



NYSBIP Webinar Series

Fleet Electrification Planning

NYSERDA Clean Transportation

April 9, 2024



NYSERDA



Agenda

Fleet Electrification Plan Overview:

- What is a fleet electrification plan (FEP)?
- What are the benefits of a FEP?
- How to complete a FEP?
- What does a FEP include?
- What are the FEP steps?



What is a fleet electrification plan (FEP)?

A Fleet Electrification Plan is a roadmap to electrifying a district or contractor's entire school bus fleet by 2035. This includes a comprehensive evaluation of existing fleet operations and depot electrical capabilities. The plan will serve as a guide, or action plan, that identifies and prioritizes recommendations to help fleet owners informed decisions about bus and infrastructure purchases.

What are the benefits of a FEP?

A well-developed FEP provides:

- Role-identification and workforce needs
- Relationship-building with key external partners (utilities, dealers, engineers, operators, funders, AHJs)
- A customized, tangible plan for meeting NYS's electrification requirements with prioritized actions
- A living resource that can easily be updated to account for new technologies or route changes
- A reference document for annual Education Law 3638 reporting requirements

Completing the FEP unlocks:

- \$30,000 in additional NYSBIP Charging Voucher Funds per bus
- Raise vehicle caps for the NYSBIP School Bus Voucher





How to complete a FEP?

NYSERDA provides:

- **Funding** for developing a 'Fleet Electrification Plan' and will cover 50% of costs for contractors, 75% of the costs for non-Priority Districts, and 100% of the costs for Priority Districts
- **Access** to pre-qualified contractors who can develop the plan
- **Administration** to reduce burdens on fleet owners, including direct payment to contractors
- **Review** of deliverables throughout the Plan process to ensure they meet expectations
- **Approval** of the proposed Plan scope and final report to ensure districts receive the resources needed to execute the Plan



How to complete a FEP?

Districts and contractors can also develop the FEP on their own. A qualified engineering partner with electric vehicle and charging experience is highly recommended.

The NYSBIP Implementation Manual includes guidance on the key steps for completing a Fleet Electrification Plan.

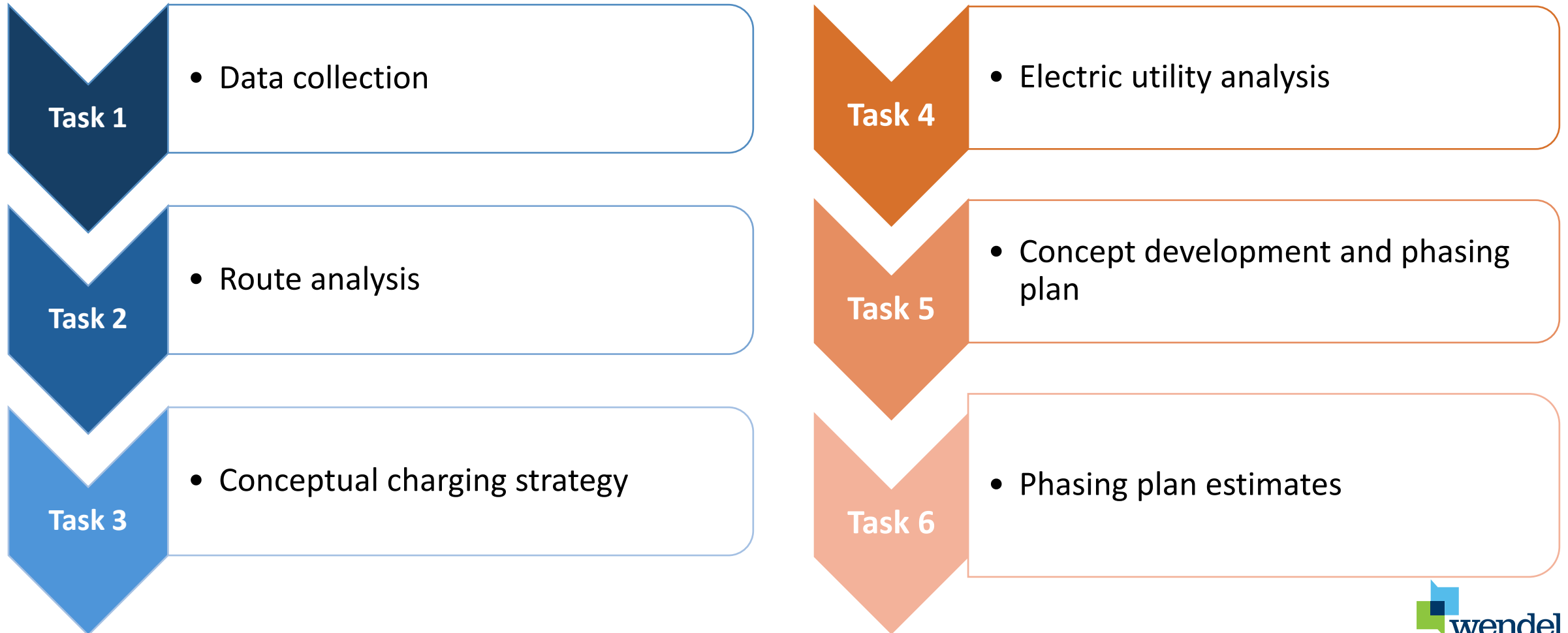
Once completed, it can be submitted to NYSERDA for review and approval to qualify for NYSBIP bonuses.

What does a FEP include?

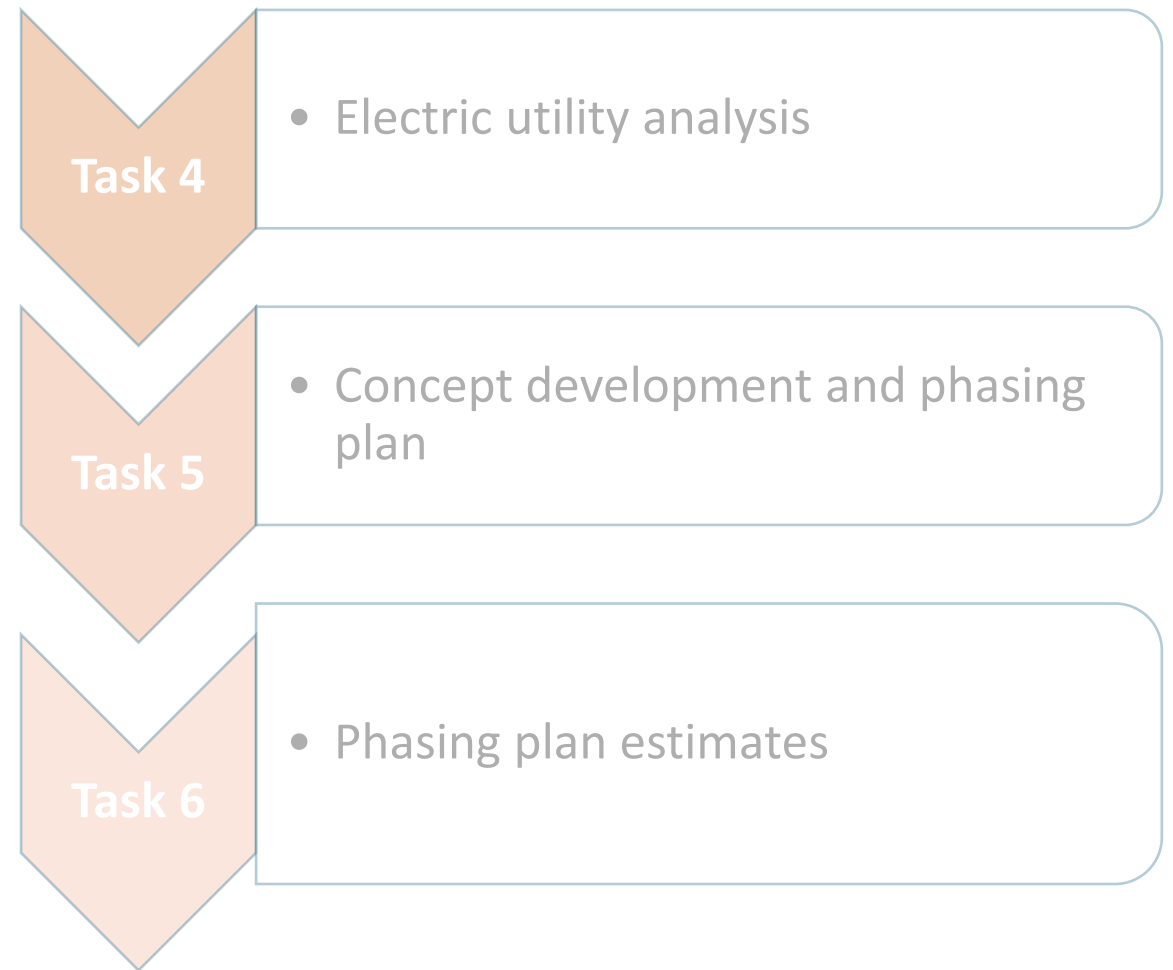
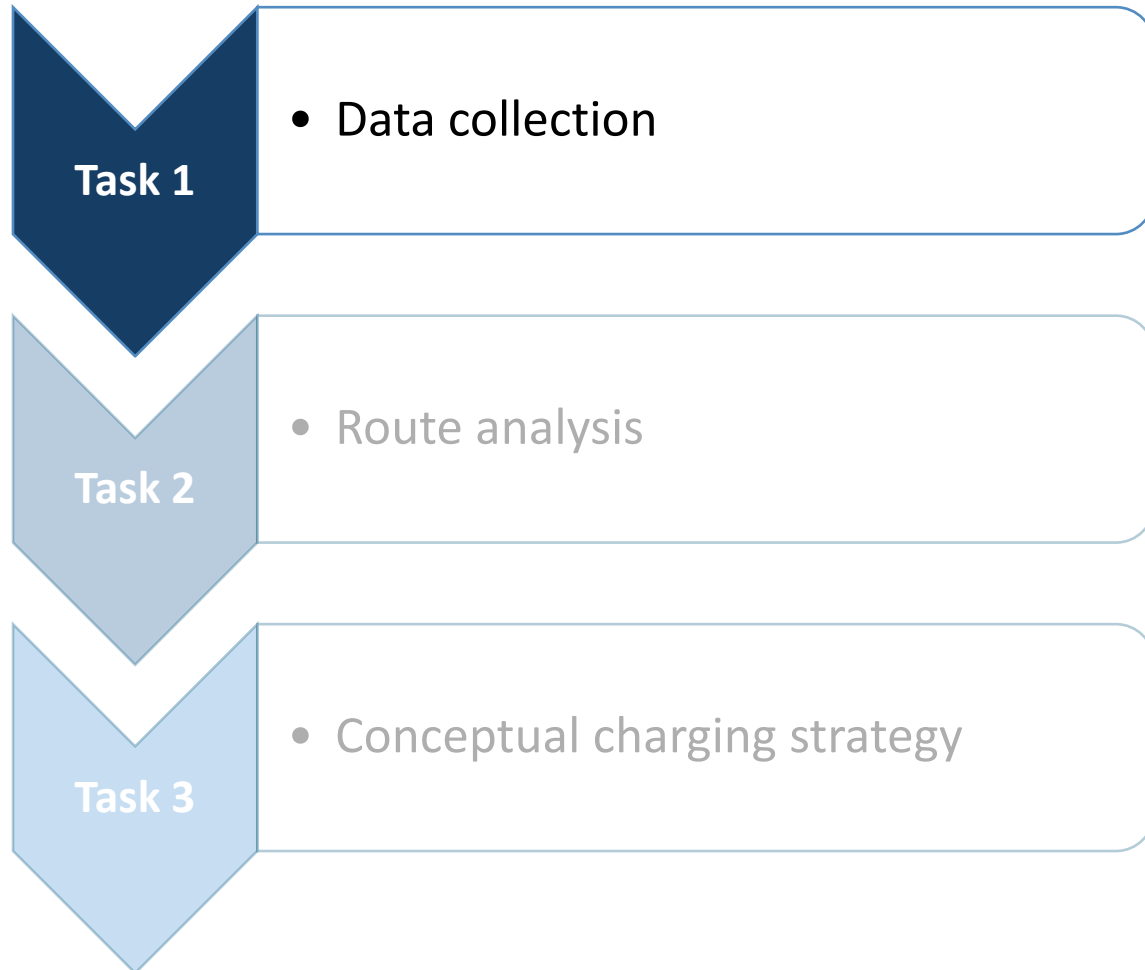
Title	Description
Electrification Goals	An overview of the electric bus assessment and the approach to fleet electrification. This may include the proposed timeline and milestones for electrification.
Route Analysis	Analysis of the time and distance involved in each available bus route, which is necessary to understand the range requirements. The analysis will define the specification requirements (hilly, etc.) for each bus route to provide recommended minimum battery requirements and the total energy required to charge the batteries.
Utility Assessment	An assessment, performed by your Utility, that analyzes your existing grid connection and determines how much additional electrical capacity is required. This assessment will tell you what equipment needs, upgrades, and costs are needed to provide that additional power.
Charging Strategy	Development of a charging strategy that includes Charger power ratings and quantities and preferred times of day to charge. The charging strategy will include identification of demand during on-peak and off-peak times.
Phasing Plan	Development of a phasing plan identifying necessary capital works projects, vehicle replacement plan, and phased plan for Charger Installation aligned with vehicle replacement plan. This phasing plan should include a schedule and transition cost estimate for Utility upgrade/sitework, bus purchases, and Charger purchases, as well as a comparison of operating costs.

What are the FEP steps?

The typical Fleet Electrification Plan consists of the following tasks:



What are the FEP steps?





Data Collection

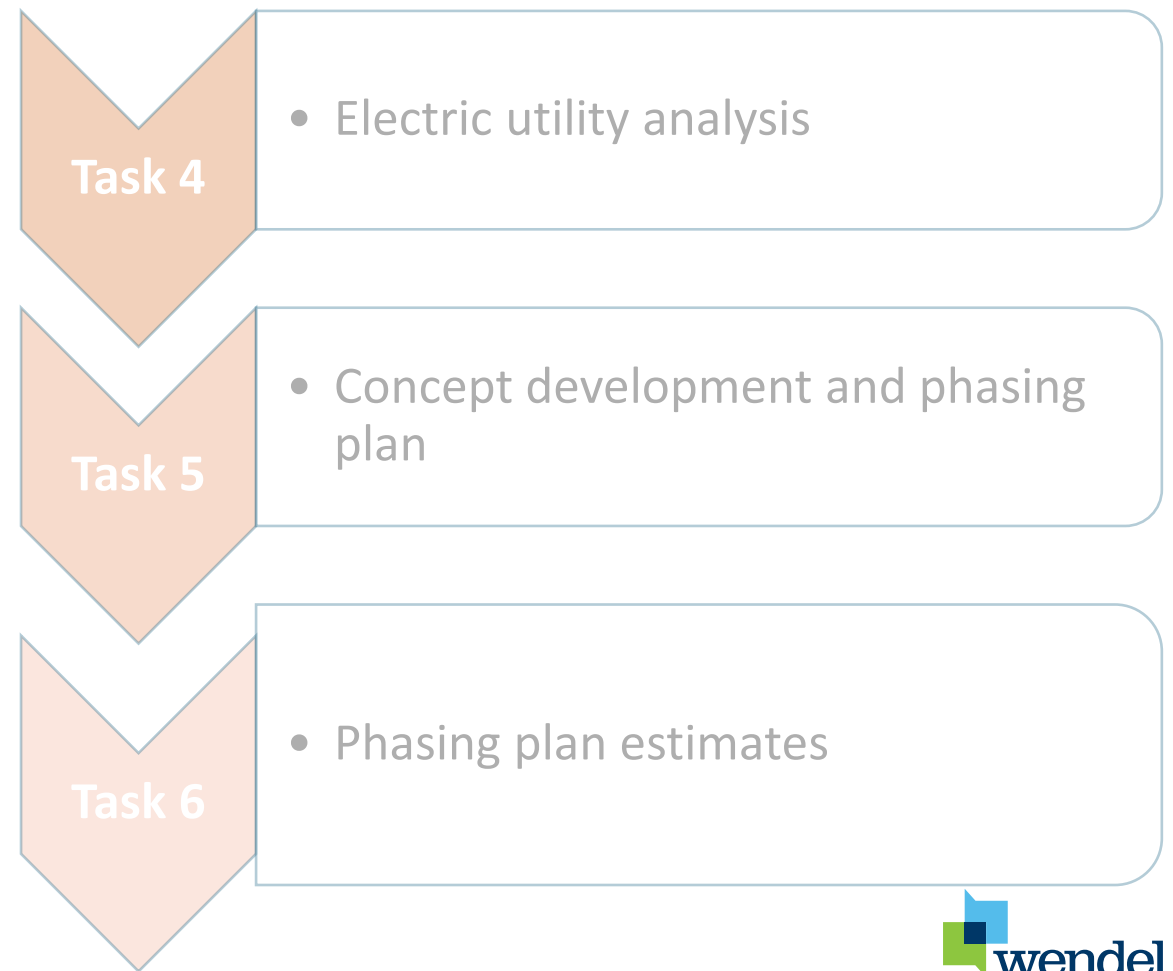
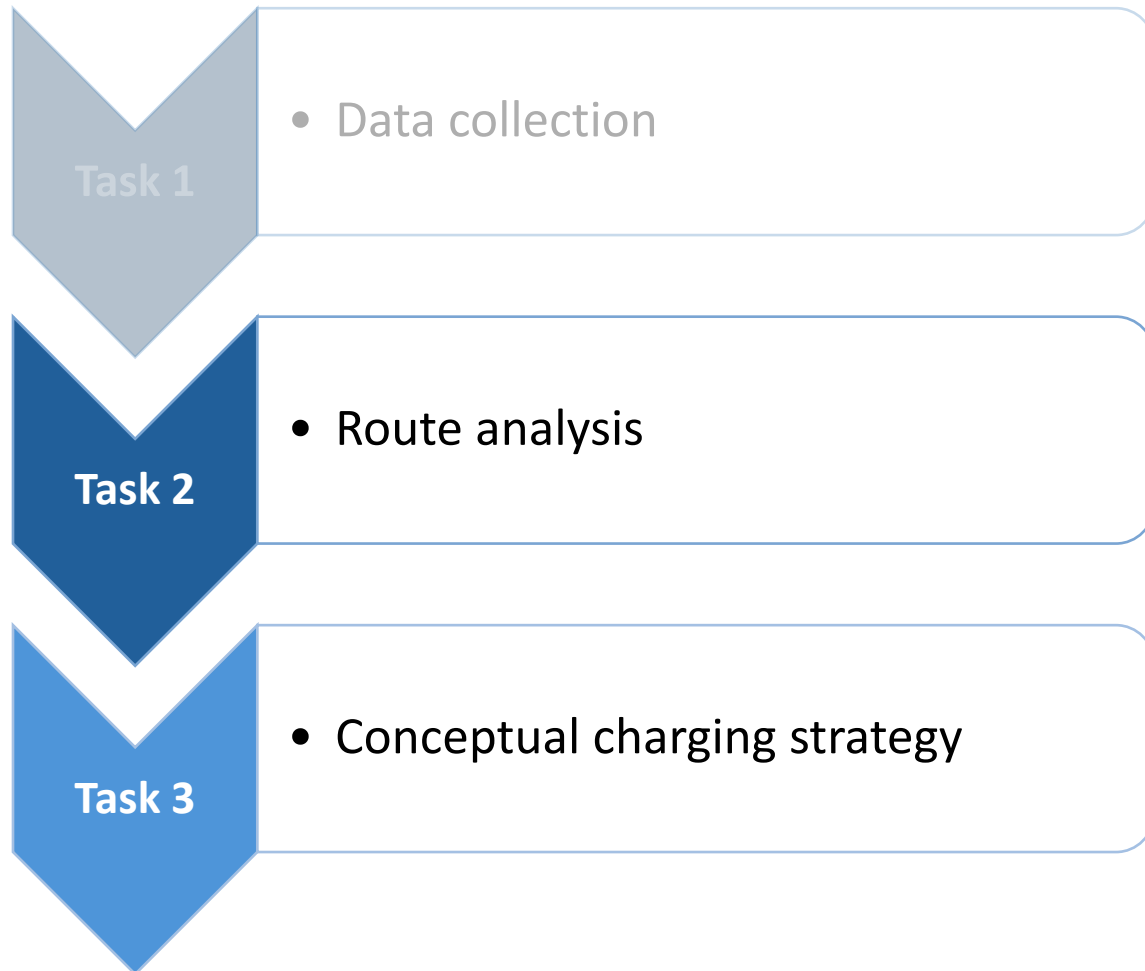
- Fleet Information
- Bus schedules and route data
- Bus parking/storage arrangements
- Fueling
- Bus Maintenance Records
- Utility Data
- Existing school electrical distribution information
- Existing Site Plan



Difficulties with Data Collection

- Lack of a comprehensive list of buses with ages and types
- Lack of replacement schedule
- Snapshot in time – buses are often being replaced/retired
- Fleet size varies based on driver availability. Routes change often
- Receiving routes that are not linear (one route ends at 3:00 PM but “starts” the next route at 2:40 PM)
- Contracted bus routes are often missed
- Routes not received in needed format. We request the start time as the time the bus leaves the depot and the end time as the time the bus arrives back at the depot. We often do not get this

What are the FEP steps?



Route Analysis & Conceptual Charging Strategy

Wendel analyzed current bus route data and determined the anticipated energy requirements per route. These analyses resulted in the following:

- Feasibility of use of electric bus on current routes
- Anticipated energy requirements per route
- Charging requirements
- Minimum battery size requirements
- Minimum charging durations per route
- Peak energy usage impact



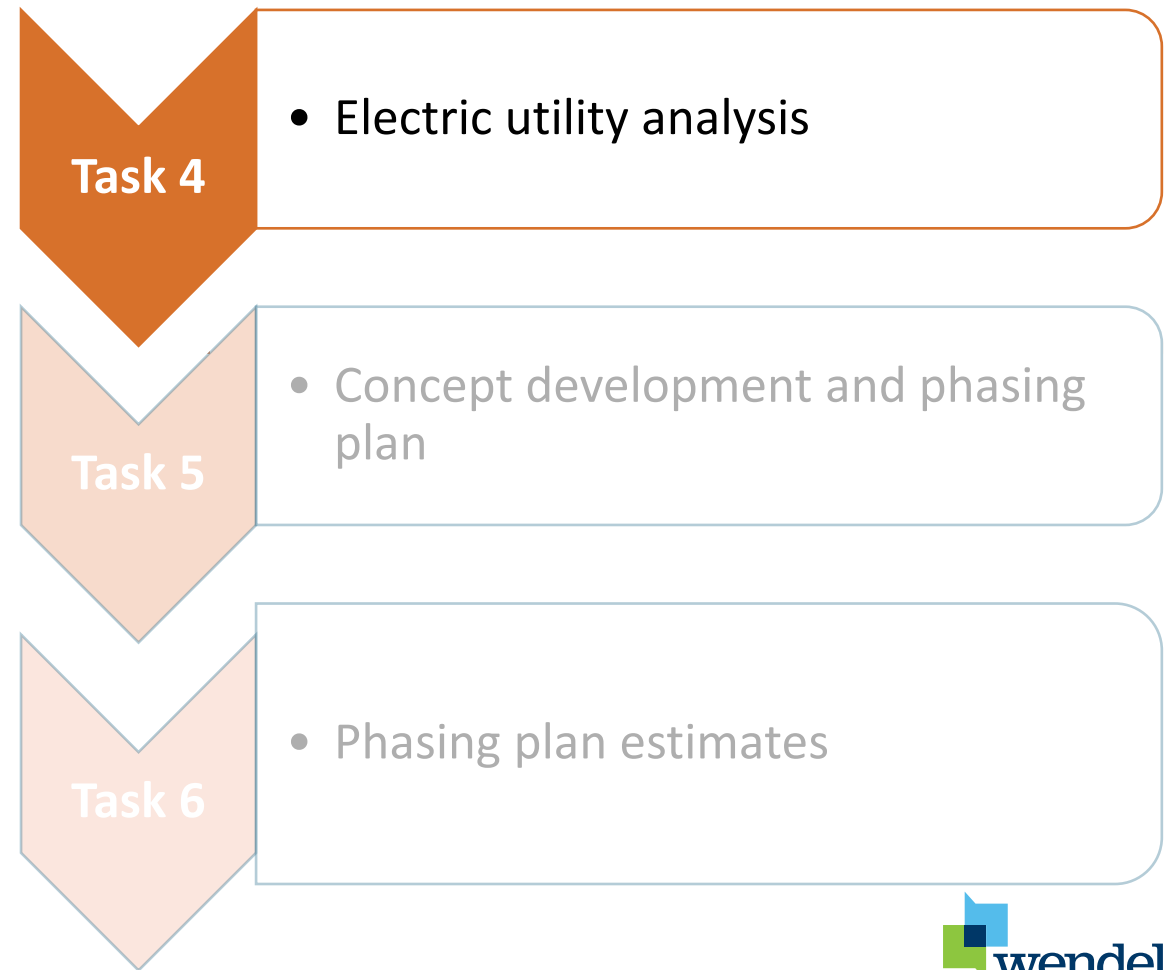
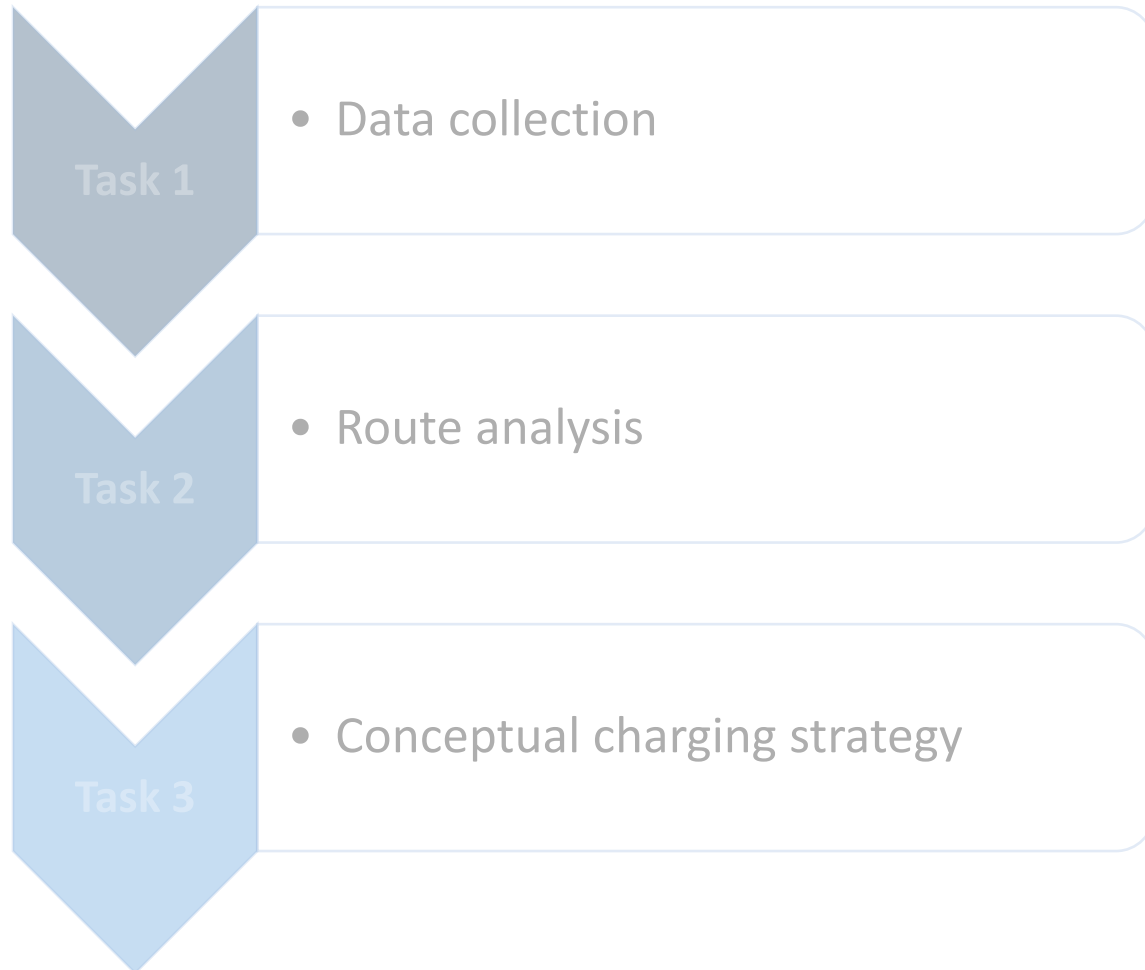
Route Analysis & Conceptual Charging Strategy

		Base Qty	Spare Qty	Total Qty
Chargers	24 kW Charger	6	4	10
	60 kW Charger	2	0	2
	120 kW Charger	2	0	2
		10	4	14
Buses	210 kWh BEB	6	4	10
	315 kWh BEB	4	0	4
		10	4	14

KEY TAKEAWAYS:

- Min battery size requirements = 10 – 210 kWh IC Buses & 4 – 315 kWh IC Buses
- Required charger sizes = 10 –24 kW chargers, 2 – 60kW chargers, & 2 – 120kW chargers
- The maximum combined bus electrical demand when all 10 route buses are converted to BEB's during a winter month was calculated to be 260.3 kW

What are the FEP steps?

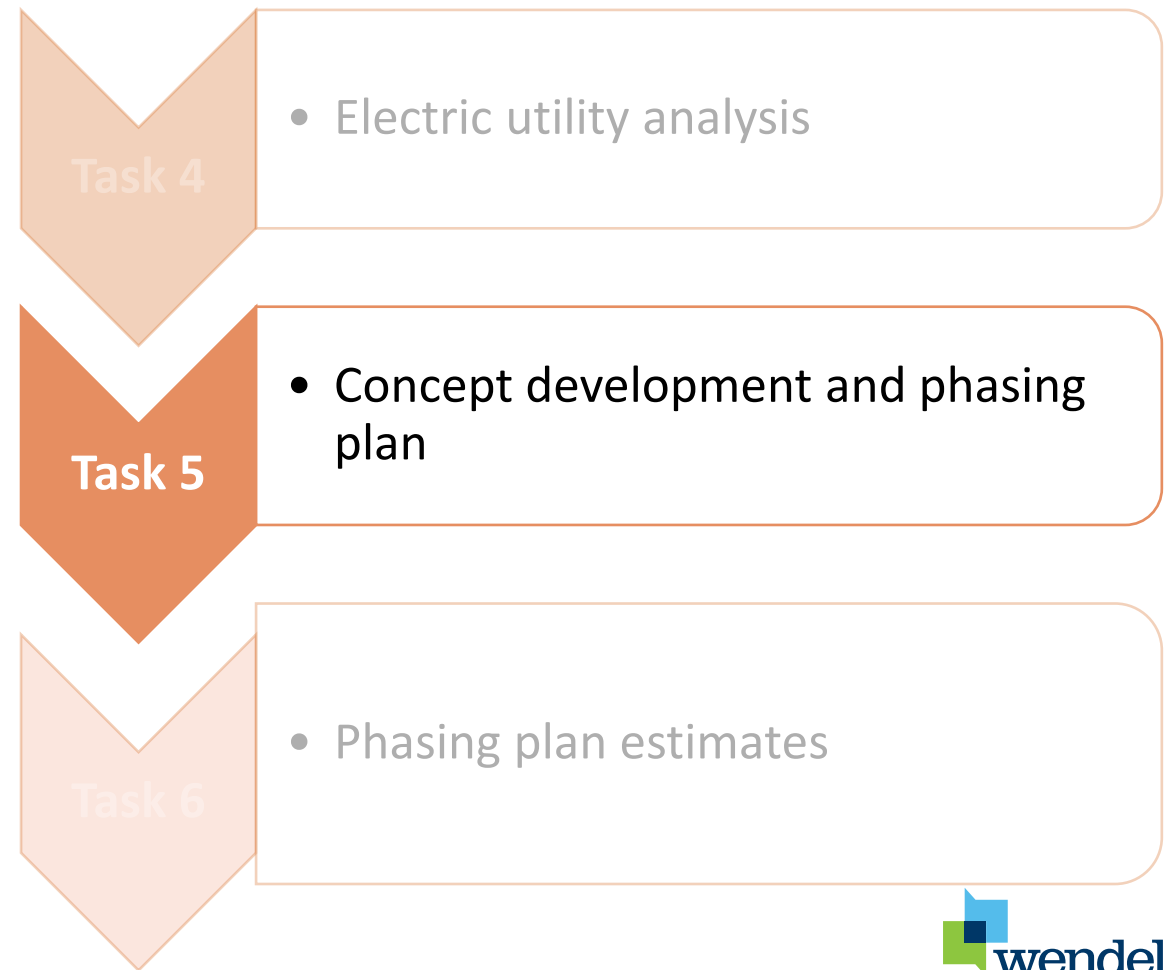
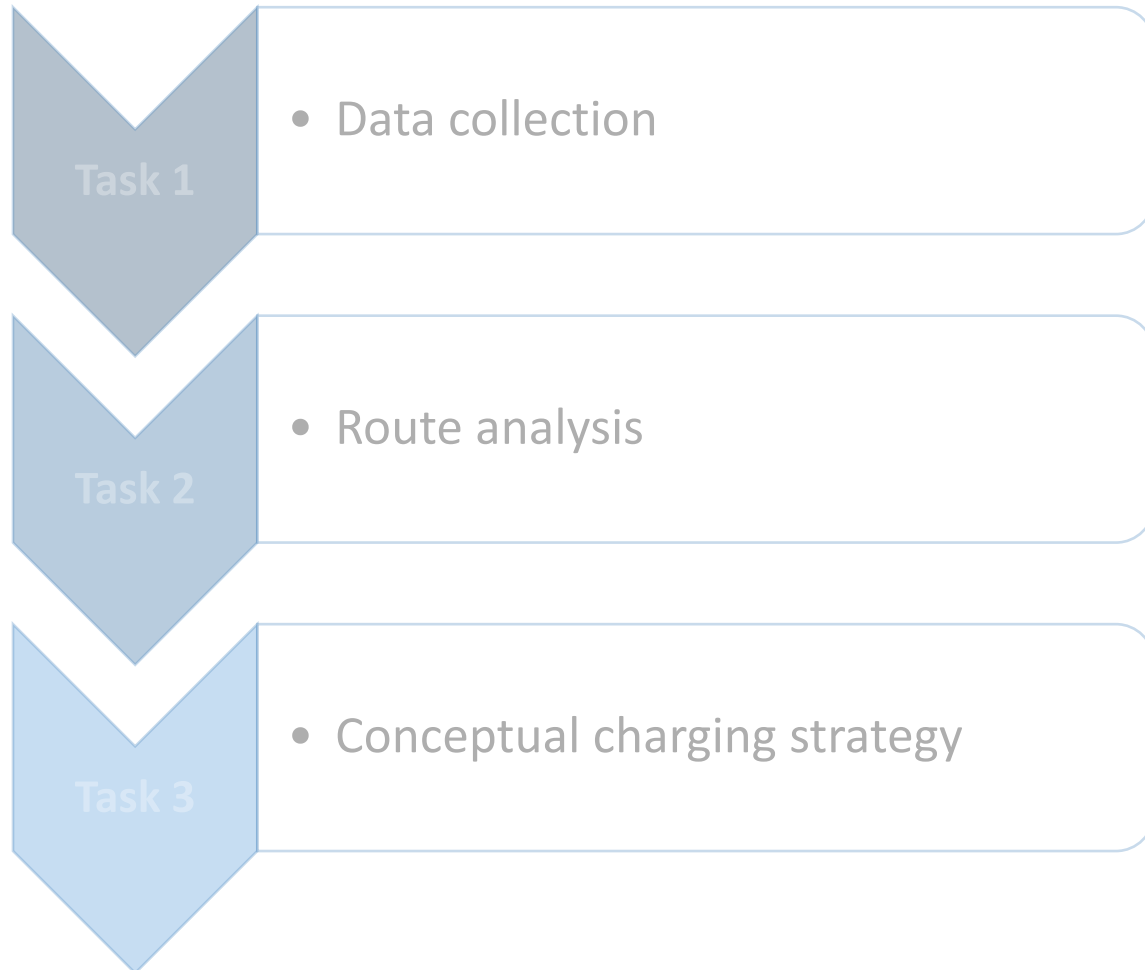


Utility Requirements

- Charging battery electric buses requires additional power from the utility
- The district will require a new service including a new feed and new transformer to get the required power
- The Substation can supply the required power for this project
- There will be costs incurred by the district for utility side upgrades (\$60k - \$80k)



What are the FEP steps?



Maintenance and Charging Considerations for Battery Electric School Buses



Ventilation – A minimum amount required to meet code
Indoor charging – increased ventilation to remove excess heat

Fire Protection – Enhanced fire protection to suppress flames and protect structure for lithium-ion battery fires

Lifting Equipment – Batteries add additional weight to vehicles. Most lifts are still adequate but should be evaluated with specific vehicles

Structural – Enhancements to building structures to handle dispensers, pantographs, cables and conduits



O&M Operating Procedures – Modifications to existing Standard SOP's to handle battery electric vehicles, including fire prevention and safety measures

Phasing & Costs

- Transition plan phases determined by bus procurement schedule and includes 2027 & 2035 deadline dates

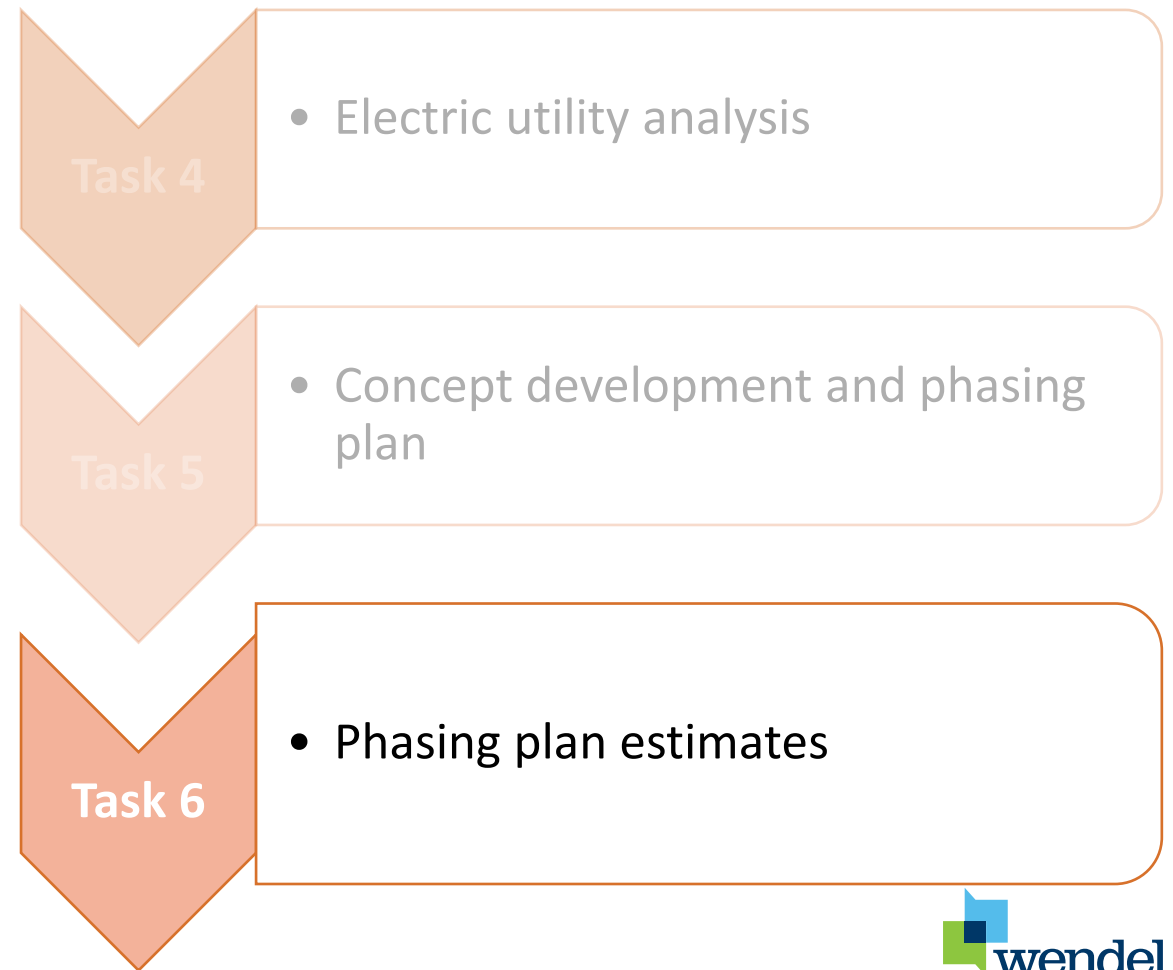
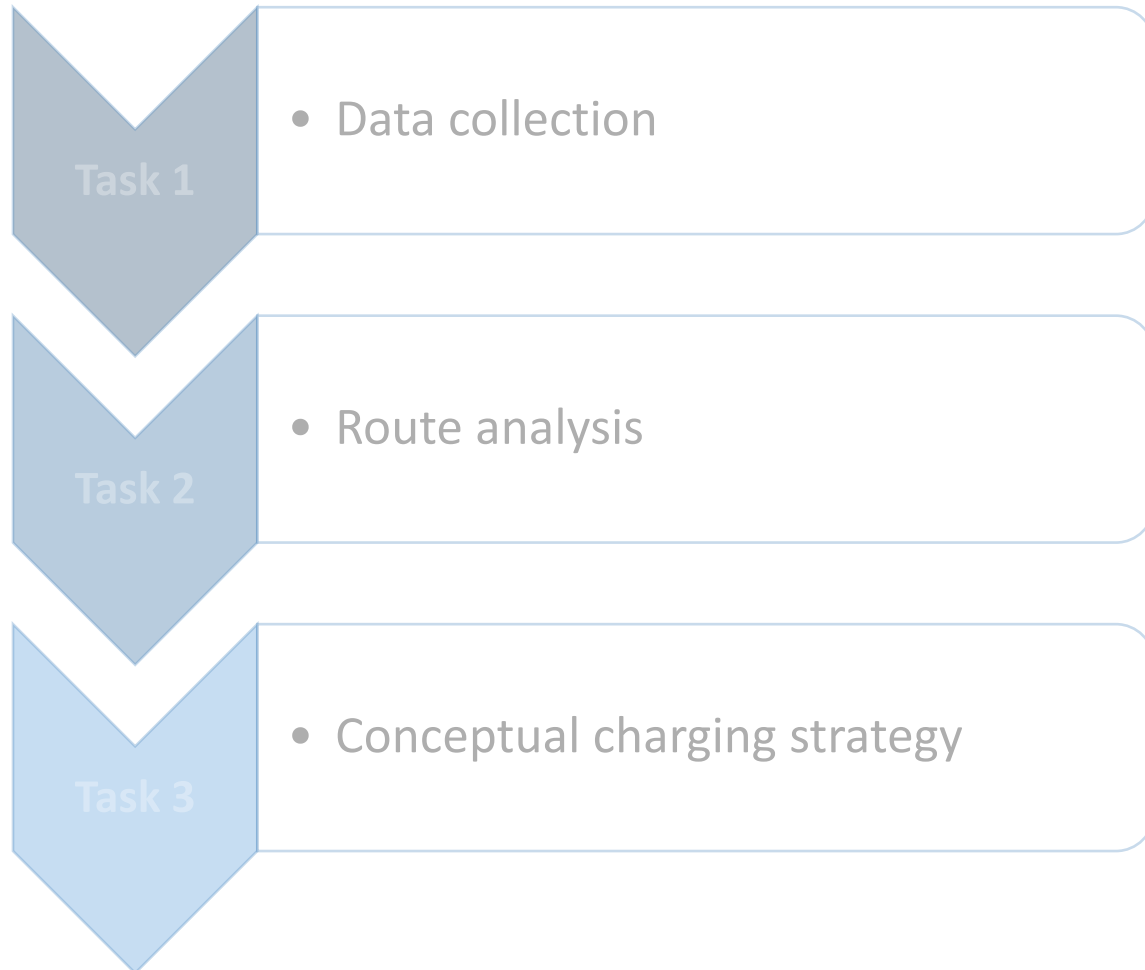
	Existing	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total
Battery Electric Buses Procured	0	0	3	8	9	9	8	6	6	6	4	4	4	0	0	0	0	0	0	67
Battery Electric Bus Fleet Size	0	0	3	11	20	29	37	43	49	55	59	63	67	67	67	67	67	67	67	67

- The bus procurement schedule above was the basis to determine when the phases for Sweet Homes electrical infrastructure upgrades would occur

*The above proposed BEB procurement schedule is subject to change based on available funding

**Sweet Home CSD anticipates procuring their first 3 BEBs through the NYS Truck Voucher Incentive Program (TVIP) in 2023 with delivery in mid to late 2024. The district has also applied for EPA grant

What are the FEP steps?





Phasing & Costs

Temporary Charging Phase - \$960,960

- Phase 0 is the temporary charging phase for the three TVIP buses that are anticipated to be in use for the 2024 – 2025 school year

Phase 1 - \$5,690,540

- New National Grid service required, primary cable trench from new service to power distribution equipment, power feeds, fire protection upgrades, and charging equipment required (34 60kW chargers).

Phase 2 - \$2,346,641

- Additional Power feeds and charging equipment required (20 60kW Chargers).

Phase 3 - \$880,771

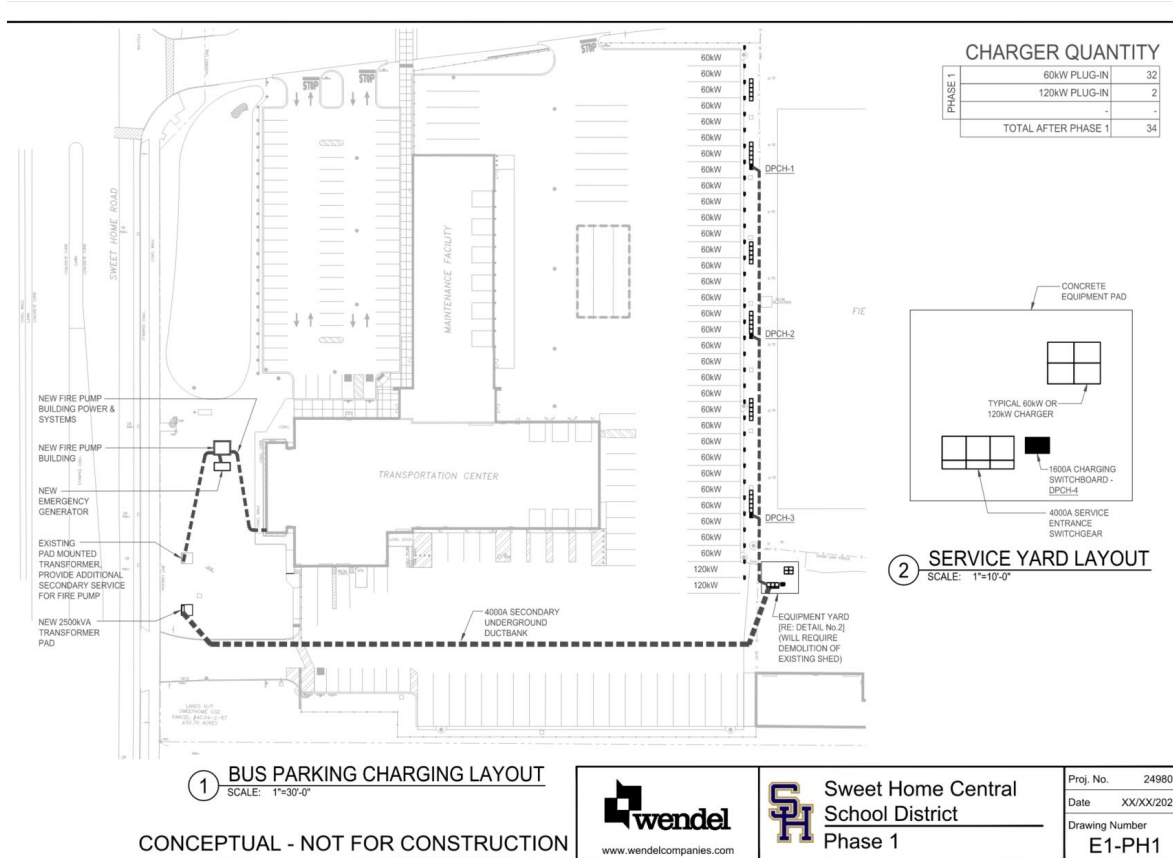
- Additional Power feeds and charging equipment required (8 60 kW Chargers).

Phase 4 - \$1,229,365 (optional for spare buses)

- Additional Power feeds and charging equipment required (5 120 kW Chargers).

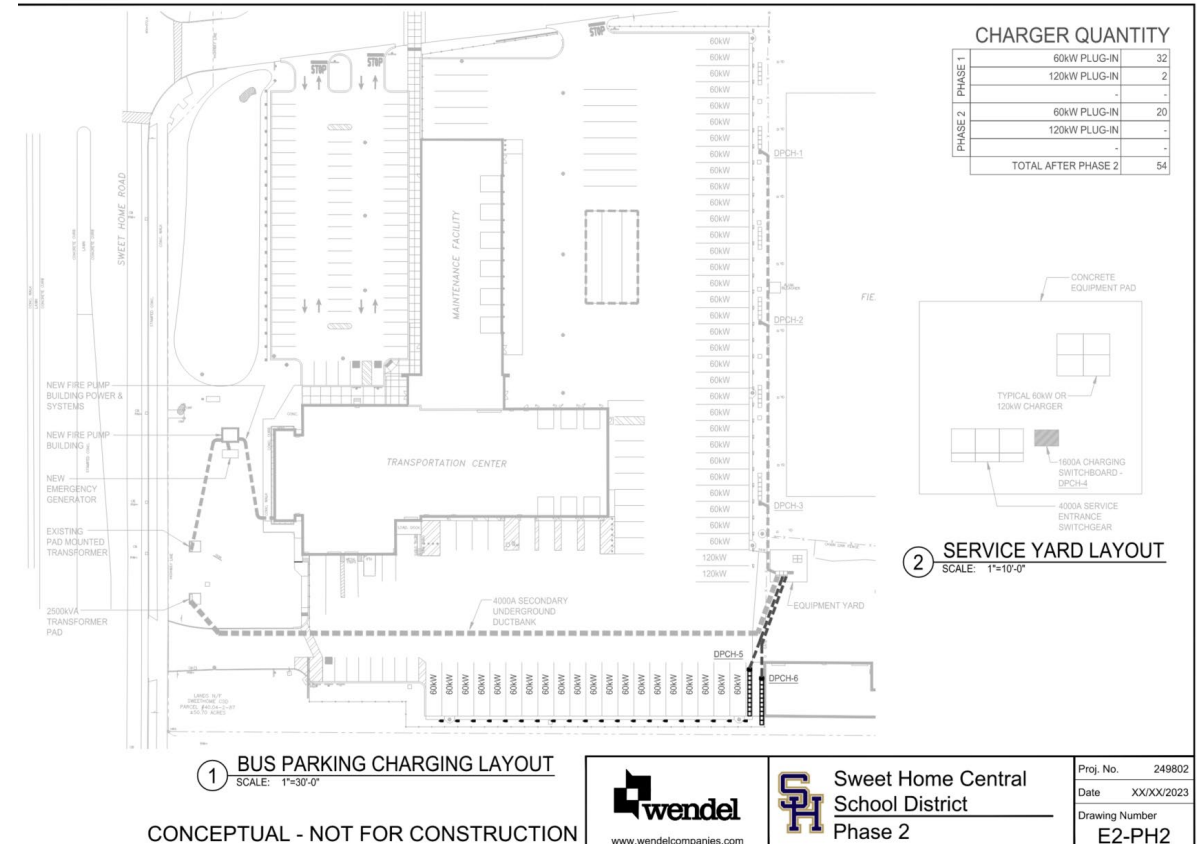
TOTAL All Phases – \$11,108,277

Phasing & Costs



Sweet Home Central School District
Phase 1

Proj. No. 249802
Date XX/XX/2023
Drawing Number E1-PH1

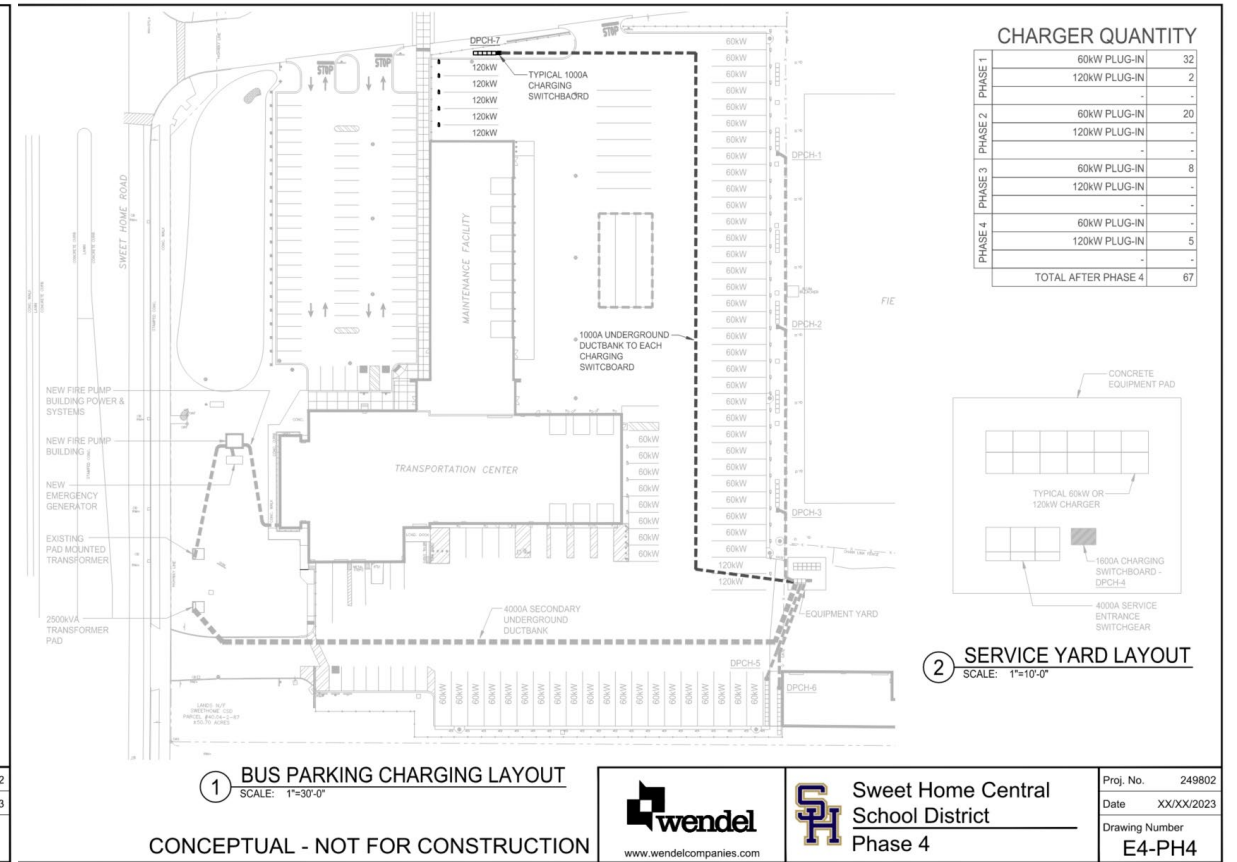
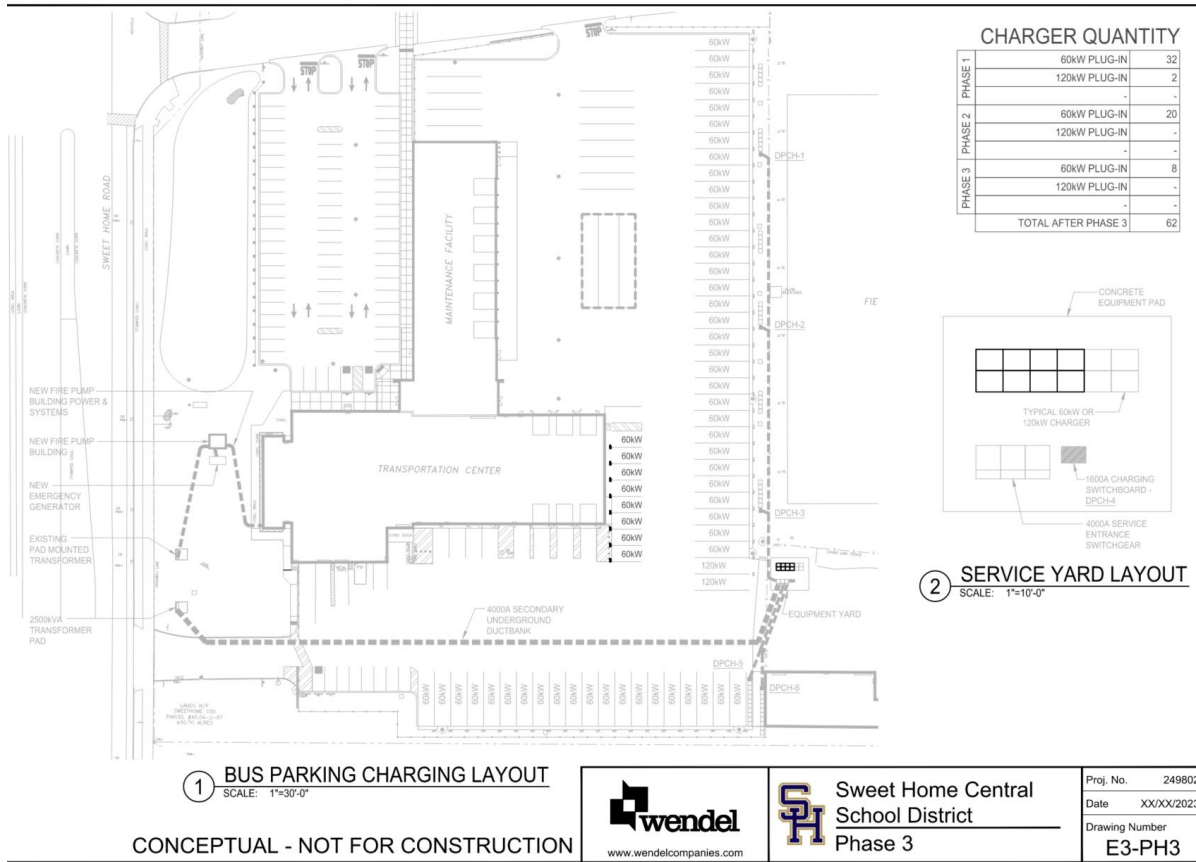


Sweet Home Central School District
Phase 2

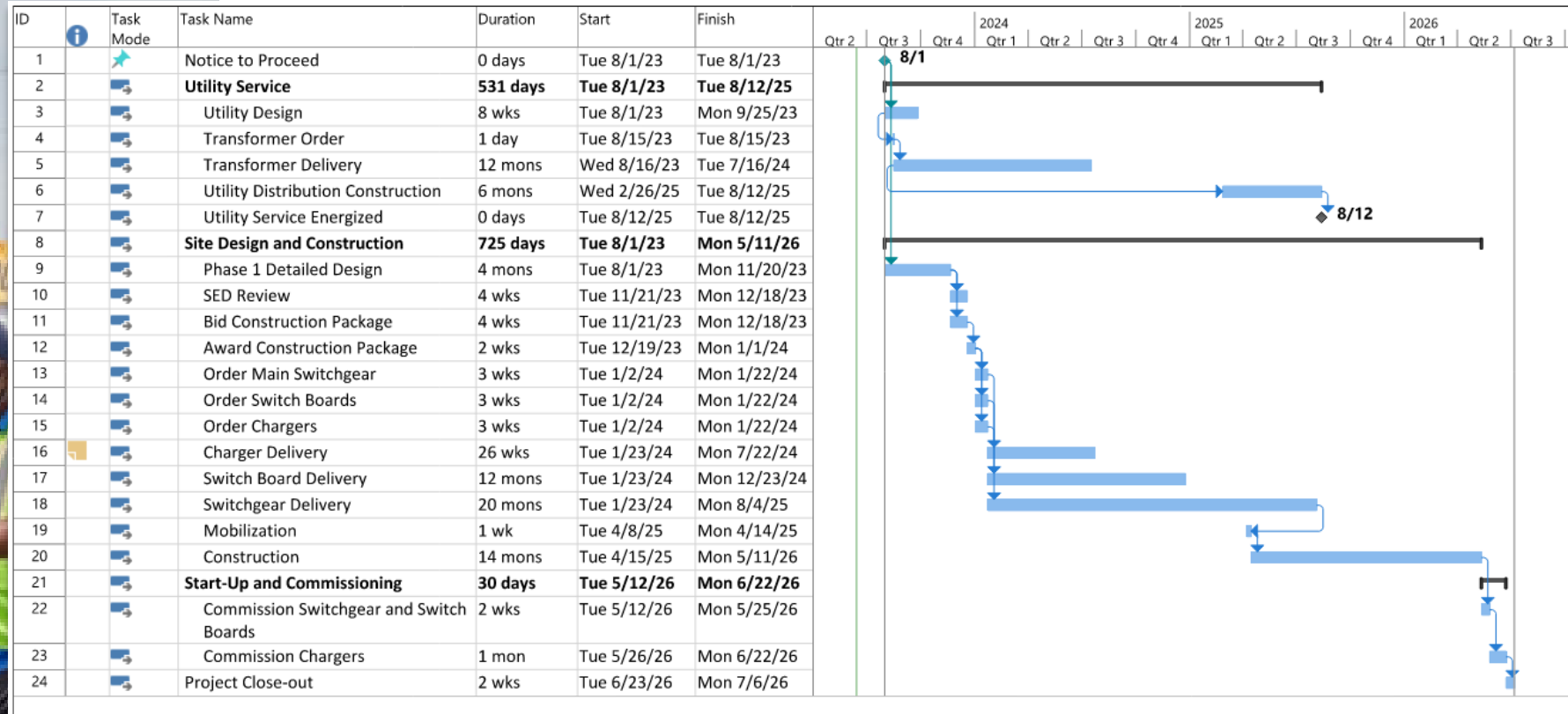
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Phasing & Costs



Next Steps



- Temporary Charging Phase Design and Implementation
- Detailed Design

Frequently Asked Questions

- How long does an FEP take?
- Our FEP is done, what do we do next?
- When do we qualify for the FEP bonus?
- We already did a Route or Fleet Assessment with our bus dealer or Utility, do we really need this?
- We already have a few ESBs, do we really need this?
- What if we have multiple bus depots?
- What if we contract out our bus fleet?





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Thank You!

Contact us: schoolbus@nyserda.ny.gov

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