



## **ENVIRONMENTAL CONSEQUENCES OF ELECTRICITY SECTOR REFORMS**

### **Abstract**

Worldwide, the electricity industry is in the process of undergoing fundamental transitions. The reform process typically involves one or more of the following changes: commercialisation, privatisation, unbundling/restructuring and introduction of competition. The environmental impacts of these changes pull in different directions. There is concern that restructured electricity markets may not always incorporate adequately the environmental impacts of electricity resource development and consumption decisions. However, the electricity sector reform process also offers an opportunity to promote positive environmental changes: because the sector is already in flux, it may be easier to address environmental issues. The paper gives an overview of power sector reform in six countries where reforms have already been implemented, and concludes that reform measures will have to be accompanied by competitively neutral regulations in order to stimulate investment in environmentally sound technologies, including renewable and energy efficient technologies.

## **EKOLOŠKE POSLJEDICE REFORMI ENERGETSKOG SEKTORA**

### **Sažetak**

Proizvodnja električne energije u cijelom svijetu prolazi kroz period temeljitih promjena. Karakteristično je da proces reforme uključuje jednu ili više između sljedećih pojava: komercijalizaciju, privatizaciju, restrukturiranje/razdvajanje i uvođenje konkurencije. Ekološki utjecaji ovih promjena vode u različitim smjerovima. Postoji bojazan da restrukturirana tržišta električne energije neće uvijek moći na odgovarajući način objediniti ekološki utjecaj u razvitku izvora električne energije i odluke o potrošnji. Međutim, proces reforme elektroenergetskog sektora nudi mogućnost promicanja pozitivnih ekoloških promjena: budući da se sustav već nalazi u periodu promjena, možda bi bilo jednostavnije prvo pristupiti ekološkim temama. Ovaj referat daje prikaz reforme energetskog sektora u šest zemalja koje su je već provele, sa zaključkom da mjere reforme trebaju biti praćene odredbama, koje djeluju neutralno na konkurenciju kako bi se potaknulo ulaganje u ekološki razumne tehnologije, uključujući tehnologije obnovljivih izvora i energetski efikasne tehnologije.

### **INTRODUCTION**

With the worldwide trend towards increasing competition, former heavily regulated industries are to an increasing extent exposed to market forces. Countries as diverse as the United States, the United Kingdom, Chile, Argentina, Norway, Sweden, Australia and New Zealand, had already set out on their liberalisation course during the 1980s in

pursuing a general policy of liberalisation and privatisation of regulated industries such as telecommunications, financial services and water, and of the energy market. Under the "modern school of thinking" energy utilities are increasingly considered to be market actors like any others, but with possibly a special role to play in terms of the general public interest.

The expectation is that reform of the power sector will yield important short and long term benefits, due to enhanced economic efficiency (World Energy Council, 1998). In countries that have liberalised, consumers have gained through lower prices. Other significant gains are also expected, notably further efficiency, technical gains, service innovations and improved investment decisions. There are also economy-wide benefits from improved efficiency in the sector, since electricity is an input to almost all goods and services (Acutt and Elliott, 1999). Greater competition will most likely lower electricity prices. However, concern has been growing that lower electricity prices may increase total electricity consumption (Energy Information Administration, 1997) and reduce price-based incentives for renewable energy sources and energy efficiency activities (Wohlgemuth, 2000). The bottom-line environmental question in electricity utility reform, therefore, is: Will power sector reform mean cleaner or dirtier air?

### ***DIMENSIONS OF CHANGE***

Introduction of competition is not the only change in electricity sector reform, albeit a key one. Transformations include:

- *Commercialisation*: a change in management and operation of a utility to make it similar to a commercial enterprise and subject to corporate laws. Commercialisation involves introducing commercial objectives into the management and operation of a state-owned enterprise. Subsidies, including state guarantees for borrowing, are removed and the enterprise becomes subject to the same tax laws, prices, and accounting rules as other private sector companies. Most countries view commercialisation as an intermediate step towards privatisation and other reforms.
- *Privatisation*: a change from public to private ownership of existing electricity sector assets. While privatisation of public enterprises in various economic sectors has been a wide spread phenomenon over the past decade, the electricity industry is typically one of the last ones to be privatised, because it is considered to be vital for the functioning of the state.
- *Unbundling/Restructuring*: a change in the structure of the power sector. Unbundling involves the separation of a vertically integrated electric utility into legally and functionally distinct firms providing separate generation, transmission, distribution and retail services. England and Wales and Chile pioneered unbundling models in the 1980s. Since then, countries that have separated or are in the process of separating generation, transmission, and distribution assets include Argentina, Australia, New Zealand, Poland, Sweden and the United States.
- *Competition*: a change in the rules by which the electricity sector operates. Under wholesale competition, generators compete to sell electricity to the grid. Under retail competition, suppliers compete to supply electricity to end-users. Retail competition can be introduced through different mechanisms. In one, multiple power generators have direct access to the transmission and distribution networks, allowing them to compete to supply final customers regardless of their location and who owns the

wires. In another model, independent retail service providers buy power from generators, contract for use of transmission and distribution facilities, and sell the power to the final customers. Where distribution and retail functions remain within the same entity, the service provider buys from wholesale power producers and contracts only for transmission access.

Table 1 gives an overview of power sector reform in six countries where reforms have already been implemented.

**Table 1: Power sector reform examples**

	Reform				
	Commercialis.	Ownership	Unbundling	Wholesale comp.	Retail competition
Argentina	✓	Predominantly private	✓	✓	Over 100 kW only
Chile	✓	Predominantly private	Yes, with cross-ownership	✓	✓ (limited competition)
New Zealand	✓	Mixed private and public	Yes, with cross-ownership	No	On service, not price
Norway	✓	Public	✓	✓	Yes, with residential in 1997
UK	✓	Predominantly private	✓	✓	Above 100 kW 1997, totally in 1998
US	✓	Predominantly private	✓	✓	Initially large consumers, eventually all

Source: USAID (1998)

### **IMPLEMENTING ENVIRONMENTAL COMMITMENTS IN REFORMED ELECTRICITY MARKETS**

The key question is: Is there a conflict between energy market reform and environmental commitments? The discussion suggests that there need be no conflict, provided governments address environmental issues in an appropriate, i.e., market-compatible, way. Moreover, energy market reforms may substantially benefit the environment.

Governments have a number of environmental policy instruments at their disposal (Drillisch and Riechmann, 1997). Some instruments do not distort competition because they affect all market players equally. Environmental taxes and quotas are examples of policy instruments, which are compatible with competition. Other instruments tend to distort competition because they treat some market players differently from others. This is the case with many types of subsidies, price controls and quotas of national fuels, among others. The scope for using these instruments is limited in open energy markets because they are not consistent with competition.

Market reform can also benefit the environment by encouraging the promotion of environmentally friendly energies, while reducing the role of governments. For instance, end user choice gives electricity consumers the ability to choose green electricity<sup>2</sup> and energy efficient services. In the past, policy makers made these choices; now it is up to the consumer. Key elements of effective reform and effectively functioning markets are, 1) that prices give the right signals (including externalities) to all market players; and 2) an active government attitude to deal with the network characteristics of the energy sector (Newbery, 1997). Thus, market reform may improve environmental performance as subsidies recede and consumers get the right to choose in energy markets.

Electricity sector reform focuses primarily on reducing the cost of electricity production and reducing the price charged for electricity delivered to customers; it focuses less on environmental issues. One consequence of electricity market reform is already evident in a number of countries. Competition in generation favours a different technology mix (International Energy Agency, 1999). It often prompts a move away from reliance on large central stations. Investment criteria have changed, because generators no longer have long-term guarantees and can no longer pass costs on to consumers easily. This shift favours the development of new cost-effective technologies with shorter lead times than earlier generations of large, centralised and capital-intensive technologies. The effect of this shift is not straightforward or uniform. In some cases, environmental damage can be caused: by extending the operating life, older, high-emitting coal-fired plants secure a larger market for their cheap power.

Case study: United States

In the United States, the key federal laws governing utility emissions for the past 25 years, the Clean Air Act and its amendments, was engineered to address a system of regional monopolies with state regulators. Grandfathered in - and exempt from - some emissions controls were many coal-fired plants built before 1978 that were expected to be phased out. In the new era, utilities can compete nation-wide, and there may be more demand to use coal-fired plants (Dahl and James, 1998). The Clean Air Act assumed that existing plants would be retired after about 30 years and replaced with new, less polluting equipment. But coal is so cheap, and the cost of building a new power plant of any type so high, that it is predicted that many deregulated providers will gear up older plants.

As a result, environmental groups are pressing states and Congress for specific environmental protections against increased pollution, financial incentives for energy efficiency and renewable energy, and federal pollution guidelines to be part of the overall deregulatory effort.

The situation could be mitigated by measures: "cap-and-trade" programs among utilities to prevent increases in pollution levels; "green pricing" to encourage consumers to use less polluting sources; and state or federal standards requiring a percentage of electricity coming from renewable sources.

California has led the way in developing incentives such as a "public benefits fund" that rewards the power producer that provides the most renewable energy for a given amount of money. The state also adopted a consumer right-to-know law forcing electricity firms to list fuels used to generate power.

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<sup>2</sup> Green pricing, is a concept in which consumers voluntarily agree to pay a higher price for electricity generated by environmentally friendly, i.e. renewable, energy sources. Surveys carried out in many developed countries repeatedly indicate a willingness by electricity consumers to pay a higher price for clean energy, and green pricing provides customers with the choice to do precisely that. As the ultimate "market-driven" approach to environmental protection, green pricing is likely to receive increased emphasis in liberalised markets; and in fact, as one of the few non-price means of distinguishing one's service in a commodity market, green energy could well become a marketing strategy for energy companies in the competitive market (Wohlgemuth et al., 1999).

The environmental consequences of market restructuring and subsidy reform are complex, case specific and difficult to forecast in a quantitative fashion. Some issues include:

The impact of restructuring and liberalisation on the environment will depend on pre-existing circumstances such as fuel mix, and plant vintage and on relative changes in prices for different fuels;

Electricity market reform can provide an opportunity to address environmental concerns, as certain inefficiencies are revealed. For instance, subsidies and cross-subsidies will become more visible, and a closer link between costs of production and prices might be established;

Certain policy tools for environmental protection may need to be reconsidered where markets are liberalised and new approaches are warranted. Policies for creating effective markets for energy efficiency on the demand side should be linked with competitive restructuring.

Table 2 summarises the implications of power sector reforms on the environment.

**Table 2:** Environmental implications of power sector reforms

<b>Reform</b>	<b>Environmental implications of sector reform</b>
Commercialisation	<ul style="list-style-type: none"> <li>▪ Reduction of waste and better accounting (+)</li> <li>▪ Reduction of energy losses (+)</li> </ul>
Privatisation	<ul style="list-style-type: none"> <li>▪ Boost for off-grid renewable generation (+)</li> <li>▪ Assets upgraded by private capital (+)</li> </ul>
Unbundling	<ul style="list-style-type: none"> <li>▪ Distributed generation depends on ability to capture system-wide benefits (0)</li> <li>▪ Equal access to transmission depends on contract terms (0)</li> <li>▪ Energy losses reduced due to profit incentives (+)</li> </ul>
Wholesale competition	<ul style="list-style-type: none"> <li>▪ Low capital cost, dispatchable generation rather than renewable generation favoured by short-term-oriented markets (-)</li> <li>▪ Highly efficient fossil generation technologies favoured (+)</li> <li>▪ Non-renewable generation favoured (-)</li> </ul>
Retail competition	<ul style="list-style-type: none"> <li>▪ Low capital cost generation favoured (-)</li> <li>▪ Incentives to invest in environmental technology R&amp;D reduced (-)</li> <li>▪ Retail supplier could seek competitive advantage based on environmental attributes of generation mix ("green marketing") (+)</li> </ul>

(+) positive; (-) negative; (0) depends on concrete implementation

Source: USAID (1998)

## **CONCLUSIONS**

The news about liberalisation is not invariably positive. Along with intense competition, free markets also bring uncertainty and unpredictability that often results in high price volatility (Amundsen and Tjøtta, 1997). Competitive markets may not always incorporate adequately the environmental impacts of electricity resource development and consumption decisions. Supplemental actions may be needed to ensure that

environmental goals will be protected and effectively incorporated in complex proposals for regulatory reform.

Liberalisation is not necessarily a threat to the environment. It may even create better opportunities for environmentally friendly ways of generating electricity. Liberalisation, however, will have to be accompanied by regulations, incentives and the provision of information in order to stimulate incentives for investment in environmentally sound technologies, including renewable and energy efficient technologies.

Competition makes short-term profit maximisation the overriding company concern. Combined with higher discount rates in the public sector, companies become reluctant to invest in renewable energy and energy efficient technologies (Eikeland, 1998). This clearly reflects the shift from strategic to operational objectives.

The liberalisation of energy markets may benefit the environment as the dismantling of subsidies and more cost-reflective energy pricing can decrease greenhouse gas emissions, particularly in developing and transition economies.<sup>3</sup>

In liberalised energy markets, environmental policies should rely on competitively neutral policy tools, such as tradable "green" certificates and environmental taxes. A key challenge in the context of reformed energy markets, growing energy trade and global environmental impacts is the promotion of international co-operation to mitigate emissions of greenhouse gases.

The final verdict on the environmental effects of increased competition is still out, as impacts can go both ways. However, if implemented properly and compatible with the market-oriented industrial organisation, electricity sector reform could, contrary to sceptics, pave the way for "sustainable electricity".

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<sup>3</sup> For a more general discussion of privatisation issues in transition countries see Havrylyshyn and McGettigan (1999).

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