

# **Public-Private Strategies to Grow a V2G Industry in Washington State**

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with analysis provided by

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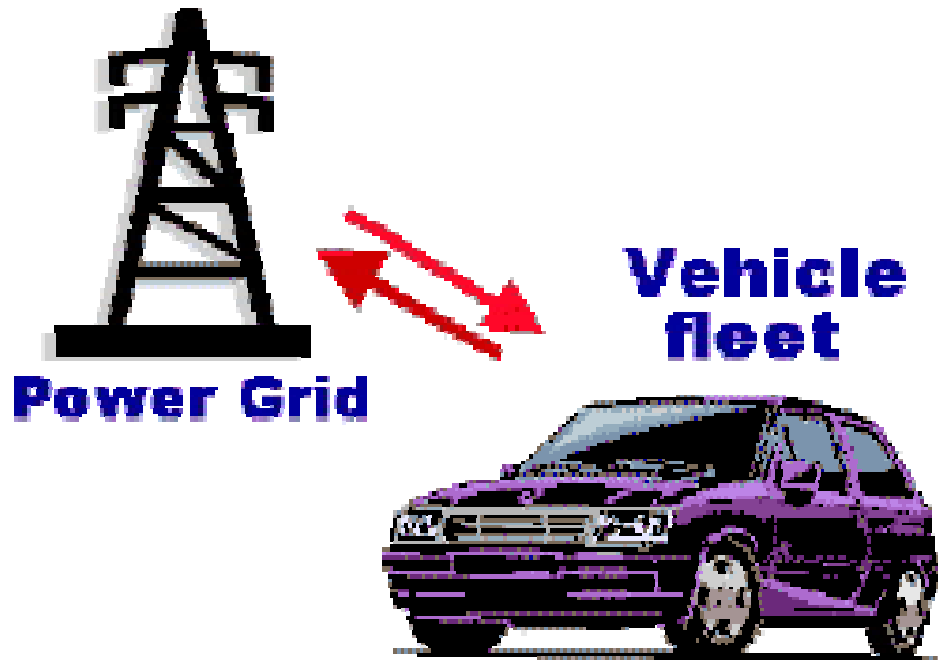
Technical Forum:

The Seattle Electric Vehicle to Grid Forum

June 6, 2005

# General Overview

- V2G could be a critical link to cleaner air and the transition to a sustainable energy future. Excellent option to reduce transport sector's CO<sub>2</sub> emissions.
- The initial barrier for an emerging V2G industry will be the divergent costs between battery and/or hybrid electric vehicles versus ICE vehicles.
- The public benefits of an emerging V2G infrastructure are potentially quite large, creating an important role for the public sector in supporting the growth of this industry.
- The various benefits of V2G are recognized by disparate public agencies, which will require innovation on the regulatory/public policy side.



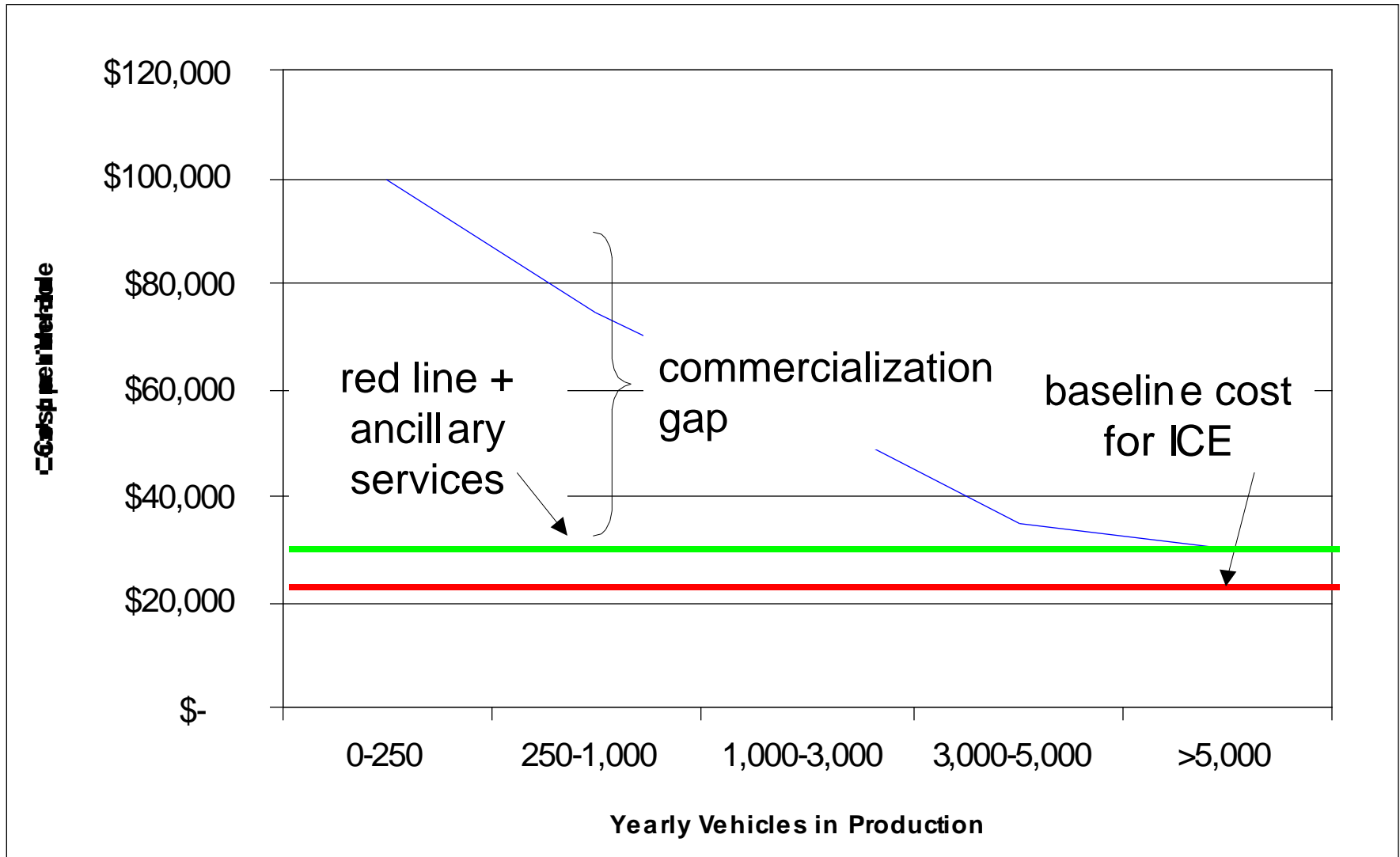
Is it a car or is it a power source?

**One product, serving two valuable functions:  
Transportation and  
Distributed Power Services**

- One percent of new vehicles sold in King Co. equals 1,100 cars totaling 5,500 tons per year CO<sub>2</sub> offsets and other emissions reduction benefits. (Cumulative CO<sub>2</sub> reduction over 7 years 38,500 tons.)
- These vehicles also represent a >11 MW (10 kW / vehicle) power resource connected to the greater Seattle electric grid.

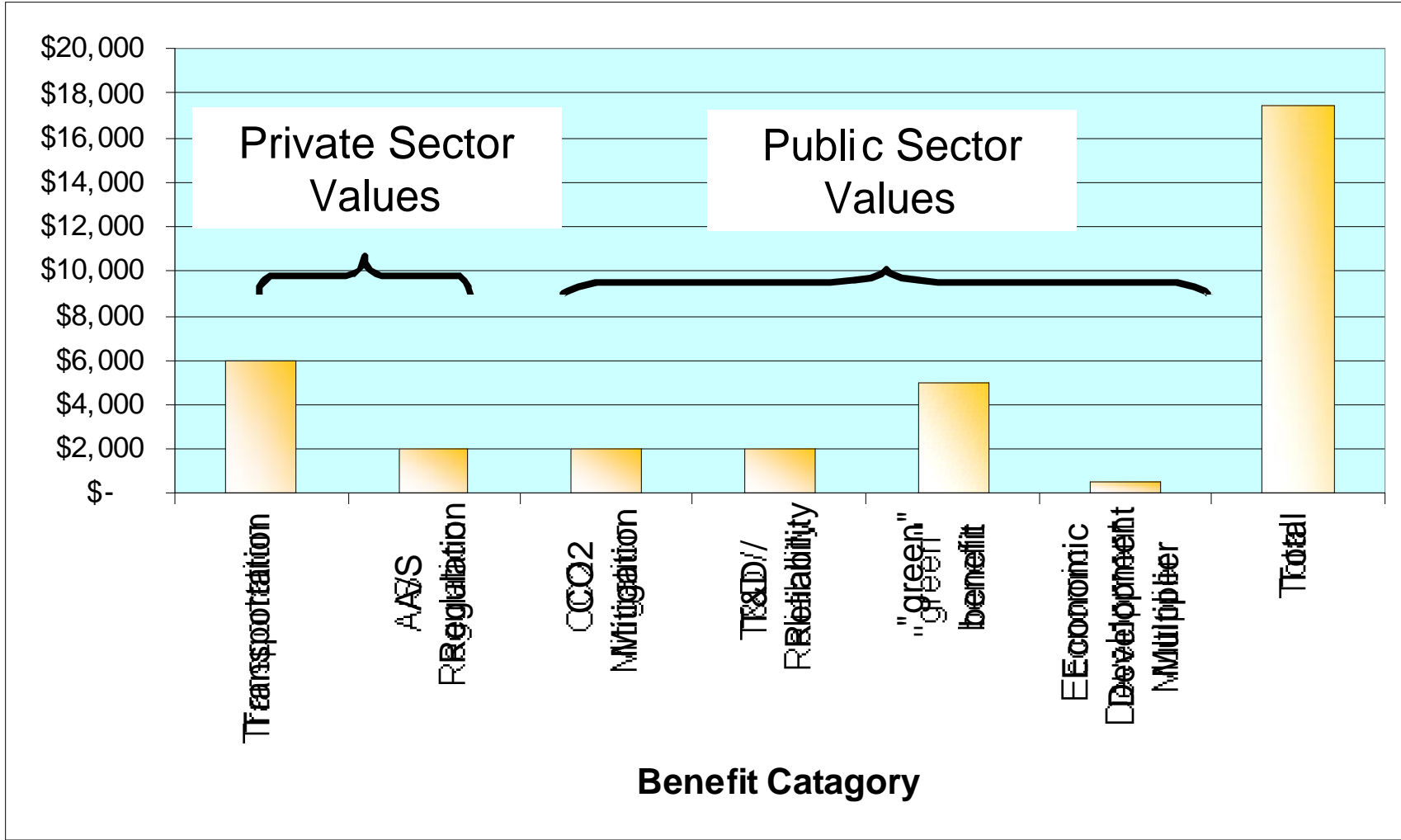
# The Commercialization Challenge

## V2G BEV/PHEV Production Volume vs. Unit Cost



# The Commercialization Challenge

## Private/Public Values from BEVs/PHEVs with V2G Capabilities



# Private Values Captured by Re-Manufacturer & Unified Management Entity

- Re-manufacturer focuses on delivering fully functional V2G BEVs/PHEVs, markets vehicles to UME.
- The Unified Management Entity (UME) = Leasing Agent + Service Contractor + Aggregator + Energy Services Provider (power market participant).
- Initially, Seattle City Light or Puget Sound Energy could serve as UME to demonstrate the protocol and control technology to deliver V2G power from aggregated fleet vehicles.

# Private Values

## Private Investment Alone

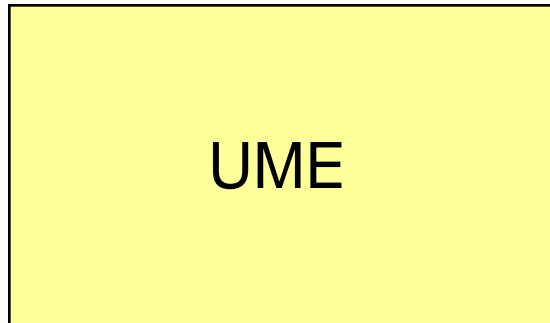
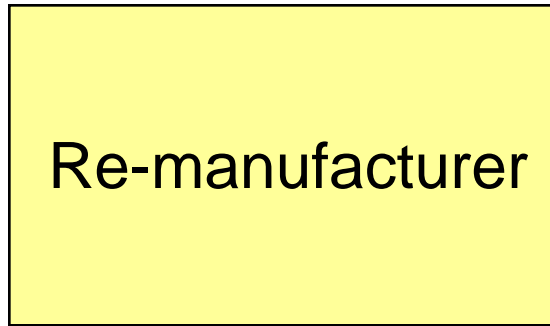
Tony Maine: Director, Future Enterprises Pty Ltd. AU

- Extensive business model illustrates 10 years to positive cash flow, ICEs and BEVs reaching cost parity in 20 years.
- The private investor is rewarded with a multi-million dollar / year profitable business.
- It seems unlikely that a major investors could tolerate this lengthy timeframe until the concept has been proven.
- The major cash consumer is underwriting the difference between EV and ICEV costs before parity is reached.

# The Commercialization Challenge

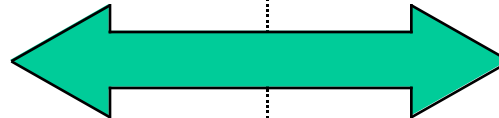
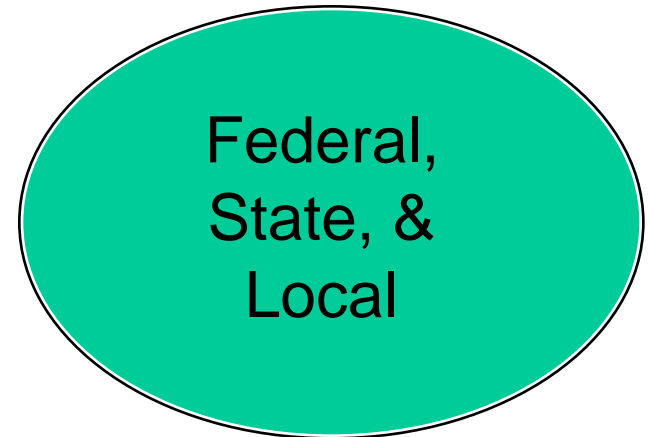
## Coordination Across Public-Private Lines

Private Sector



Public Sector

Underwrite the development of V2G BEV/PHEV market through direct purchases & direct subsidies.



Market/regulatory reforms to allow aggregated vehicles to connect to grid and provide energy services.

# Public Values

## Possible Scenarios for Seattle

- Washington State V2G Working Group forms and begins to assess and implement needed market and regulatory reforms for V2G power delivery.
- Seattle City Light and/or Puget Sound Energy serves to coordinate City and State vehicle purchases with target of 250 fleet vehicles in year one and develops V2G deployment expertise (serving as UME).
- Year two and three the Washington State V2G Working Group identifies fleet managers to purchase V2G BEVs/PHEVs and obtains state funding for the direct subsidy of 500 and 1,000 vehicles in year 2 & 3 respectively, say \$10,000 - \$15,000 per vehicle.
- Private sector introduces UME or Seattle City Light and/or Puget Sound Energy continues in this role.

# Public Values: Who Pays?

Year One:       $\$75,000 * 250 \text{ vehicles} = \$19\text{M}$

1/3 Justified in Capital Budgets of City and State Governments

~ \$13M Subsidy necessary

Year Two:       $\$50,000 * 500 \text{ vehicles} = \$25\text{M}$

2/3 paid by private fleet owners \$35k per vehicle (requires corporate partner willing to pay above market costs for fleet vehicles, but would generate revenue for energy services sold through UME)

~\$7.5M Subsidy necessary (\$15k per vehicle)

Year Three:       $\$40,000 * 1,000 \text{ vehicles} = \$40\text{M}$

2/3 paid by private fleet owners \$30k per vehicle (with sale of V2G power services, approaching parity with conventional fleet vehicles)

~\$10M Subsidy necessary (\$10k per vehicle)

# Public Values: Who Pays?

Three years, 1,750 V2G BEVs/PHEVs in Seattle area, 8,750 tons annual CO<sub>2</sub> reduction (61,250 tons cumulative over 7 yrs.) and 17.5 MW distributed power resource.

**\$30.5M total three-year subsidy:**

**Three year program \$500 per ton CO<sub>2</sub> and \$1.75M per MW for distributed power resources**

## Public Benefits Charges Possibilities

- \$ / vehicle registration
- \$ / gallon of gasoline
- \$ / kWh of electricity

For Earth Day 2003, the Mayor and Council set a long term goal of having a **100% clean and green fleet.**

# Public Values: Who Pays?

Vehicles Registered in WA ~4.5M registered vehicles

@ \$2 / annual registration public benefits charge = \$9M

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~7.3M gallons per day in WA x 365 = 2,665M gallons /  
year (source: DOE's EIA)

@ \$.005 / gallon public benefits charge = \$13M

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~76,500M kWh annually in WA (source: DOE's EIA)

@ \$.0002 / kWh public benefits charge = \$15M

# Summary

- A V2G industry would generate both private and public values in Washington State, thus requires public-private strategies.
- Washington State represents an excellent environment to pursue the development of a V2G infrastructure.
- Initial public subsidy could translate into long lasting public benefits and yet again establish Washington State as an innovator in energy and information technology.

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