1

Barriers to Renewable Energy

When addressing the reasons behind the hitherto slow transition to a 'solar economy' – one based on renewable energy (RE) as opposed to fossil fuels or nuclear – there are several main categories of barriers to address. These are chiefly cost, administration, technical and legal. Policies and programmes are required to support RE due to the existence of these barriers in the short term, but there is also a need to eradicate such barriers completely over time. These barriers are arguably dominated by the large subsidies that are still supplied to the fossil fuel and nuclear industries, even after many decades of support. Feed-in laws help offset these subsidies, but reducing them independently has proven politically difficult, especially when dealing with elected officials who represent coal states, for example. This tends to result in increasing RE subsidies rather than reducing subsidies for conventional energy.

This chapter examines these issues, and draws primarily on Beck and Martinot (2004) and Sawin (2004). These barriers are primarily considered for developed countries, but the barriers for developing countries are referred to briefly in Chapter 8.

Costs and pricing

- Subsidies for competing fuels. Large public subsidies for all energy forms, both implicit and explicit, can distort investment cost decisions. The World Bank and International Energy Agency estimate global annual subsidies for fossil fuels to be in the range of US$100–200 billion (please note that dollars and cents are US throughout unless otherwise stated), although such figures are very difficult to assess (by comparison, the world spends around $1 trillion annually on purchases of fossil fuels). Public subsidies can take many forms: direct budgetary transfers, tax incentives, research and development (R&D) spending, liability insurance, leases, land rights of way, waste disposal and guarantees to mitigate project financing or fuel price risks.
- High initial capital costs. Even though lower fuel and operating costs may make renewable energy cost-competitive on a life cycle basis, higher initial

capital costs can mean that RE provides less generation capacity per initial dollar invested than conventional energy sources. Thus, RE investments generally require higher amounts of financing for the same capacity. Depending on the circumstances, capital markets may demand a premium in lending rates for financing RE projects because more capital is being risked up front than in conventional energy projects. RE technologies may also face high taxes and import duties. These duties may exacerbate the high first-cost considerations relative to other technologies and fuels.

- Difficulty of fuel price risk assessment. Risks associated with fluctuations in future fossil fuel prices may not be quantitatively considered in decisions about new power generation capacity because these risks are inherently difficult to assess. Historically, future fuel price risk has not been considered an important factor because future fossil fuel prices have been assumed to be relatively stable or moderately increasing. Thus, risks of severe fluctuations are often ignored. However, greater geopolitical uncertainties and energy market deregulation have bred new awareness concerning future fuel price risks. RE technologies (with the exception of biomass) avoid fuel costs and fuel price risk. This 'risk-reduction premium', is, however, often missing from economic comparisons and analytical tools because it is difficult to quantify. Furthermore, for some regulated utilities, fuel costs are factored into regulated power rates, so that consumers rather than utilities bear the burden of fuel price risks, and utility investment decisions are made without considering fuel price risk.
- Unfavourable power pricing rules. RE sources feeding into an electric power grid may not receive full credit for the value of their power. Two factors are at work here. Firstly, RE generated on distribution networks near final consumers rather than at centralized generation facilities may not require transmission and distribution (i.e. would displace power coming from a transmission line into a node of a distribution network). But utilities may pay only wholesale rates for the power, as if the generation was located far from final consumers and required transmission and distribution. Thus, the 'locational' value of the power is not captured by the producer. Secondly, RE is often an 'intermittent' source whose output level depends on the resource (i.e. wind and sun) and cannot yet be entirely controlled. Utilities cannot count on the power at any given time and may lower prices for it. Lower prices take two common forms: (i) a zero price for the 'capacity value' of the generation (utility pays only for the 'energy value') and (ii) an average price paid at peak times (when power is more valuable) which is lower than the value of the power to the utility, even though the renewable energy output may directly correspond with peak demand times and thus should be valued at peak prices.
- Transaction costs. RE projects are typically smaller than conventional energy projects. Projects may require additional information not readily available, or may require additional time or attention to financing or permitting because of unfamiliarity with the technologies or uncertainties over perfor-

mance. For these reasons, the transaction costs of RE projects – including resource assessment, siting, permitting, planning, developing project proposals, assembling financing packages and negotiating power-purchase contracts with utilities – may be much larger on a per-kW capacity basis than for conventional power plants. Higher transaction costs are not necessarily an economic distortion in the same way as some other barriers, but simply make renewables more expensive. However, in practice some transaction costs may be unnecessarily high – for example, overly burdensome utility interconnection requirements and high utility fees for engineering reviews and inspection.

- Environmental externalities. The environmental impacts of fossil fuels often result in real costs to society, in terms of human health (e.g. loss of work days, health care costs), infrastructure decay (e.g. from acid rain), declines in forests and fisheries and, perhaps ultimately, the costs associated with climate change. 'Dollar' costs of environmental externalities are difficult to evaluate and depend on assumptions that can be subject to wide interpretation and discretion. Although environmental impacts and associated dollar costs are often included in economic comparisons between renewable and conventional energy, investors rarely include such environmental costs in the bottom line used to make decisions. If externalities were factored in, some renewables, particularly wind power, would already be cheaper than conventional energy sources.

Legal and regulatory

- Lack of legal framework for independent power producers. In many countries, power utilities still control a monopoly on electricity production and distribution. In the absence of a legal framework, independent power producers may not be able to invest in RE facilities and sell power to the utility or to third parties under so-called 'power purchase agreements'. Or utilities may negotiate power purchase agreements on an individual ad hoc basis, making it difficult for project developers to plan and finance projects on the basis of known and consistent rules.
- Restrictions on siting and construction. Wind turbines, rooftop solar hot-water heaters, photovoltaic (PV) installations and biomass combustion facilities may all encounter building restrictions based upon height, aesthetics, noise or safety, particularly in urban areas. Wind turbines have faced specific environmental concerns related to siting along migratory bird paths and coastal areas. Urban planning departments or building inspectors may be unfamiliar with RE technologies and may not have established procedures for dealing with siting and permitting. Competition for land use with agricultural, recreational, scenic or development interests can also occur.
- Transmission access. Utilities may not allow favourable transmission access to RE producers, or may charge high prices for transmission access.

Transmission access is necessary because some RE resources, like windy sites and biomass fuels, may be located far from population centres. Transmission or distribution access is also necessary for direct third-party sales between the RE producer and a final consumer. New transmission access to remote RE sites may be blocked by transmission access rulings or right of way disputes.

- Utility interconnection requirements. Individual home or commercial systems connected to utility grids can face burdensome, inconsistent, or unclear utility interconnection requirements. Lack of uniform requirements can add to transaction costs. Safety and power-quality risk from non-utility generation is a legitimate concern of utilities, but a utility may tend to set interconnection requirements that go beyond what is necessary or practical for small producers, in the absence of any incentive to set more reasonable but still technically sound requirements. In turn, the transaction costs of hiring legal and technical experts to understand and comply with interconnection requirements may be significant. Policies that create sound and uniform interconnection standards can reduce interconnection hurdles and costs.
- Liability insurance requirements. Small power generators may face excessive requirements for liability insurance, particularly generators using 'net metering' provisions. Net metering allows customers to use their own generation, from PVs usually, to offset their consumption by allowing their electric meters to run backwards when they generate electricity in excess of their demand. This offset means that customers receive retail prices for the excess electricity they generate. The phenomenon of 'islanding', which occurs when a self-generator continues to feed power into the grid when power flow from the central utility source has been interrupted, can result in serious injury or death to utility repair crews. Although proper equipment standards can prevent islanding, liability is still an issue. Several US states have prohibited utilities from requiring additional insurance beyond normal homeowner liability coverage as part of net metering statutes.

Market performance

- Lack of access to credit. Consumers or project developers may lack access to credit to purchase or invest in RE because of lack of collateral, poor credit ratings, or distorted capital markets. In rural areas, 'microcredit' lending for household-scale RE systems may not exist. Available loan terms may be too short, relative to the equipment or investment lifetime. In some countries, power project developers have difficulty obtaining bank financing because of uncertainty as to whether utilities will continue to honour long-term power purchase agreements to buy the power.
- Perceived technology performance uncertainty and risk. Proven, cost-effective technologies may still be perceived as risky if there is little experience

with them in a new application or region. The lack of visible installations and familiarity with RE technologies can lead to perceptions of greater technical risk than for conventional energy sources. These perceptions may increase required rates of return, result in less capital availability, or place more stringent requirements on technology selection and resource assessment. 'Lack of utility acceptance' is a phrase used to describe the historical biases and prejudices on the part of traditional electric power utilities. Utilities may be hesitant to develop, acquire and maintain unfamiliar technologies, or give them proper attention in planning frameworks. Finally, prejudice may exist because of poor past performance that is out of step with current performance norms.

- Lack of technical or commercial skills and information. Smooth market function requires low-cost access to good information and the requisite skills for all concerned. However, in specific markets, skilled personnel who can install, operate and maintain RE technologies may not exist in large numbers. Project developers may lack sufficient technical, financial and business development skills. Consumers, managers, engineers, architects, lenders or planners may lack information about RE technology characteristics, economic and financial costs and benefits, geographical resources, operating experience, maintenance requirements, sources of finance and installation services. The lack of skills and information may increase perceived uncertainties and interfere with decision making.