

ELECTRIC SCHOOL BUSES

AN OVERVIEW OF MAINE'S FLEETS

Introduction

From a quieter ride to reduced emissions, electric school buses offer numerous advantages over their gas and diesel counterparts. An electric drivetrain has a fraction of the parts that an internal combustion bus has, leading to reduced maintenance costs and complexity. Electric school buses are much more efficient, cutting operational costs by 50% or more. They are also significantly quieter and cleaner than a diesel or gasoline bus, leading to better working and riding conditions.

Federal and State decisionmakers are championing the benefits of electric school buses. In 2022, the US Environmental Protection Agency (US EPA) launched the Clean School Bus Program, providing up to \$5 billion in funding to schools nationwide to adopt clean transportation technology like electric school buses. Many of the projects listed in this case study were funded through this program. In addition, the State of Maine set standards for the deployment of electric school buses with the passage of LD 1579 in May 2022. The new law sets a goal for 75% of new school bus acquisitions in the state to be zero emissions by 2035. The Maine Department of Education established the Maine Clean School Bus Program to help with this transition.

Schools across Maine are bringing the benefits of electric school buses to the areas they serve. Electric school buses are being adopted in all parts of the state and in many different types and sizes of communities. Schools have taken a variety of technical and funding approaches to projects. These early deployments are leading by example and will help develop best practices and strategies for other schools to follow.

Baileyville – East Range CSD (AOS 90) & Waite Public Schools

East Range II is in Topsfield and is part of AOS 90. Waite Public Schools uses AOS 90 as their fiscal agent. These schools manage and maintain their transportation internally.

Baileyville



Statistics

Number of Buses	2
Make(s)	Lion Electric
Model(s)	Type C
Mfg. Estimated Range	100
Charger Mfg. & Type	Blink Level 2
Daily Route Miles	Less than 100
Year in service	Awaiting Delivery
Funding source(s)	EPA Rebate

These schools were awarded funding through the EPA Clean School Bus Program in 2022 and received a total of \$790,000 to cover the cost of buses and charging stations. Both schools were prioritized for the EPA Clean School Bus funding because of their rural location. They selected Lion Electric as their vendor for buses and charging stations. Charging station installation is being handled by a local electrician. The schools are using two 19.2 kilowatt Blink level 2 charging stations that can fully recharge a bus overnight and provide a partial top off for midday charging on an as needed basis. East Range has chosen a 71-passenger bus with a 100-mile range, while Waite has chosen a 57-passenger bus with a wheelchair lift that also has a 100-mile range. Both schools have small existing diesel fleets (2 for East Range and 1 for Waite) which means they will be part of small handful of fleets in Maine that are majority electric.

Bingham



Statistics	
Number of Buses	1
Make(s)	Lion Electric
Model(s)	Type C
Mfg. Estimated Range	120
Charger Mfg. & Type	Blink Level 2
Daily Route Miles	40
Year in service	Awaiting Delivery
Funding source(s)	EPA Rebate

Bingham – RSU 83/MSAD 13

MSAD 13 serves the Central Somerset County towns of Bingham and Moscow and hosts students from Pleasant Ridge Plantation, Concord Township and West Forks. The district currently serves approximately 180 students in grades K-12. The district manages and maintains their transportation fleet internally.

The district applied for funding through the EPA Clean School Bus Program rebate in 2022 and was awarded \$395,000 for a bus and charging station. The school was prioritized for the EPA Clean School Bus funding because of its rural location. The school selected a standard Lion type C 70-passenger bus with 120-mile range. They also purchased their charging station through Lion, opting for a Blink brand level 2 19.2 kilowatt charging station that can fully recharge their bus overnight and

provide a partial top off for midday charging on an as needed basis. The charging station will be installed at the high school where they park their bus fleet.


The electric bus will initially be assigned to a lower mileage in town route (40 miles total for a whole day) to evaluate its performance and allow for staff to get familiar with electric vehicle operation. They will explore assigning the bus to transport students to the regional tech center in Skowhegan, a 60-mile round trip, to realize greater operational cost savings. As of early 2023, the school is in the process of installing their charging station and waiting for the delivery of the bus.

Camden – RSU 28/MSAD 28

RSU 28, also known as Five Towns Consolidated School District, serves communities in the greater Camden-Rockport area. There are two schools in the district, a PreK-4 elementary school located on Rt. 90 in Rockport near the high school and a 5-8 middle school located in downtown Camden. The school currently operates 15 conventional buses that it manages in-house. The school has already implemented many other sustainability measures, such as solar energy, and intends to expand their electric fleet to align with their overall goals to make the school more environmentally friendly.

The school purchased their first electric bus, a 71 passenger Lion Type C, in 2022. The school selected a high-power level 2 charging station that can recharge the bus overnight and provided a mid-day top off if needed. The school received project funding through a grant from the Diesel Emissions Reduction Act


Camden



Statistics	
Number of Buses	1
Make(s)	Lion Electric
Model(s)	Type C
Mfg. Estimated Range	100
Charger Mfg. & Type	Level 2
Daily Route Miles	60 (approx.)
Year in service	2022
Funding source(s)	DERA + Local

program funded by the US EPA and administered by the Maine Department of Environmental Protection. The school also partnered with its town government to receive funding from the Community Resilience Partnership. The remaining cost was funded by a 10-year capital lease program through the school. Although the cost minus the grants still is higher than comparable diesel buses, the school is confident that the maintenance and operational savings will offset the cost premium over the vehicle’s lifetime. The school is actively pursuing funding for additional electric school buses.

Castine



Statistics	
Number of Buses	1
Make(s)	Thomas
Model(s)	Saf-T-Liner C2
Mfg. Estimated Range	138
Charger Mfg. & Type	Proterra Level 3
Daily Route Miles	89 (approx.)
Year in service	Awaiting Delivery
Funding source(s)	EPA CSB

Castine – Castine Public Schools
 Castine Public School is part of School Union 93, encompassing the communities


on the Blue Hill peninsula. As of 2022, they operate a single diesel bus with an average daily route mileage of just under 90 miles.

The district applied for funding through the EPA Clean School Bus Program rebate in 2022 and was awarded \$395,000 for a bus and charging station. The school was prioritized for the EPA Clean School Bus funding because of its rural location. For their electric bus and charging station, Castine chose a 72-passenger Thomas Saf-T-Liner C2 Jouley and Proterra level 3 charging station. This charging station can charge the bus in between routes or overnight. Castine will be joining a handful of Maine schools that are operating exclusively electric fleets. As of May 2023, the school is awaiting delivery of their bus and is in the process of installing their charging station. The school has partnered with the town to place the charging station at the town transfer station.

Dayton – Dayton Public Schools

Dayton Public School is in Northern York County, just inland of Biddeford and Saco. While the school manages the bus fleet internally, the buses are stored at a shared facility with Biddeford and Saco. Before acquiring electric buses, the fleet consisted of 5 diesel buses. By replacing 4 of their 5 diesel buses with electric buses, Dayton will have one of the largest majority electric school bus fleets in the state. The district applied for funding through the EPA Clean School Bus Program rebate in 2022 and was awarded \$1,500,000 for buses and charging stations. The school was prioritized for the EPA Clean School Bus funding because of its rural location. Dayton elected to purchase 4 Thomas Built Saf-T-Liner C2 Jouley buses and Proterra level 3 charging stations. They are purchasing two 77 passenger buses, one 72 passenger bus, and one 72 passenger bus with wheelchair lift. The school is working with a local electrician to install their chargers while the buses are on order. The school was able to borrow an electric bus from another school district to test routes and is confident that these electric buses will meet their needs.

Dayton



Statistics	
Number of Buses	4
Make(s)	Thomas
Model(s)	Saf-T-Liner C2
Mfg. Estimated Range	138
Charger Mfg. & Type	Proterra Level 3
Daily Route Miles	60 (approx.)
Year in service	Awaiting Delivery
Funding source(s)	EPA CSB

Mount Desert Island – MDIRSS

The Mount Desert Island Rural School System serves the communities on Mount Desert Island and select surrounding areas. Each school in the district owns their buses, which are managed and stored at a

central shared location. MDI High School, Mt. Desert CSD, and Southwest Harbor Public Schools are the three schools within the district with electric school buses. The High School is the first operator of an electric school bus in Maine.

The school found that their first electric school bus was successful in reducing their operational costs by half during the first year of operation. Winter weather reduced range by up to 22% but this was anticipated and did not affect operation. Additional information can be found in [this case study](#).

Despite a few warranty repairs to the body of the bus, the school decided to purchase two additional Lion buses. The district applied for funding through the EPA Clean School Bus Program rebate in 2022 and was awarded \$1,185,000 for three buses and charging stations. The district was prioritized for the EPA Clean School Bus funding because of its rural location. These additional buses are 71 passenger models with 125 miles of

MDIRSS



Statistics

Number of Buses	1 + 2
Make(s)	Lion
Model(s)	Type C
Mfg. Estimated Range	120
Charger Mfg. & Type	Multiple Mfg. Level 2
Daily Route Miles	80
Year in service	2021 + 2023
Funding source(s)	DERA /Local + EPA

range. The school is installing 24 kilowatt ABB DC Wallbox charging stations. As of early 2023, the school is in the process of installing their charging station and waiting for the delivery of the bus.

Old Town – Cyr Bus Line

Cyr Bus Line provides contracted student transport in northern and central Maine. Their Old Town division was the first private school transportation fleet in the state to go electric and is documented in a [detailed case study](#). Cyr Bus Line has also installed 120 kilowatt solar array to reduce and stabilize their electricity cost.

Cyr Bus Line started with one bus in the summer of 2022. This was the first Thomas electric bus in the state. This bus has provided reliable service with no downtime for repairs. The bus runs an in-town route of 100 miles per day with mid-day charging in

Cyr Bus Line



Statistics

Number of Buses	2
Make(s)	Thomas
Model(s)	Saf-T-Liner C2
Mfg. Estimated Range	138
Charger Mfg. & Type	Delta Level 3
Daily Route Miles	100
Year in service	2022 + 2023
Funding source(s)	DERA + self


winter to offset additional battery power used by electric heat. The company estimates that the bus costs \$0.25 per mile to operate, as compared to a diesel bus at \$0.70 per mile. Cyr Bus Line was so satisfied with the bus that they have recently taken delivery of a second bus and have a third on order.

Pleasant Point - Sipayik Elementary School

Sipayik Elementary School is a tribally controlled school for the Passamaquoddy community near Eastport in Washington County, serving grades K-8. The school currently operates 7 conventional school buses.


The district applied for funding through the EPA Clean School Bus Program rebate in 2022 and was awarded \$1,095,000 for three buses and charging stations. The

Sipayik Elementary



Statistics	
Number of Buses	3
Make(s)	Lion
Model(s)	Type A + Type C
Mfg. Estimated Range	75 + 100
Charger Mfg. & Type	ABB Level 3
Daily Route Miles	TBD
Year in service	Awaiting Delivery
Funding source(s)	EPA CSB

RSU 13



Statistics	
Number of Buses	1
Make(s)	IC
Model(s)	Type C
Mfg. Estimated Range	135
Charger Mfg. & Type	InCharge Level 2
Daily Route Miles	70
Year in service	2022
Funding source(s)	DERA + Local

school was prioritized for the EPA Clean School Bus funding because of financial need. They are purchasing two 71-passenger Lion type C buses and one 24-passenger Lion Type A bus. They are the first Maine school to order an electric type A bus. For charging stations, the school has ordered 3 ABB 24kW level 3 DC charging stations and is having them installed by a local electrician.

Rockland – RSU 13

RSU 13 serves Rockland, South Thomaston, Thomaston, Owl’s Head, and Cushing. They operate a total fleet of 39 buses with an average route length of 49 miles.

Rockland’s bus is the first IC brand electric bus in the state and features 71 seats. The

RSU 12



Statistics

Number of Buses	2
Make(s)	Thomas
Model(s)	Saf-T-Liner C2
Mfg. Estimated Range	138
Charger Mfg. & Type	Level 3
Daily Route Miles	TBD
Year in service	Awaiting Delivery
Funding source(s)	EPA CSB

210 kW battery delivers a manufacturer’s estimated range of 135 miles on a full charge. Originally outfitted with baseboard heat, the manufacturer has upgraded the bus with a forced air system. The school currently uses a 19.2 kilowatt level 2 charger that can charge the bus overnight while they wait for their 30 kilowatt level 3 charging station to be installed following utility upgrades. The level 3 charging station will allow them to charge the bus about 50% faster. The bus has performed well and received very positive feedback from staff.

Somerville – RSU 12

Located in central Maine, RSU 12 serves the towns of Alna, Chelsea, Palermo, Somerville, Westport Island, Whitefield, and Windsor. RSU 12 currently operates 23 buses that are stationed at schools and drivers’ homes across the district.

The district applied for funding through the EPA Clean School Bus Program rebate in 2022 and was awarded \$395,000 for buses and charging stations. The school was prioritized for the EPA Clean School Bus funding because of its rural location. RSU 12 selected two 81 passenger Thomas Saf-T-Liner C2 Jouley buses. The school chose to use 20 kW level 3 charging stations that do not require three phase power. These charging stations will allow the buses to recharge overnight and top off during the day as needed. The choice of these chargers allowed RSU 12 to avoid extensive electrical upgrades at their parking locations and deploy the project at a lower cost. As of May 2023, the school district is awaiting delivery of their vehicles and installation of their charging stations.

Vinalhaven – RSU 8/MSAD 8

Vinalhaven School is a K-12 public school that serves Vinalhaven island. Purchasing an

Vinalhaven




Statistics

Number of Buses	1
Make(s)	Lion
Model(s)	Type C with Lift
Mfg. Estimated Range	100 Miles
Charger Mfg. & Type	Clipper Creek Level 2
Daily Route Miles	45 to 65
Year in service	2022
Funding source(s)	Local

electric school bus has allowed for the school to offer student transportation again.

Because of the limited geography served, Vinalhaven chose a Lion Type C electric bus with a 100-mile capacity battery pack, the smallest capacity Lion offers in a Type C bus. The 54-passenger bus is also equipped with a wheelchair lift and two wheelchair positions. The school uses a Clipper Creek brand level 2 charging station that can provide up to 19.2 kilowatts of power to charge the bus. Vinalhaven receives all its electricity ¹from wind turbines located on the island, meaning the fuel for the bus is not only renewable but also locally made.

Waterboro



Statistics	
Number of Buses	2
Make(s)	IC
Model(s)	Type C
Mfg. Estimated Range	135 miles
Charger Mfg. & Type	TBD
Daily Route Miles	60-110
Year in service	Awaiting Order
Funding source(s)	EPA CSB

Waterboro – RSU 57/MSAD 57

RSU 57 serves the Southern Maine towns of Alfred, Limerick, Lyman, Newfield Shapleigh, and Waterboro. The school currently operates 70 internal combustion school transportation vehicles that operate an average of 80 miles per day.

The district applied for funding through the EPA Clean School Bus Program rebate in 2022 and was awarded \$790,000 for buses and charging stations. The school was prioritized for the EPA Clean School Bus funding because of its rural location. RSU 57 is purchasing two IC type C buses that seat 71 passengers and have the capability to charge with level 2 and 3 charging stations. The 210-kilowatt hour battery delivers a manufacturer’s estimated range of 135 miles on a full charge. The buses will be equipped with electric heat. As for May 2023, the school is wrapping up infrastructure planning and placing equipment orders.

Wells – Wells-Ogunquit CSD

Wells-Ogunquit Community School District serves the towns of Wells and Ogunquit in York County and provides education for students in kindergarten through grade 12. They currently operate 46 internal combustion transportation vehicles that cover an average of 31 miles per day.

The district applied for funding through the EPA Clean School Bus Program rebate in 2022 and was awarded \$4,345,000 for buses and charging stations. The school was prioritized for the EPA Clean School

¹ <https://www.islandinstitute.org/ii-solution/fox-islands-wind/>

Wells Ogunquit



Statistics

Number of Buses	11
Make(s)	Thomas
Model(s)	Saf-T-Liner
Mfg. Estimated Range	138
Charger Mfg. & Type	InCharge Level 3
Daily Route Miles	TBD
Year in service	TBD
Funding source(s)	EPA

Bus funding because of its rural location. With the purchase of 11 Thomas Saf-T-Liner C2 Jouley 77 passenger buses, Wells-Ogunquit will have the largest electric school bus fleet in the state. These buses will be standard but with the addition of optional air brakes. Wells-Ogunquit is relying on their transportation provider, Student Transportation of America, to manage the project and coordinate the selection and installation of charging stations. As of March 2023, the project is going to use 30 kilowatt level 3 charging stations provided by InCharge. The project may be used to explore vehicle to grid deployment in Maine².

Winthrop – Winthrop Public Schools
Winthrop Public Schools provides K-12 education to Winthrop in Kennebec

County. The school currently provides school transportation with 11 buses.

The district applied for funding through the EPA Clean School Bus Program rebate in 2022 and was awarded \$1,580,000 for buses and charging stations. The school was prioritized for the EPA Clean School Bus funding because of its rural location. The school has ordered four 71 passenger Lion type C buses with 125 miles of range. As of May 2023, the school has received three of the four buses and plans on placing them in service for the 2023-2024 school year. For charging stations, the school chose the ABB DC Wallbox 24 kilowatt level 3 units. This equipment was installed by a local electrician. Once in service, each bus will reduce the school's carbon dioxide emissions by 27,000 pounds.

Winthrop



Statistics

Number of Buses	4
Make(s)	Lion
Model(s)	Type C
Mfg. Estimated Range	125 miles
Charger Mfg. & Type	ABB Level 3
Daily Route Miles	60-70
Year in service	2023
Funding source(s)	EPA

² <https://wgme.com/news/local/proposed-bill-aims-to-lower-cost-of-electric-school-buses-in-maine>

Yarmouth



Statistics

Number of Buses	2
Make(s)	Lion
Model(s)	Type C
Mfg. Estimated Range	100
Charger Mfg. & Type	PowerCharge Level 2
Daily Route Miles	30-50
Year in service	2023
Funding source(s)	SBPP + Local

Yarmouth – Yarmouth School Department

Yarmouth School Department serves the town of Yarmouth in Cumberland County. The school operates 15 buses and 4 minivans to provide school transportation. Yarmouth is also notable for the preference for class D (flat front, transit style) school buses.

The school purchased two 71 passenger Lion type C buses with diesel auxiliary heaters. These buses are also equipped with air ride suspension and air brakes. For charging, the school elected to install two PowerCharge 19.2 kilowatt level 2 charging stations at their depot facility which are sufficient to charge the buses overnight. These buses were funded with a combination of school bus purchase program and local funding.

Summary

Maine is charging ahead with school transportation electrification. With 40 electric buses on order and 12 of those delivered, the state is well on its way to electrifying its school bus fleet. The electric bus fleet also shows a diversity of school bus manufacturers (Thomas, Lion, and IC) – all of which have at least one vehicle in service in the state – and charging station vendors. Additionally, electric school buses are being adopted by all types of schools from rural communities to larger municipalities or multiple-town school districts. The varying needs of these schools are reflected in their choice of bus model and charging equipment. There are also multiple operational models within this group of early adopters with direct school management, contract operation, and transportation provider models represented. Notably, there are several fleets that have transitioned to nearly 100% electric operation. These 15 early deployments of electric school buses will inform future projects by providing models on how to deploy the technology successfully and manage obstacles.