F		36	NO		
CT007	448	8:52:00 AM	9:50:00 AM	9.24	M-F		25	YES	BACK @ GARAGE	
STM101	448	1:48:00 PM	3:12:00 PM	19.12	M-F		43	NO		
WS112	448	3:12:00 PM	3:50:00 PM	8.1	M-F		29	NO		
CT107	448	3:53:00 PM	4:54:00 PM	12.6	M-F		37	YES	BACK @ GARAGE	
MKV	449	6:12:00 AM	7:15:00 AM	21.69	M-F		2	NO		MKV AM
HVSP002	449	7:30:00 AM	9:05:00 AM	27.88	M-F		11	YES	BACK @ GARAGE	
BHSP101	449	1:25:00 PM	2:22:00 PM	25.21	M-F		3	NO		
HK102	449	2:30:00 PM	3:00:00 PM	4.4	M-F		51	NO		HKOUT102
HVSP102	449	3:20:00 PM	5:06:00 PM	32.35	M-F		10	YES	BACK @ GARAGE	
HRKSPED	450	6:12:00 AM	7:24:00 AM	20.73	M-F		4	NO		HKSPED A
BHS001	450	7:34:00 AM	8:08:00 AM	14.1	M-F		4	NO		
HVSP	450	8:00:00 AM	9:12:00 AM	17.91	M-F		3	YES	BACK @ GARAGE	HVSP001
LH111	450	1:48:00 PM	3:19:00 PM	23.11	M-F		63	NO		
HVSP101	450	3:25:00 PM	3:55:00 PM	7.56	M-F		3	NO		
COSP102	450	4:00:00 PM	4:43:00 PM	13.02	M-F		6	YES	BACK @ GARAGE	
WEWS001	451	6:18:00 AM	7:51:00 AM	30.95	M-F		15	NO		
CTSP002	451	8:15:00 AM	9:42:00 AM	28.74	M-F		11	YES	BACK @ GARAGE	
WEWS101	451	1:24:00 PM	3:43:00 PM	43.84	M-F		15	NO		
CTSP101	451	3:53:00 PM	5:12:00 PM	22.65	M-F		12	YES	BACK @ GARAGE	
LH003	453	6:06:00 AM	7:18:00 AM	14.48	M-F		84	NO		
HV002	453	7:49:00 AM	8:50:00 AM	22.1	M-F		38	YES	BACK @ GARAGE	
HK101	453	9:10:00 AM	9:30:00 AM	7.98	M-F		46	NO		
HK101B	453	9:45:00 AM	10:10:00 AM	11.71	M-F		21	NO		
HSLATE	453	10:19:00 AM	10:48:00 AM	11.86	M-F		1	YES	BACK @ GARAGE	HS LATE
LH103	453	1:48:00 PM	3:17:00 PM	15.02	M-F		107	NO		
HV102	453	3:25:00 PM	4:36:00 PM	36.57	M-F		35	YES	BACK @ GARAGE	
LM015	455	6:18:00 AM	7:17:00 AM	13.4	M-F		44	NO		
WS024	455	7:44:00 AM	8:50:00 AM	11.58	M-F		50	NO		
CO008	455	8:55:00 AM	9:48:00 AM	12.58	M-F		26	YES	BACK @ GARAGE	
HK002	455	11:42:00 AM	12:44:00 PM	11.24	M-F		33	YES	BACK @ GARAGE	
LM115	455	1:36:00 PM	3:00:00 PM	13.06	M-F		52	NO		
WS132	455	3:10:00 PM	3:50:00 PM	9.01	M-F		20	NO		
CO108	455	3:55:00 PM	4:54:00 PM	12.36	M-F		27	YES	BACK @ GARAGE	
STM004	456	6:24:00 AM	7:42:00 AM	16.06	M-F		34	NO		
HV001	456	7:58:00 AM	9:18:00 AM	19.91	M-F		46	YES	BACK @ GARAGE	
HK0002B	456	11:36:00 AM	12:12:00 PM	#N/A	M-F		34	NO		nothing matched in Total Mileage by Route
HK001B	456	12:24:00 PM	1:00:00 PM	19.91	M-F		32	YES	BACK @ GARAGE	HV001

STM104	456	1:54:00 PM	3:16:00 PM	19.73	M-F		28	NO		
HV101	456	3:25:00 PM	4:30:00 PM	17.14	M-F		48	YES	BACK @ GARAGE	
COD002	457	6:00:00 AM	6:51:00 AM	14.63	M-F		2	NO		
STJB001	457	6:49:00 AM	7:35:00 AM	19.66	M-F		9	NO		
WS018	457	7:47:00 AM	8:30:00 AM	14.47	M-F		35	NO		
CT008	457	8:52:00 AM	9:42:00 AM	9.93	M-F		29	YES	BACK @ GARAGE	
STJB101	457	1:18:00 PM	2:50:00 PM	26.33	M-F		9	NO		
WS118	457	3:10:00 PM	3:46:00 PM	5.86	M-F		31	NO		
CT108	457	3:55:00 PM	4:48:00 PM	10.42	M-F		30	YES	BACK @ GARAGE	
MVHS002	458	6:00:00 AM	7:12:00 AM	22.43	M-F		5	NO		
JSP001	458	7:45:00 AM	9:12:00 AM	28.24	M-F		10	YES	BACK @ GARAGE	
MVHS101	458	1:00:00 PM	2:41:00 PM	31.97	M-F		5	NO		
JSP101	458	3:23:00 PM	4:42:00 PM	21.04	M-F		10	YES	BACK @ GARAGE	
LM010	459	6:18:00 AM	7:17:00 AM	18.1	M-F		31	NO		
JS003	459	7:59:00 AM	9:18:00 AM	15.96	M-F		46	YES	BACK @ GARAGE	
CAS101	459	1:36:00 PM	2:00:00 PM	4.25	M-F		4	NO		
LM110	459	2:08:00 PM	3:05:00 PM	11.39	M-F		50	NO		
JS103	459	3:23:00 PM	4:30:00 PM	13.65	M-F		44	YES	BACK @ GARAGE	
LH029	460	6:18:00 AM	7:16:00 AM	17.31	M-F		49	NO		
WS008	460	7:59:00 AM	8:30:00 AM	10.13	M-F		26	NO		
CT001	460	8:43:00 AM	9:48:00 AM	13.2	M-F		40	YES	BACK @ GARAGE	
LH129	460	1:48:00 PM	3:17:00 PM	23.69	M-F		69	NO		
WS113	460	3:20:00 PM	3:46:00 PM	7.27	M-F		32	NO		
CT101	460	3:53:00 PM	4:37:00 PM	6.84	M-F		26	YES	BACK @ GARAGE	
LM005	461	6:24:00 AM	7:20:00 AM	9.89	M-F		49	NO		
JS007	461	8:15:00 AM	9:18:00 AM	12.96	M-F		55	YES	BACK @ GARAGE	
LM105	461	1:36:00 PM	3:04:00 PM	15.08	M-F		53	NO		
JS107	461	3:27:00 PM	4:16:00 PM	10.07	M-F		55	NO		
WS353	461	4:20:00 PM	5:00:00 PM	#N/A	W,TH		12	YES	BACK @ GARAGE	nothing matched in Total Mileage by Route
LM016	462	6:24:00 AM	7:18:00 AM	10.35	M-F		48	NO		
HV003	462	7:56:00 AM	9:18:00 AM	21.59	M-F		45	YES	BACK @ GARAGE	
LM116	462	1:36:00 PM	3:05:00 PM	21.37	M-F		35	NO		
HV103	462	3:22:00 PM	4:30:00 PM	18.13	M-F		44	YES	BACK @ GARAGE	
LH021	463	6:12:00 AM	7:17:00 AM	12.62	M-F		75	NO		
HV009	463	7:59:00 AM	9:18:00 AM	20.1	M-F		49	YES	BACK @ GARAGE	
LH121	463	1:48:00 PM	3:00:00 PM	12.64	M-F		72	NO		
HV109	463	3:25:00 PM	4:18:00 PM	10.56	M-F		52	YES	BACK @ GARAGE	
WS356	463	4:20:00 PM	5:00:00 PM	#N/A	W,TH		10	YES	BACK @ GARAGE	nothing matched in Total Mileage by Route
LH001	464	6:18:00 AM	7:12:00 AM	11.62	M-F		67	NO		
WS025	464	7:41:00 AM	9:00:00 AM	18	M-F		45	YES	BACK @ GARAGE	
LH101	464	1:48:00 PM	3:06:00 PM	13.8	M-F		69	NO		
WS125	464	3:12:00 PM	4:30:00 PM	17.61	M-F		46	YES	BACK @ GARAGE	
LM014	465	6:18:00 AM	7:15:00 AM	10.86	M-F		47	NO		
WS030	465	7:58:00 AM	8:30:00 AM	7.24	M-F		37	NO		
CT005	465	8:45:00 AM	9:48:00 AM	13.11	M-F		35	YES	BACK @ GARAGE	
LM114	465	1:36:00 PM	2:59:00 PM	12.94	M-F		52	NO		
WS130	465	3:10:00 PM	3:51:00 PM	6.71	M-F		44	NO		
CT005	465	4:00:00 PM	4:48:00 PM	13.11	M-F		38	YES	BACK @ GARAGE	
LH011	466	6:12:00 AM	7:17:00 AM	14.52	M-F		67	NO		
WS013	466	7:59:00 AM	9:00:00 AM	7.68	M-F		35	YES	BACK @ GARAGE	
SPRTS002	466	1:54:00 PM	2:30:00 PM	10.78	M-F		40	NO		
HKOUT104	466	2:36:00 PM	3:00:00 PM	4.4	M-F		49	NO		
WS121	466	2:57:00 PM	4:42:00 PM	28.07	M-F		50	YES	BACK @ GARAGE	
LM018	467	6:12:00 AM	7:15:00 AM	13.74	M-F		50	NO		
WS005	467	8:05:00 AM	8:30:00 AM	4.83	M-F		40	NO		
CO001	467	8:49:00 AM	9:18:00 AM	11.94	M-F		37	YES	BACK @ GARAGE	
LM118	467	1:36:00 PM	3:03:00 PM	14.3	M-F		44	NO		

WS105	467	3:10:00 PM	3:49:00 PM	5.82	M-F		37	NO		
CO101	467	3:55:00 PM	4:55:00 PM	11.72	M-F		37	YES	BACK @ GARAGE	
STM003	469	6:06:00 AM	7:42:00 AM	25.35	M-F		17	NO		
JS001	469	8:00:00 AM	9:18:00 AM	24.53	M-F		45	YES	BACK @ GARAGE	
PRD	469	11:00:00 AM	12:48:00 PM	37.97	M-F		10	YES	BACK @ GARAGE	PRD12:15
BLS102	469	1:24:00 PM	2:21:00 PM	13.02	M-F		4	NO		
STM103	469	2:22:00 PM	3:35:00 PM	19.49	M-F		21	NO		
JS101	469	3:25:00 PM	4:36:00 PM	18.73	M-F		47	YES	BACK @ GARAGE	
LM011	470	6:18:00 AM	7:15:00 AM	12.19	M-F		50	NO		
WS020	470	7:35:00 AM	8:30:00 AM	18.59	M-F		44	NO		
CO012	470	8:57:00 AM	9:48:00 AM	9.12	M-F		34	YES	BACK @ GARAGE	
LM111	470	*1:36:00 PM*	3:05:00 PM	15.58	M-F		51	NO		
WS120	470	3:10:00 PM	3:48:00 PM	8.15	M-F		26	NO		
CO112	470	3:55:00 PM	4:42:00 PM	6.14	M-F		35	YES	BACK @ GARAGE	
LH030	471	6:00:00 AM	7:13:00 AM	16.98	M-F		69	NO		
WS009	471	7:44:00 AM	9:00:00 AM	15.16	M-F		46	YES	BACK @ GARAGE	
LH130	471	1:48:00 PM	3:00:00 PM	13.37	M-F		57	NO		
WS109	471	3:10:00 PM	4:12:00 PM	13.63	M-F		48	NO		
WS351	471	4:20:00 PM	5:00:00 PM	#N/A	W,TH		9	YES	BACK @ GARAGE	nothing matched in Total Mileage by Route
LM009	472	6:18:00 AM	7:18:00 AM	11.66	M-F		49	NO		
WS027	472	7:50:00 AM	9:00:00 AM	16.85	M-F		40	YES	BACK @ GARAGE	
LM109	472	1:36:00 PM	3:07:00 PM	20.64	M-F		39	NO		
WS127	472	3:15:00 PM	4:00:00 PM	10.09	M-F		48	NO		
ODC104	472	4:02:00 PM	4:42:00 AM	11.71	M-F		7	YES	BACK @ GARAGE	
LH015	473	6:12:00 AM	7:14:00 AM	12.04	M-F		61	NO		
WS007	473	7:35:00 AM	9:00:00 AM	18.07	M-F		48	YES	BACK @ GARAGE	
LH113	473	1:48:00 PM	3:05:00 PM	13.75	M-F		69	NO		
WS107	473	3:10:00 PM	4:24:00 PM	15.54	M-F		49	YES	BACK @ GARAGE	
HELP002	474	6:42:00 AM	7:45:00 AM	15.84	M-F		11	NO		
WS032	474	8:00:00 AM	8:48:00 AM	16.85	M-F		1	YES	BACK @ GARAGE	
LH128	474	1:48:00 PM	3:08:00 PM	16.09	M-F		47	NO		
WS108	474	3:10:00 PM	3:54:00 PM	11.38	M-F		23	NO		
CT109	474	4:00:00 PM	4:42:00 PM	10.48	M-F		24	YES	BACK @ GARAGE	
LH026	475	6:00:00 AM	7:17:00 AM	17.41	M-F		41	NO		
LHSM001	475	7:30:00 AM	7:42:00 AM	4.77	M-F		12	NO		
HV008	475	8:16:00 AM	9:12:00 AM	10.53	M-F		42	YES	BACK @ GARAGE	
CAS102	475	1:36:00 PM	2:05:00 PM	4.98	M-F		12	NO		
LH126	475	2:10:00 PM	3:21:00 PM	19.38	M-F		41	NO		
HV108	475	3:22:00 PM	4:24:00 PM	7.74	M-F		44	YES	BACK @ GARAGE	
LH027	476	6:12:00 AM	7:16:00 AM	17.65	M-F		67	NO		
WS019	476	7:51:00 AM	9:00:00 AM	15.07	M-F		39	YES	BACK @ GARAGE	
LH127	476	1:48:00 PM	3:09:00 PM	20.24	M-F		58	NO		
WS119	476	3:20:00 PM	4:11:00 PM	12.39	M-F		45	NO		
WS352	476	4:15:00 PM	5:00:00 PM	#N/A	W,TH		14	YES	BACK @ GARAGE	nothing matched in Total Mileage by Route
LH016	477	6:18:00 AM	7:11:00 AM	11.28	M-F		72	NO		
WS001	477	7:40:00 AM	9:00:00 AM	17.57	M-F		44	YES	BACK @ GARAGE	
LH116	477	1:48:00 PM	3:05:00 PM	10.91	M-F		58	NO		
WS101	477	3:10:00 PM	4:10:00 PM	13.98	M-F		45	NO		
WS354	477	4:15:00 PM	5:00:00 PM	#N/A	W,TH		9	YES	BACK @ GARAGE	nothing matched in Total Mileage by Route
LM022	478	6:12:00 AM	7:21:00 AM	11.65	M-F		49	NO		
HV006	478	7:52:00 AM	9:00:00 AM	15.42	M-F		50	NO		
PRDRET	478	9:12:00 AM	10:18:00 AM	30.11	M-F		14	YES	BACK @ GARAGE	PRD RET
LM122	478	1:36:00 PM	3:00:00 PM	11.69	M-F		50	NO		
HV106	478	3:22:00 PM	4:36:00 PM	14.83	M-F		48	YES	BACK @ GARAGE	
LH004	479	6:18:00 AM	7:21:00 AM	10.19	M-F		67	NO		
WS028	479	7:50:00 AM	8:54:00 AM	14.73	M-F		45	YES	BACK @ GARAGE	
LH104	479	1:48:00 PM	3:00:00 PM	10.63	M-F		62	NO		

WS128	479	3:10:00 PM	5:20:00 PM	13.12	M-F		51	NO		
WS357	479	4:15:00 PM	5:00:00 PM	#N/A	W,TH		8	YES	BACK @ GARAGE	nothing matched in Total Mileage by Route
LH007	480	6:18:00 AM	7:21:00 AM	18.22	M-F		65	NO		
WS011	480	7:47:00 AM	8:30:00 AM	11.05	M-F		46	NO		
CO011	480	8:53:00 AM	9:48:00 AM	11.11	M-F		33	YES	BACK @ GARAGE	
SPRT001	480	2:00:00 PM	3:05:00 PM	11.59	M-F		45	NO		SPRTS001
WS111	480	3:10:00 PM	3:55:00 PM	8.26	M-F		50	NO		
CO111	480	4:00:00 PM	4:54:00 PM	10.81	M-F		29	YES	BACK @ GARAGE	
LM002	481	6:18:00 AM	7:21:00 AM	9.64	M-F		50	NO		
HV004	481	8:10:00 AM	9:12 SM	12.89	M-F		48	YES	BACK @ GARAGE	
LM102	481	1:36:00 PM	3:01:00 PM	16.93	M-F		28	NO		
HV104	481	3:22:00 PM	4:24:00 PM	9.62	M-F		49	YES	BACK @ GARAGE	
STM005	482	6:30:00 AM	7:50:00 AM	19.58	M-F		31	NO		
JS005	482	8:12:00 AM	9:18:00 AM	13.97	M-F		52	YES	BACK @ GARAGE	
STM105	482	1:42:00 PM	3:12:00 PM	25.59	M-F		47	NO		
JS105	482	3:30:00 PM	4:24:00 PM	10.94	M-F		51	YES	BACK @ GARAGE	
STM006	483	6:42:00 AM	7:49:00 AM	14.82	M-F		20	NO		
JS006	483	8:18:00 AM	9:18:00 AM	10.89	M-F		51	YES	BACK @ GARAGE	
STM106	483	1:54:00 PM	3:20:00 PM	24.49	M-F		33	NO		
JS106	483	3:25:00 PM	3:58:00 PM	5.34	M-F		50	NO		
ODC102	483	4:01:00 PM	5:00:00 PM	16.4	M-F		6	YES	BACK @ GARAGE	
COD001	484	6:00:00 AM	6:49:00 AM	12.15	M-F		3	NO		
NAT001	484	6:57:00 AM	7:41:00 AM	16.2	M-F		8	NO		
HV007	484	8:08:00 AM	9:12:00 AM	14.16	M-F		48	YES	BACK @ GARAGE	
NC101	484	1:54:00 PM	3:15:00 PM	19.15	M-F		15	NO		
HV107	484	3:22:00 PM	4:30:00 PM	11.02	M-F		45	YES	BACK @ GARAGE	
LM103	485	1:36:00 PM	3:04:00 PM	11.87	M-F		66	NO		
WS124	485	3:10:00 PM	4:18:00 PM	12.04	M-F		53	YES	BACK @ GARAGE	
LH018	486	6:18:00 AM	7:16:00 AM	10.33	M-F		61	NO		
WS006	486	7:48:00 AM	8:25:00 AM	8.5	M-F		47	NO		
CO005	486	8:40:00 AM	9:48:00 AM	15.42	M-F		35	YES	BACK @ GARAGE	
LH118	486	1:48:00 PM	3:03:00 PM	13.22	M-F		49	NO		
WS106	486	3:10:00 PM	3:48:00 PM	6.18	M-F		41	NO		
CO105	486	4:00:00 PM	4:42:00 PM	6.94	M-F		30	YES	BACK @ GARAGE	
LH005	487	6:06:00 AM	7:17:00 AM	17.3	M-F		69	NO		
WS015	487	7:42:00 AM	9:00:00 AM	20.52	M-F		36	YES	BACK @ GARAGE	
LH105	487	1:48:00 PM	2:59:00 PM	14.4	M-F		54	NO		
WS115	487	3:10:00 PM	5:12:00 PM	45.93	M-F		44	YES	BACK @ GARAGE	
LHSP002	488	6:18:00 AM	7:13:00 AM	14.24	M-F		4	NO		
WSSP002	488	7:34:00 AM	8:22:00 AM	16.69	M-F		11	NO		
COSP002	488	8:54:00 AM	9:42:00 AM	13.67	M-F		6	YES	BACK @ GARAGE	
LHSP102	488	1:42:00 PM	2:45:00 PM	15.08	M-F		5	NO		
CHA101	488	2:47:00 PM	3:08:00 PM	10.19	M-F		2	NO		
WSSP102	488	3:18:00 PM	4:20:00 PM	14.8	M-F		9	YES	BACK @ GARAGE	
LH017	489	6:12:00 AM	7:20:00 AM	12.76	M-F		71	NO		
WS016	489	7:48:00 AM	8:30:00 AM	11.1	M-F		38	NO		
CO007	489	8:57:00 AM	9:42:00 AM	9.27	M-F		25	YES	BACK @ GARAGE	
LH107	489	1:48:00 PM	3:06:00 PM	18.83	M-F		72	NO		
WS116	489	3:15:00 PM	3:48:00 PM	7.45	M-F		29	NO		
CO107	489	4:00:00 PM	4:30:00 PM	6.72	M-F		23	YES	BACK @ GARAGE	
LM006	490	6:12:00 AM	7:17:00 AM	13.9	M-F		49	NO		
JS008	490	8:19:00 AM	9:18:00 AM	12.08	M-F		47	YES	BACK @ GARAGE	
LM106	490	1:36:00 PM	3:06:00 PM	14.59	M-F		56	NO		
JS108	490	3:26:00 PM	4:18:00 PM	8.3	M-F		46	YES	BACK @ GARAGE	
LM008	491	6:24:00 AM	7:17:00 AM	8.49	M-F		55	NO		
WS029	491	7:52:00 AM	8:30:00 AM	11.29	M-F		48	NO		
CT009	491	8:52:00 AM	9:42:00 AM	10.72	M-F		24	YES	BACK @ GARAGE	

LM108	491	1:36:00 PM	3:00:00 PM	13.34	M-F		53	NO		
WS129	491	3:15:00 PM	3:49:00 PM	8.79	M-F		46	NO		
OD104	491	3:55:00 PM	4:54:00 PM	20.08	M-F		7	YES	BACK @ GARAGE	
LM012	492	6:24:00 AM	7:17:00 AM	12.57	M-F		44	NO		
WS026	492	7:51:00 AM	8:28:00 AM	9.31	M-F		46	NO		
CT010	492	8:56:00 AM	9:43:00 AM	9.61	M-F		23	YES	BACK @ GARAGE	
LM112	492	1:36:00 PM	2:58:00 PM	13.91	M-F		46	NO		
WS126	492	3:10:00 PM	3:51:00 PM	7.7	M-F		40	NO		
CT110	492	3:53:00 PM	4:42:00 PM	9.34	M-F		24	YES	BACK @ GARAGE	
LH019	493	6:12:00 AM	7:18:00 AM	17.04	M-F		75	NO		
JS004	493	7:50:00 AM	9:18:00 AM	18.47	M-F		50	YES	BACK @ GARAGE	
LH119	493	1:48:00 PM	3:17:00 PM	24.64	M-F		74	NO		
JS104	493	3:25:00 PM	4:42:00 PM	17.77	M-F		50	YES	BACK @ GARAGE	
LM004	494	6:18:00 AM	7:20:00 AM	10.38	M-F		53	NO		
WS002	494	7:47:00 AM	8:30:00 AM	15.05	M-F		43	NO		
CT004	494	8:47:00 AM	9:42:00 AM	11.27	M-F		24	YES	BACK @ GARAGE	
LM104	494	1:36:00 PM	3:00:00 PM	18.3	M-F		48	NO		
WS102	494	3:10:00 PM	3:51:00 PM	10.61	M-F		32	NO		
CT104	494	3:53:00 PM	4:48:00 PM	12.52	M-F		25	YES	BACK @ GARAGE	
LH025	495	6:24:00 AM	7:20:00 AM	9.51	M-F		82	NO		
WS022	495	7:42:00 AM	8:58:00 AM	20.26	M-F		33	YES	BACK @ GARAGE	
LH125	495	1:48:00 PM	3:07:00 PM	14.24	M-F		72	NO		
WS122	495	3:10:00 PM	4:16:00 PM	18.25	M-F		43	NO		
LAP103	495	4:30:00 PM	5:24:00 PM	15.3	M-TH		4	YES	BACK @ GARAGE	
LH010	496	6:00:00 AM	7:25:00 AM	20.47	M-F		67	NO		
WS031	496	7:47:00 AM	9:01:00 AM	20.17	M-F		36	YES	BACK @ GARAGE	
LH110	496	1:48:00 PM	3:10:00 PM	16.61	M-F		50	NO		
WS131	496	3:15:00 PM	4:24:00 PM	18.68	M-F		47	YES	BACK @ GARAGE	
LH002	497	6:00:00 AM	7:20:00 AM	16.86	M-F		75	NO		
HARK001	497	7:30:00 AM	7:45:00 AM	15.44	M-F		34	NO		
WS017	497	7:45:00 AM	8:30:00 AM	6.47	M-F		46	NO		
CT006	497	8:45:00 AM	9:48:00 AM	12.31	M-F		42	YES	BACK @ GARAGE	
LH102	497	1:48:00 PM	3:00:00 PM	12.97	M-F		61	NO		
WS117	497	3:10:00 PM	3:55:00 PM	8.63	M-F		50	NO		
CT106	497	3:56:00 PM	4:42:00 PM	7.3	M-F		31	YES	BACK @ GARAGE	
LM007	498	6:06:00 AM	7:17:00 AM	17.67	M-F		37	NO		
JS002	498	7:53:00 AM	9:18:00 AM	26.64	M-F		54	YES	BACK @ GARAGE	
LM107	498	1:36:00 PM	3:12:00 PM	15.7	M-F		50	NO		
JS102	498	3:25:00 PM	4:42:00 PM	24.94	M-F		55	YES	BACK @ GARAGE	
LM001	499	6:18:00 AM	7:17:00 AM	16.05	M-F		48	NO		
HV005	499	8:04:00 AM	9:18:00 AM	17.65	M-F		37	YES	BACK @ GARAGE	
LM101	499	1:36:00 PM	3:06:00 PM	21.43	M-F		55	NO		
HV105	499	3:22:00 PM	4:54:00 PM	23.68	M-F		39	YES	BACK @ GARAGE	
LH014	500	6:18:00 AM	7:20:00 AM	12.43	M-F		57	NO		
WS014	500	7:46:00 AM	9:00:00 AM	18.33	M-F		48	YES	BACK @ GARAGE	
LH114	500	1:48:00 PM	3:10:00 PM	10.41	M-F		62	NO		
WS114	500	3:15:00 PM	4:30:00 PM	39.51	M-F		51	YES	BACK @ GARAGE	
LMSP001	501	6:18:00 AM	7:17:00 AM	14.51	M-F		7	NO		
JSP002	501	7:54:00 AM	9:18:00 AM	28.09	M-F		7	NO		
WKST	501	9:30:00 AM	11:00:00 AM	#N/A	M-F		7	YES	BACK @ GARAGE	nothing matched in Total Mileage by Route
LMSP102	501	1:36:00 PM	2:51:00 PM	18.03	M-F		8	NO		
JSP102	501	3:23:00 PM	4:36:00 PM	18.66	M-F		7	YES	BACK @ GARAGE	
LH013	502	6:06:00 AM	7:20:00 AM	13.93	M-F		74	NO		
HARK002	502	7:30:00 AM	7:45:00 AM	9.04	M-F		29	NO		
HV010	502	8:08:00 AM	9:12:00 AM	9.94	M-F		49	YES	BACK @ GARAGE	
LH120	502	1:48:00 PM	3:12:00 PM	13.79	M-F		107	NO		
HV110	502	3:25:00 PM	4:18:00 PM	10.01	M-F		48	YES	BACK @ GARAGE	

LH006	503	6:24:00 AM	7:20:00 AM	7.72	M-F		100	NO		
WS010	503	7:53:00 AM	8:30:00 AM	8.81	M-F		47	NO		
CO010	503	8:58:00 AM	9:42:00 AM	9.5	M-F		29	YES	BACK @ GARAGE	
LH109	503	1:48:00 PM	3:13:00 PM	15.45	M-F		67	NO		
WS110	503	3:15:00 PM	3:50:00 PM	6.01	M-F		47	NO		
CO110	503	4:00:00 PM	4:42:00 PM	6.58	M-F		31	YES	BACK @ GARAGE	
LH028	504	6:24:00 AM	7:20:00 AM	10.81	M-F		58	NO		
WS021	504	7:29:00 AM	9:00:00 AM	21.99	M-F		47	YES	BACK @ GARAGE	
LAP004	504	12:36:00 PM	1:48:00 PM	19.84	M-F		8	NO		
LH122	504	1:48:00 PM	3:00:00 PM	12.75	M-F		67	NO		
LHS357	504	3:15:00 PM	5:12:00 PM	33.8	M-F		46	YES	BACK @ GARAGE	
LM003	505	6:18:00 AM	7:20:00 AM	13.29	M-F		52	NO		
WS004	505	7:55:00 AM	8:30:00 AM	8.05	M-F		47	NO		
CO006	505	8:56:00 AM	9:42:00 AM	10.97	M-F		34	YES	BACK @ GARAGE	
LH117	505	1:48:00 PM	3:09:00 PM	12.4	M-F		55	NO		
WS104	505	3:10:00 PM	3:51:00 PM	7.3	M-F		42	NO		
CO106	505	3:55:00 PM	4:48:00 PM	7.01	M-F		38	YES	BACK @ GARAGE	
	506								NOT DELIVERED YET	
	507								NOT DELIVERED YET	
	508								NOT DELIVERED YET	

Columns with asterisks are required

	Type A, Type B, Type C, or Type D						Please provide one of the three options below			For District Use
*Bus Number / Name	*Bus Type	*Spare or Route Bus?	*Year Bus Procured / Age	Model Number	Estimated Bus Replacement Year	Total Yearly Mileage	Weekly Fuel Consumption (Gallons)	Monthly Fuel Consumption (Gallons)	Yearly Fuel Consumption (Gallons)	Notes
EX. CB311	Type D	Route	2020	66C 44A Blue Bird All American-84	2027	3.62	15.4	76.8	921.0	Used as Spare Bus - No Routes
409	Type C	Route	2013		2025					
410	Type C	Spare	2013		2025					
412	Type C	Route	2013		2025					
414	Type C	Spare	2014		2025					
415	Type C	Route	2014		2025					
418	Type C	Spare	2014		2026					
421	Type C	Spare	2014		2026					
422	Type C	Spare	2014		2026					
424	Type C	Spare	2015		2027					
426	Type C	Spare	2015		2027					
427	Type C	Spare	2015		2027					
428	Type C	Spare	2015		2027					
429	Type C	Spare	2015		2027					
430	Type C	Spare	2015		2027					
431	Type C	Spare	2015		2027					
432	Type C	Spare	2016		2028					
433	Type C	Route	2016		2028					
434	Type C	Route	2016		2028					
435	Type C	Spare	2016		2028					
436	Type C	Route	2016		2028					
437	Type C	Route	2016		2028					
438	Type C	Spare	2016		2028					
439	Type C	Route	2016		2028					
440	Type A	Spare	2016		2028					
441	Type A	Route	2016		2028					
442	Type C	Route	2017		2029					
443	Type C	Spare	2017		2029					
444	Type C	Route	2017		2029					
445	Type C	Route	2017		2029					
446	Type C	Spare	2017		2029					
447	Type C	Spare	2017		2029					
448	Type C	Route	2017		2029					
449	Type C	Route	2017		2029					
450	Type C	Route	2018		2030					
451	Type C	Route	2018		2030					
452	Type C	Spare	2018		2030					
453	Type C	Route	2018		2030					
454	Type C	Spare	2018		2030					
455	Type C	Route	2018		2030					
456	Type C	Route	2018		2030					

457	Type C	Route	2018		2030					
458	Type A	Route	2017		2029					
459	Type C	Route	2019		2031					
460	Type C	Route	2019		2031					
461	Type C	Route	2019		2031					
462	Type C	Route	2019		2031					
463	Type C	Route	2019		2031					
464	Type C	Route	2019		2031					
465	Type C	Route	2019		2031					
466	Type C	Route	2019		2031					
467	Type C	Route	2020		2032					
468	Type A	Spare	2019		2031					
469	Type C	Route	2020		2032					
470	Type C	Route	2020		2032					
471	Type C	Route	2020		2032					
472	Type C	Route	2020		2032					
473	Type C	Route	2020		2032					
474	Type C	Route	2020		2032					
475	Type C	Route	2020		2032					
476	Type C	Route	2021		2033					
477	Type C	Route	2021		2033					
478	Type C	Route	2021		2033					
479	Type C	Route	2021		2033					
480	Type C	Route	2021		2033					
481	Type C	Route	2021		2033					
482	Type C	Route	2021		2033					
483	Type C	Route	2021		2033					
484	Type C	Route	2021		2033					
485	Type C	Route	2022		2034					
486	Type C	Route	2022		2034					
487	Type C	Route	2022		2034					
488	Type C	Route	2022		2034					
489	Type C	Route	2022		2034					
490	Type C	Route	2022		2034					
491	Type C	Route	2023		2035					
492	Type C	Route	2023		2035					
493	Type C	Route	2023		2035					
494	Type C	Route	2023		2035					
495	Type C	Route	2023		2035					
496	Type C	Route	2023		2035					
497	Type C	Route	2023		2035					
498	Type C	Route	2024		2036					
499	Type C	Route	2024		2036					
500	Type C	Route	2024		2036					
501	Type C	Route	2024		2036					
502	Type C	Route	2024		2036					
503	Type C	Route	2024		2036					
504	Type C	Route	2024		2036					
505	Type C	Route	2024		2036					
506	Type C	route	2025		2037					Not delivered yet
507	Type C	route	2025		2037					Not delivered yet
508	Type C	Route	2025		2037					Not delivered yet

Bus Number	Column1	Route Number	Total Route Time	Total Route Mileage
Bus Number	409			
409		COD003	2730	10.09
409		COD055	7648	33.23
409		HV SPEC	1754	6.95
409		HK002	2748	11.24
409		ODC101	13100	34.6
409		ODC103	2336	9.33
Bus Number	412			
412		LHSP001	5818	18.44
412		WSSP001	6942	26.96
412		ARM9:302	4000	15.85
412		HK005	3554	14.32
412		LHSP101	6100	21.09
412		WSSP101	7354	26.87
Bus Number	415			
415		CANT001	7712	29.02
415		COSP001	6548	24.13
415		ARM11:15	5912	29.45
415		CANT101	8318	28.73
415		COSP101	5930	22.48
Bus Number	431			
431		LMSP002	1024	3.87
Bus Number	433			
433		COD056	7630	24.09
433		WS MKV A	5512	25.32
433		PR102	5348	27.21
433		OD102	10948	35.21
Bus Number	434			
434		COD006	3400	13.09
434		COD059	7418	40.11
434		LAP003	3842	14.5
434		STFM101	8406	39.52
434		LHS358	8448	38.33
434		LAP104	4948	18.67
Bus Number	435			
435		LAP001	836	3.21
Bus Number	436			
436		COD008	2942	9.6
436		COD058	4100	16.59
436		CO009	4948	19.55
436		HKTOMV	4048	11.16
436		HARK102	2200	7.61
436		PPWM101	11254	48.06
436		CO109	3836	8.68
Bus Number	437			
437		COD005	2424	9.61
437		COD054	7836	34.11
437		PR003	5142	27.63
437		PRD101	4754	27.38
437		LHS356	8448	26.95

437		LAP105	2324	9.06
Bus Number	439			
439		QWCN001	7836	30.4
439		CT003	6254	19.74
439		QHSV101	7918	33.12
439		CT103	4118	12.54
Bus Number	441			
441		PRD001	6142	24.15
441		MV SB AM	4818	22.86
441		PR003B	9406	47.58
441		BSMT1001	13754	52.91
Bus Number	442			
442		LH022	4548	11.76
442		CTSP001	6848	24.35
442		OD105	9548	36.11
442		CTSP102	6812	25.05
Bus Number	444			
444		LM017	4918	13.28
444		WS003	3430	7.43
444		CO004	4024	12.54
444		LM117	6524	15.59
444		WS103	2812	6.09
444		CO104	3748	12.31
Bus Number	445			
445		LM021	6148	18.05
445		WS023	4406	14.89
445		CO002	4142	10.02
445		LM121	6148	16.42
445		WS123	3424	11.99
445		CO102	4424	8.41
Bus Number	448			
448		STM001	5912	19.44
448		WS012	3142	7.47
448		CT007	4518	9.24
448		STM101	6800	19.12
448		WS112	2948	8.1
448		CT107	4354	12.6
Bus Number	449			
449		MKV AM	4524	21.69
449		BON AM 2	1530	1.56
449		HVSP002	8330	27.88
449		BHSP101	5248	25.21
449		HKOUT102	1554	4.4
449		HVSP102	9006	32.35
Bus Number	450			
450		HKSPED A	5406	20.73
450		BHS001	3312	14.1
450		HVSP001	4936	17.91
450		LH111	6536	23.11
450		HVSP101	2136	7.56
450		COSP102	3248	13.02
Bus Number	451			

451		WEWS001	7918	30.95
451		CTSP002	7806	28.74
451		WEWS101	11542	43.84
451		CTSP101	6136	22.65
Bus Number	453			
453		LH003	5454	14.48
453		HV002	5518	22.1
453		HK101	2218	7.98
453		HK101B	3312	11.71
453		HS LATE	2606	11.86
453		LH103	6300	15.02
453		HV102	8436	36.57
Bus Number	455			
455		LM015	4454	13.4
455		WS024	4142	11.58
455		CO008	3948	12.58
455		LM115	5600	13.06
455		WS132	2918	9.01
455		CO108	4424	12.36
Bus Number	456			
456		STM004	5924	16.06
456		HV001	5642	19.91
456		STM104	6536	19.73
456		HV101	5136	17.14
Bus Number	457			
457		COD002	3842	14.63
457		STJB001	4506	19.66
457		WS018	4242	14.47
457		CT008	3824	9.93
457		STJB101	7536	26.33
457		WS118	2636	5.86
457		CT108	3530	10.42
Bus Number	458			
458		MVHS002	5418	22.43
458		JSP001	7054	28.24
458		MVHS101	9124	31.97
458		JSP101	5836	21.04
Bus Number	459			
459		LM010	4348	18.1
459		CA002	1048	3.29
459		JS003	5524	15.96
459		CAS101	1236	4.25
459		LM110	4930	11.39
459		JS103	4842	13.65
Bus Number	460			
460		LH029	4330	17.31
460		WS008	3036	10.13
460		CT001	4454	13.2
460		LH129	6318	23.69
460		WS113	2636	7.27
460		CT101	2730	6.84
Bus Number	461			

461		LM005	4100	9.89
461		JS007	4642	12.96
461		LM105	6054	15.08
461		JS107	4018	10.07
Bus Number	462			
462		LM016	3742	10.35
462		HV003	5942	21.59
462		LM116	6100	21.37
462		HV103	4924	18.13
Bus Number	463			
463		LH021	5118	12.62
463		HV009	5754	20.1
463		LH121	4648	12.64
463		HV109	3448	10.56
Bus Number	464			
464		LH001	3724	11.62
464		WS025	5730	18
464		LH101	5248	13.8
464		WS125	5642	17.61
Bus Number	465			
465		LM014	3842	10.86
465		WS030	3100	7.24
465		CT005	4554	13.11
465		LM114	5512	12.94
465		WS130	3242	6.71
465		CT105	3700	10.75
Bus Number	466			
466		LH011	4942	14.52
466		BON AM	2348	9.33
466		WS013	2912	7.68
466		SPRTS002	2600	10.78
466		HKOUT104	1606	4.4
466		WS121	8218	28.07
Bus Number	467			
467		LM018	4836	13.74
467		WS005	2406	4.83
467		CO001	4136	11.94
467		LM118	5842	14.3
467		WS105	2918	5.82
467		CO101	4554	11.72
Bus Number	469			
469		STM003	8206	25.35
469		JS001	6124	24.53
469		PRD12:15	7918	37.97
469		BLS102	3254	13.02
469		STM103	6224	19.49
469		JS101	5318	18.73
Bus Number	470			
470		LM011	4318	12.19
470		WS020	5512	18.59
470		CO012	3306	9.12
470		LM111	6030	15.58

470		WS120	2824	8.15
470		CO112	3118	6.14
Bus Number	471			
471		LH030	5724	16.98
471		WS009	5436	15.16
471		LH130	4712	13.37
471		WS109	4548	13.63
Bus Number	472			
472		LM009	4424	11.66
472		WS027	5000	16.85
472		LM109	6242	20.64
472		WS127	4048	10.09
472		ODC104	2942	11.71
Bus Number	473			
473		LH015	4648	12.04
473		WS007	6300	18.07
473		LH113	5048	13.75
473		WS107	5454	15.54
Bus Number	474			
474		HELP002	4806	15.84
474		WS032	3342	16.85
474		LH128	5336	16.09
474		WS108	3348	11.38
474		CT109	3306	10.48
Bus Number	475			
475		LH026	5930	17.41
475		LHSM001	1818	4.77
475		CA001	2448	3.59
475		HV008	4048	10.53
475		CAS102	1424	4.98
475		LH126	6618	19.38
475		HV108	3918	7.74
Bus Number	476			
476		LH027	4706	17.65
476		WS019	4824	15.07
476		LH127	5454	20.24
476		WS119	4806	12.39
Bus Number	477			
477		LH016	4006	11.28
477		WS001	5800	17.57
477		LH116	4442	10.91
477		WS101	5012	13.98
Bus Number	478			
478		LM022	4736	11.65
478		HV006	5300	15.42
478		PRD RET	5242	30.11
478		LM122	5342	11.69
478		HV106	5312	14.83
Bus Number	479			
479		LH004	4036	10.19
479		WS028	4324	14.73
479		LH104	4424	10.63

479		WS128	3830	13.12
479		MKV WM P	4042	19.51
Bus Number	480			
480		LH007	4700	18.22
480		WS011	4206	11.05
480		CO011	3706	11.11
480		SPRTS001	3054	11.59
480		SPRTS003	2012	9.13
480		WS111	3512	8.26
480		CO111	4054	10.81
Bus Number	481			
481		LM002	4030	9.64
481		HV004	4536	12.89
481		LM102	5706	16.93
481		HV104	3724	9.62
Bus Number	482			
482		STM005	5824	19.58
482		JS005	4924	13.97
482		STM105	6306	25.59
482		JS105	4130	10.94
Bus Number	483			
483		STM006	4754	14.82
483		JS006	4342	10.89
483		STM106	7218	24.49
483		JS106	2612	5.34
483		ODC102	4324	16.4
Bus Number	484			
484		COD001	3324	12.15
484		NAT001	4318	16.2
484		HV007	4648	14.16
484		NC101	6100	19.15
484		HV107	4424	11.02
Bus Number	485			
485		LM103	5918	11.87
485		WS124	4412	12.04
Bus Number	486			
486		LH018	4248	10.33
486		WS006	3536	8.5
486		CO005	4542	15.42
486		LH118	4848	13.22
486		WS106	2736	6.18
486		CO105	3406	6.94
Bus Number	487			
487		LH005	5500	17.3
487		WS015	4642	20.52
487		MV ALD A	5518	28.45
487		LH105	4524	14.4
487		WS115	9624	45.93
Bus Number	488			
488		LHSP002	3848	14.24
488		WSSP002	4618	16.69
488		COSP002	3642	13.67

488		LHSP102	4618	15.08
488		CHA101	2318	10.19
488		WSSP102	3942	14.8
Bus Number	489			
489		LH017	5030	12.76
489		WS016	4006	11.1
489		CO007	3136	9.27
489		LH107	5218	18.83
489		WS116	2754	7.45
489		CO107	3018	6.72
Bus Number	490			
490		LM006	4718	13.9
490		JS008	4230	12.08
490		LM106	6212	14.59
490		JS108	3354	8.3
Bus Number	491			
491		LM008	3712	8.49
491		WS029	3718	11.29
491		CT009	3848	10.72
491		LM108	5642	13.34
491		WS129	2906	8.79
491		OD104	4854	20.08
Bus Number	492			
492		LM012	3848	12.57
492		WS026	3612	9.31
492		CT010	3436	9.61
492		LM112	5406	13.91
492		WS126	3124	7.7
492		CT110	3236	9.34
Bus Number	493			
493		LH019	5030	17.04
493		JS004	6018	18.47
493		LH119	6348	24.64
493		JS104	6142	17.77
Bus Number	494			
494		LM004	4600	10.38
494		WS002	4248	15.05
494		CT004	4324	11.27
494		LM104	5518	18.3
494		WS102	3124	10.61
494		CT104	3754	12.52
Bus Number	495			
495		LH025	4136	9.51
495		WS022	5648	20.26
495		LH125	5306	14.24
495		WS122	5536	18.25
495		LAP103	3536	15.3
Bus Number	496			
496		LH010	7000	20.47
496		WS031	5248	20.17
496		LH110	5718	16.61
496		WS131	5124	18.68

Bus Number	497			
497		LH002	5948	16.86
497		HARK001	3142	15.44
497		WS017	2618	6.47
497		CT006	4536	12.31
497		LH102	4600	12.97
497		WS117	3500	8.63
497		CT106	2800	7.3
Bus Number	498			
498		LM007	6042	17.67
498		JS002	6842	26.64
498		LM107	6854	15.7
498		JS102	5918	24.94
Bus Number	499			
499		LM001	4254	16.05
499		HV005	5148	17.65
499		LM101	6300	21.43
499		HV105	6518	23.68
Bus Number	500			
500		LH014	4330	12.43
500		WS014	5106	18.33
500		LH114	4318	10.41
500		WS114	9406	39.51
Bus Number	501			
501		LMSP001	3742	14.51
501		JSP002	6618	28.09
501		LMSP102	4736	18.03
501		JSP102	4030	18.66
Bus Number	502			
502		LH013	5206	13.93
502		HARK002	2024	9.04
502		HV010	3836	9.94
502		LH120	5748	13.79
502		HV110	3754	10.01
Bus Number	503			
503		LH006	4000	7.72
503		WS010	3512	8.81
503		CO010	3224	9.5
503		LH109	5930	15.45
503		WS110	2648	6.01
503		CO110	3124	6.58
Bus Number	504			
504		LH028	3606	10.81
504		WS021	7100	21.99
504		LAP004	4806	19.84
504		LH122	4642	12.75
504		LHS357	10436	33.8
Bus Number	505			
505		LM003	4836	13.29
505		WS004	3500	8.05
505		CO006	3430	10.97
505		LH117	5436	12.4

505	WS104	3106	7.3
505	CO106	3518	7.01

WS355LR Bus 433 is a late run and the total mileage will depend on who stays after school and needs a ride that day.
Can we say an average of 10 miles?

HK0002B 456
6.85 miles

WS353 461 is again a Late run from WSS and will depend on the number of students that ride on that particular day.
Average 10 miles?

WS356 463 is a WSS Late run/depends on number of students
Avg 10 miles

The same for 471, 476, 477, 479 these are all WSS late run buses two days a week (Wed and Thurs)

WKST 501 is a midday "Workstudy" run that takes special needs students to places to work. The locations change quarterly along with the mileage.
Currently that run is 18 miles.

This will all depend on which businesses are willing to open their doors for students to work there. I would say 18-22 miles