



# Renewable Energy and Plug-in Electric Vehicles

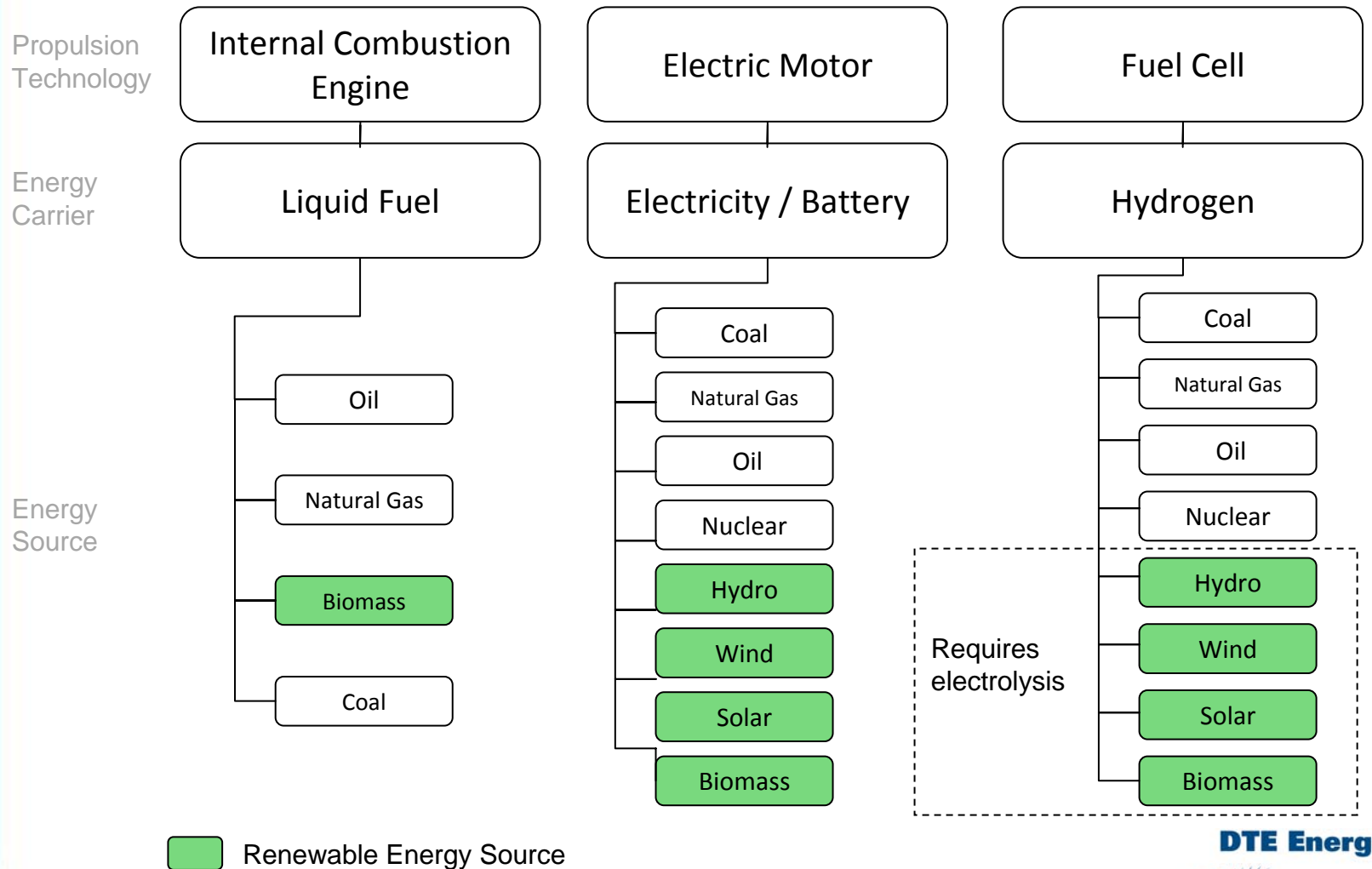
Michael Delaney  
DTE Energy



# Today's Discussion

- Electricity as an automotive renewable energy carrier
- Renewable energy support via plug-in electric vehicles

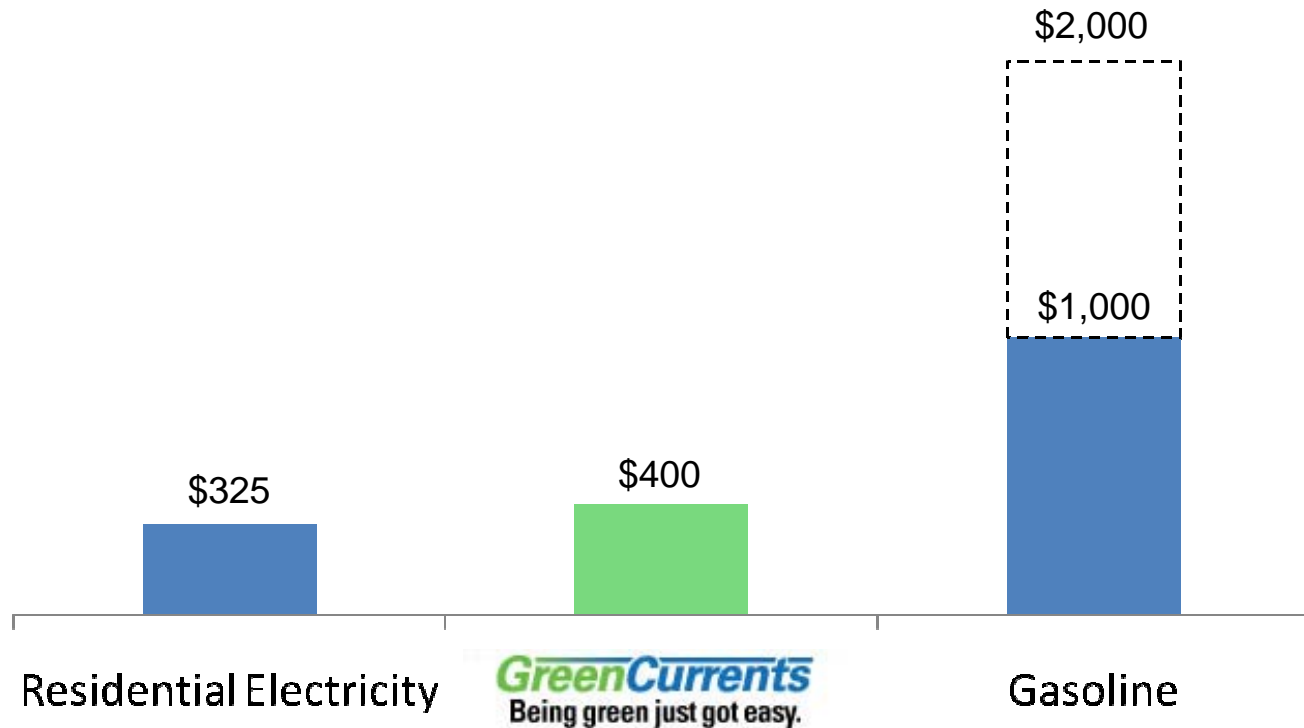
# Electric “Fuel” Enables Access to Renewable Sources





# Economics of Renewable Energy as a Vehicle Fuel

Annual Vehicle Fuel Costs\*



\* 12,500 miles/year, 4 mi/kWh electric, 25 mi/gal gasoline, Detroit Edison residential rate of 10.5 cents/kWh, GreenCurrents Renewable Energy Credits (RECs) at 2.5 cents/kWh, gasoline at \$2.00-4.00/gal

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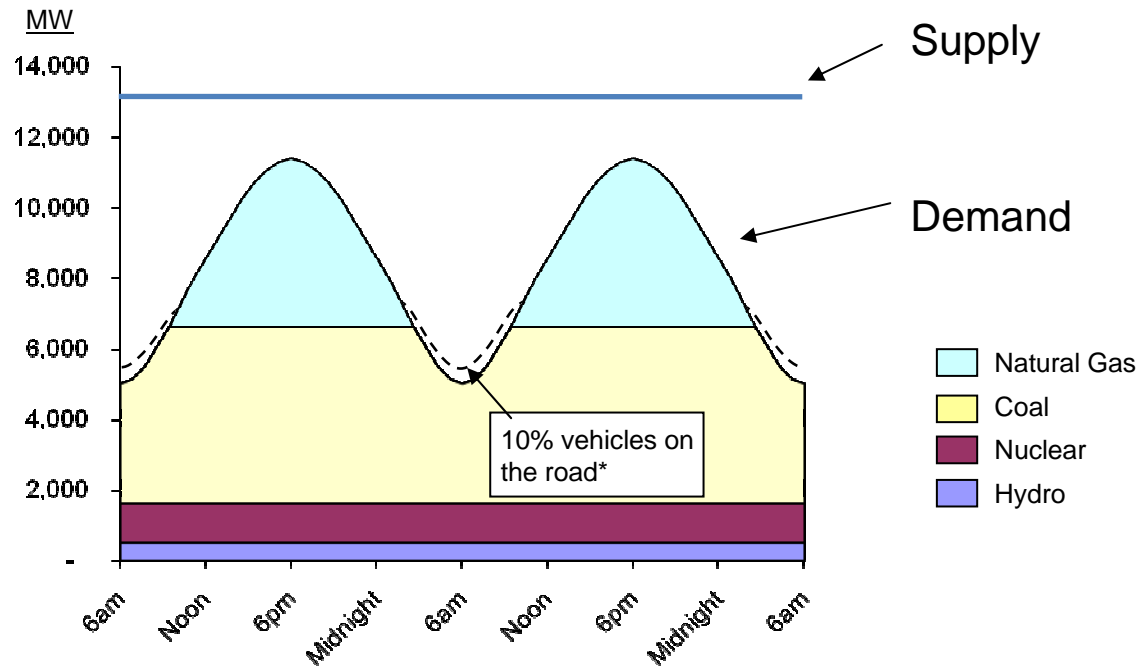
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# Meeting Demand for Electricity

ILLUSTRATIVE

## Summer Electric Load



\* PHEV is likely to also contribute to increased load during peak hours. Illustrative example of electric utility load – similar to Detroit Edison. Estimated 4 million cars and light trucks in (does not include diesel trucks, buses, etc) in Detroit Edison's service territory, 12,500 miles per year, 3 mi/kWh average efficiency, 75% electric operation

Source: DTE analyses

# Utility Uses for Energy Storage

Bulk Storage

Spinning Reserve

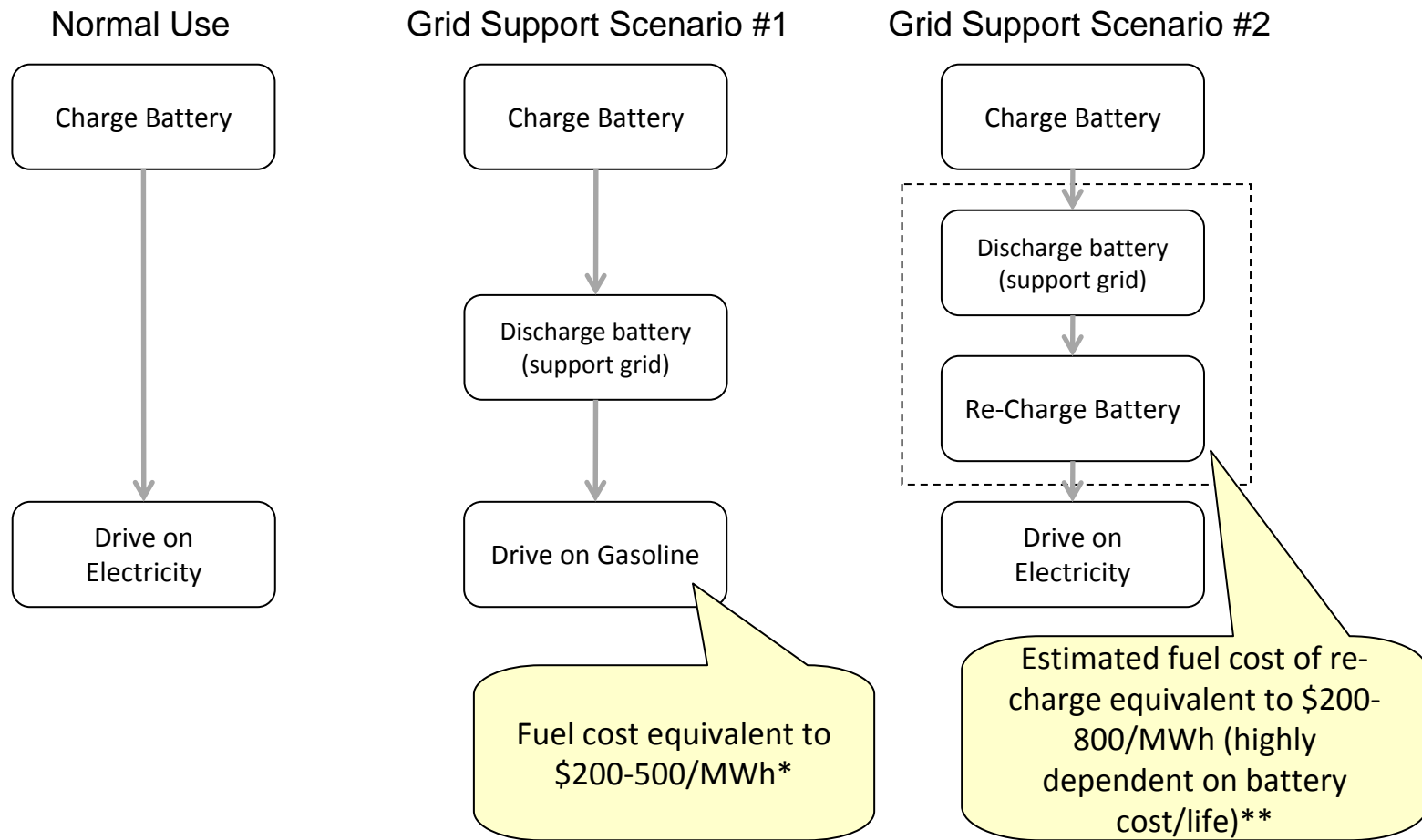
Frequency Regulation

Defer Distribution  
Upgrades



Requirements  
Larger Capacity  
Longer Availability

# Economical Bulk Storage Utilizing Plug-in EVs Appears Difficult



\* \$2.00-5.00/gal, 25-50 mpg, 2.5-5 mi/kWh

\*\* Re-charge using off-peak electricity at \$50/MWh, battery at \$300-1,000/kWh, 50-75% usable capacity, 10 year life (3,600 cycles), 7% discount rate

# What is DTE Energy Doing?

Utility-Vehicle Interface  
Demonstrations

Venture Capital  
Investing

Cross-Industry  
Collaboration