ELECTRIC VEHICLES

IN SASKATCHEWAN

I Am Jason Cruickshank

Bought a Chevy Bolt
and Founded SaskEV in 2017

48 000 electric km driven

BUILDING MOMENTUM FOR ELECTRIC VEHICLES IN SASKATCHEWAN

SaskEV

I Am Tyler Krause

Bought a Tesla Model 3
and founded Tesla Owners SK in 2018

31 000 electric km driven

TESLA OWNERS SASKATCHEWAN

EV’s in SK

- History of Electric Vehicles
- Types of Electric Vehicles
- Electric Vehicle Functionality
- Environmental Impact
- Electric Vehicle Market and Community

EV Benefits

- Superior Driving Experience
- Safe
- Low Maintenance Costs
- Reliable
- Efficient
- Environmental benefits

EV Challenges

- Higher upfront cost (~$15 000 or more)
- Lack of charging infrastructure
- Decreased range in winter

“

“We will not stop until every car on the road is electric”

- Elon Musk, Tesla CEO

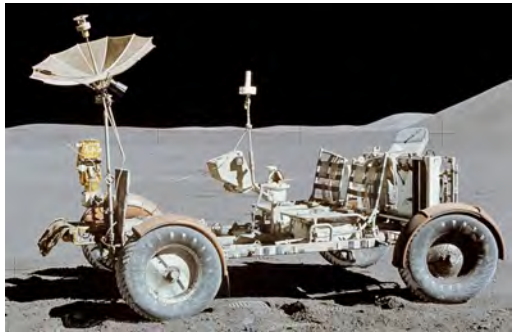
BREIF HISTORY OF ELECTRIC VEHICLES

Energy.gov

1828-1835 – First EVs
First USA EV in 1890
(William Morrison)

1901 – First Hybrid
(Ferdinand Porsche)

1908 Model T released, EV"S decline by 1935



1971 – Lunar Rover (NASA)

BREIF HISTORY OF ELECTRIC VEHICLES

1974 – CitiCar
(Sebring-Vanguard)

1996 - GM EV1
(cars reclaimed in 2003)

Energy.go
v

2000 – Toyota Prius
(Hybrid, still in production)

BREIF HISTORY OF ELECTRIC VEHICLES

Energy.gov

2008 – Tesla Roadster
(Gen 2 Revealed in 2017)

2010 – Nissan Leaf
(almost 500 000 sold to date)

2010 – Chevy Volt
(First Plug-in Hybrid Produced until 2019)

BREIF HISTORY OF ELECTRIC VEHICLES

Energy.gov

2012 – Tesla Model S
(quickest car in production in 2016)

2017 – Tesla Semi
(Revealed)

2017 – Chevy Bolt
(Still in production)

BREIF HISTORY OF ELECTRIC VEHICLES

Energy.gov

2017 – Tesla Model 3 (Set to surpass LEAF in 2020)

2017 – Rivian R1T/R1S (announced truck and SUV)

2019 – Tesla CyberTruck (200 000 reservations in 2 days)

TYPES OF ELECTRIC VEHICLES

- **H**ybrid **E**lectric **V**ehicle (**HEV**)
  Gas + Electric (not Plug-In)
- **P**lug-in **H**ybrid **E**lectric **V**ehicle (**PHEV**)
  Gas + Plug-in-Electric
- **B**attery **E**lectric **V**ehicle (**BEV**)
  Fully Plug-in Electric

TYPES OF ELECTRIC VEHICLES

- **H**ybrid **E**lectric **V**ehicle (**HEV**)

  - **Small battery**
  - **Moderate maintenance**
  - **Always needs gasoline**
  - **No option to plug in**
  - **Least efficient**
  - **Most environmental impac**

2016 Toyota Prius

TYPES OF ELECTRIC VEHICLES

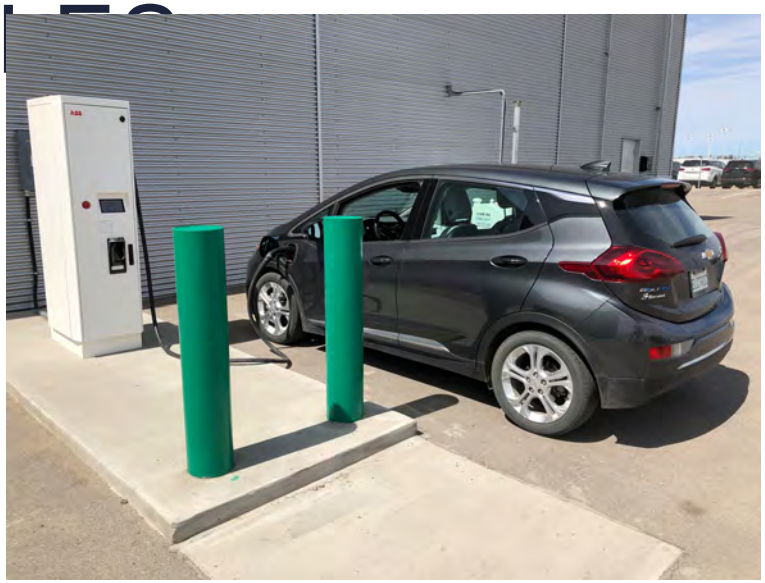
- **P**lug-in **H**ybrid **E**lectric **V**ehicle (**PHEV**)
  - **Medium/Small battery**
  - **Most maintenance**
  - **Only electric for short trips**
  - **Needs gas in winter, or long trips**
  - **20-75km electric range**

2020 Mistubishi Outlander

TYPES OF ELECTRIC VEHICLES

- **B**attery **E**lectric **V**ehicle (**BEV**) Fully Plug-in Electric

  - **Largest battery**
  - **Lowest maintenance**
  - **Total dependent on electricity**
  - **Most up-front cost**
  - **Least environmental impact**
  - **100km-600km electric range**

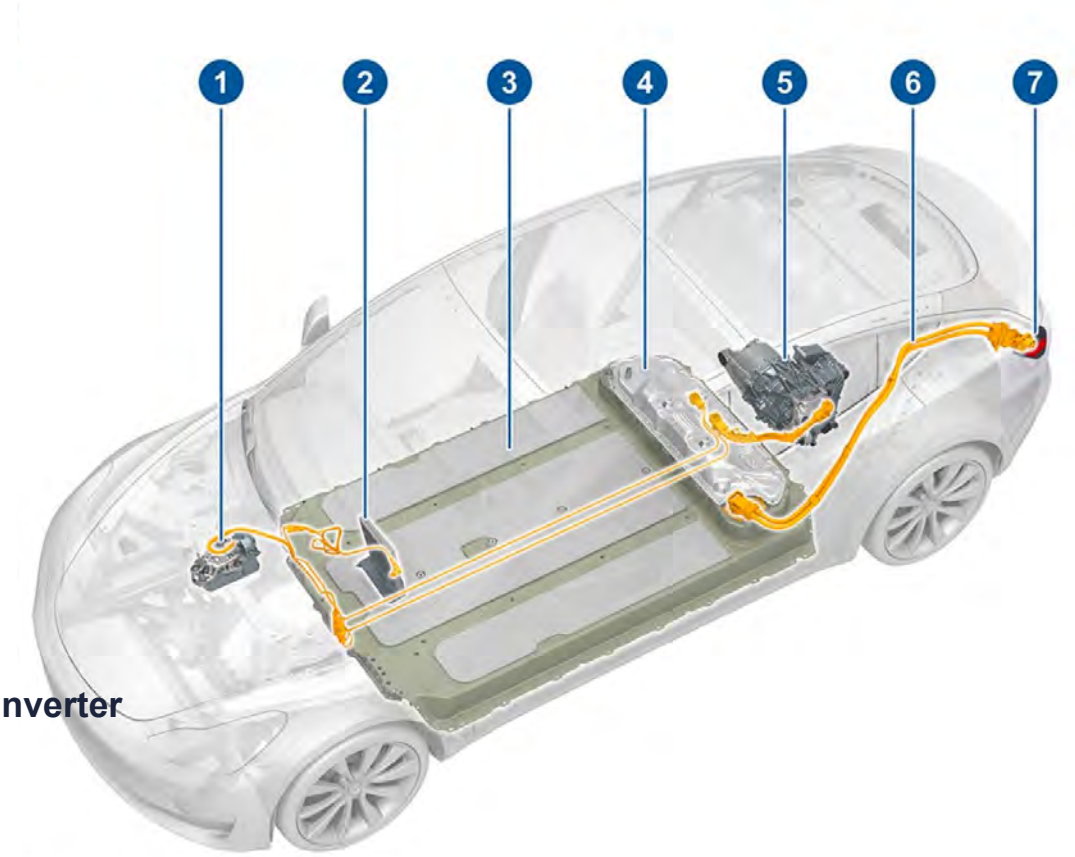


Jason's 2017 Chevy Bolt

ELECTRIC VEHICLE FUNCTIONALITY

In Saskatchewan

Basic Components

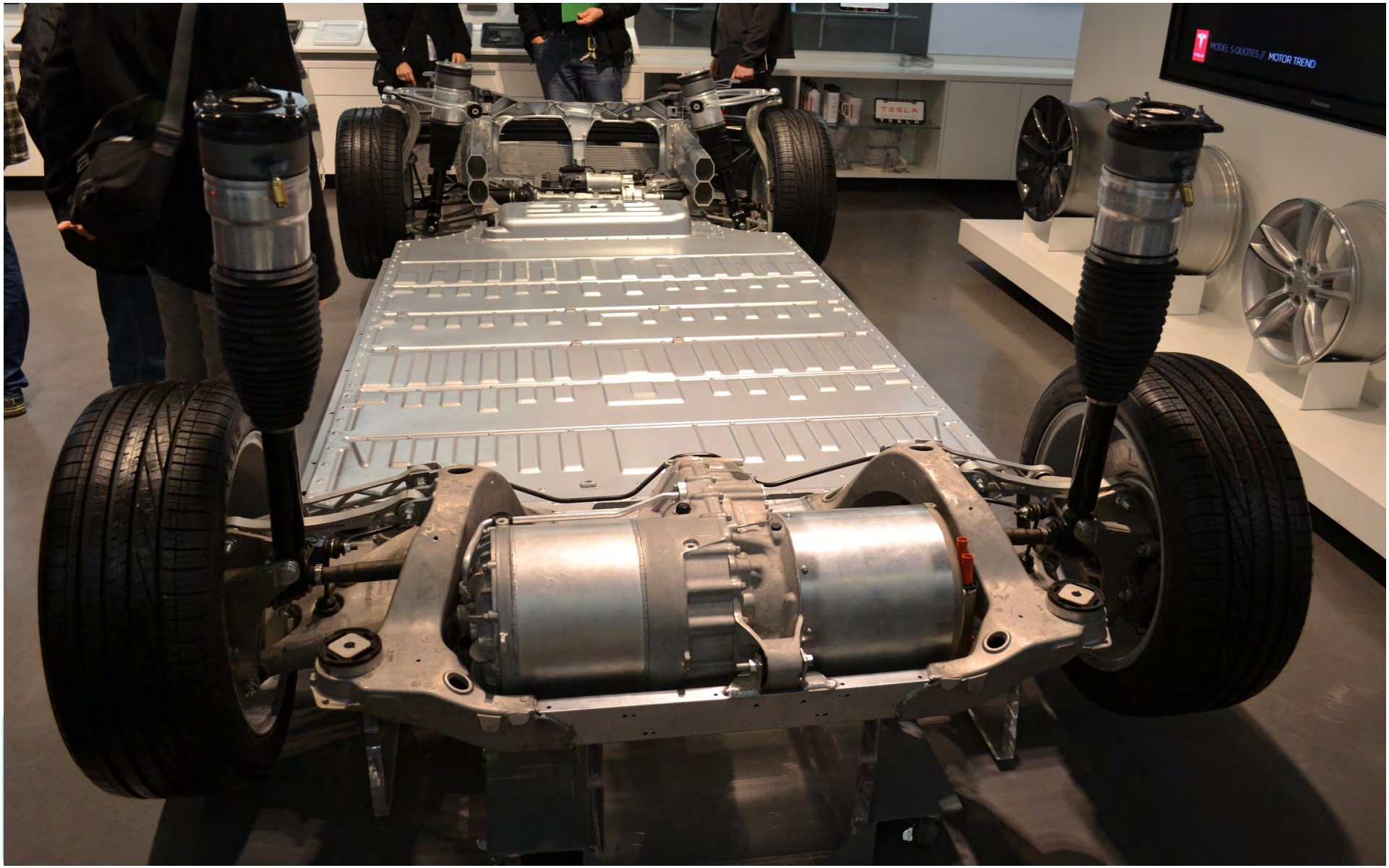


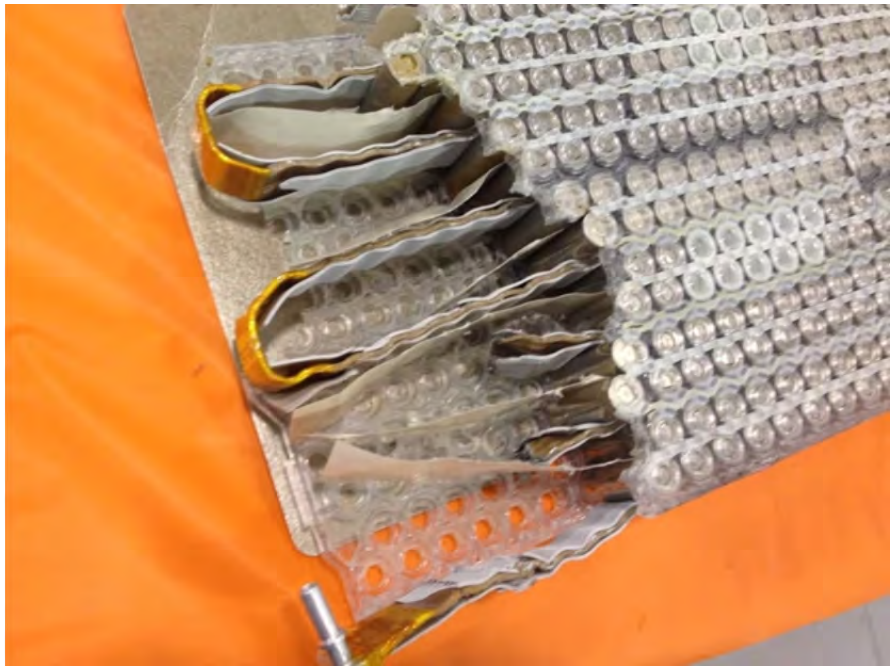
1. A/C Compressor
2. Electric Cabin Heater
3. High Voltage Lithium Ion DC Battery
    - Upward of 1200lbs, 100kW
    - Thousands of cells
    - Usually liquid cooled/heated

4. Battery Service Panel

5. AC Rear (and/or Front) Drive Motor and Inverter
    - 0 to 18 000 RPM
    - Up to 520HP combined
6. High Voltage Cabling
    - Required special training for first responders

7. Charge port


MODEL S QUOTES // MOTOR TREND
TESLA



HOW DOES IT WORK IN WINTER?

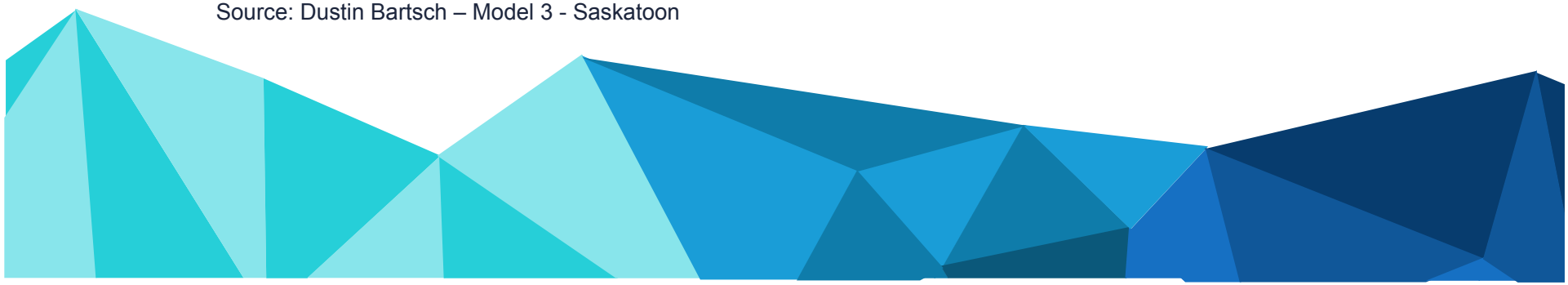
Very well!

- Batteries are temperature controlled
- Heaters are electric, and very quick
- Great traction control
- Electric motors *always* work

HOW DOES IT WORK IN

Temperature	Wh/km	Efficiency %	Kilometers Recorded
-35 to -30 C	290.6	48.8	43.29
-30 to -25 C	289.56	49	237.5
-25 to -20 C	286.53	49.8	285.07
-20 to -15 C	276.21	51.9	401.03
-15 to -10 C	247.89	57.8	598.45
-10 to -5 C	231.44	61.8	1441.65
-5 to 0 C	221.07	64.8	2176.5
0 to 5 C	207.18	68.8	1329.16
5 to 10 C	185.16	76	566.75
10 to 15 C	169.81	82.9	150.58
15 to 20 C	153.26	91.3	80.45

Source: Dustin Bartsch – Model 3 - Saskatoon



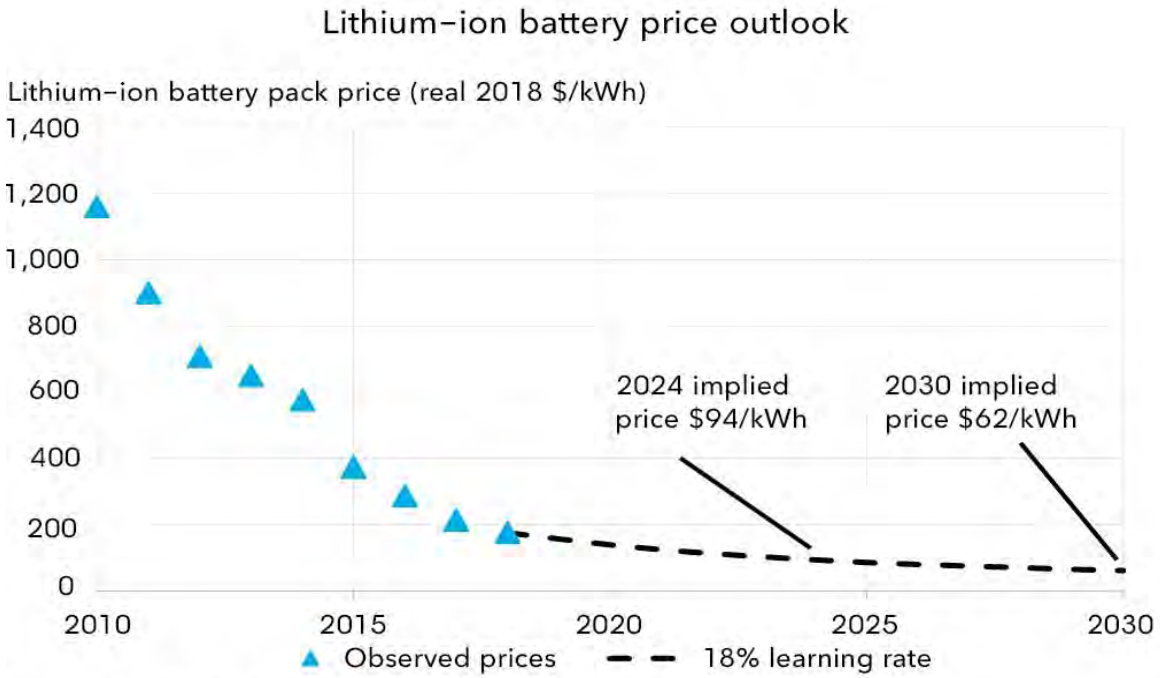
Starting" a Tesla in -34C Cold Canadian Winter

HOW MUCH DOES IT COST?

UPFRONT COSTS

- **Starting at $38 000, upwards of $120 000 or more**
- **$15 000 more than a gas car in the same class**
- **$5000 federal rebate on BEV's less than $55000**
- **Will be 10% federal rebate on used EV's in 2020 up to $2000**
- **Batteries packs to be under $100USD/kWh by 2024 ($6000 for 60kWh)**
- **Best price per km is Hyundai Kona, under $100/km (415km)**

HOW MUCH DOES IT COST?



Source: BloombergNEF

HOW MUCH DOES IT COST?

Item	Year	Amount	Source
Wiper Blades	1	$62.98	Autozone
Rotation	1	$0.00	Tesla
Cabin Air Filter	2	$34.00	Tesla
Brake Fluid Flush	2	$90.00	yourmechanic.com
New Tires	2	$436.76	Tire Rack
Tire Installation	2	$90.00	Local Premium
Wiper Blades	3	$62.98	Autozone
Rotation	3	$40.00	
Cabin Air Filter	4	$34.00	Tesla
Brake Fluid Flush	4	$90.00	yourmechanic.com
Rotation	4	$40.00	
Total		$980.72	

SOURCE: CLEANTECHNICA.COM

MAINTENANCE

There is no mandatory maintenance for some EV's,

Maintenance is very minimal.

HOW MUCH DOES IT COST?

CHARGING COSTS

- **Level 3 chargers**
  $10 to $30/400km

- **Home charging**
  200Wh/km x $0.14/1000Wh
  = 2.4 cents/km

Source: Tyler Krause - Model 3 - Saskatoon

Source: Devin Arthur - Chevy Bolt (Sudbury, ON)

If you drive 15000km per year
$30/month
(compared to over $140 for a Honda Civic)

HOW LONG DOES THE BATTERY LAST?

Can last up to 500 000km or more

Chevy Bolt: 160 000km/8yr warranty

Model 3 (LR): 192 000km/8yr warranty

Source: Hansjörg Gemmingen (on his second battery)

HOW TO CHARGE EV's ?

LEVEL 1 (120V AC)
~ 8km/hr

NEMA 5-15

LEVEL 2 (240V AC)
~ 30 km/hr with mobile charger
~ 70 km/hr with dedicated charger

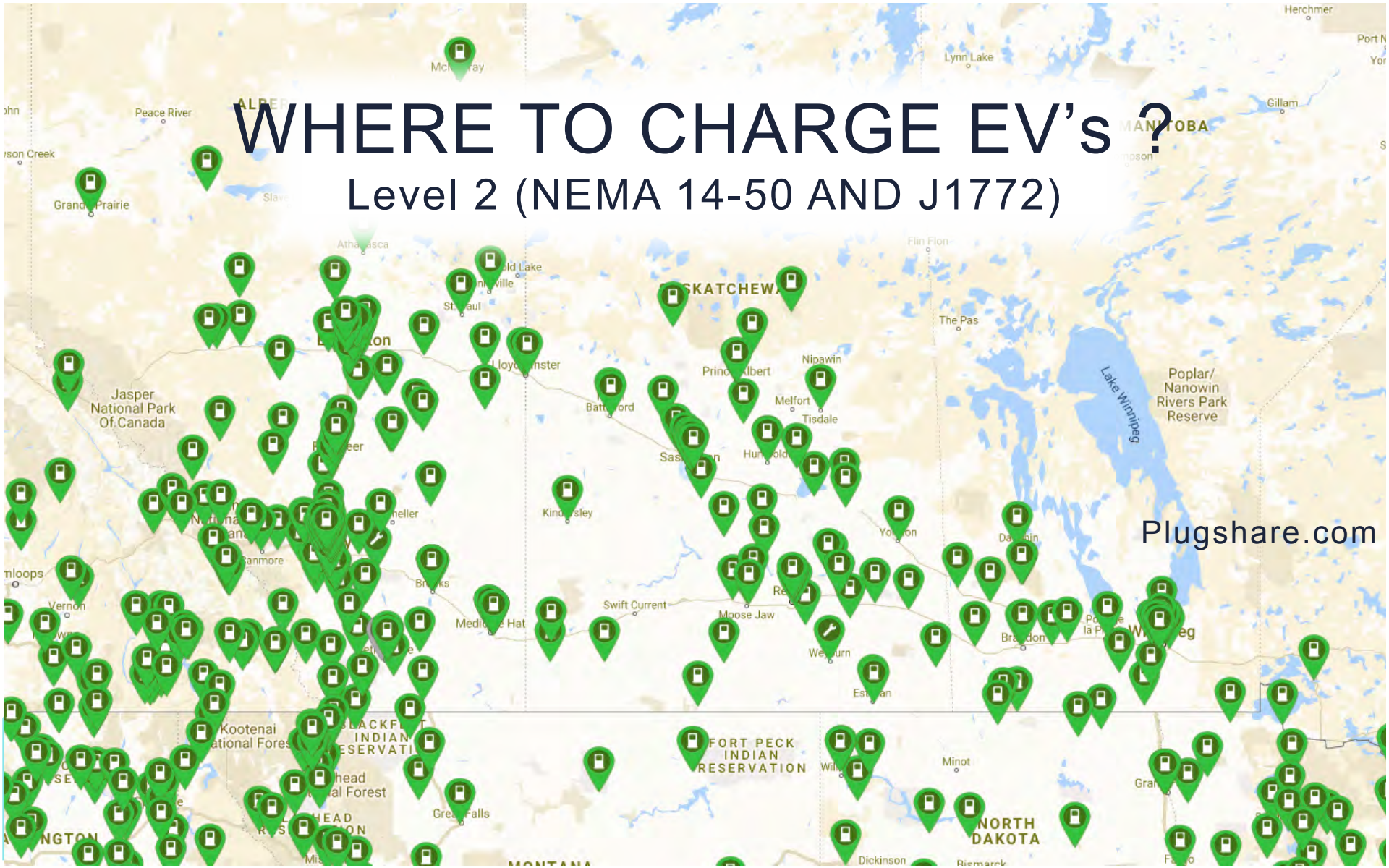
NEMA 14-50

J1772

LEVEL 3 (400V+ DC)
~ 400km in 20 min

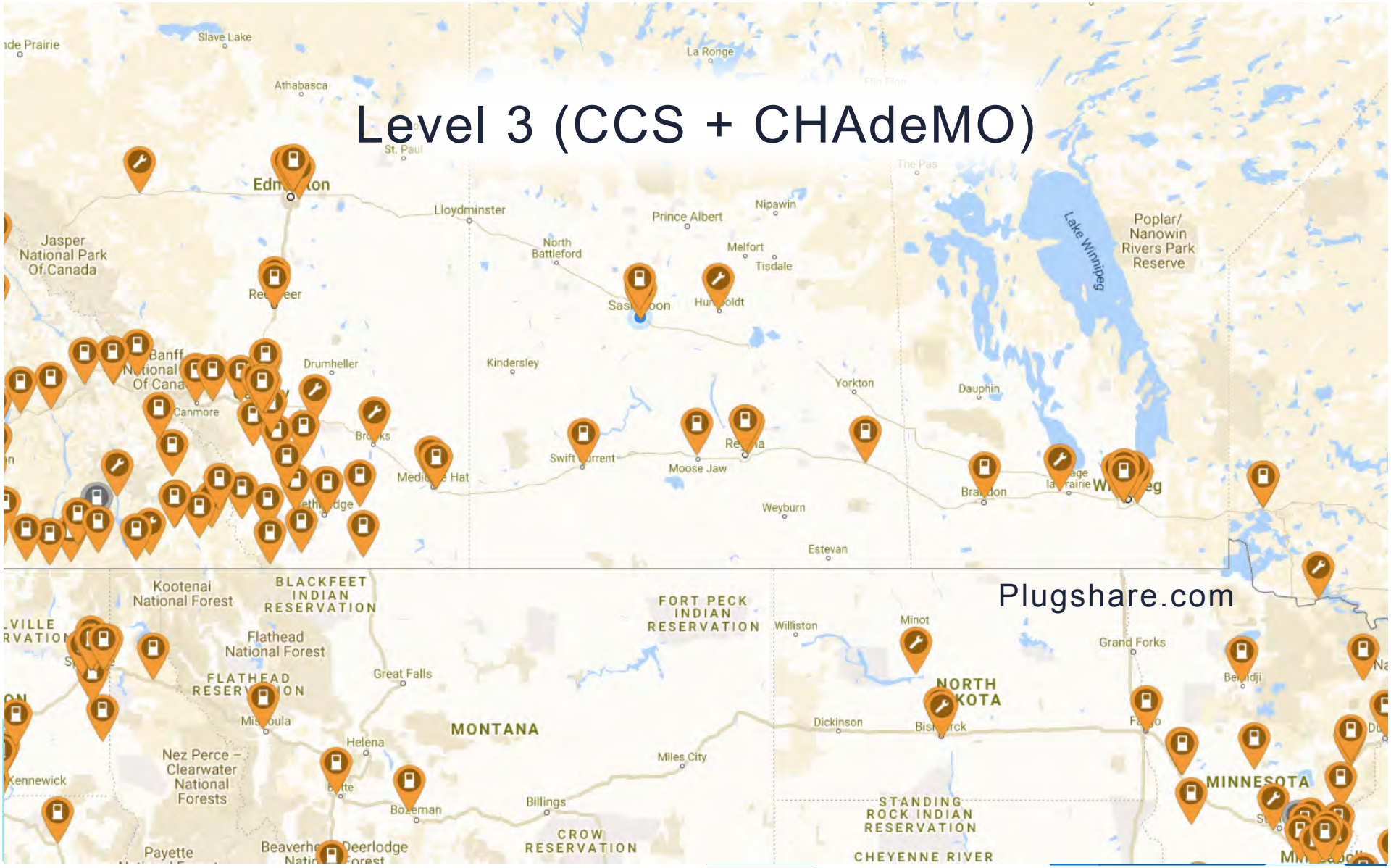
WHERE TO CHARGE EV's ?

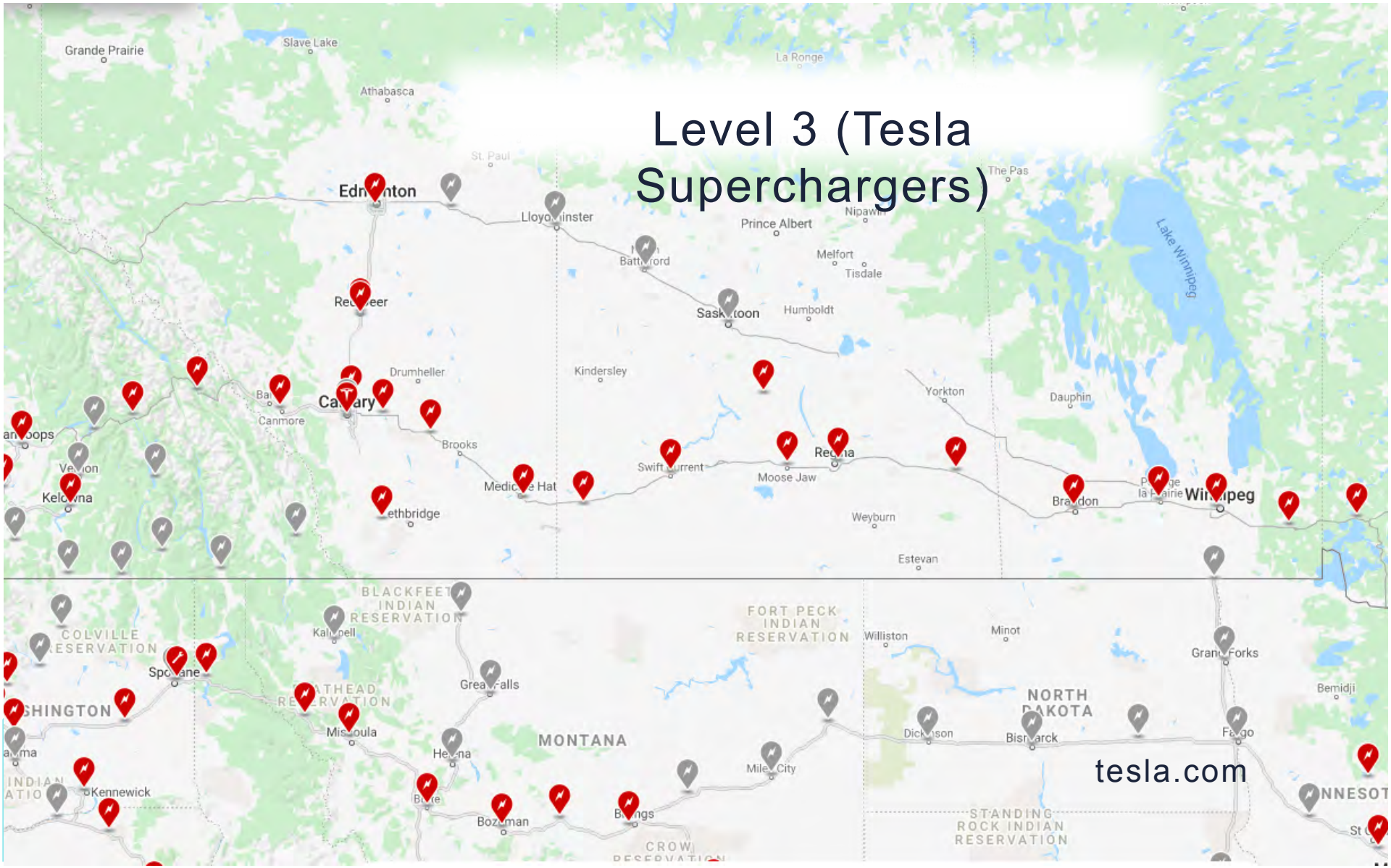
Level 2 (NEMA 14-50 AND J1772)



Level 2 Saskatoon

Level 3 (CCS + CHAdeMO)




Level 3 (Tesla Superchargers)
Grande Prairie
Slave Lake
Athabasca
La Ronge
St. Paul
The Pas
Edmonton
Lloydminster
Prince Albert
Nipawin
Battleford
Melfort
Tisdale
Lake Winnipeg
Saskatoon
Humboldt
Drumheller
Kindersley
Yorkton
Dauphin
Canmore
Brooks
Swift Current
Moose Jaw
Regina
Medicine Hat
Lethbridge
Brandon
Winnipeg
Weyburn
Estevan
Kelowna
Vernon
COLVILLE RESERVATION
BLACKFEET INDIAN RESERVATION
FORT PECK INDIAN RESERVATION
Williston
Minot
Grand Forks
Bemidji
Spokane
Great Falls
NORTH DAKOTA
Missoula
Helena
MONTANA
Dickinson
Bismarck
Fargo
Miles City
Kennewick
Bozeman
Billings
STANDING ROCK INDIAN RESERVATION
CROW RESERVATION
tesla.com

HOW SAFE ARE EV'S?

Very safe

Of all 900+ car tested by NHTSA, the Model 3 Has the lowest probably of injury in a collision, and won the IIHS Top Safety Pick+ award.

Audi E-Tron also won the same award.

"You don't need to trade away safety if you want to choose an electric vehicle "

- David Zuby, chief research officer of IIHS

Source: EURO NCAP

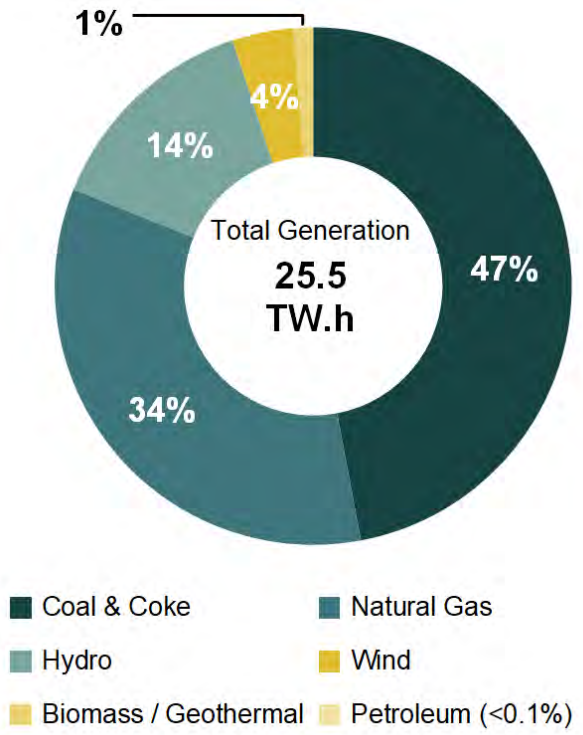

DPCcars

Environmental Impact

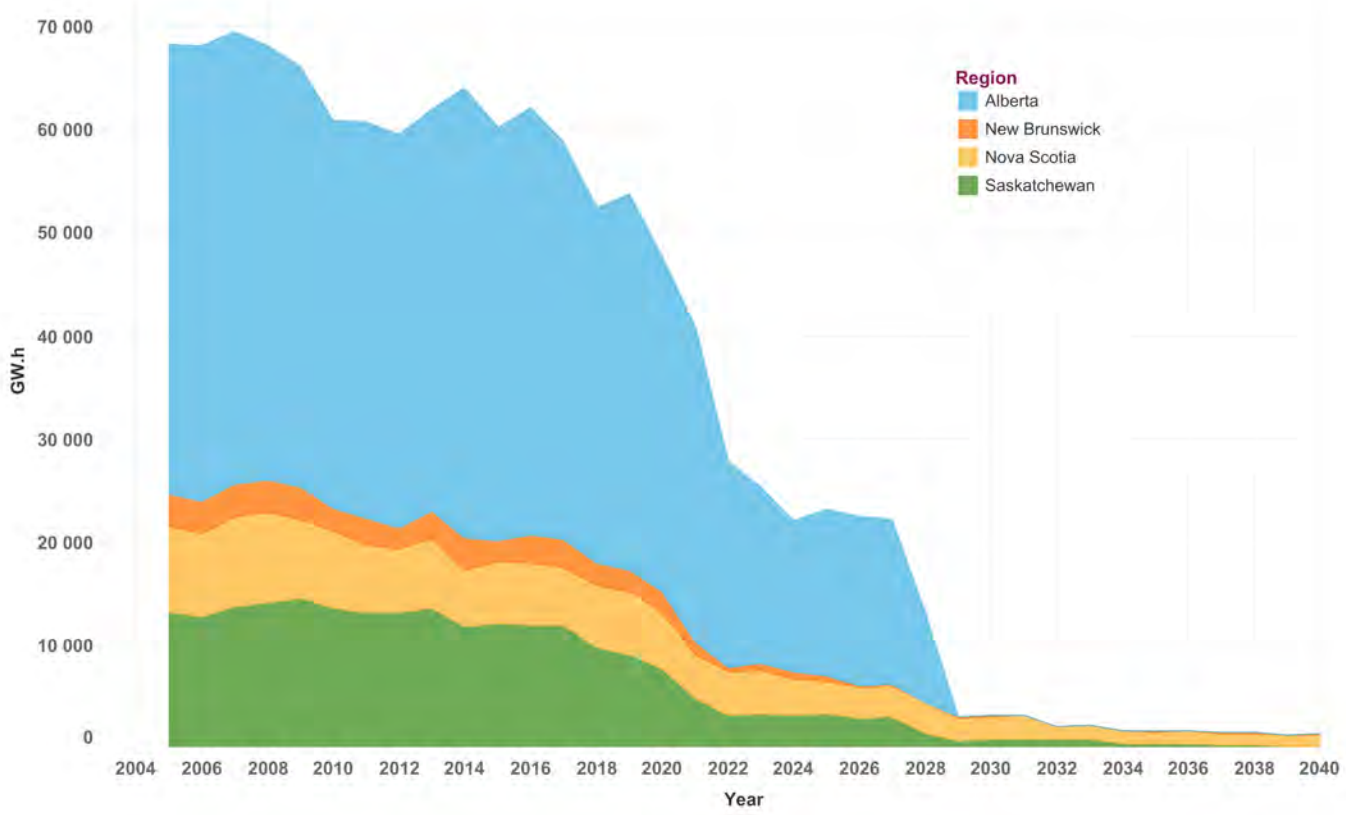
In Saskatchewan

BUT AREN'T EV'S JUST POWERED WITH COAL?

Well, sort of...



COAL POWER IN CANADA

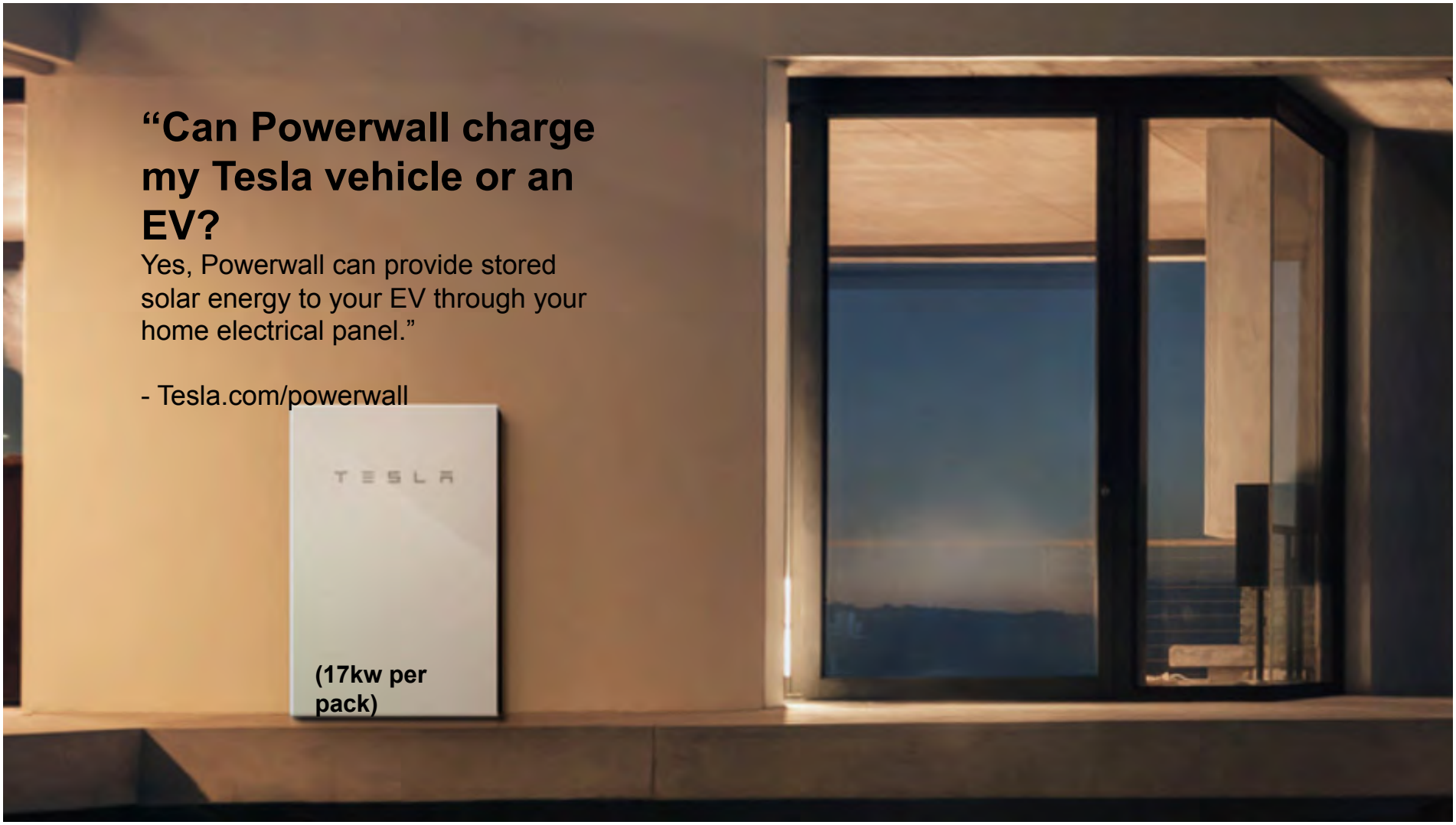


Source: Canada Energy Regulator

OR, CHARGE WITH THE SUN

- **Medicine Hat Community Renewable Energy Microgrid Demonstration Project**
- **170 MWh Solar**
- **Wind turbines**
- **Grid includes EV chargers**

Source: Tyler Krause


“Can Powerwall charge my Tesla vehicle or an EV?
Yes, Powerwall can provide stored solar energy to your EV through your home electrical panel.”
- Tesla.com/powerwall
TESLA
(17kw per pack)

HOW EFFICIENT ARE EV'S

In Saskatchewan

	2019 Toyota Prius Prime (PHEV)	Nissan Leaf SV/SL (BEV	2019 Chevy Bolt (BEV)	Tesla Model 3 (BEV)
2020	-15%	-30%	-34%	-40%
2022	-21%	-42%	-45%	-50%
2024	-23%	-45%	-48%	-53%
2026	-25%	-50%	-53%	-58%
2028	-30%	-60%	-62%	-66%
2030	-35%	-69%	-71%	-74%

Source: SaskPower

HOW EFFICIENT ARE EV'S

Compared to gas cars

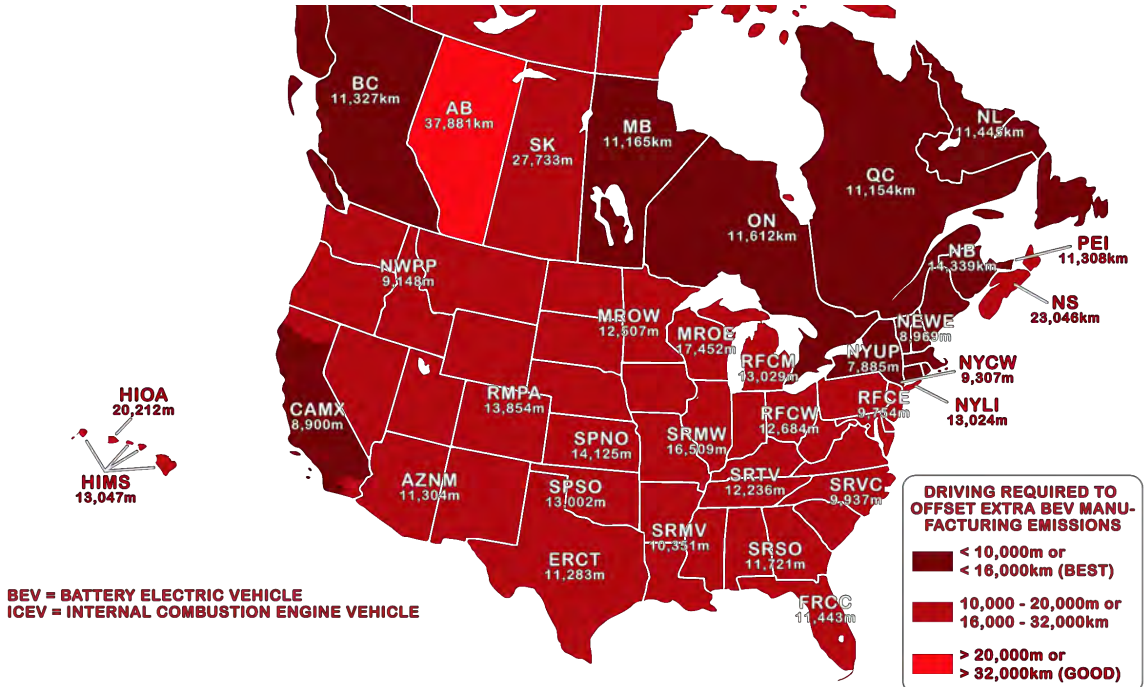
- Gas car = only 12%-30% efficient
- EV's = are over 77% efficient

Source: U.S. Department of Energy

- Natural gas turbine has net thermal efficiency of 60%

Source: National Academies of Science Engineering and Medicine

HOW EFFICIENT ARE EV'S



BEV = BATTERY ELECTRIC VEHICLE
ICEV = INTERNAL COMBUSTION ENGINE VEHICLE

COBALT, LITHIUM AND BATTERY FIRES

- 75kWh Model 3 battery used 4.5kg of cobalt, down 59%
  (Benchmark Minerals 2018)
- 2-3kg of Lithium Carbonate per kWh (120-180kg average)
  (Meridian International Research 2010)
- BYD uses 0kg of cobalt

"The share of the total environmental impact of E-mobility caused by the battery is 15%."

- Meridian International Research, 2010

“Tesla is committed to only sourcing responsibly produced materials…Tesla suppliers are required to provide evidence of the existence of policies that address these social, environmental, and sustainability issues as well as responsible sourcing.”

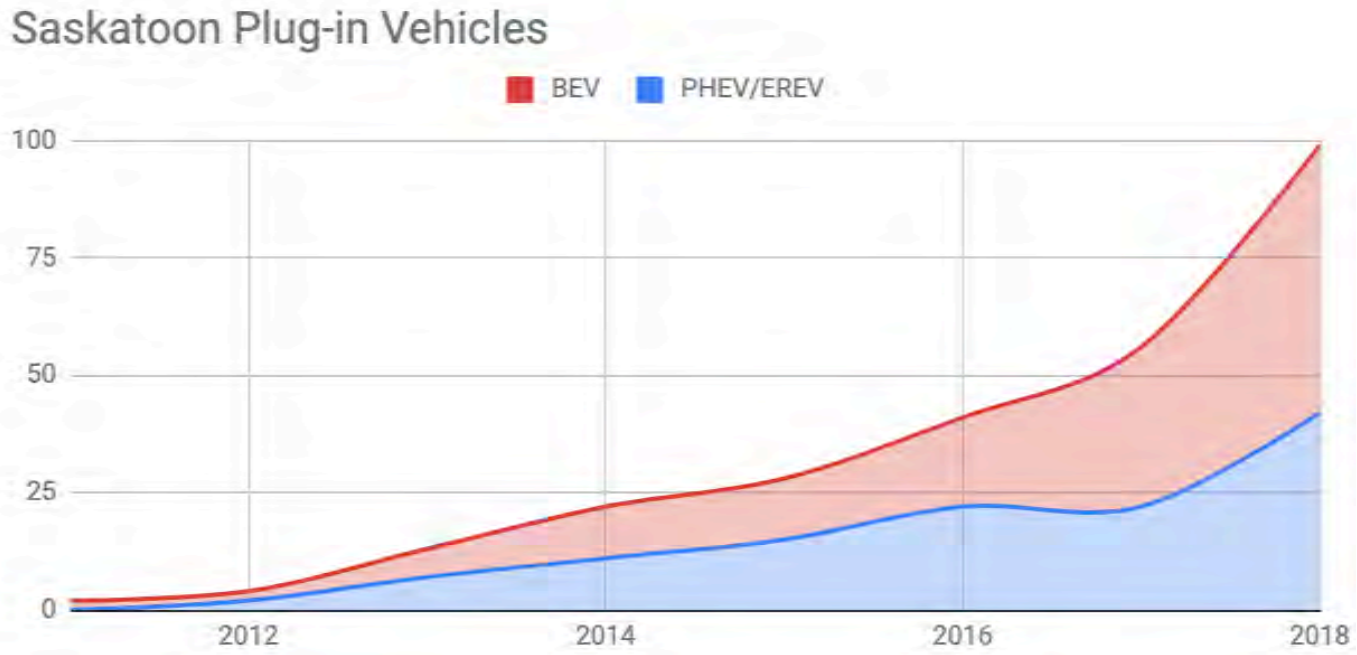
- Tesla Conflict Minerals Report ,2018

“The propensity and severity of fires and explosions from ... lithium-ion battery systems are anticipated to be somewhat comparable to or perhaps slightly less than those for gasoline or diesel vehicular fuels”

- NHTSA Lithium-ion Battery Safety Issues for Electric and Plug-in Hybrid Vehicles, 2017

EV Market and Community

HOW MANY EV'S IN SK?



Source: SaskEV

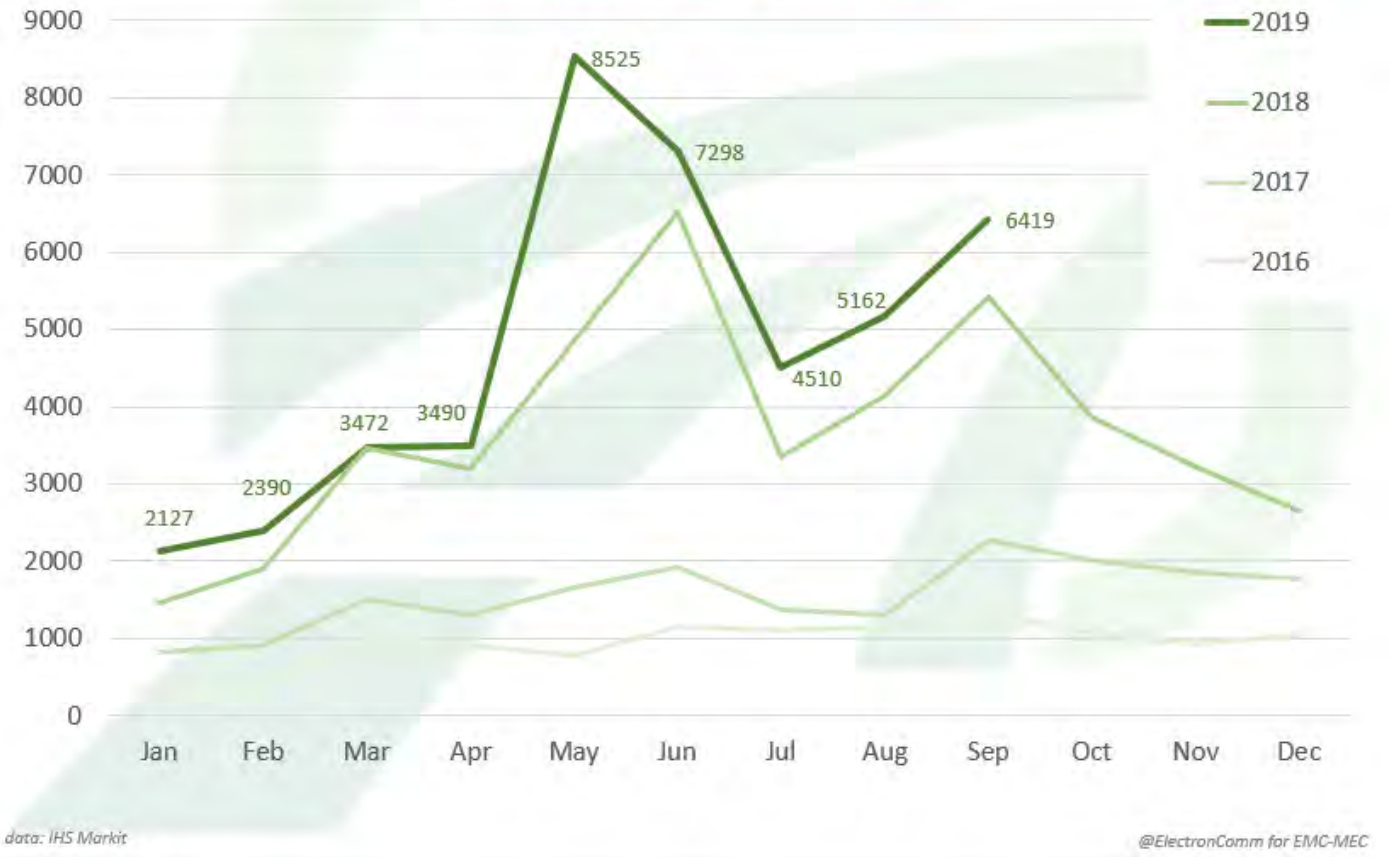
EV SALES IN CANADA

Province/ Territory	Q3 2018 Sales	Q3 2019 Sales	Change	Approx. ZEV Population
Alberta	344	428	+24%	3,200
BC	2,415	4,696	+94%	31,000
Manitoba	39	97	+149%	600
NB	10	57	+470%	300
Newfoundland	3	18	+500%	75
NWT	1	1	0%	10
Nova Scotia	28	53	+89%	350
Nunavut	0	0	0%	1
Ontario	5,609	3,127	-44%	41,300
PEI	4	27	+575%	75
Quebec	4,426	7,532	+70%	59,000
Saskatchewan	22	52	+136%	300
Yukon	1	3	+200%	10
Canada	12,902	16,091	+25%	136,000

Source: Electric Mobility Canada

EV SALES GROWTH IN CANADA

(Monthly Zero Emission Vehicle Sales)



data: IHS Markit

@ElectronComm for EMC-MEC

TESLA OWNERS CLUBS


TESLA

SaskEV.ca

BUILDING MOMENTUM FOR ELECTRIC VEHICLES IN SASKATCHEWAN

SaskEV

43 events (so far)

Founded October 2017

SEVAonline.ca

SEVA
Saskatchewan Electric Vehicle Association

Regina based EV group

~70 members


Peavey Mart
Hardware & A Whole Lot More!
SEVA
SEVA

Thanks!

Any questions?

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