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SYMPOSIUM: THE IMPACT OF ELECTRICITY NETWORK ORGANISATION, REGULATION AND PRICING ON RENEWABLES AND DISTRIBUTED GENERATION

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SELECTED SYMPOSIUM CONTRIBUTIONS WILL BE PUBLISHED IN A SPECIAL ISSUE OF *ENERGY POLICY*

Electric power networks are frequently conceived strictly as a means of transporting inexpensive power from outlying areas to load centers. However, power networks have acquired a range of new roles over the last century and their functions now include facilitating wholesale competition and improving reliability through the pooling of resources. This symposium will explore a still broader, more future-oriented view of the network that incorporates its capabilities and responsibilities in an environment characterized by a large number of renewable and conventionally fired distributed generation (DG) technologies. In such an environment, a properly "informated" network, appropriately organized and regulated, becomes a crucial market-facilitating element in any liberalisation/restructuring policy.

Symposium Objectives

- Explore organisational, governance, regulatory and pricing policies for the liberalised environment with emphasis on the effect these issues have on the diffusion of conventional and renewables-based DG
- Develop Incentive, regulatory and pricing mechanisms to help implement EC renewable targets and priority access objectives.
- Develop organisational, governance, regulatory and pricing policies that:
  - Promote efficient transmission investment as well as efficient utilization of existing assets.
  - Promote, or at least do not hinder, the diffusion of small scale renewables/DG.
  - Exploit the nature of DG technologies and promote the network's arbitrage and market-making functions.
- Conceptualise the network's future roles and capabilities in a decentralised environment:
  - Power networks allow markets to arbitrage the constantly fluctuating value of electricity, which will vary among distant load centers or from one house to the next.
  - Power networks provide the means for creating markets that enable flexible contracts and transactions between all loads, suppliers and ancillary service providers thereby enabling large numbers of suppliers to competitively meet demand.
- Develop a set of open-architecture and information-flow requirements for decentralizing transmission system control in order to facilitate market-based decision making and operation to promote DG.
- Explore the value of connectivity and develop pricing structures that induce transmission providers to efficiently expand the provision of access. One aspect of the connectivity value relates to mitigating market power, an issue that surfaces frequently in the California case.

BACKGROUND

New technology allows us to consider the prospect of a reconceived electricity production and delivery system that incorporates 21st Century concepts of efficiency and quality. This no doubt includes greater diffusion of renewables and DG, linked by an open-architecture network with few centralized control functions. Under this vision, the network becomes an essential market-making entity that increases the value of power transactions and the number of suppliers. This, in turn, enhances competition and benefits consumers through lower electric prices and the mitigation of market power.[1] Such a decentralized network, which may serve a wide range of needs and create the infrastructure for innovation and new services,[2] relies on market mechanisms as opposed to the current centralized automatic dispatch (AGC).

This symposium will explore the organization, pricing structures, governance and regulatory regimes needed to exploit the network's potential capabilities and to extract a wide range of efficiency benefits for consumers, while creating service options and opportunities not yet conceived.

Network policies and architecture directly affect the economics of renewables and other DG technologies, many of whose costs have been falling sharply.[3] The network interface is crucial for these technologies and congestion-based tariffs that properly exploit their benefits while efficiently recovering network investment can do much to enhance the actual cost effectiveness of DG/renewables.

Network operating and governance policies in many countries are pretty much relics of a bygone era; they hinder innovation and do not promote efficient utilization of existing investment.[4] For example, widely used postage-stamp rates (i.e. *MW-month* based fees independent of location) do not induce generators to locate in such a manner as to reduce transmission loading. Indeed tariff structures that incorporate properly designed access charges can help recover fixed network costs more efficiently while correctly valuing DG/renewable's network access.[5] Appropriate incentive regulation can also induce strategically located DG/renewables for transmission and distribution-augmentation.[6]

Finally, more open network access for renewables is essential to help meet recently revised EU targets.[7] While the European Parliament recognizes this, it generally relies on administrative *fiat* to require priority access,[8] although existing not-for profit network operators may have insufficient incentives to provide this.[9] A more promising approach to attaining renewables targets and priority access is through properly designed pricing structures implemented under incentive regulation. For example, a pricing system that rewards regulated, for-profit wires companies for increasing access and kWh throughput is more likely to promote innovative ways of providing access and opening markets— all of which enhances competition and yields lower electric prices. The real impact of the EC's priority access requirement is not limited to increasing the share of renewable energy– it is in creating robust competitive wholesale and retail electricity markets. Such an end result can better be achieved through proper economic incentives for network operators than through administrative requirements.

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Tentative Symposium Program

(To be developed following the recommendations of the organisational meeting)

Day 1: PM Registration
-Welcome
-Keynote Address: The Role Electric Power Networks in Fostering DG/Renewables: Creating Opportunities and Enhancing the Value of Commerce Through Connectivity
- Overview Paper: Network Governance, Regulation and Pricing in a Decentralized open Market Environment

Day 2: Keynote Address: Transmission Network Organization— Transatlantic Views

AM: Session 1: Intermittent Sources and Decentralized Network Operation
AM Session 2: DG/renewables and the new Challenges to Network Security

Lunch

PM: Session 2: Congestion Pricing and Management – Impact on DG/Renewables
PM: Session 3: Open Network Architecture: Interconnection and Other Issues

Day 3: Keynote Address:
AM Session 1: IT & Distributed Intelligence for Distributed Generation
AM Session 2: System Security – outside threats
Rapporteur Reports:

LUNCH
Adjourn

Pre-Symposium Organizational Meeting
Paris: November 29-30, 2001

Purpose

The playing field for renewables/DG is affected by a number of public policies, which vary from country to country. For example: government policies might favor renewables or CHP over conventional technologies, while market liberalization may limit access to transmission and distribution networks (DG/renewables can be potential competitors). In addition, transmission and distribution ownership, organization, and pricing matter. Some of the issues to be discussed at this organizational meeting include:

i. Transmission and distribution providers play a key role in providing network access for new generation. However, they have little incentive to open third-party access to smaller renewables/DG resources. On the contrary, integrated utilities may resist such access by smaller plants to mitigate the loss of market share. The lack of regulatory incentives to connect new capacity can be a barrier.

ii. The current transmission network operation using centralised generation control (AGC) favours large central resources. A DG/renewables-based network would likely suggest a more decentralised architecture with limited central control.

iii. DG/renewables and liberalised markets for balancing and other ancillary services; under centralised AGC, intermittent generators and others may have to develop better, lower cost alternatives (e.g. forecasting, load management, energy storage) to cover their intermittency. What are the possibilities under an information-rich (i.e. “informated”) network of the future?

iv. Pricing of network services is also important. The absence of congestion pricing means that generation plants including DG/renewables get no incentive to locate near loads. Real-time prices and scheduling help flexible but intermittent renewables

v. Experience in California and elsewhere suggests that market-power concentration may be an obstacle to more open markets, which are in everyone’s interest. In the long run, DG/Renewables may help broaden competition thereby helping reduce prices.

vi. Fixed versus variable charge pricing

vii. The role of increased CHP/renewables on network stability and reliability– dealing with CHP intermittency and the possible inflexibility.

The above issues become more critical given the EU directive to guarantee transmission and distribution network access and to give priority in dispatch for renewables.

Finally, using standard finance portfolio theory, it can be shown that the addition of certain renewables to the generation mix serves to reduce expected generating costs and risk. Individual firms may not value or be willing to pay for risk-reduction or energy security benefits of such renewables, which in turn suggests the need for public policy.

NOTES

[1] The concentration of market power is often cited as an important contributing factor to the California problems; e.g. see: Scott Harvey and William W. Hogan "On the Exercise of Market Power Through Strategic Withholding In California," April 24, 2001, available at: www.hogan.com.

[2] A decentralised approach to transmission operation is given in: S. Awerbuch, L. Hyman and A. Vesey, *Unlocking the benefits of Restructuring: A Blueprint for Transmission*, PUR, 1999.

[3] At the very least, an open architecture requires uniform interconnection standards, which are not common. In the US, Texas recently became the first state to adopt such standards for decentralized power plants.

[4] Shimon Awerbuch, Michael Crew and Paul Kleindorfer, "Network – Wholesale Enabler," in Michael Crew, Editor, *Expanding Competition in Regulated Industries,* Boston: Kluwer Academic, 2000.

[5] Under such tariffs, DG technologies that are located close to loads and hence help alleviate congestion receive no particular credit; the power they produce is subject to the same tariffs as, for example, a central-station nuclear plant located hundreds of miles from the load centers. The issue is addressed by the EC [*Report on the proposal for a European Parliament and Council directive on the promotion of electricity from renewable energy sources in the internal electricity market*; Committee on Industry, External Trade, Research and Energy, 30 October 2000; (COM(2000) 279 – C5-0281/2000 – 2000/0116(COD)).

[6] Transmission and distribution augmentation is described in S. Awerbuch "Regulation and Pricing for Distribution: Promoting DG Through Cost-Based Access and Usage Charges," *Public Utilities Fortnightly*, July 1, 2000.

[7] European Parliament, Session Document, op. cit.

[8] Amendment 7, Article 7, paragraph 1, op. cit.

[9] Network operating procedures, designed by the IEEE and similar other engineering committees, have never been subjected to a market setting that rewards better asset utilisation and higher kWh throughput [Awerbuch, Hyman, Vesey, *Unlocking the Benefits of Restructuring*, PUR, 1999, Chapter 3]. Although a market setting in no way implies that operators can be expected to "run the system over the edge," [ibid. p. 39]. Managers of not-for-profit system operators see their role as "maximising system reliability, if need be, at the customer's expense" [Ibid. p. 31].