



# **Utilities in a Carbon Constrained World: Opportunities and New Players with the Smart Grid**

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# Silver Spring Networks

## About Us

Leading provider of Smart Grid solutions

- hardware, software, and services
- open, secure, flexible, proven

Founded in 2002

Based in Redwood City, CA

Backed by Foundation Capital, Kleiner Perkins

## Awards



## Growing Deployments Worldwide



### ***Our utility clients serve:***

- 20%+ of all US consumers,
- across 300,000 square miles of service territory,
- delivering over 690 Million MWh of power annually (roughly the consumption of Australia, South Africa, and South Korea... combined)

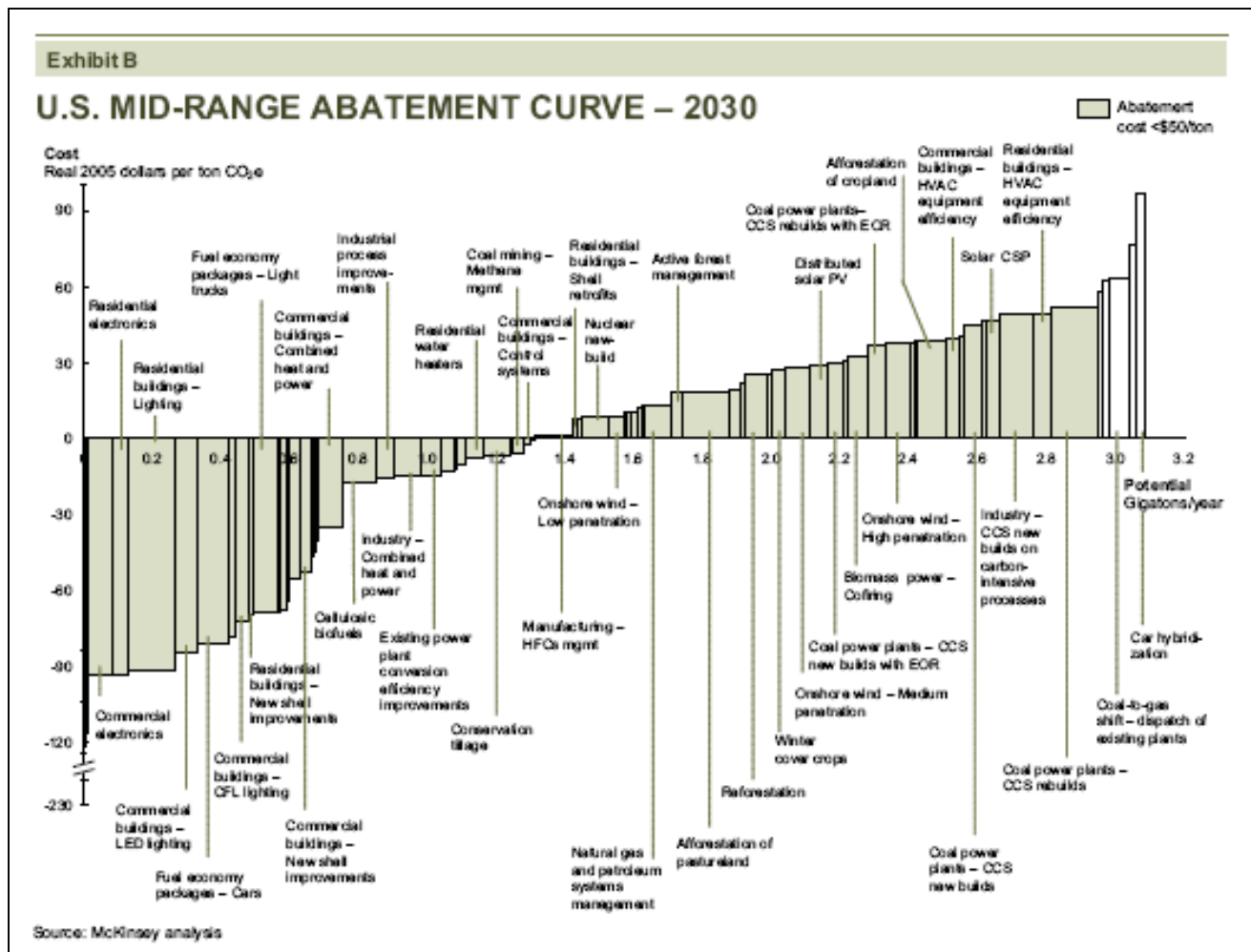
# Document Overview

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- Smart Grid can significantly enhance utility efforts to abate GHG emissions
  - ~9% of 2005 GHG emissions (or up to 25% of Waxman-Markey target) abatement potential enabled with Smart Grid applications
  - Smart Grid enables much greater GHG abatement than traditional methods by providing more information and control over the electric grid
- Business models to achieve this will be varied and broad
  - Greater information from the Smart Grid will enable many potential business models: Direct to consumer, 3<sup>rd</sup> party businesses enabled by utilities, utility provided services
  - Many emerging markets will have multiple business models that impact utilities – Electric Vehicles a prime example

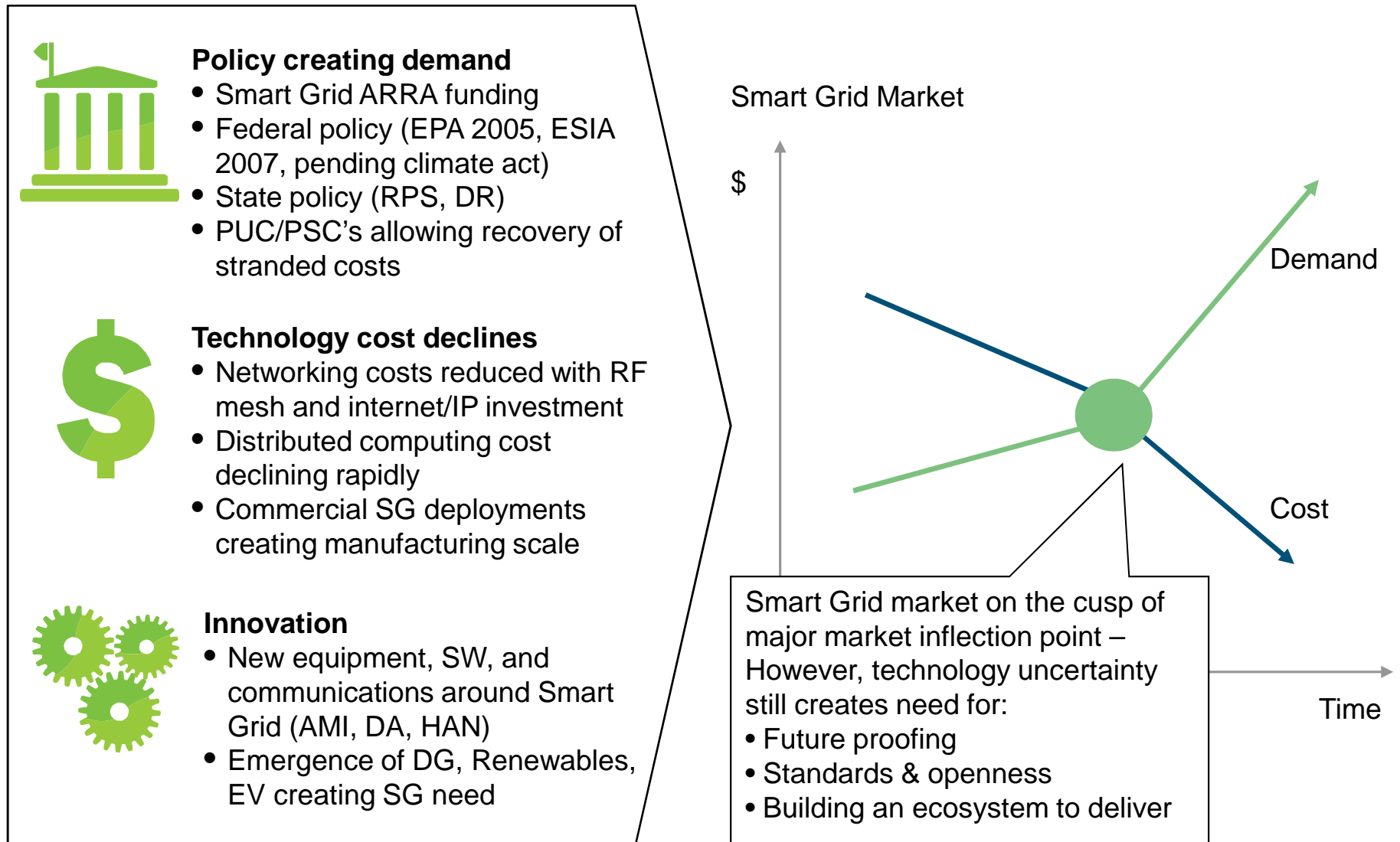
# There is no silver bullet to address climate change

McKinsey US GHG Abatement Cost Curve – December 2007



- 2030 US abatement goals - 3.5-5.2 Gton CO<sub>2</sub>e (based on 2007 proposed bills); 3 Gton Waxman Markey
- Meeting abatement goals would require doing everything on GHG abatement cost curve
- Smart Grid can enable/enhance significant abatement opportunities

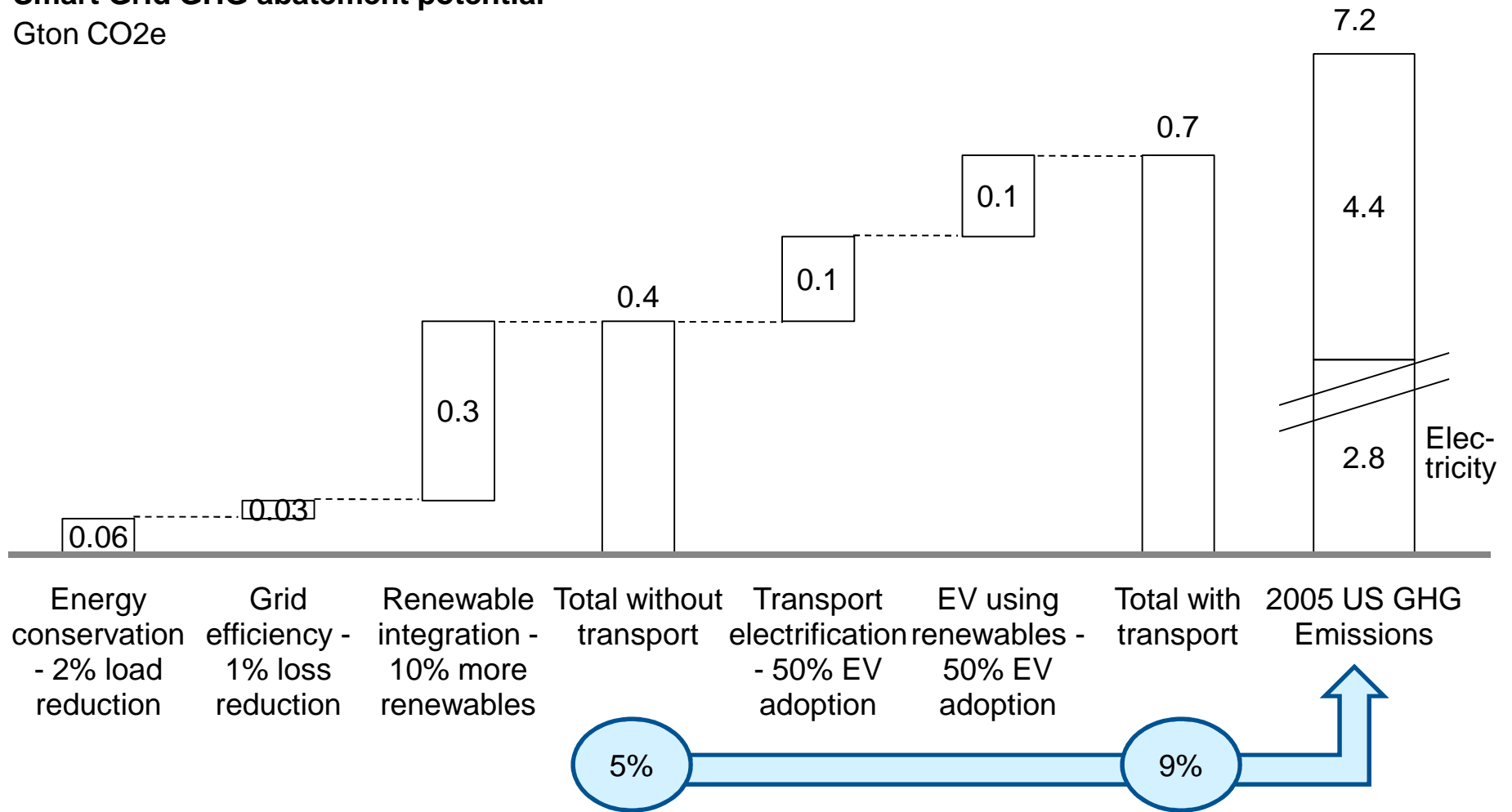
# A convergence of market events has created the ability for Smart Grid to exist today



# Smart Grid can enable the reduction of ~5-9% of 2005 GHG emissions






## Smart Grid GHG abatement potential

Gton CO2e



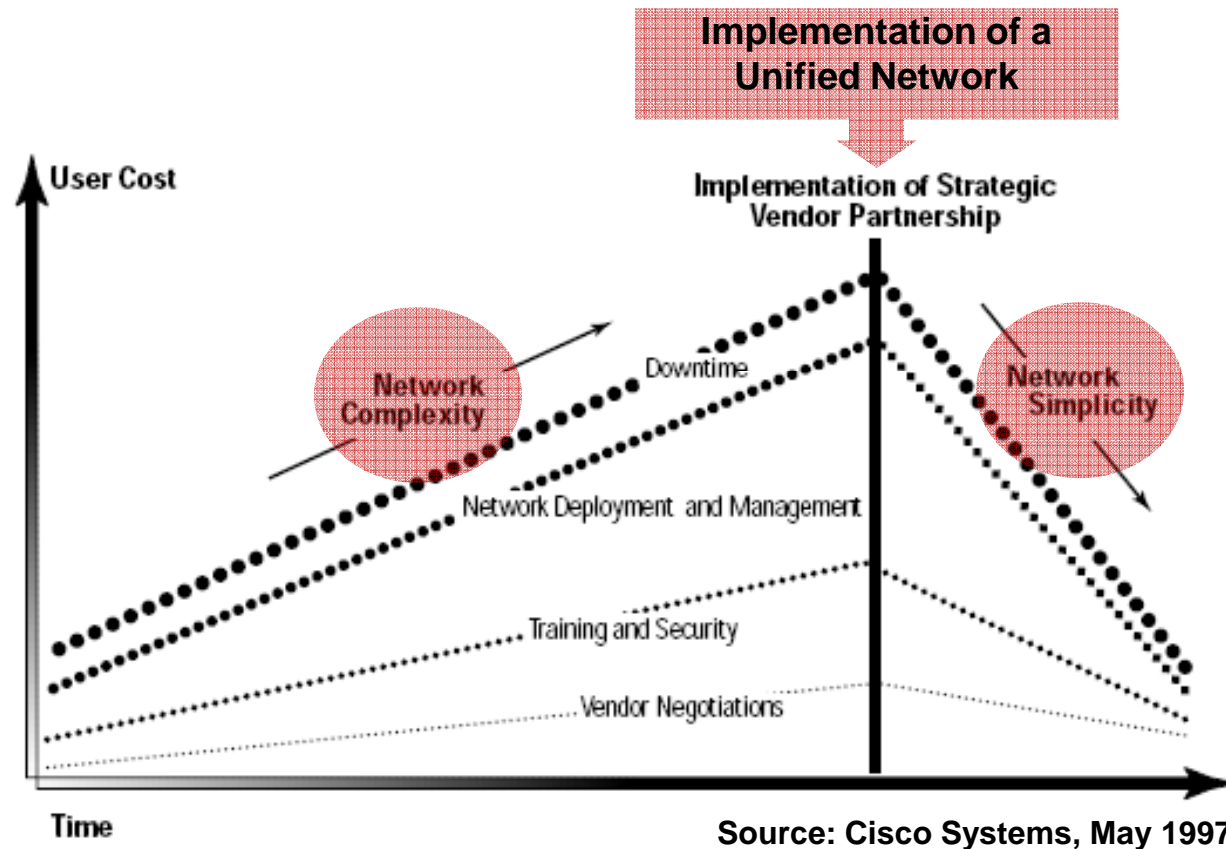
Enabling renewable integration and transport electrification are key Smart Grid applications for combating climate change

# Smart Grid enables more economic reduction of GHG than without Smart Grid

	<b>How SG enables</b>	<b>Potential impact</b>	<b>Without SG</b>
 <b>Energy conservation</b>	<ul style="list-style-type: none"> <li>• Provides more real time feedback on energy usage</li> <li>• Home Area Network enables information</li> </ul>	<ul style="list-style-type: none"> <li>• Studies show 5-15% energy usage reduction</li> </ul>	<ul style="list-style-type: none"> <li>• Only monthly feedback (bill), or next day (with AMI only)</li> </ul>
 <b>Grid efficiency</b>	<ul style="list-style-type: none"> <li>• Distribution Automation allows for Volt-VAR optimization and reduction of line losses</li> </ul>	<ul style="list-style-type: none"> <li>• Initial utility pilots show 1-2% baseload improvements, more during peak</li> </ul>	<ul style="list-style-type: none"> <li>• Utilities generally pre-program cap banks seasonally</li> </ul>
 <b>Renewable integration</b>	<ul style="list-style-type: none"> <li>• Demand Response creates active loads to follow renewables</li> <li>• Distribution Automation provides voltage stabilization</li> </ul>	<ul style="list-style-type: none"> <li>• Renewables impact the grid ~20% of load</li> <li>• DR of 15-20% could allow ~10% more renewables</li> </ul>	<ul style="list-style-type: none"> <li>• Utilities need to build more generation to firm renewables</li> </ul>
 <b>Transport Electrification</b>	<ul style="list-style-type: none"> <li>• DA can prevent local distribution problems from large EV load draws</li> <li>• Manages peak demand with DR applications</li> </ul>	<ul style="list-style-type: none"> <li>• Electric motors are more efficient than ICE, allowing for greater efficiency, even with coal</li> </ul>	<ul style="list-style-type: none"> <li>• Utilities need to build more generation to handle additional peak load</li> </ul>
 <b>EV with renewables</b>	<ul style="list-style-type: none"> <li>• Allows for Smart Charging of EV's to firm renewable generation</li> <li>• Can be used as ancillary services</li> </ul>	<ul style="list-style-type: none"> <li>• Drives to zero GHG fuel if charging is flexible with renewable production</li> </ul>	<ul style="list-style-type: none"> <li>• Utilities fuel EV's with coal and natural gas</li> </ul>

# An integrated network can help deliver Smart Grid benefits faster and cheaper

## Cisco whitepaper example – 1997



### Benefits

- Less systems integration
- Less additional communications costs
- Enables low latency applications

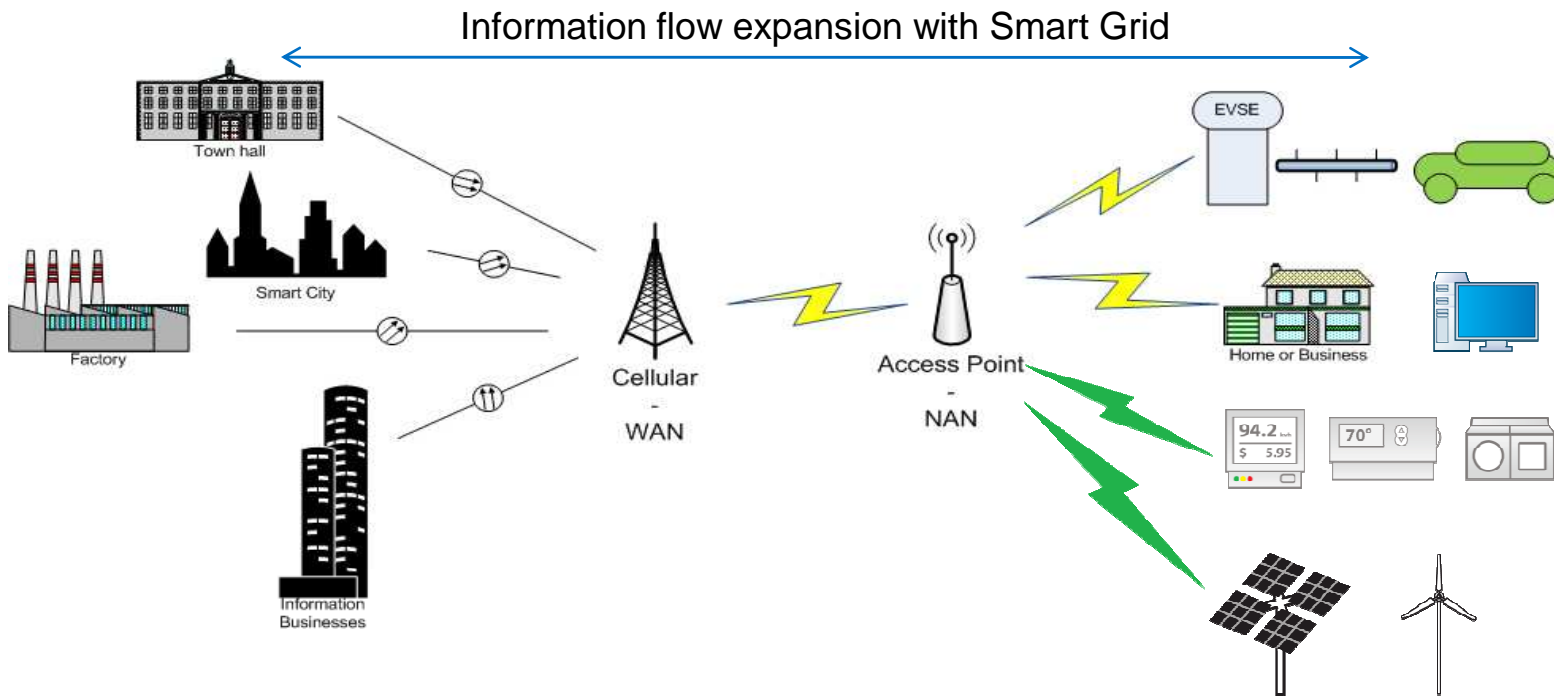
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## More information and connectivity allows new business models to emerge



Business model type	Example
<ul style="list-style-type: none"> <li>• 3<sup>rd</sup> party direct to consumer</li> <li>• 3<sup>rd</sup> party enabled by utility</li> <li>• Utility provided services</li> </ul>	<ul style="list-style-type: none"> <li>• Google PowerMeter captures user energy data and presents to consumer</li> <li>• Utility provides PV production data to solar provider for monitoring services (e.g. – SunPower)</li> <li>• Utility (with partners) provides energy efficiency recommendations to consumer to reduce usage</li> </ul>

Security, consumer privacy, and potential liability may inhibit information flows and new business models

# Example: Electric Vehicles have diverse potential business models

## Automakers



- Uses OnStar for customer interface and charging status
- Provides maintenance status and other services for a monthly fee



- Offering remote charging status, remote climate control, other services via vehicle

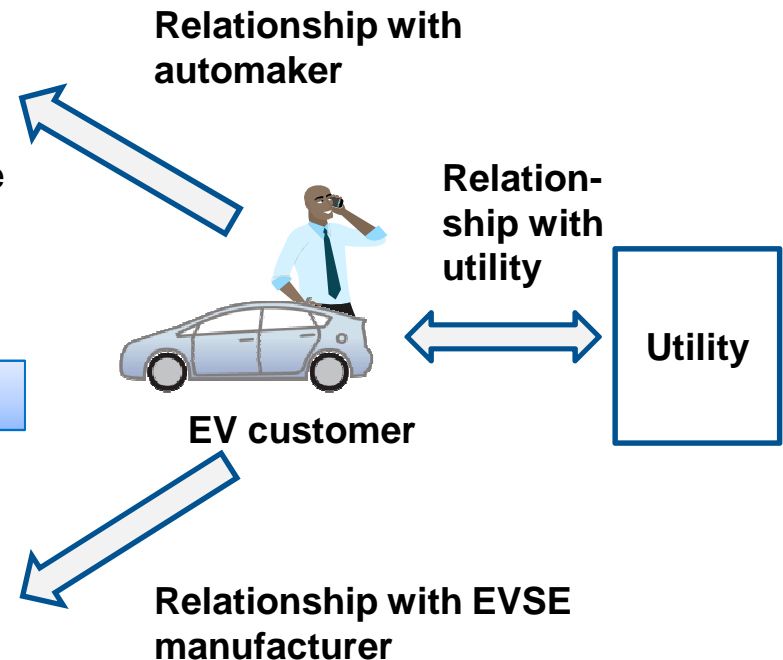
## Electric Vehicle Supply Equipment (EVSE) Manufacturers



- Owns battery and charging/swap stations; consumers pay per mile



- Consumers join Coulomb network for public charging and web portal
- Vendors buy infrastructure and charge for parking (w/ electricity)



# Thank you

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- Whitepaper available: “Connecting Smart Grid and Climate Change” – Michael Jung and Peter Yeung, Silver Spring Networks
  - [www.smartgridtoday.com](http://www.smartgridtoday.com)
  - [http://www.energypulse.net/centers/article/article\\_display.cfm?a\\_id=2210](http://www.energypulse.net/centers/article/article_display.cfm?a_id=2210)
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