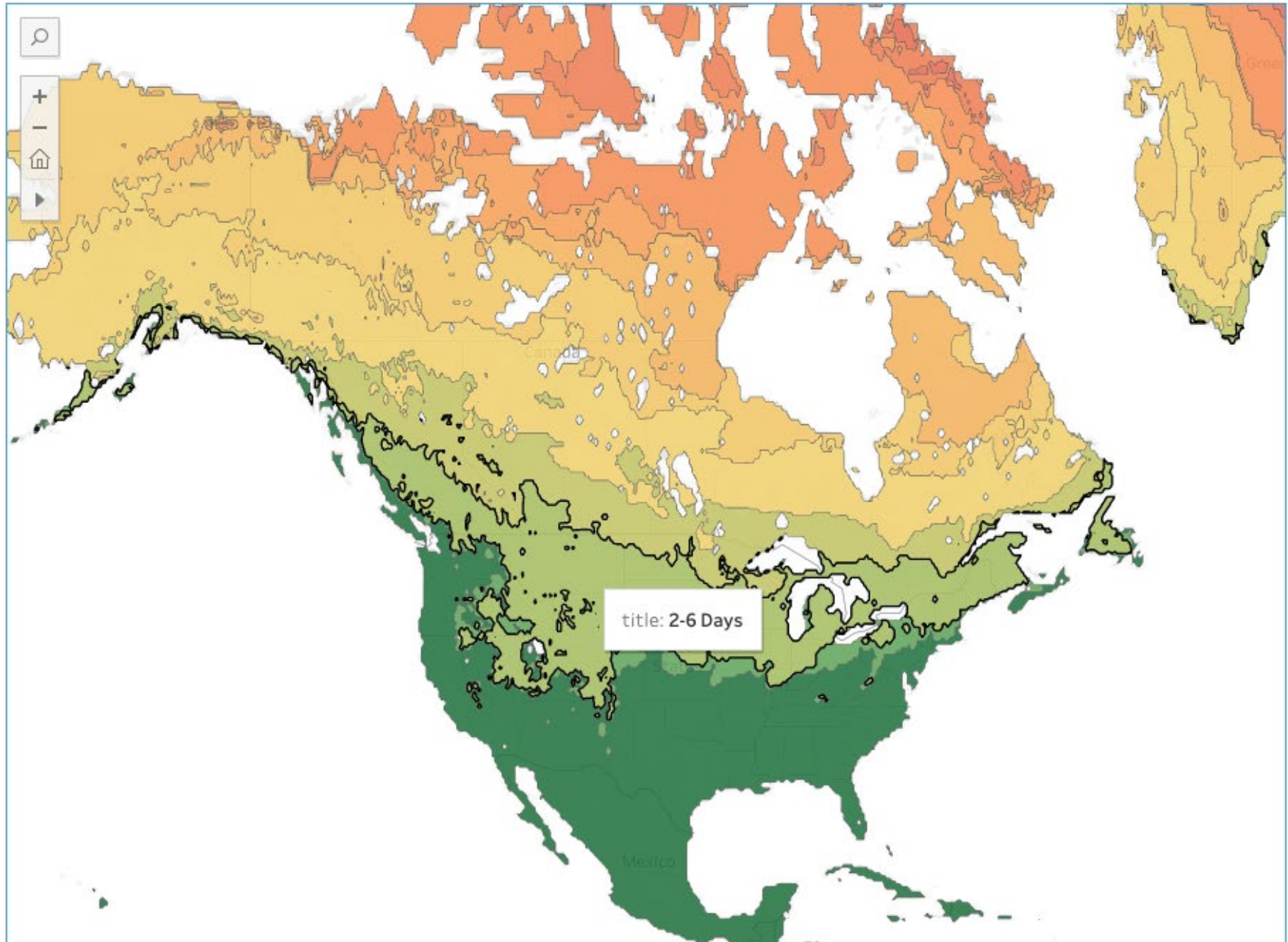


# Cold Weather Impacts on Battery Electric Vehicles

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The Alaska Center for Energy and Power



# Consecutive MPID Map

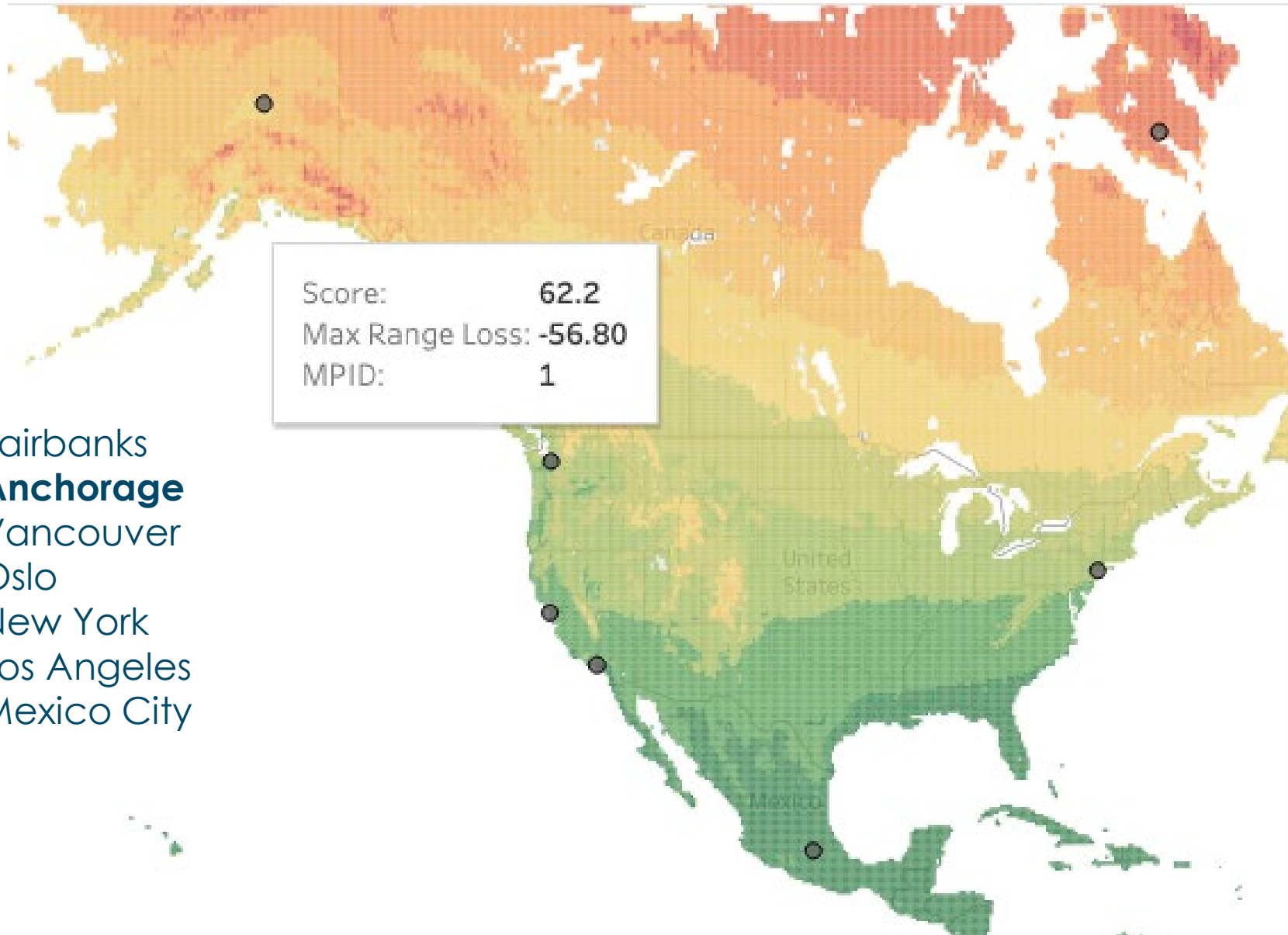
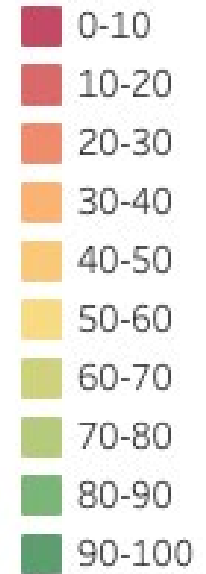


## # of MPIDs

- 0 Days
- 1 Day
- 2-6 Days
- 7-13 Days
- 14-29 Days
- 30-59 Days
- 60-89 Days
- 90-119 Days
- 120-149 Days
- 150-179 Days
- 180-209 Days
- 210-239 Days
- 240+ Days

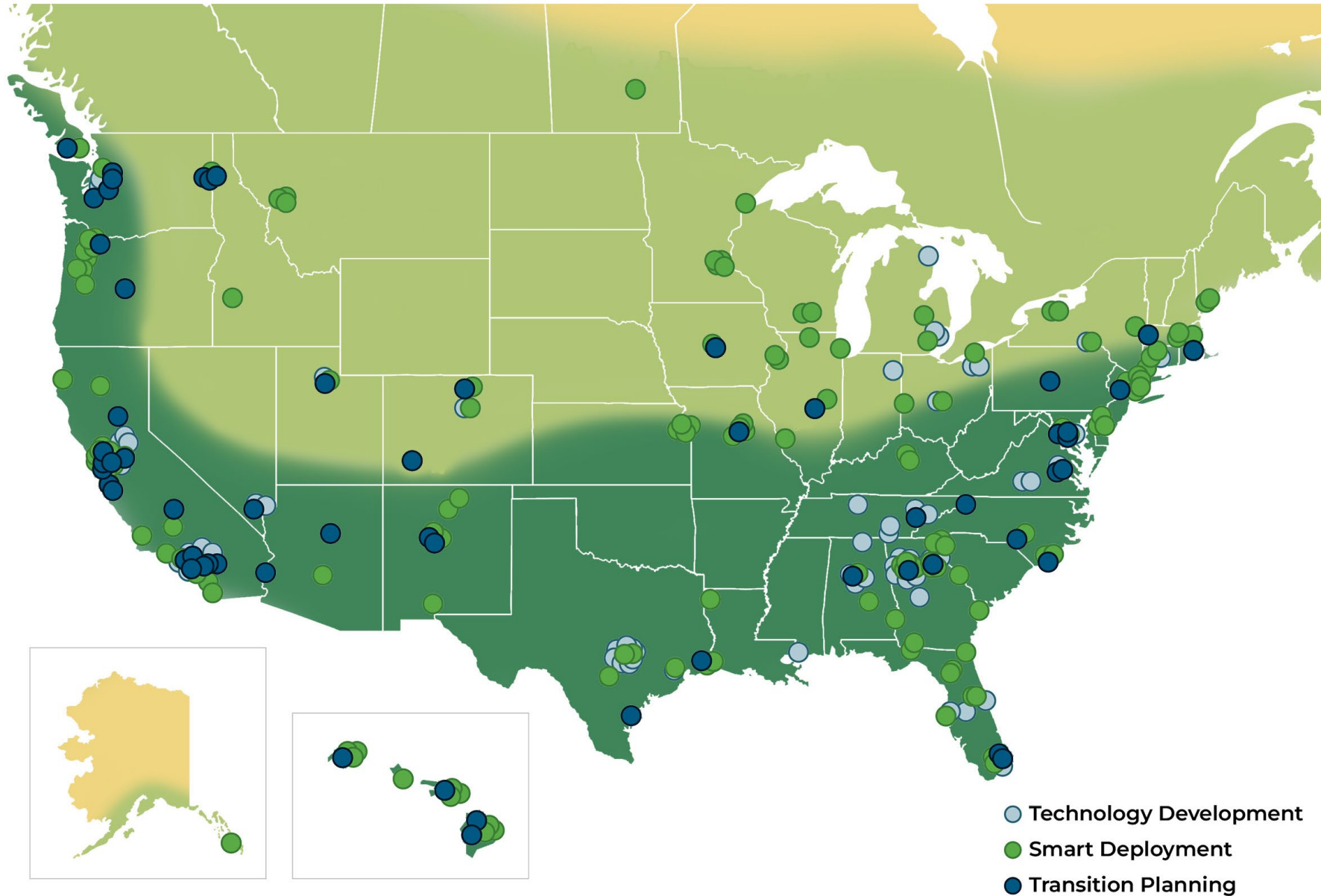
title: 2-6 Days

## EV Score

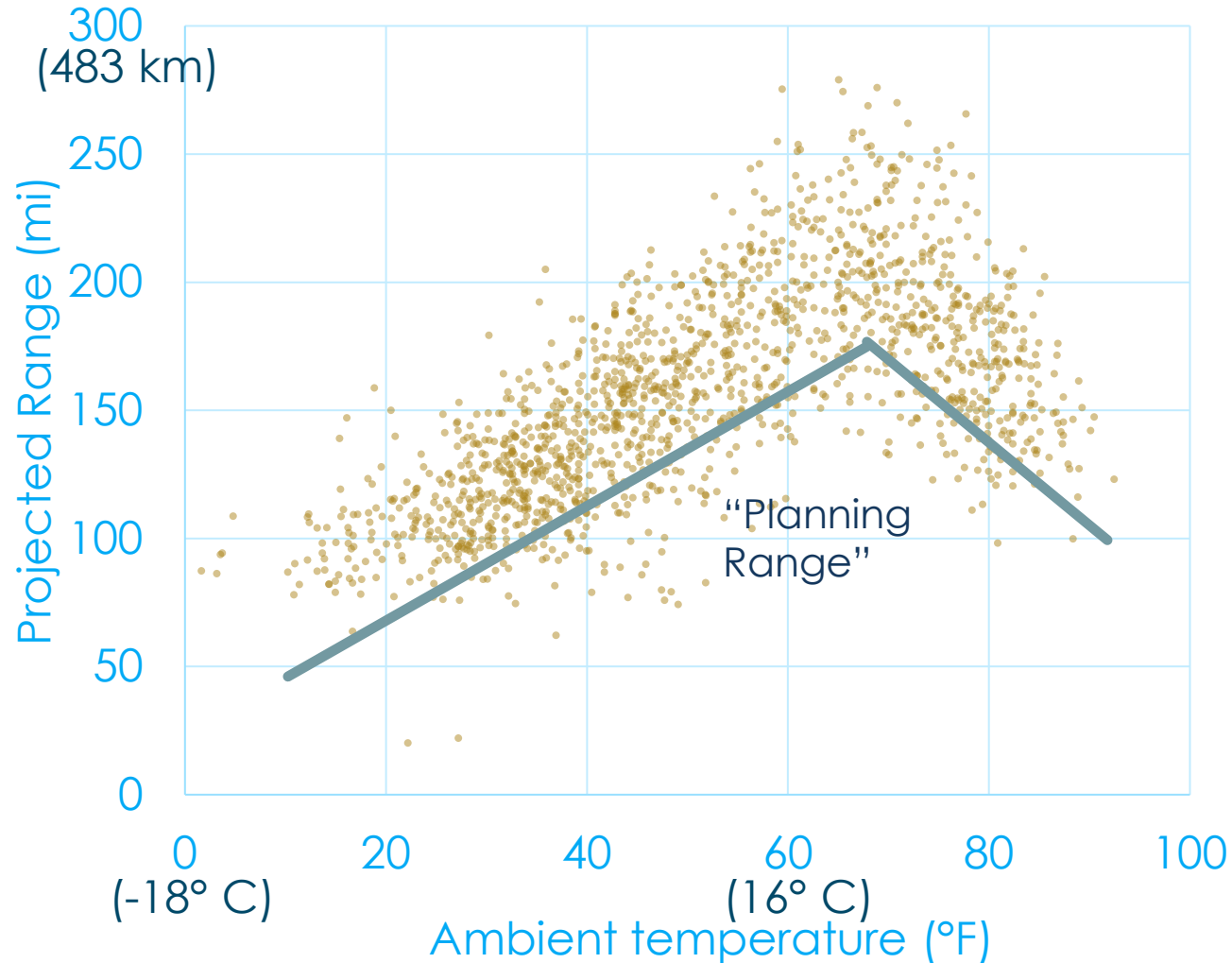


- 49.3 – Fairbanks
- 60.5 – Anchorage**
- 62.2 – Vancouver
- 67.9 – Oslo
- 79.9 – New York
- 92.0 – Los Angeles
- 98.0 – Mexico City

# Examples of Medium- & Heavy-Duty BEVs



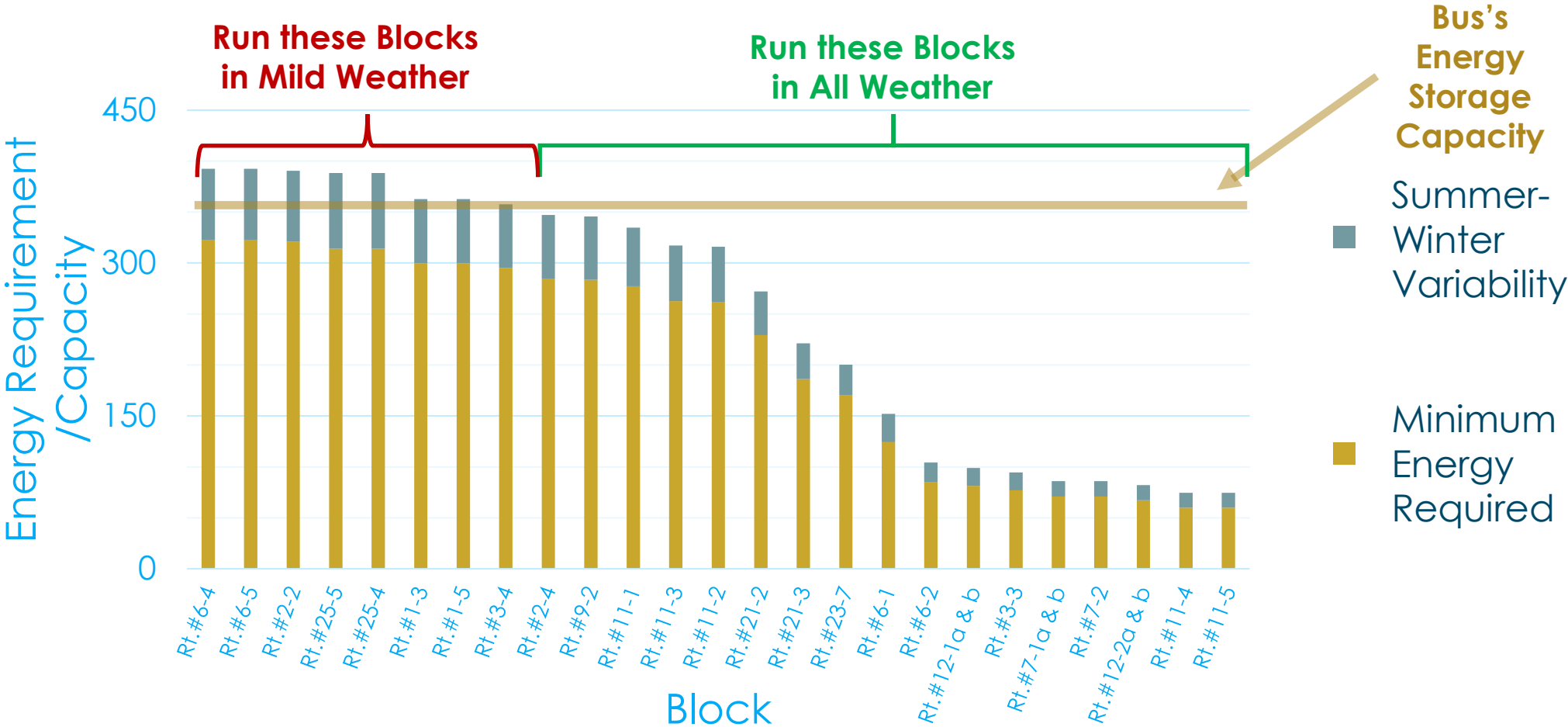
# Net Impact on Cold Weather Range



- Cold weather range can be less than half of what it is under the best conditions.
- This effect is more pronounced on slower routes, which use a greater proportion of their energy to heat the cabin.
- It can be useful to develop a **Planning Range** as a function of temperature to identify a reliable range based on the conditions.

# Seasonal Bus Assignments

- For partial fleet electrification, operators can shift BEBs from easier to harder blocks seasonally to optimize utilization.



# Nome, Alaska

Total yearly miles driven: 7300.0

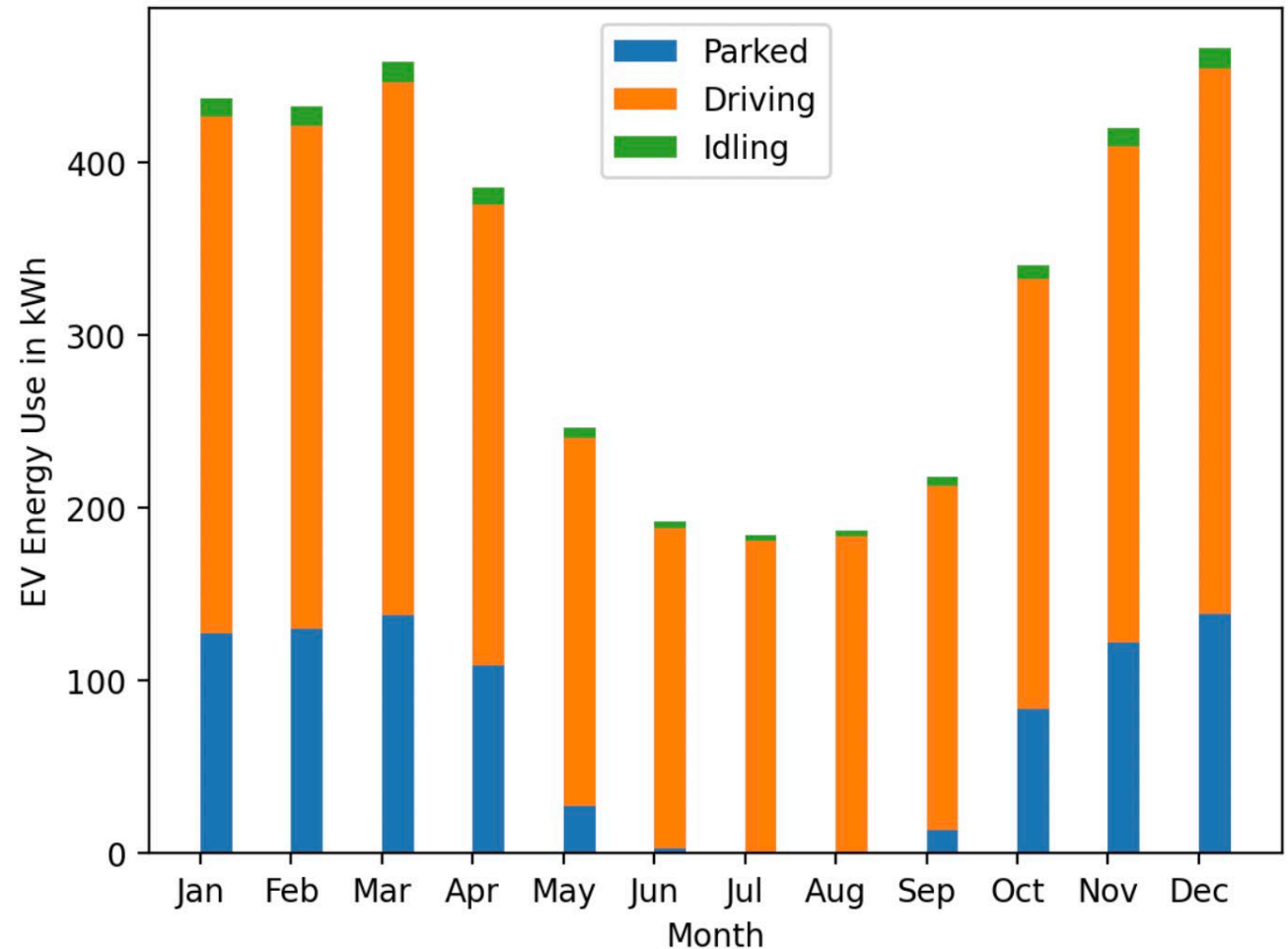
Total cost of Electric Vehicle fuel per year = \$ 1768.0

Total cost of Internal Combustion Engine (gas) fuel per year = \$ 1332.0

Total kg CO2 emissions of Electric Vehicle per year = 2631.0

Total kg CO2 emissions of Internal Combustion Engine per year = 2959.0

Note that costs and emissions for the Internal Combustion Engine vehicle include gas and any electricity used for block/oilpan/etc heating.



# Anchorage, Alaska

Total yearly miles driven: 7300.0

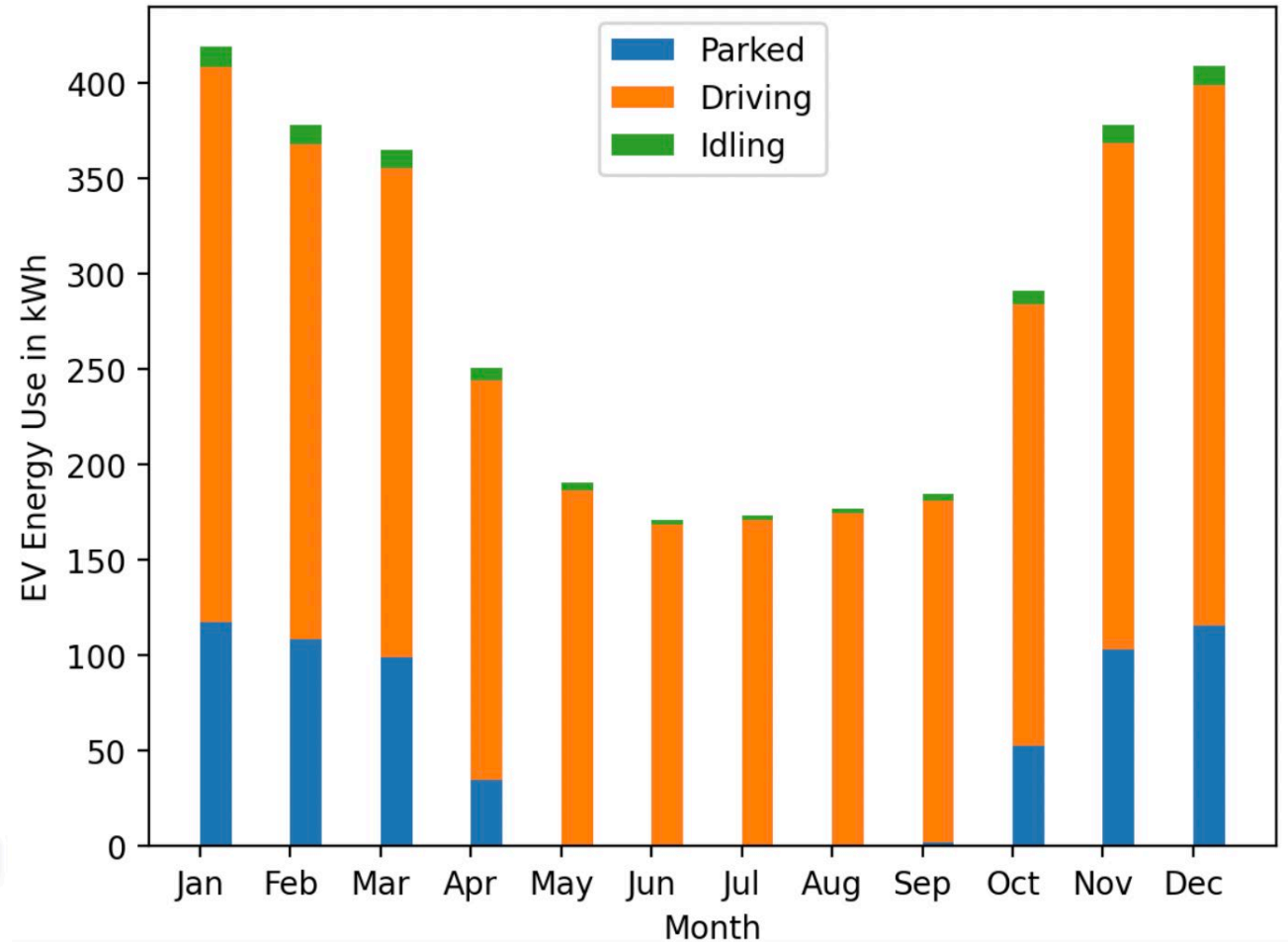
Total cost of Electric Vehicle fuel per year = \$ 678.0

Total cost of Internal Combustion Engine (gas) fuel per year = \$ 1284.0

Total kg CO2 emissions of Electric Vehicle per year = 1166.0

Total kg CO2 emissions of Internal Combustion Engine per year = 2852.0

Note that costs and emissions for the Internal Combustion Engine vehicle include gas and any electricity used for block/oilpan/etc heating.





# Winter Storing of BEVs

## Battery Health and Performance

Storing the vehicle indoors helps maintain a more consistent temperature, which can extend the life of the battery and preserve its performance characteristics.

## Faster Pre-Conditioning

Many BEVs offer a pre-conditioning feature that allows you to heat the cabin and warm up the battery before starting your drive. If the vehicle is stored indoors, the pre-conditioning process is more effective because the cabin and battery are starting from a warmer baseline temperature.

## Range Preservation

Storing the vehicle indoors helps keep the battery warmer, allowing for better range retention.

## Charging Efficiency

Batteries charge more efficiently when they are warmer, so storing the vehicle indoors can lead to faster and more efficient charging sessions.

# Maximize Your EV's Potential

## Range Loss

- HVAC
- Battery degradation
- Driver behavior

## Capacity Fade

- Charging at low temperatures
- Operating at very low or very high states of charge
- Fast charging
- Deep discharge

## Tips for Maximizing Range

- Use HVAC wisely
- Pre-heat or pre-cool cabin
- Store EV indoors
- Keep your EV plugged in on really cold days
- Limit Fast Charging
- Use the motor to brake
- Avoid very high speeds
- Ensure proper tire pressure