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Winter Happens: The Effect of Ambient Temperature on the Travel Range of Electric Vehicles

The operation of electric vehicles in cold weather is a concern, but there is not a lot of literature available regarding the precise nature of impacts on travel range. Two types of commercial battery electric vehicles, namely, the Nissan Leaf and the Mitsubishi i-MiEV, were driven to depletion across a broad range of temperatures that occur naturally in Winnipeg, MB, Canada, due to its climate. Analysis of data showed that the travel range can be reasonably interpreted as a function of ambient temperature using a series of simple linear segments: an upper plateau above about +20 °C, a lower plateau below about -15 °C, and a linearly varying segment in the middle. Both the Leaf and i-MiEV appeared to follow this model, with a good correlation of data for the middle (linearly varying) segment. Impacts of air conditioning on the travel range were also separately tested. This paper provides guidance for more rigorous assessments of electric-vehicle range performance into the future.

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