



Alternative Fuel Electric School Bus Panel

Eric Cellar
Energy Services Manager

Ohio Electric Cooperatives

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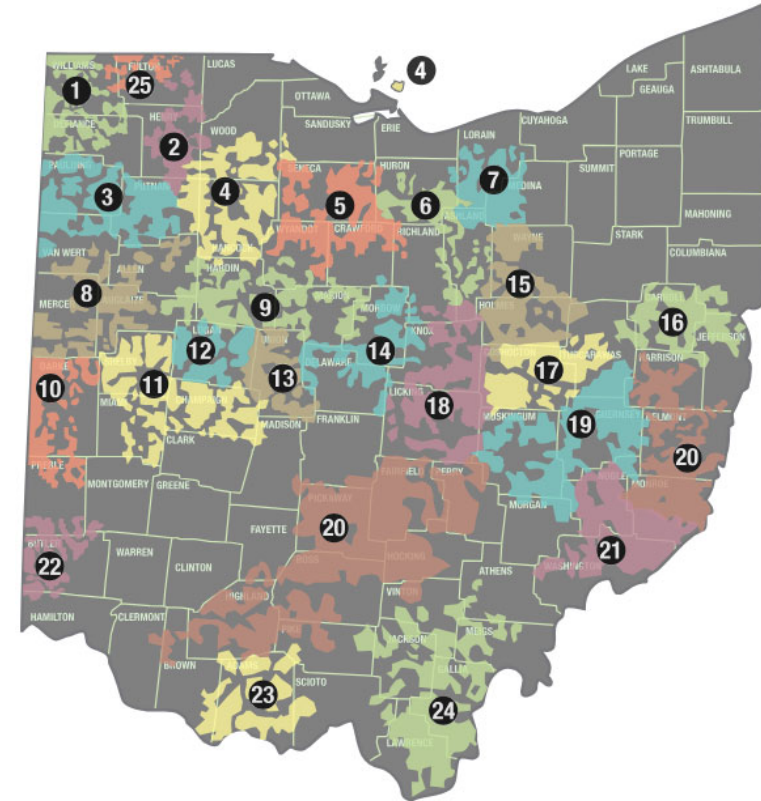
- May 11, 1935 – Pres. FDR - Rural Electrification Administration - expand electric service beyond metro
- 25 electric coops, 380,000 members, 77 of 88 OH counties

South Central Power Company

- 126,000 members
- 24 counties, 11,778 miles of power distribution lines
- Lancaster, OH HQ
- Power, security, and fiber Internet services
- 26 school districts in part or whole, urban and rural

South Central Power Foundation

- Since 2014, \$4.6M in grants to our communities



Coops Partner With Our Communities



Coops Partner With Our Communities



Coops Partner With Our Communities



Typical School Bus Lot – Without EV*

Current Electric “Size”

- Heating, Ventilation & Air Conditioning (HVAC)
 - Small building
 - Seasonal occupancy
 - Not metered with school
- 4+ Outdoor Lights (OL)
- Size may = seasonal home
- ~5-10 kW – Kilowatt
 - Load amount used at one instant
- ~1-2 kWh – Kilowatt Hour
 - Amount used in 1 hour
- ~ 1,100 kWh / month



South Central
Power Co.

* Hypothetical example for illustration only

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Future School Bus Lot – With EV Buses



** Hypothetical example for illustration only*

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Future School Bus Lot – With EV Buses



Potential Industrial “Size”

- ~1,000 kW per EV Charger
- 2 (4?) Buses per Charger
- 10 (or more?) Chargers
- 10,000 kW
 - Vs. ~5-10 kW
- Extremely higher Coop / utility “Cost to Serve” investment, rates



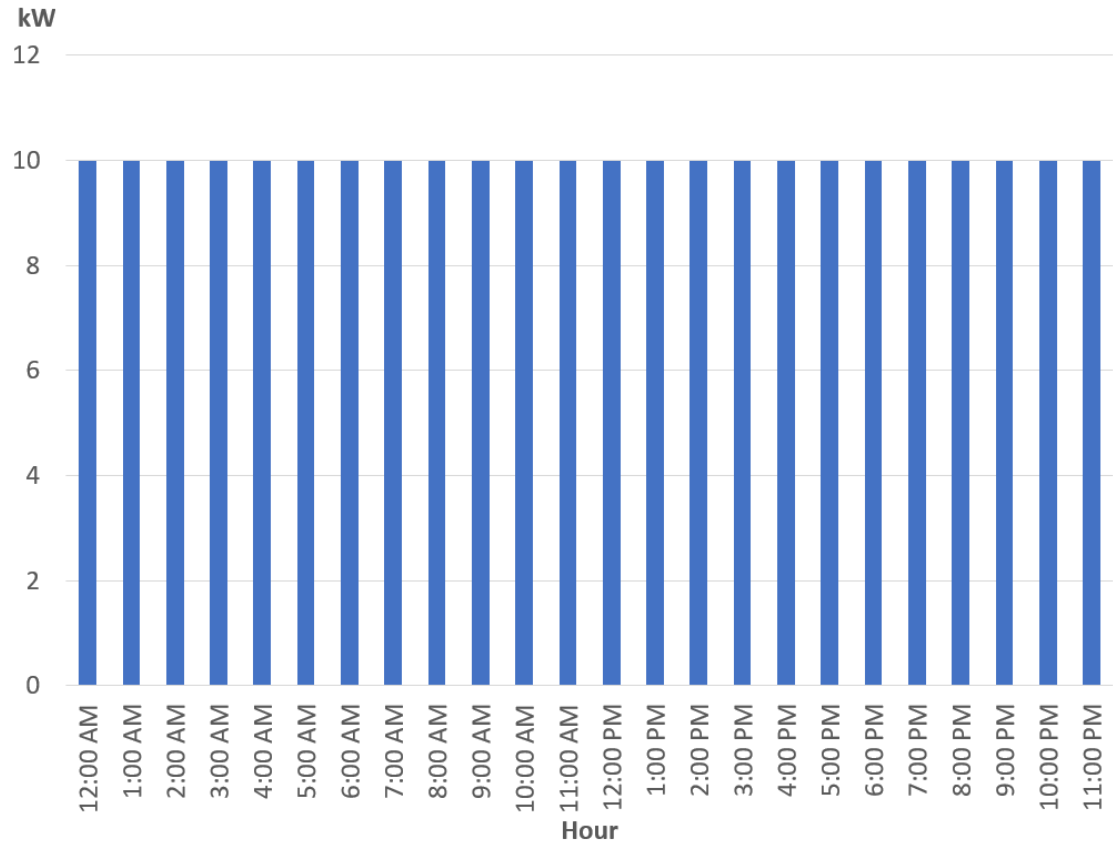
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Current School Bus Lot – Hourly kW

Without EV Buses

- Assumes hourly kW (peak demand) is same every hour of day
- Coop / utility investment to serve is:
 - ~Normal
 - ~Not normal since seasonal usage is not 24x7x365

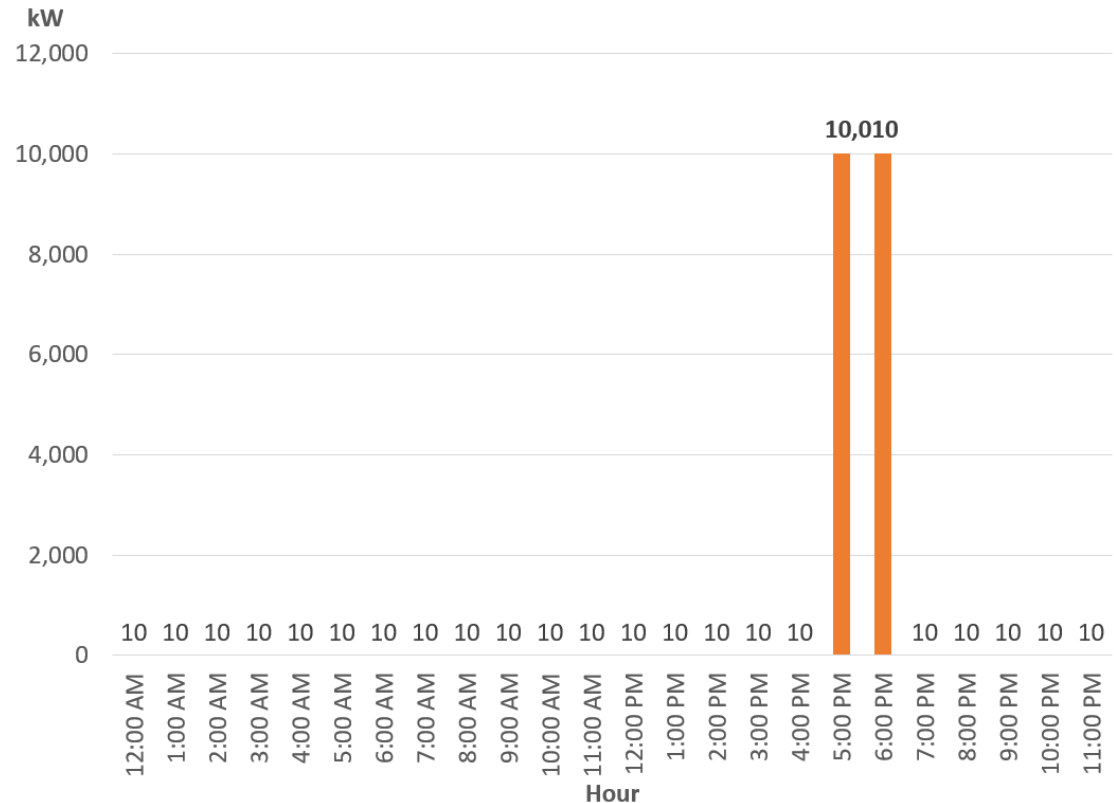


** Hypothetical example for illustration only*

Future School Bus Lot – Hourly kW

Potential Industrial “Size”

- Buses return to garage / lot and charge at same time
- Load is “not managed” with “Plug and Charge”
- 10 kW coop service size explodes to 10,010 kW for only a few hours of day
 - Costs much higher

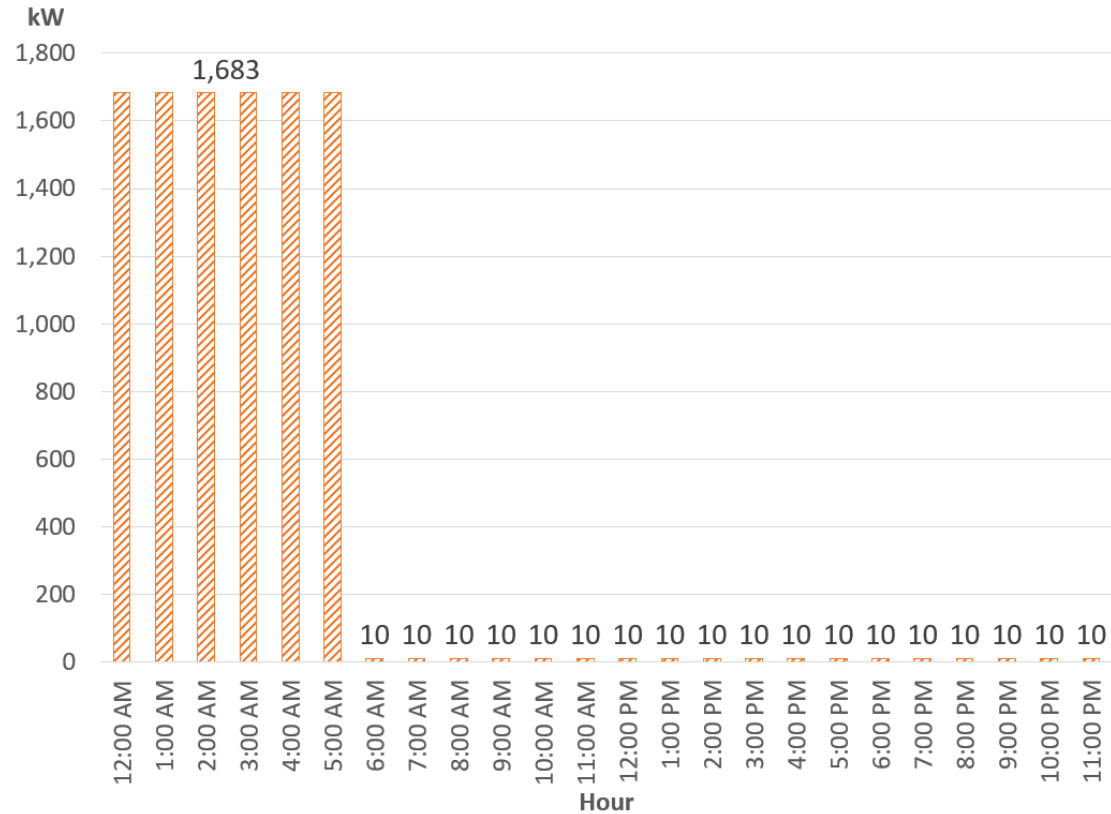


* Hypothetical example for illustration only


Coop Partnership – Load Management

Shift EV Charging from High Cost Hours to Lower Cost Hours

- “Manage” the EV Charger load to recharge during lower cost hours
- Spread charging over several hours
- Potential lower cost EV Charger investment for school and Coop



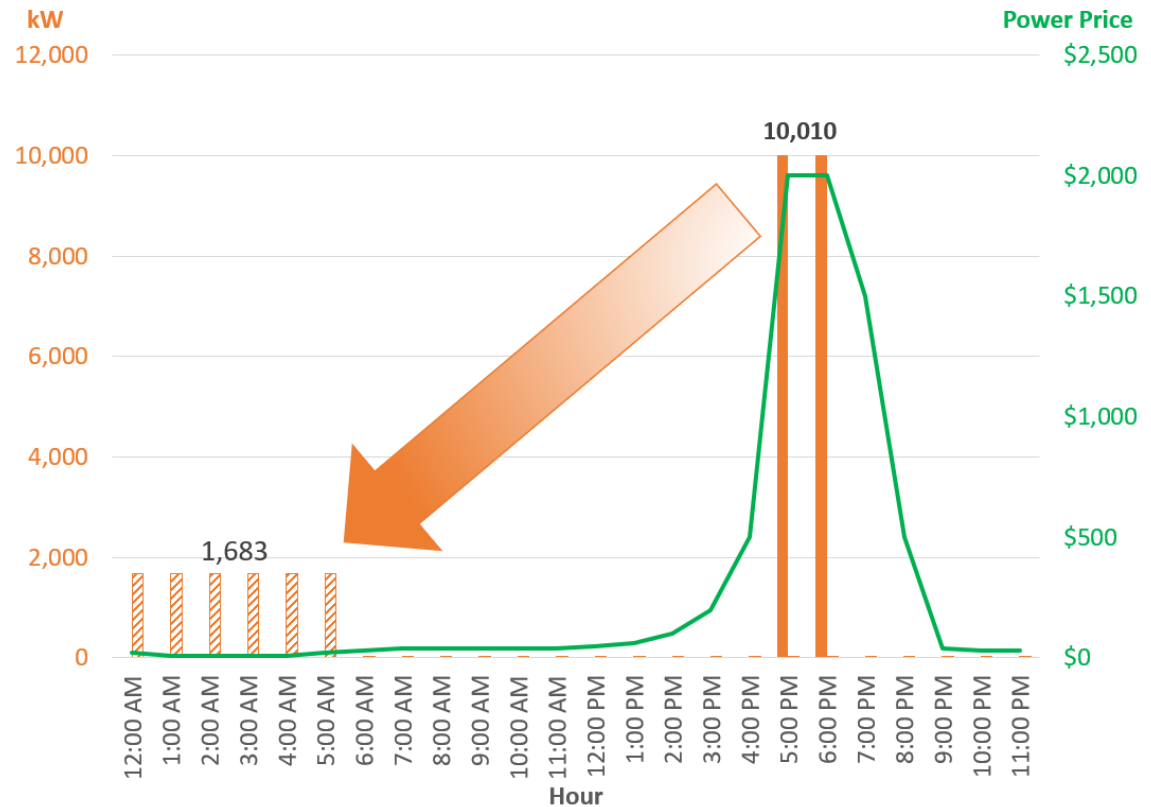
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Partnership – Load Management – Why?

Avoid High Cost Hours

- Significant Coop / utility costs occur during < 1% of the hours
- Innovative Coop load management or rate programs could incentivize
 - “Pay For Performance”
 - “Time Of Use”
 - Other pricing options
- Optimize school ROI with lower EV installation and operating costs



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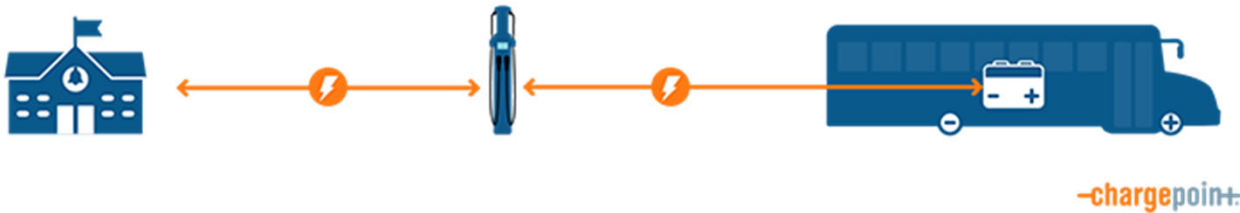
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Partnership - Vision

Bidirectional charging – vehicle-to-grid (V2G)



Bidirectional charging – vehicle-to-building (V2B)



Optimize EV Bus Investment

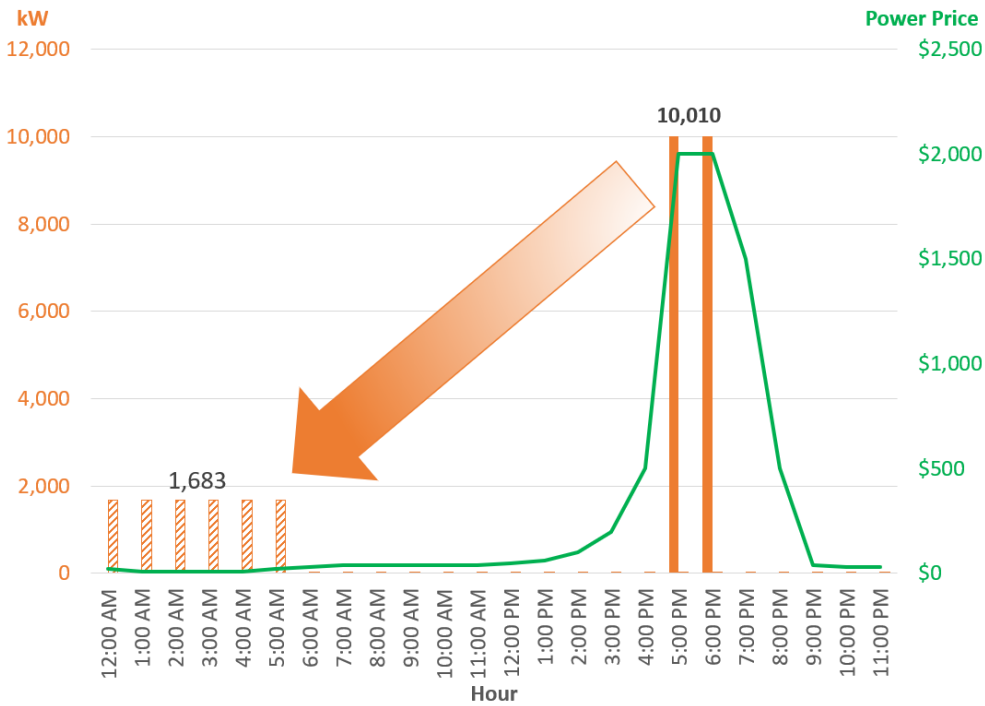
- EV bus = mobile rechargeable battery
- EV bus “Asset” is under utilized during some summer high power cost hours
- Partner with your Coop / utility
 - Coop charges bus battery during cheap hours
 - Coop pulls cheap power from bus battery during high cost power hours
 - Rinse and Repeat
- WIN / WIN SAVINGS!!!



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Coop Partnerships - Summary



Bidirectional charging – vehicle-to-grid (V2G)



Bidirectional charging – vehicle-to-building (V2B)



-chargepoint+





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