PHEVs for Remote Areas – A Case Study

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Hybrid vehicles can be efficiently used to commute to remote communities and reduce transportation cost and GHG emissions. Researchers, Scientist and students working at ELA (Experimental lakes area) located east of Kenora, at about ~275kms from Winnipeg, make weekly trips to Winnipeg on 6-8 semi or full-size pick ups and vans carrying people, equipment and bio-samples collected at the lakes to the Fisheries and Oceans office in Winnipeg. Being a research facility and with increasing oil prices, operating costs and growing concerns about climate change and vehicle emissions, there is a need to look for efficient and cleaner ways of road transport to and from ELA. A plug-in hybrid has all the benefits of a regular hybrid car, with more versatility. This poster explores the possibility of replacing the existing full-size truck fleet at ELA with PHEVs. A PHEV has an additional battery pack and a cord to connect to a standard electric outlet. This allows a plug ‘n go vehicle to be charged when it is sitting idle like at home at night.

Gasoline Vs PHEVs

- **Gasoline Driven**
  - Vehicles used at ELA have a range of 400-450kms with a highway mileage of ~20 mpg
  - Annual cost of transportation highly dependent on market fluctuations and increases with the age of the vehicle due to higher maintenance cost
  - Major sources of inefficiency are idling, frictional losses at high speed and pumping losses

- **PHEV**
  - PHEVs (ex: Toyota RAV4) have a range of 125miles (~200kms) on one full recharge with a top speed of 80mph (i.e. travel time remains the same) thus suitable for ELA and other remote communities that are at about the same distance away from urban areas.
  - Total recharge time is 6-7 hrs for a full charge i.e. from 0-100%. Ideally suitable for ELA where vehicles have a very limited use within the community, thus allowing for more time to recharge and are available all the time for highway travel like a normal gasoline vehicle.
  - Lower cost of transportation and less varying cost over time as better batteries and system electronics are introduced in PHEVs
  - Just a 20mile Electric range PHEV increases the fuel economy to 40mpg for full-size SUVs (Ref Fig).

A potential annual savings of over 35% on transportation cost by switching to PHEVs

- Though ELA generates its power from diesel, recharging PHEVs from this power has higher fuel-to-wheel efficiency than regular gasoline driven vehicles due to very high battery to wheel efficiency (~90%).

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