

Policies Supporting Entrepreneurial Innovation and Investment in Low- Carbon Energy

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Businesses where entrepreneurs have been catalysts for innovation

- Telecom & Internet – opening to more competition led to rapid innovation by entrepreneurs
- Electricity – Portfolio Standards, feed-in tariffs, and open procurement led to rapid innovation and deployment of wind and solar renewables in several countries
- Key differences – capital intensity and lead times are more challenging for many low-carbon innovations.

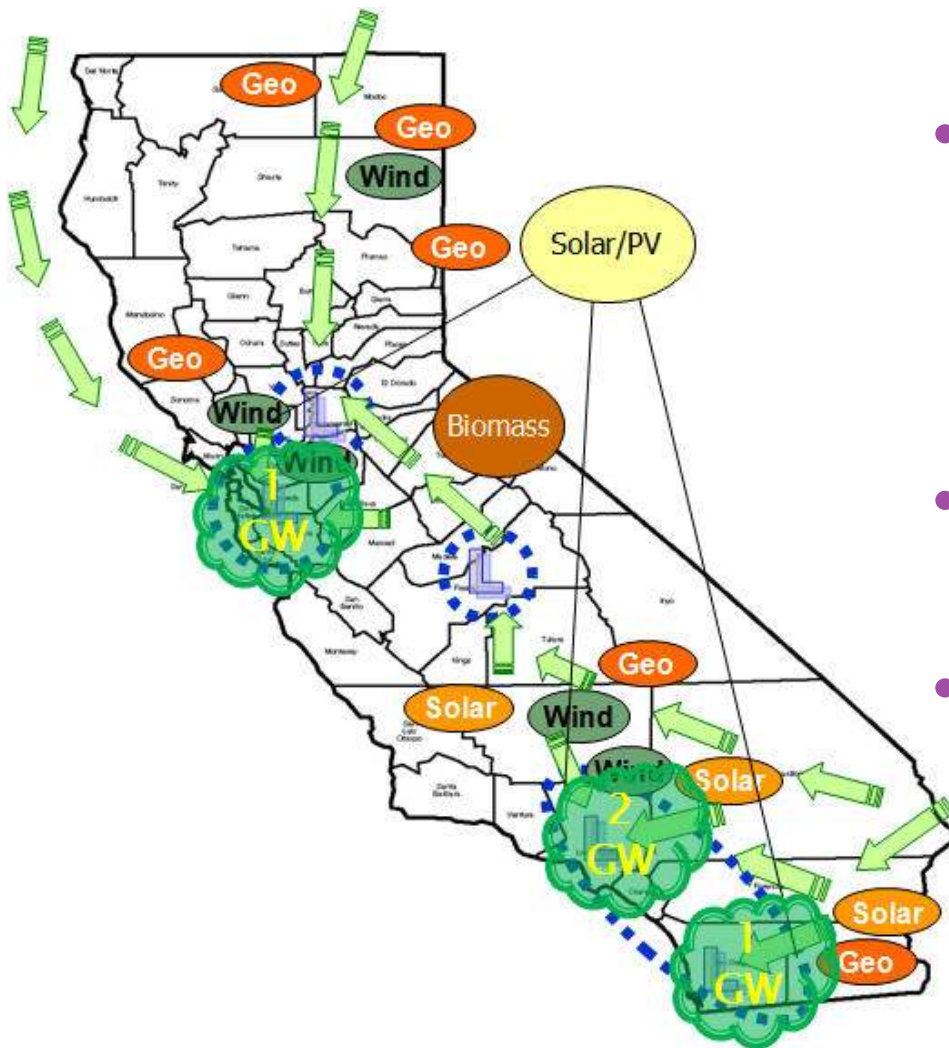
Innovations in Critical Low-Carbon Energy Technologies Driven by Entrepreneurs

- Energy efficiency
- Renewables – solar and wind – esp. distributed renewables
- Electric vehicles
- Enabling Technologies for variable wind and solar
 - Battery Electricity Storage
 - Smart Pricing and Smart Devices

Battery Electricity Storage Policies

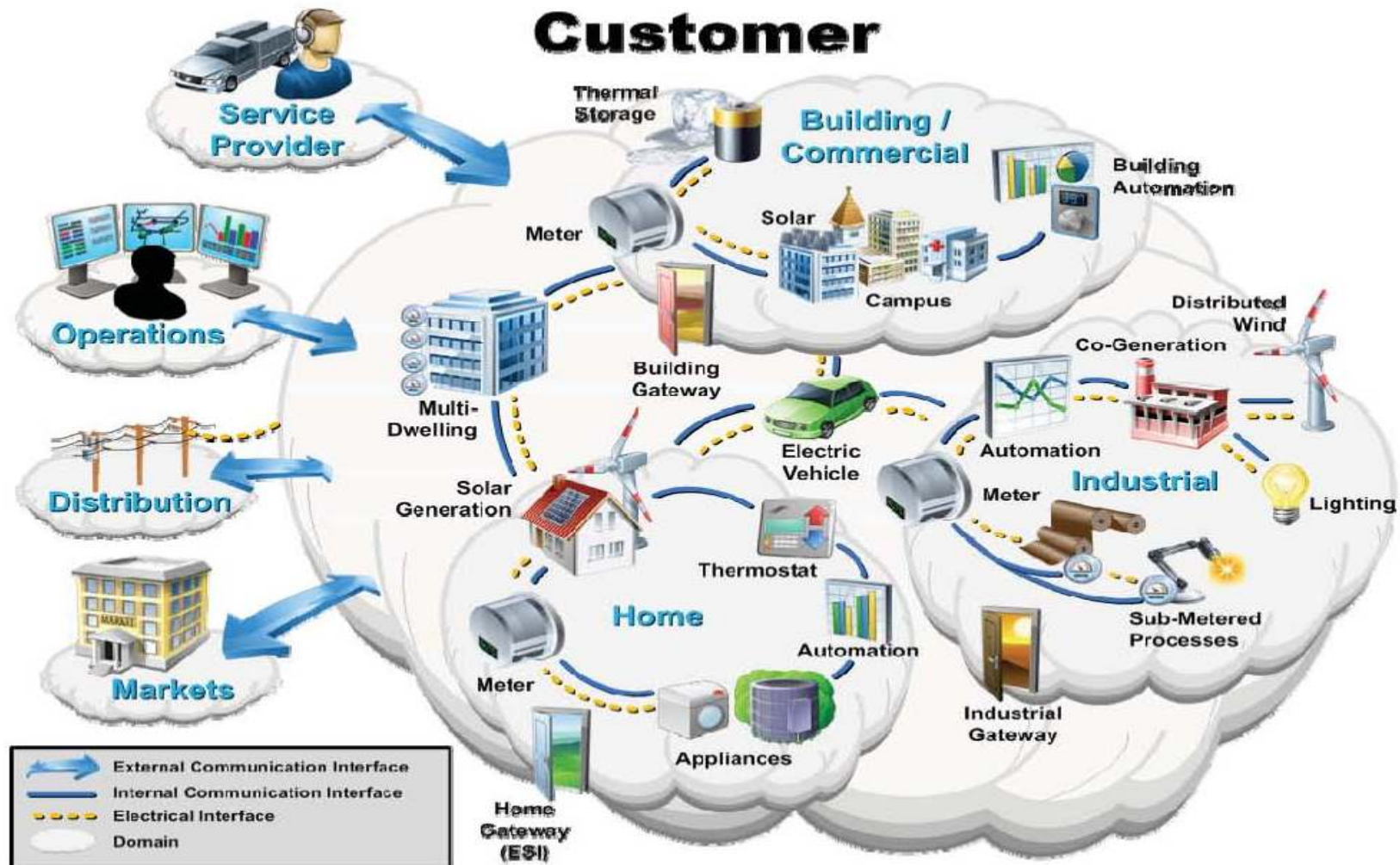
- Battery Storage provides multiple benefits
 - Local reliability
 - Short-term balancing (ramping and regulation)
 - Load following
 - Loss Reduction
 - Transmission Expansion Deferral or Elimination
 - Distribution Expansion Deferral or Elimination
- A storage product can jointly provide all benefits, but there may be no buyer to pay for all.

4 GW of Storage in CA by 2020



- Needed to meet the 33% RPS standard with 25 GW solar and wind with 70 GW peak.
- Evaluation of joint benefits is too difficult.
- Policy Recommendation: Storage Portfolio Standard at 5% of peak.

Smart Pricing and Smart Devices



Smart Pricing is Essential for High Penetration of Variable Renewables

- 24/7 5-minute dynamic locational prices to all customers and distributed energy resources.
- Dynamic forward hourly and long-term transactions to hedge risk for customers and suppliers.
- Prices vary to balance supply and demand with variable renewables.
- Key barrier is fear of dynamic prices being manipulated – solution is oversight and proper design.
- Policy mandating smart pricing is essential.
- Smart pricing will encourage innovation and investment in smart devices and efficiency.

Policies that encourage entrepreneurial involvement in low-carbon energy

- Support for early stage venture capital
- Support for transitional investment capital (grants and loan guarantees).
- Open procurement by monopoly utilities
- Prices on carbon and other emissions
- Renewable portfolio and efficiency standards
- International Smart Grid standards
- Investment incentives and long-term contracts
- Smart pricing

Policies that deter entrepreneurial involvement in low carbon energy

- Monopoly control of energy procurement
- Dependence on large suppliers for innovation
- Flat and fixed pricing of electricity

thank you