

Are Government Incentives Necessary for Decarbonization?



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Innovations for the 21st Century Grid

Generic Decarbonization Approach

- Decarbonize the electricity grid
 - Increase renewables (solar, wind, hydro, others) in generation mix
 - Eliminate coal-fired generation
 - Increase capacity for assuring reliability (storage, capacity markets, pricing)
 - Manage demand by time of day and season
- Electrify energy demand
 - Expand electric light-duty vehicles and fast chargers
 - Expand medium- and heavy-duty electric trucks
 - Replace fossil based space & water heating with electric heat pumps

Incentives for decarbonization

- Behavioral incentives
 - Carbon prices (induced, with cap & trade, or direct)
- Technology incentives
 - Technology forcing regulations (eg, renewable portfolio standards)
 - Price subsidies (eg, feed-in tariffs)
 - Bans (eg, restrictions on use of fossil-based technologies when alternatives exist)
 - Subsidies for clean capital purchase (by firms or households)
- Market incentives
 - Capital markets – look forward and favor cleaner tech
 - Prices – economies of scale and increasing demand should reduce prices further
 - Consumer demand for green products is real
 - Perceived progressive companies may attract higher quality, more stable workforce
 - Liability rules (eg Shell ruling in Netherlands court)
 - Shareholder action (eg Exxon shareholders pushing alternative corporate governance)

NB: First two bullets require state/government action

Schumpeter: Invention, Innovation, Diffusion

- Time is a critical ingredient
- Example: Electric vehicles rely on batteries
- R&D on new batteries proceeding aggressively
 - Market demand from mobile phones incentivized previous progress on batteries
- Innovation necessary to make inventions cheap and reliable
- Diffusion is always slow – scale economies accompany diffusion
 - Even the electric light bulb took decades to achieve full potential
- Case of Li-ion battery
 - New generation may reduce dependence on lithium
 - Production scale economies and increasing demand will push down price
 - Price currently < \$200 a kWh
 - Price expected to decline to \$50/kWh
 - New technologies may cause further declines in production costs

Conclusions

- Decarbonization will not happen without state intervention
- Companies which anticipate state action will do best and reap highest profits
- Wide variety of tools available to governments