ELECTRIC VEHICLE CHARGING STATIONS & EV INFRASTRUCTURE

Bill Chatfield, Director of Operations
Walled Lake Consolidated Schools

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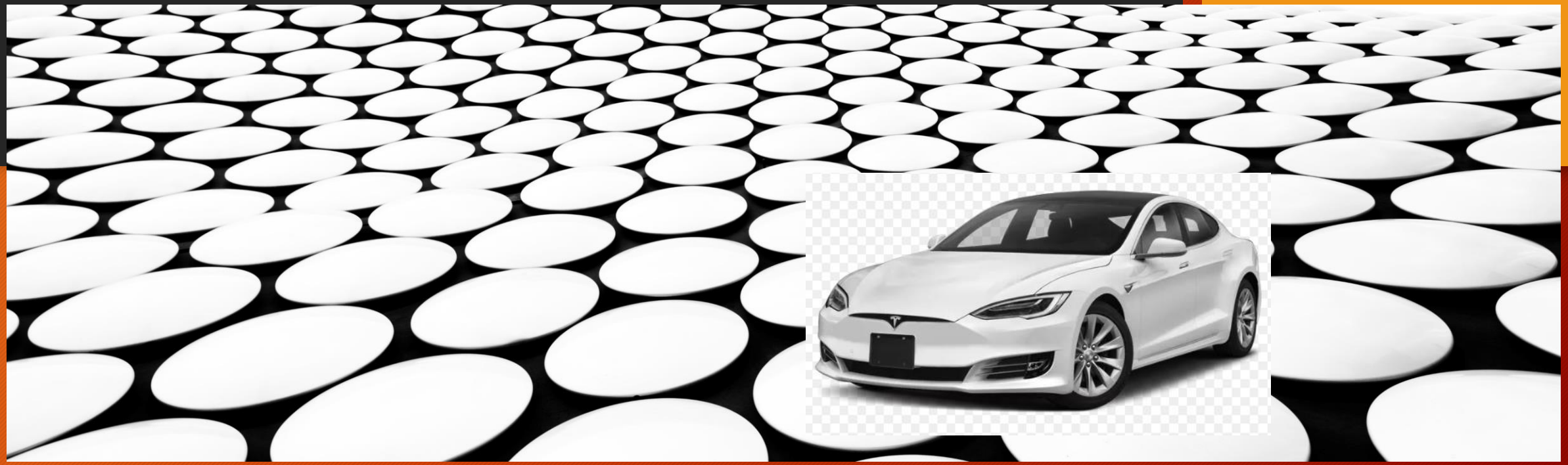
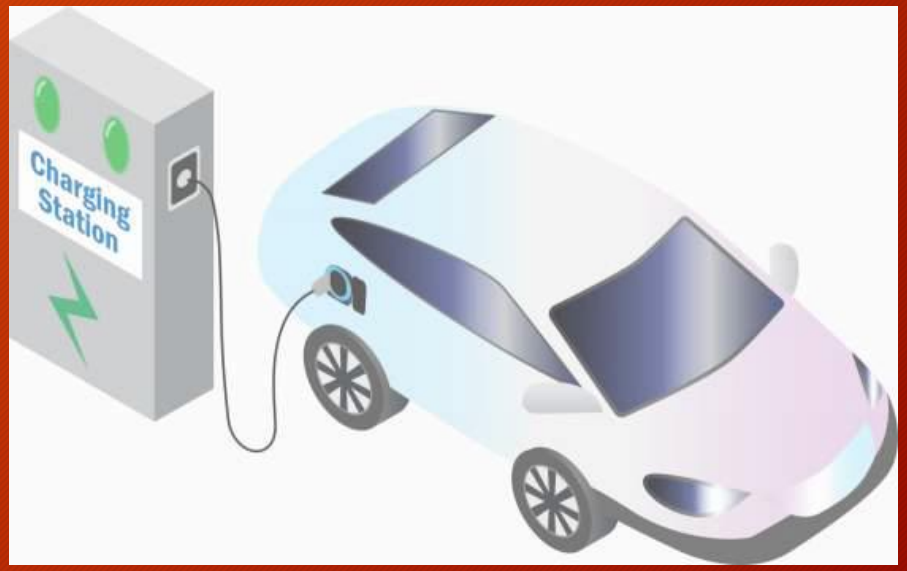
Energy and Technology Innovation Specialist
School District of the City of Pontiac



April 25, 2024

Why do it?

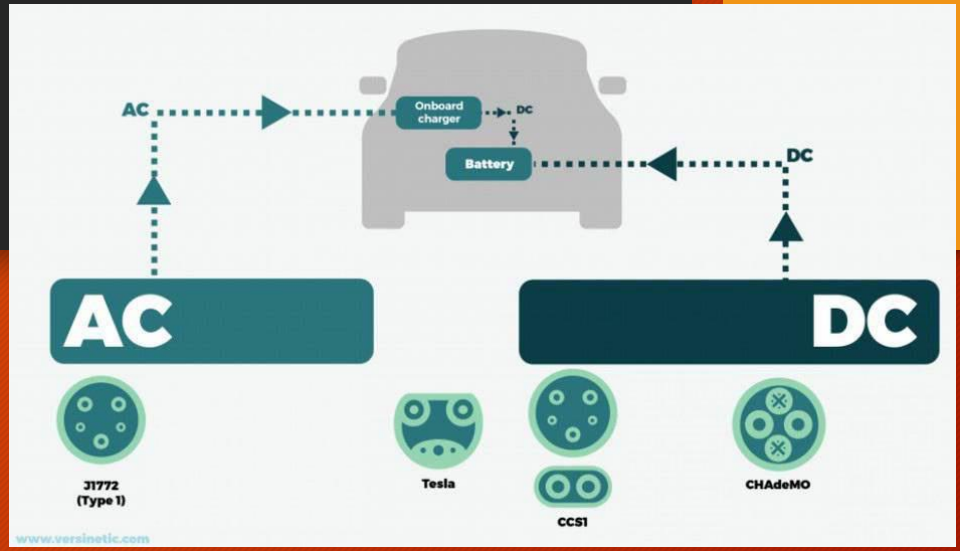
- Convenience to Staff and Community
- Opportunity – Grants
- EV Charging is Inevitable



What Unit to Install?

- AC or DC (Fast) Charger?
- Will you be Billing Users?
- Want Reliability
- Do they Offer Service Contract?

Process/Options



 Charger Type	 Voltage	 Electrical Load	 Approximate Material Cost per Charger	 Connectors
Level 1	120V (AC)	1.9kVA	$$$	J1772 (standard) ** Tesla
Level 2	208V/240V, 1Ø (AC)	3.3-19.2kVA	$,$$$	J1772 (standard) ** Tesla
DC Fast Charging (Level 3/4)	Up to 1000V (DC) (fed by 480V, 3Ø AC)	30-360kW***	$$,$$$-$$$,$$$	CCS Combo (USA) ** CHAdeMO (Japan) **** Tesla

Considerations

Applications: Public/Employee EV Charging

Goals with EV Charging

- Recharge EV from 0% -100% while on site?
- Replenish charge spent to get to site
- Provide convenience (no specific charge goal)

Pay-to-Charge vs. Free-to-Charge

- Monthly licensing/servicing fees can be costly
- Some fee structures operate on electricity usage versus monthly fees ($/kWh)

Local Ordinances

- Ann Arbor requires a certain number of parking spots with EV Charging capabilities (%installed, ready, and capable %)
- K12: 10% Installed, 15% Ready, 25% Capable

How Many EV Chargers?

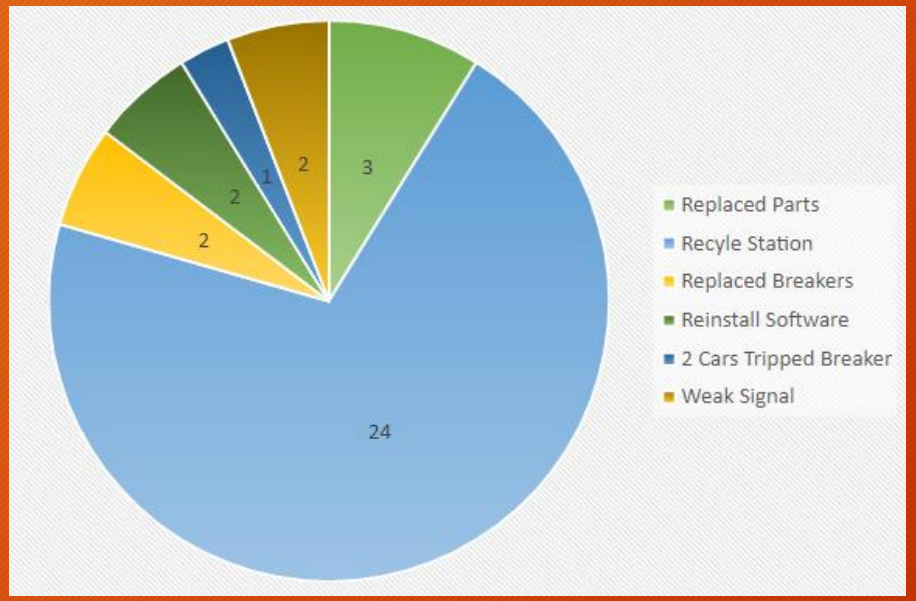
- New facilities: % of parking spots.
- Existing Facilities: Typically aim for % of parking spots or whatever is allowed without significant electrical upgrades.

Connecting to the Grid/Cloud

- Need a Subscription Service
  - Similar to a Credit Card Vendor
- Only Way to Connect is with App
- Requires a Cellular Modem
- About $500 annually

Suggest a Maintenance Agreement

- Units Require Maintenance and Service
  - They will break – software upgrades
- About $500 annually



Reported Problems

70% of issues resolved by resetting breaker

The Walled Lake Plan

- Install one AC charging station (2 plugs) at each Bond school – 34 currently
- Subscribe to Cloud Service
- Specify Service and Maintenance Contract
- Charging users $3 per hour to charge (up from $1/hr)
  - Unintended Consequence

The Results

12 Month Review

- 846 individual uses
- 11,800 kwh of consumption ($1,475)
- 13.9 kwh use per charge ($1.74 per use)
- 2.66 hours average duration per use
- $3,320 in user revenue
- $3.92 average revenue per use

EV Infrastructure in the District

Bill Holcomb
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School District of the City of Pontiac

Pontiac's Current EV Infrastructure

4 Public Chargepoint CT4021 Level II chargers (8 ports across district)

4 Ford Pro Level II charging ports for District EV Transit Fleet

10 BorgWarner 125kW Power Control System (PCS) (RES-DCV125-480FR) with Dispensers

16 BorgWarner 60kW PCS (RES-DCVC60-480) with 9 Dispensers

15 BorgWarner Dispensers (RES-D3-CS20-V1G-S) with 60kW or 125kW PCS for Sequential Charging

2 Ford eTransit 10-passenger vans

2 Ford eTransit cargo vans

40 IC 77-passenger EV Buses on order, delivery expected in August-December 2024

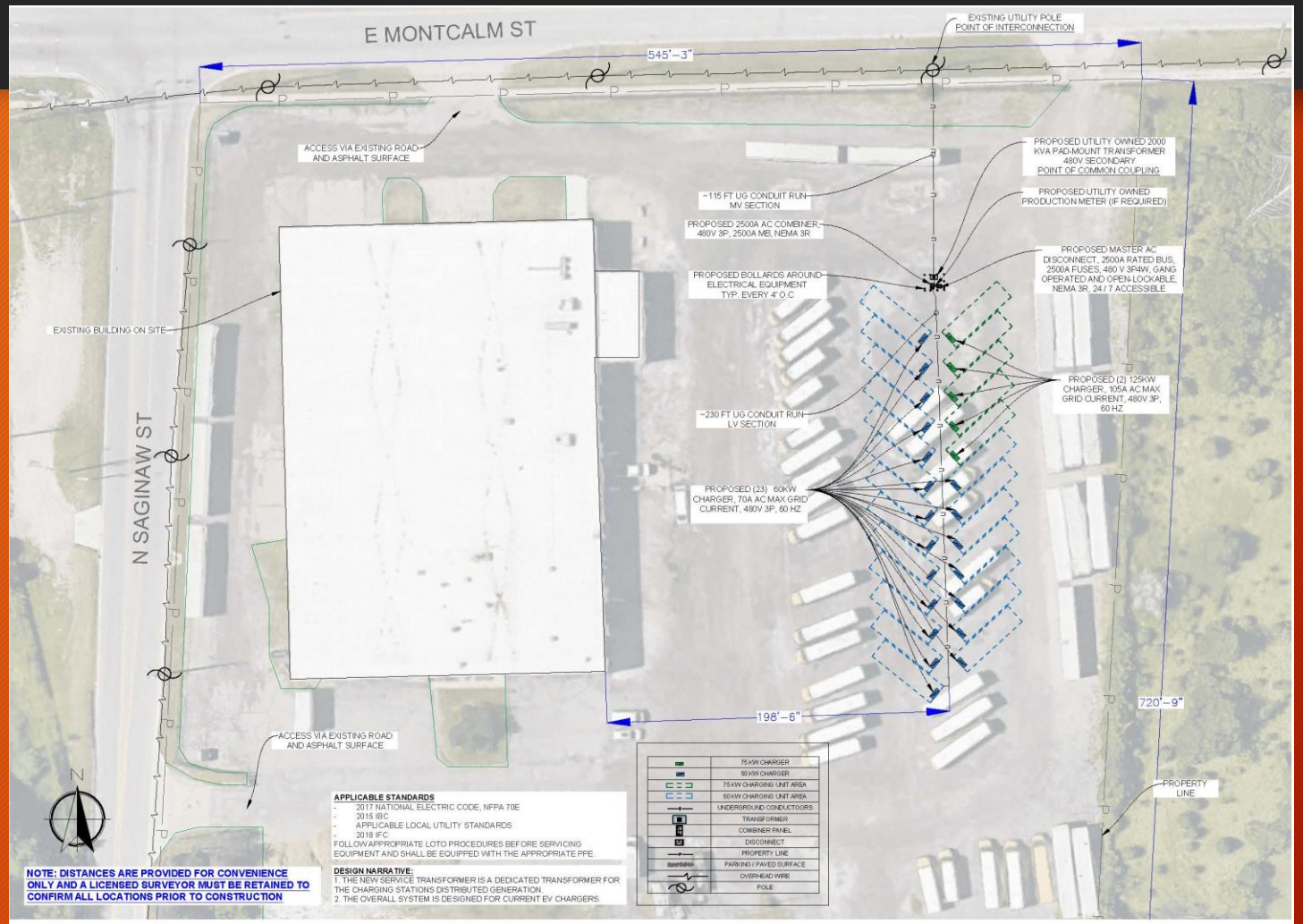
Pontiac's Future EV Infrastructure

MOU with local municipalities to use EVs as Mobile Power units during power outages due to natural or national disasters

EVs to provide power for communications devices, small medical equipment, and charging for shelters or medical facilities.

Pilot program with DTE to for V2G.

Pontiac School Installation Site



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EV-01

PROPOSED SITE PLAN - FOR DISCUSSION ONLY, NOT FOR CONSTRUCTION

SCALE : 1/32" = 1'-0"

What funding is available for my school?

EPA Clean School Bus Program

- $5 Billion dollars set aside for schools from 2022-2026 (22 and 23 applications are closed)

DTE Charging Forward eFleet Rebate

- Level 2 stations receive $2,500 per port
- DC Fast Charger (DCFC) stations receive up to $70,000 per charger

Consumers Energy Electric Vehicle Support for Business

- Level 2 publicly accessible chargers receive up to $7,500
- Public DC Fast Charger (DCFC) stations can get up to $70,000 per charger

IRS Clean Vehicle Tax Credits

- Two credits are available for vehicles purchased or leased for business use.
- Clean vehicle credit under IRC 30D (sole proprietorships and other business entities): How the credit works and qualified vehicles
- Commercial clean vehicle credit under IRC 45W (businesses and tax-exempt organizations): How the credit works and qualified manufacturers
- Additionally, you may be eligible for the Alternative Fuel Vehicle Refueling Property Credit as described in section 45D(e).

Additional **State of Michigan Incentives**

- **State of Michigan Incentives**
  - Michigan's National Electric Vehicle Infrastructure (NEVI) Planning
  - Alternative Fuel Development Property Tax Exemption
  - Medium- and Heavy-Duty Grant Program
  - Charge Up Michigan Placement Project
  - Natural Gas Fueling Station Air Quality Permit Exemption
  - Alternative Fuel Vehicle (AFV) Emissions Inspection Exemption
  - Natural Gas Vehicle (NGV) Weight Exemption
  - Electrification Technology Grants

Additional **Federal Incentives that may be pertinent to you**

- Alternative Fuel Infrastructure Tax Credit
- National Alternative Fuels Corridors
- National Electric Vehicle Infrastructure (NEVI) Formula Program
- Public School Energy Program
- State Energy Program (SEP) Funding
- Transportation Energy Efficiency Grants

Please do your research, this is not an all-inclusive list and new opportunities for funding and partnerships arise all the time.

Thanks to the U.S. Department of Energy for this info

Next Steps…

“So, aside from the funding, how does this get done?”

6 Key Steps to planning EV Charging Stations and Infrastructure

Step 1: Plan EV Infrastructure

Step 2: Prepare Construction Budget Proposal & Installation Timeline

Step 3: Contact Local Utilities

Step 4: Secure Permits from Local Government

Step 5: Complete Installation, Commissioning, and Municipal Inspections

Step 6: Develop a Maintenance Plan

6 Key Steps to planning EV Charging Stations and Infrastructure

Step 1: Plan EV Infrastructure

When contemplating your EV project, plan for your current needs, as well as expansion down the road. Here are some things to consider:

- ❑ **Traffic patterns:** Which site(s) best support your needs? Existing utilities, topology, etc…
- ❑ **Full Site Assessment:** Including load calculations, should be scheduled using a licensed electrical contractor
- ❑ **Property Layout:** Level 2/DCFC or combination, number of parking spaces and chargers, distance to electrical service source
- ❑ **Weather Considerations:** Awnings for cooling, cord management to protect from snowplows, water or ice
- ❑ **Physical Barriers:** Protect the charging stations, bollards, jersey barriers, etc…
- ❑ **Accessibility:** Parking and charging accommodations for people of all abilities
- ❑ **Lighting & Security:** Cameras, infrared to detect thermal runaways, perimeter security & fencing
- ❑ **Power Storage:** Incorporation of solar cells and battery
- ❑ **Wi-Fi or Broadband Connectivity:** SMART Chargers & Networked Chargers require to function
- ❑ **Charger Brand:** Consider the best charger for your needs
- ❑ **Installation:** Trenching, easements, permits, etc…

6 Key Steps to planning EV Charging Stations and Infrastructure

Step 2: Prepare construction budget proposal and installation timeline

- ❑Research all available grants, rebates, and tax incentives to offset capital expenses
- ❑Determine the impact of product availability on installation timing

Step 3: Contact local utilities

- ❑New service may need to be set up with the utility provider to supplement the electrical infrastructure
- ❑Determine if Primary or Secondary service is needed; this can affect your budget and timing

Step 4: Secure permits from local government

- ❑Know your requirements for easements, permits, and inspections
- ❑School Districts are subject to LARA inspections and MAY NOT REQUIRE local municipality inspections

Step 5: Complete installation, commissioning, and municipal inspections

- ❑As a final step, your contractor will complete the EVSE installation, including facilitating any needed inspections

Step 6: Develop a maintenance plan

- ❑The EVSE connections to the vehicles are rated for 10,000 connections, but you'll still need a qualified contractor ready for issues that may arise. Aside from routine preventive maintenance, other things can impact routine operations such as vehicular impact, wear and tear from regular usage, and weather exposure

Consider Additional Needs

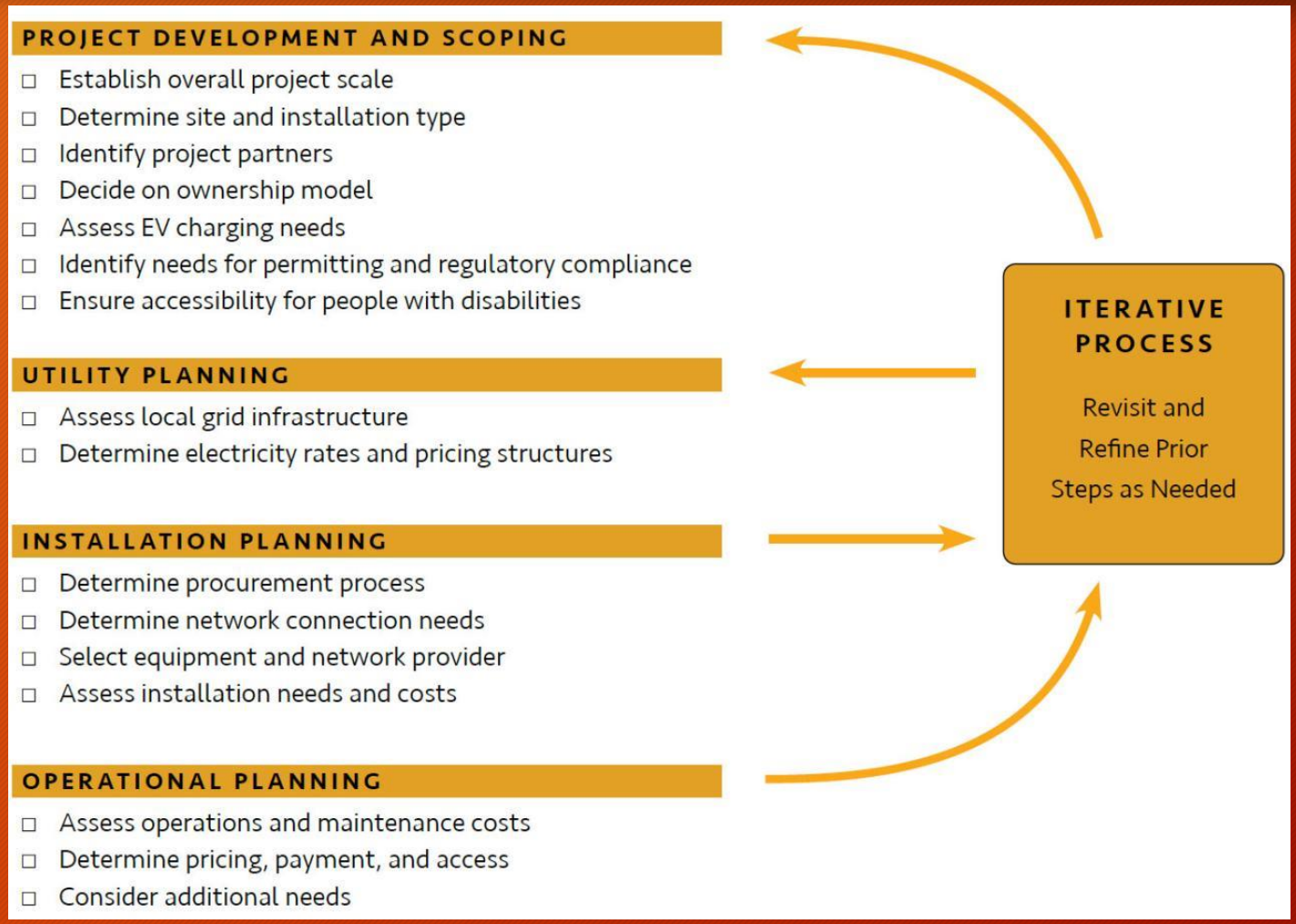
- Additional factors to consider in planning include station security, visibility, and signage. Adequate on-site lighting makes charging stations safer and more accessible for users. A report by the City of Houston mentions that installing motion sensing security lights or cameras and placing EV charging stations in or within sight of heavily trafficked areas may discourage vandalism. If vandalism does occur, the exterior materials used for EV charging stations can often be easily cleaned, and while the copper in charging cables can be stolen and resold, cord replacement is sometimes covered by insurance. Site owners should check insurance and warranty policies for coverage on theft and vandalism.

- Rural entities can also promote available charging services by adding station data to EVSE search tools, including the AFDC Station Locator. Tourism boards and departments can also be valuable partners in advertising locations of charging stations—for example, the Pure Michigan® Campaign publishes a travel planning tool that includes the locations of EV charging stations across the State. To support ease of use, consider options for communicating station information and policies (such as restrictions on time of day or duration for public charging) through onsite signage, on the site host's website, and in languages other than English.

- While some of these factors are not likely to present a major hurdle to project implementation, it's a good idea to identify any additional needs early and factor them into the overall planning process.

Thanks to the U.S. Department of Transportation for this info

Overview EVSE Project Planning Checklist



https://www.transportation.gov/rural/ev/toolkit/ev-infrastructure-planning/project-planning-checklist

Thanks to the U.S. Department of Transportation for this info

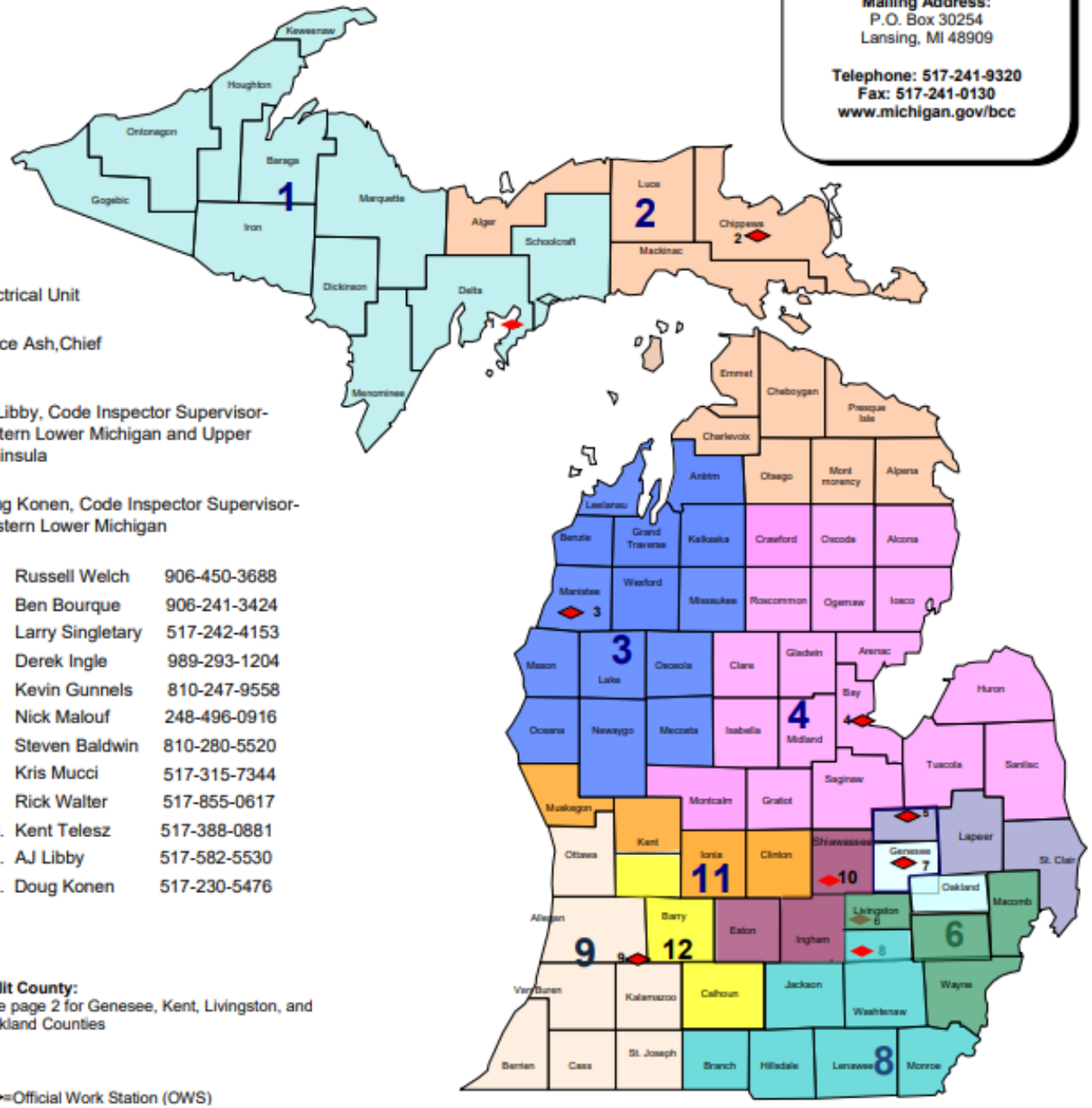
(3-12-24)

Electrical Inspector Regions

Physical Location:
1st flr, Ottawa Bldg
611 W Ottawa
Lansing MI 48933

Mailing Address:
P.O. Box 30254
Lansing, MI 48909

Telephone: 517-241-9320
Fax: 517-241-0130
www.michigan.gov/bcc



Electrical Unit

Lance Ash,Chief

AJ Libby, Code Inspector Supervisor-
Eastern Lower Michigan and Upper Peninsula

Doug Konen, Code Inspector Supervisor-
Western Lower Michigan

1.	Russell Welch	906-450-3688
2.	Ben Bourque	906-241-3424
3.	Larry Singletary	517-242-4153
4.	Derek Ingle	989-293-1204
5.	Kevin Gunnels	810-247-9558
6.	Nick Malouf	248-496-0916
7.	Steven Baldwin	810-280-5520
8.	Kris Mucci	517-315-7344
9.	Rick Walter	517-855-0617
10.	Kent Telesz	517-388-0881
11.	AJ Libby	517-582-5530
12.	Doug Konen	517-230-5476

Split County:
See page 2 for Genesee, Kent, Livingston, and Oakland Counties

◆=Official Work Station (OWS)

ELECTRICAL COUNTY SPLITS (3-12-24)

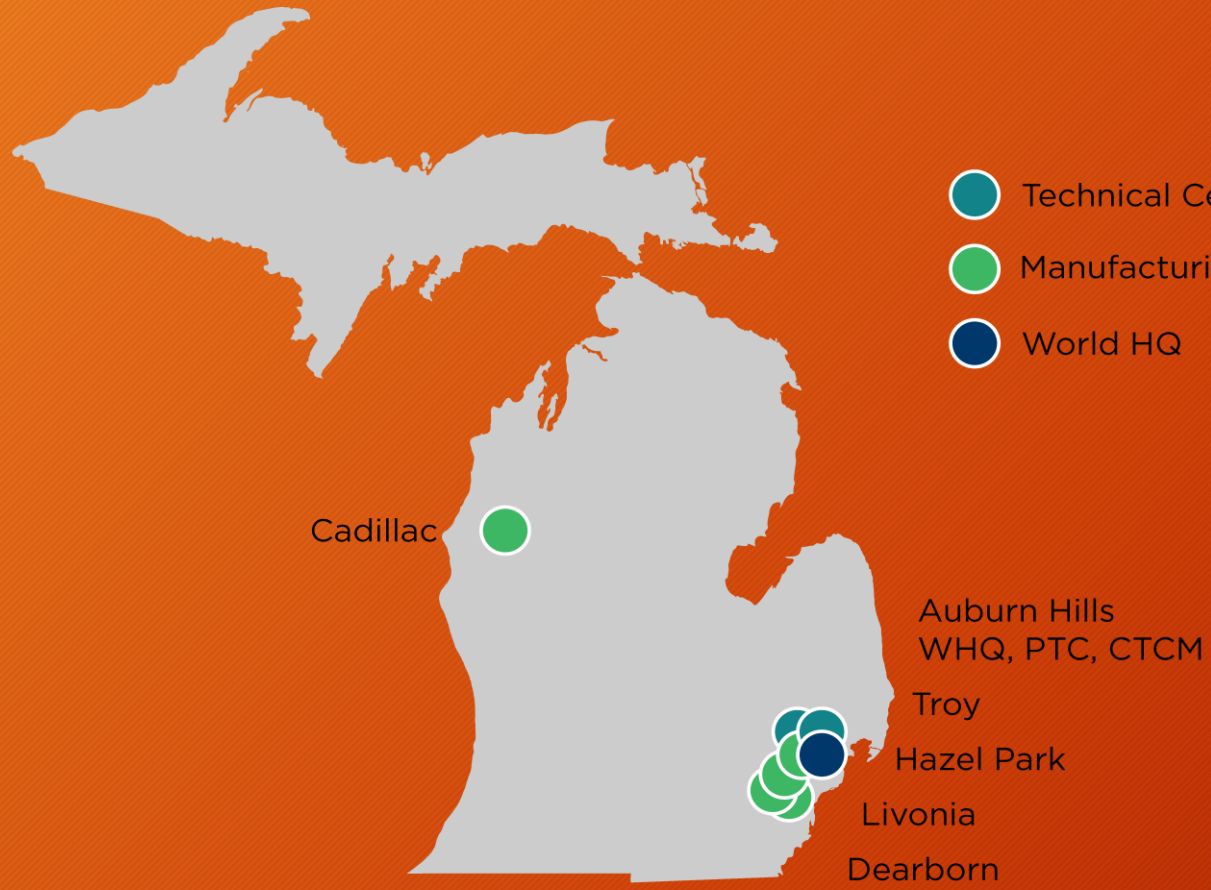
- GENESEE COUNTY
  - Kevin Gunnels (Area 5 Northern Genesee County)
  - Steven Baldwin (Area 7 Southern Genesee County)

- KENT COUNTY
  - AJ Libby (Area 11 Northern Kent County)
  - Doug Konen (Area 12 Southern Kent County)

- LIVINGSTON COUNTY
  - Nick Malouf (Area 6 Northern Livingston County)
  - Kris Mucci (Area 8 Southern Livingston County)

- OAKLAND COUNTY
  - Steven Baldwin (Area 7 Northern Oakland County)
  - Nick Malouf (Area 6 Southern Oakland County)

BorgWarner Michigan

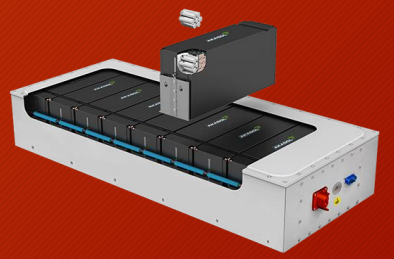


Products built in Michigan

Chargers

Heaters

Integrated Drive Module



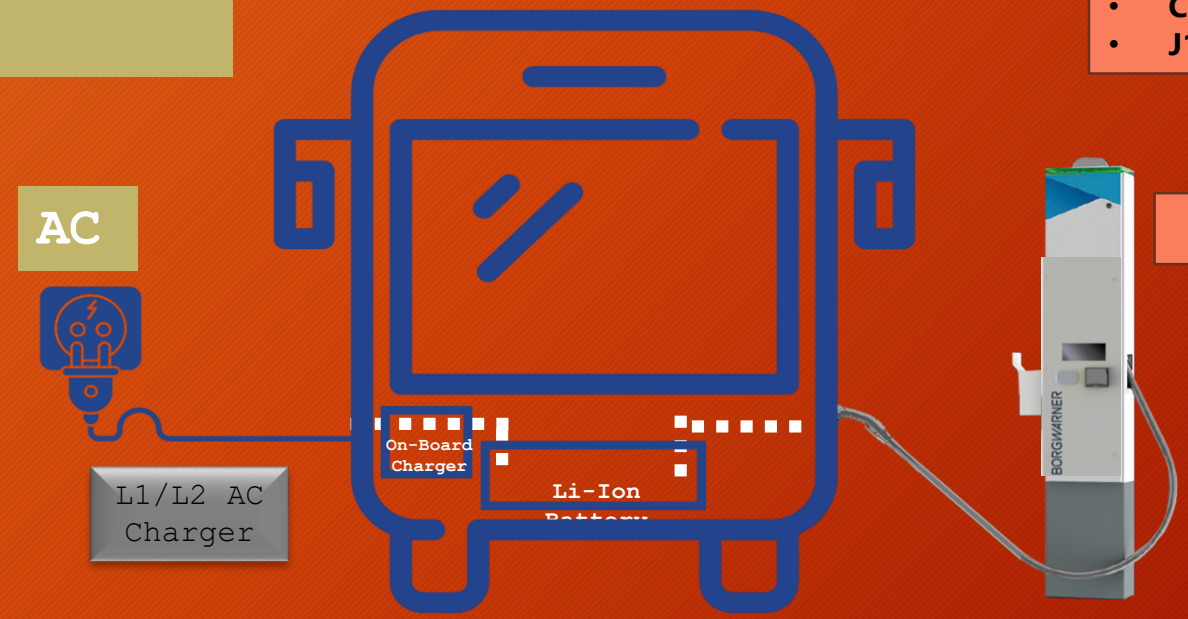
Battery Systems

Powdered metal components
for transfer cases

AC Vs. DC Charging

- AC – Alternating current
- Level 1: 1.44-1.92 (kW) @ 120V, 12-16 A
- Level 2: up to 19.2kW @ 208/240V
- Requires on-board Charger – OBC
- J1772-2017

- DC- Direct Current
- 480V 3
- Charge delivered directly to battery
- CCS1 combo Connector
- J1772-2017



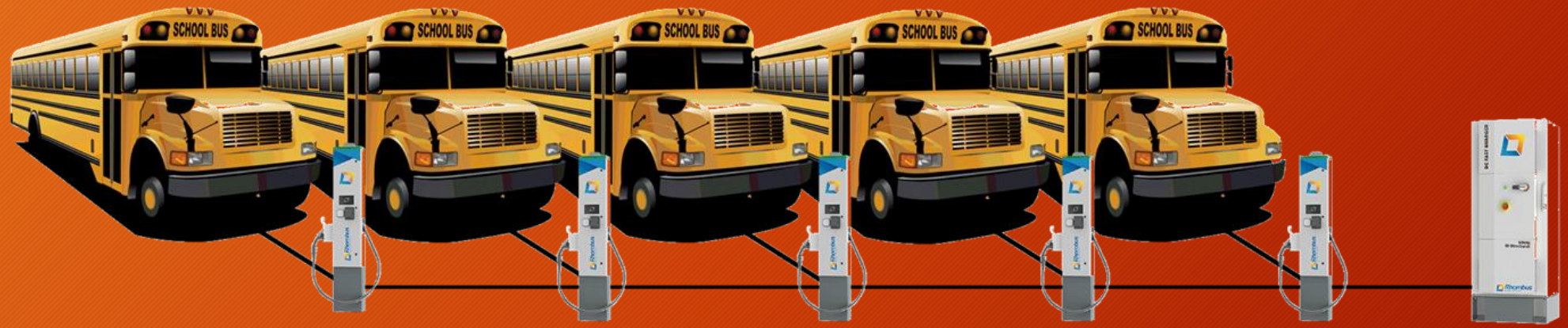
Slow charging
Currently, Unidirectional
Up to 100 hours for full charge

Fast charging
Flexible
Smart
Monetizable
Resilience applications
Unidirectional/Bidirectional
As low as 1 hour

V2G Bidirectional Charging

Electricity from EV battery sent back to grid for peak shaving

Sequential Charging and The Multiple Dispenser Requirements



GEN3-E GEN3-S GEN3-S GEN3-S GEN3-S 125kW PCS

Up to 5 dispensers can perform sequential charging on up to 5 buses

Recommendations for Schools or Site Owners

- When the school or site owner knows upfront that they may eventually be adding more chargers and/or dispensers, they should plan on including the additional infrastructure to accommodate the future chargers
- The additional conduit and wiring can be installed, the wiring for the future dispensers can be capped
- This allows for a much easier transition and lower associated costs of moving the required end dispenser (GEN3-E) to the end of the line

Examples of Sequential Charging times for 226 kW Battery Bus 60kW

State of Charge Remaining	80%	70%	60%	50%	40%	30%	20%	10%
Battery 226 Kw Remaining	180.8	158.2	135.6	113	90.4	67.8	45.2	22.6
Used Kw in transit	45.2	67.8	90.4	113	135.6	158.2	180.8	203.4
60 Kw/hr charge time 1 bus	0.8	1.1	1.5	1.9	2.3	2.6	3.0	3.4
Charge time per bus	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours
Bus 1	0.8	1.1	1.5	1.9	2.3	2.6	3.0	3.4
Bus 2	1.5	2.3	3.0	3.8	4.5	5.3	6.0	6.8
Bus 3	2.3	3.4	4.5	5.7	6.8	7.9	9.0	10.2
Bus 4	3.0	4.5	6.0	7.5	9.0	10.5	12.1	13.6
Bus 5	3.8	5.7	7.5	9.4	11.3	13.2	15.1	17.0

Examples of Sequential Charging times for 226 kW Battery Bus 125kW

State of Charge Remaining	80%	70%	60%	50%	40%	30%	20%	10%
Battery 226 Kw	180.8	158.2	135.6	113	90.4	67.8	45.2	22.6
Used Kw in transit	45.2	67.8	90.4	113	135.6	158.2	180.8	203.4
125 Kw/hr. charge time	0.36	0.54	0.72	0.90	1.08	1.27	1.45	1.63
Charge time per Bus	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours
Bus 1	0.36	0.54	0.72	0.90	1.08	1.27	1.45	1.63
Bus 2	0.7	1.1	1.4	1.8	2.2	2.5	2.9	3.3
Bus 3	1.1	1.6	2.2	2.7	3.3	3.8	4.3	4.9
Bus 4	1.4	2.2	2.9	3.6	4.3	5.1	5.8	6.5
Bus 5	1.8	2.7	3.6	4.5	5.4	6.3	7.2	8.1

Percent Charge per Miles Driven

State of Charge	80%	70%	60%	50%	40%	30%	20%	10%
Battery 226 Kw	180.8	158.2	135.6	113	90.4	67.8	45.2	22.6
Used KW	45.2	67.8	90.4	113	135.6	158.2	180.8	203.4
Hours at 30Kw	1.51	2.26	3.01	3.77	4.52	5.27	6.03	6.78

School District of the City of Pontiac

Thank you!