Characterizing the Connection between Market Structure and Innovation Processes/Outcomes along Energy-Related Technology Value Chains

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Tool development to synthesize market barriers and facilitate R&D analysis: the Energy Innovation SPARK

Coming soon: the EI-SPARK online platform

- Strategy, Policy, and Research Knowledge

Energy I-SPARK

ENERGY INNOVATION STRATEGY, POLICY, AND RESEARCH KNOWLEDGE

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- Descriptive Information
- Innovative Outcomes
- Strategic Conditions
- Knowledge Conditions

Turbine — Descriptive Information

General Description

An on-shore wind turbine is typically composed of three modules: (1) rotor, (2) nacelle, and (3) tower. A more detailed anatomy of a typical wind turbine can be found in Figure DI.1. Wind turbines account for approximately 71% of the total cost of an on-shore wind power project as of 2015 [1]

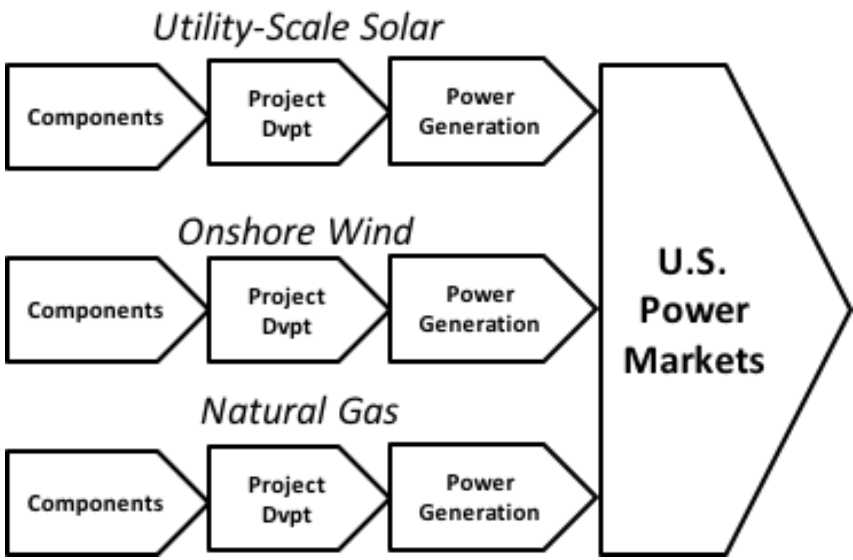
The main business activities of turbine manufacturers are designing, manufacturing, and installing wind turbines. Some turbine manufacturers also provide operations, maintenance, and performance optimization services for wind power projects.

As of 2016, the top three wind turbine manufacturers, measured by shares of cumulative installed capacity of the U.S. wind turbine fleet, are GE Renewable Energy, Vestas, and Siemens. These three manufacturers collectively represent 79% of the U.S. wind turbine market. During 2016,

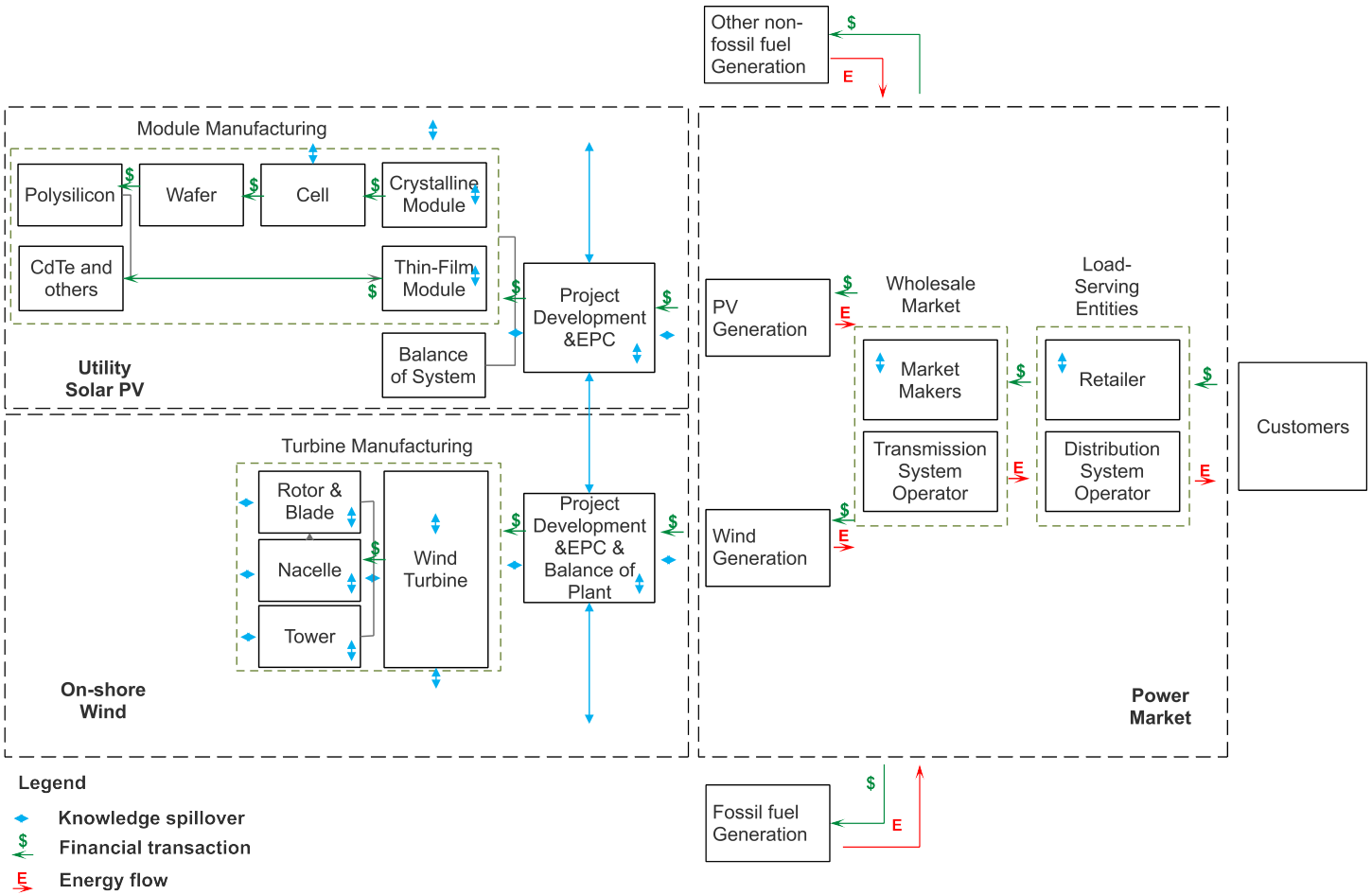
Economic/Innovation Theory behind EI-SPARK: Three Market Failures interact across Value Chains

- Negative externality
  - Pollution
- Positive externality
  - Knowledge creation by firms, the returns of which are not fully captured, leading to sub-optimal investment
- Imperfect competition
  - Imperfect competition changes the way to model technology economics and innovation effects
  - Economic effects include artificially set prices and goods and services that do not fully reflect consumer preferences
  - Innovation effects can be either positive or negative
    - Negative: Dominant firms can be “fat and lazy”
    - Positive: Dominant firms have “slack” resources to invest in RD&D
  - Is also important to understanding institutions

Constructing A Knowledge Platform for Researchers to Explore This



Value Chains currently in EI-SPARK



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