Holding a Candle to Innovation in Concentrating Solar Power Technologies: A Study Drawing on Patent Data

BACKGROUND

- The development and adoption of low carbon technologies are critical if the future carbon intensity of the economy and environmental degradation are to be minimised.
- Concentrating solar power (CSP) technologies can make a major contribution to a low-carbon and secure power system.

METHODOLOGY

- The study is based on patent data, and examines the level and dynamics of innovative activity in CSP technologies from 1978 to 2004.
- A novel methodology is developed. A new classification system permits direct and precise mapping of CSP technologies to the International Patent Classification system.
- The objectives of the study are:
    - to assess for the first time the dynamics and geographic distribution of innovative activity in CSP; and
    - to examine the actual outcome of the innovative behaviour that the authors describe (CSP installations)
    - to provide an overview of the structure of the supplying industry.

KEY FINDINGS

Innovative activity and distribution

- The innovation performance of CSP technologies is found to be surprisingly weak compared to the patent boom in other green technologies. Performance was strong around 1980 before falling dramatically, and it has only recently begun to show signs of increased activity with stronger innovative output since 2000.
- Innovation and R&D are highly concentrated in high-tech countries, the US, Germany and Japan, not all of which have high domestic CSP potential. Large CSP potential is therefore not a sufficient condition for innovation.
- There is an emergence of countries that are newly innovative in CSP: Israel, Australia and Italy. These countries have active R&D support measures or abundant natural resources, and they have clear advantages over other countries with respect to research capacity and human capital. They have potentially large markets for CSP applications and already have capacity installed.

Industry structure

- The overall impression is of an industry in which there are many small firms which focus solely on CSP technologies. Of these, 40% are active in more than one stage of the value chain.
- The size distribution of firms is vast, ranging from very small firms to giants such as Siemens and GE.
- There is a trend for consolidation through merger in recent years.

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POLICY IMPLICATIONS

- Mapping technologies to the the International Patent Classification system reveals different innovation patterns which are sensitive to the assumptions underlying the classification system. This suggests that policies which are effective in promoting specific technologies should be based on a more precise classification of the technology than those that are currently the norm.
- Consolidation in the supplying industry may have implications for the rate and extent of adoption of a new process technology so policy makers should be conversant with its structure.

THE CCP

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