8 Policy Recommendations

Without political support, even economically competitive renewable energy technologies remain at a competitive disadvantage as a consequence of distortions in energy markets created by decades of ongoing financial, political and structural support to traditional polluting technologies. Networks for power, heat, and transport have been developed over the course of a century based on use of fossil fuels and more recently for nuclear power. The switch to renewable energy will require strategic policy intervention to facilitate and accelerate the transition and political action will be needed to ensure full achievement of the economic and environmental benefits of renewable energy.

Efforts toward the introduction of a comprehensive market of renewable energy and efficient technologies include full-cost energy pricing, environmental regulations, tax incentives, codes and standards, and public education. Specifically, the following areas of action are required:

Demand Policies

- Mandatory Efficiency labelling and Standards
- Economic incentives for efficient devices
- Minimum standards in new buildings, including insulation, solar-thermal and PV
- The retrofitting of existing buildings
- Establishment of an ‘energy efficiency’ agency with a clear decision making authority

Supply Policies

- Establishment of legally binding targets
- Creation and definition of stable returns for investors
- Removal of market distortions
- Reformation of the electricity and fuel markets to accommodate environmental considerations

Transportation

- Taxation based incentives for lower consumption private vehicles
- Measures to increase the uptake of public transport
- Improved town planning

Hydrogen Economy Transition Policies

- Research and development

- Demonstration of the technology;
- Hydrogen economy target dates.
- Development of hydrogen infrastructure.

All recommendations must address both the supply and the demand side of the energy system in order to have an effect. To be effective, any set of policy changes must consider the following issues:

8.1) Increasing Energy Efficiency

Labelling and Standards

All appliances should be graded with reference to best available technology energy efficiency allowing buyers to make informed choices. The state must also set minimum standards for products in the market place that excludes inefficient products. This standard must be reviewed regularly to reflect improved technology available.

Economic Incentives for Efficient Devices

Incentive should be provided to influence consumers' actions by preparing incentives for the purchase of efficient appliances. For example, the Danish Electricity Saving Trust in Denmark has had much success in using a tariff of 0.07 yen per kWh of power rates to fund such measures as transfer of electric heating to geothermal heating, energy efficiency labelling of electrical appliances, and campaigns to promote efficient appliances and use of rebate programs.

Energy Efficiency Standards and Requirements for Buildings

In order to promote energy savings in buildings a standard for the energy efficiency of buildings must be established, covering elements such insulation, double-glazing, efficient heating, cooling, lighting and the use of solar energy for heat and power. Further compulsory thresholds for new buildings covering both thermal efficiency power efficiency and provision of solar hot water heating and solar PV must be incorporated into the building regulations.

Note: The "Stop Global Warming! Tokyo Operation" announced by the Tokyo Metropolitan Government in February 2002, made the appeal to save the future of mankind and the earth 100 years from now" and proposed comprehensive regulation of energy consumption especially focusing on the industrial sector. In particular, this involves the introduction of obligations for large-scale offices and factories to reduce carbon dioxide output, issuing and creating a market for CO2 reduction certificates for energy saving activities, the installation of wind power, and planting of

forests. As a megalopolis that counts for one percent of the CO2 output of developed nations, this is a great step that eclipses the plans of the national government<106>.

The Retrofitting of Existing Buildings

Subsidies and loans are required for the promotion of retrofitting of existing buildings. Furthermore, existing buildings should be regularly audited and managed to meet energy targets. It is important to promote the refitting and retrofitting of domestic, public and commercial premises with energy efficient materials and fittings for doors, windows, walls, water heating, lighting, and space heating, for example.

Energy Efficiency Funds

Lastly, we recommend the establishment of an energy efficiency fund, secured by the reallocation of proceeds from the electricity and gas network carriers and/or from a part of an eco-tax. The proceeds should serve the financing of competitive campaigns, from measures and programs to the market support of efficiency technologies and services as well as motivation and information campaigns. A central administration and/or implementing institution would preferably be an energy efficiency agency, similar to the model of Great Britain or Denmark, which cooperate with energy enterprises, energy agencies, providers of energy-efficient technology and other market participants. Also incentives for energy enterprises should be created for accomplishing Demand-Side Management programs (DSM) with their customers. The goal is to accelerate and contribute to the market transformation through energy cost reductions in all consumer groups in favour of efficiency techniques.

8.2) Supply Side Recommendations

Establish Legally Binding Targets for Renewable Energy and Energy Efficiency

In recent years an increasing number of countries have established targets for renewable energy, as part of their greenhouse gas reduction policies. These are either expressed as specific amounts of installed capacity or as a percentage of energy consumption.

The most ambitious target has been set by the European Union. In 2001 the European Council and the European Parliament adopted a Renewable Energy Directive establishing national targets for each member country, although these targets are not legally binding provided compliance is dem-

106.Tokyo Metropolitan Government (2001).

onstrated. The Directive aims to double the share of renewable energy in the energy mix from 6% to 12% by 2010, equal to 22% of European electricity consumption.

With most of the large hydropower potential already exploited in Europe, the majority of the increase in renewable energy in Europe will come from solar, biomass, wind and small hydroelectric energy. The same is true of Japan.

Renewable energy targets are most effective if they are based on a percentage of national consumption. This creates incentives to reduce consumption as well as create sustainable supply. If these targets are set as short term targets and long-term milestones this acts as a guide to identify where immediate policy changes are required to achieve 5-year, 10-year and 20-year targets. However, targets have little value if they are not accompanied by policies, which achieve a level playing field in energy markets, eliminate market barriers and create an environment that attracts investment capital.

Defined and Stable Returns on Investments

Policy measures adopted by Governments need to be acceptable to the requirements of the investment community in order to be effective. There are two key issues here:

- The price for renewable energy and efficient technologies must allow for risk-return profiles that are competitive with other investment options
- The duration of a project must allow investors to recoup their investment

Fixed Tariff Systems

Fixed tariff systems have proved to be the most effective instrument for the promotion of renewable energy.

Tariff systems based on a fixed price paid per unit of energy produced have been enormously successful at catalysing renewable energy markets and are enshrined in law in Germany and Spain.

As production costs decline, for instance as a result of improved technology and economies of scale, the less economic projects become profitable, expanding the deployment of renewable energy further.

The most important advantage of fixed price systems for renewable energy is that they facilitate planning of new renewable energy plant for the investors in renewable energy. The challenge in a fixed price system is fixing the “right” price. The disadvantage is the political uncertainty that may arise over how long the system will continue, which means that investors must calculate a risk premium in case the price falls during the life of the project. Germany has avoided the prob-

lem in the 1999 revision of the Stromeinspeisungsgesetz (Act on the Sale of Electricity to the Grid) by guaranteeing payments for 14 to 20 years.

Renewable Portfolio Standards (RPS)

RPS systems are typically used in the power sector, but can also be used in other areas like transport fuels. Under an RPS, such as the one operating in Texas or the UK, power companies or electricity customers are obliged to buy a number of green certificates in proportion to their total electricity consumption. The certificates are bought from the producers of renewable energy who will receive certificates in proportion to their electricity delivery, for example one certificate per delivered kWh. The system implies that part of the payment to the project owners is made in a special currency - green certificates. The price of the certificates is set in a market where buyers' demand and seller's supply determines the price. For fuels an equivalent displacement in the fuel mix is made, for example bio-ethanol mixed with the transport fuel.

An RPS can be technology neutral or broken down further into fractions to come from specific technologies wind, solar etc. The RPS market only starts, however, if penalties for not purchasing green certificates are sufficiently high to deter non-compliance. To ensure sustained investment, the RPS needs to include long-term market expansion.

One drawback of a system with specified fixed quantities of renewable energy is that the targets may not be reflective of the speed of industrial progress and the increasing competitiveness of renewable energy, and hence the standard could become a cap on development. A target which is not sufficiently high or dynamic soon becomes a constraint.

Competitive Bidding, Tendering or Auctions

Governments define a fixed amount of funds and tenders for projects, which can be technology neutral or specific. It accepts projects tendered up to the level of the available funds. Under auction, or tendering systems, power purchase agreements are entered into for an agreed period – typically 15 years. In this system there is a politically decided quantity, usually a constantly increasing quota of electricity from renewable energy sources which the power companies or the customers must purchase. This is achieved by letting the suppliers of energy products from renewable energy sources compete for the contracts.

The system, to a large degree, removes much of the political risk for investors if the price is agreed upon for a defined period such as 15 years, and the energy purchasing agreement is enforced under civil law.

Tendering systems with high penalty clauses appear to be economically efficient, but they are probably only workable for large investors, and not smaller operators such as co-operatives or

individual owners, at least not unless they are part of a larger risk-sharing arrangement through a joint project organisation.

Where targets and/or penalties are too low, a buyers' market is created and experience has shown that the aggressive competition created for lowest price leaves only small margins that will deter investors and force developers to use only a limited set of highly competitive projects.

Investment Subsidies

With subsidies for renewable energy projects, support is usually given on the basis of the rated capacity of a generator or energy production plant. These are typically used at an early stage of development when little or no additional incentives are in place. These systems can be problematic because a subsidy is given whether or not production is efficient. The international tendency is to avoid investment subsidies as a sole policy choice and adopt either fixed price tariffs or an RPS system, which essentially fix either price or quantity.

Furthermore, because such systems are often based on the availability of government funds and ongoing political goodwill, due to the short-term nature of governments, they may not provide the long-term security and stability that industry and financiers require.

There are sectors where, for example, fixed tariff systems do not work such as the retrofitting of buildings. This requires support in the form of subsidies for the fitting of renewable and efficient energy systems.

Incentives for Public Participation in Renewable Energy Ownership

One of the driving forces behind the development of wind power in Denmark was the creation of wind power cooperatives in which the residents of a particular area invest. The concept of the assets of a region providing a financial return to the region is the foundation for local people using wind power in Germany and Denmark. However, in order to succeed with these efforts, public assistance policies such as those mentioned previously are essential.

Emission Caps

Whereas taxation provides a pre-defined penalty for polluting, an emissions cap can set a pollution standard but leaves it to the market to decide how best to comply with that standard. This can also allow for the introduction of energy saving measures, which are often cheaper than new low-emission generating capacity and will therefore be a slower route to renewable market development. The Kyoto Protocol is a system based on emissions caps, although it does allow for the use of flexible mechanisms that effectively raise the level of the emissions cap.

This system is economically efficient in the short term; however it does not set out the pathway to most rapidly develop the renewable energy industries required for fossil fuel and nuclear phase out, making it economically inefficient in the longer term.

Removal of Market Distortions

In addition to market barriers there are also market distortions, which block the expansion of renewable energy. These distortions are in the form of direct and indirect subsidies, and the social cost of externalities currently excluded from costs of traditional, polluting energy from nuclear and fossil fuels. Power prices today do not reflect the full costs of energy production, or the full environmental benefits of renewable energy. Two factors are important here:

- End subsidies to fossil fuel and nuclear power sources

Conventional energy sources receive an estimated $250-300 billion in subsidies per year worldwide, and therefore markets are heavily distorted. The Worldwatch Institute estimates that total world coal subsidies are $63 billion, in Germany the total is $21 billion, including direct support of more than $70,000 per miner. Subsidies artificially reduce the price of power, keep renewable energy out of the market place, and prop up increasingly uncompetitive technologies and fuels. Halting all direct and indirect subsidies to fossil fuels and nuclear power will create a more level playing field across the energy sector. For example the 1998 OECD study “Improving the Environment through Reducing Subsidies” noted that,

“Support is seldom justified and generally deters international trade, and is often given to ailing industries. (...) support may be justified if it lowers the long-term marginal costs to society as a whole. This may be the case with support to ‘infant industries’, such as producers of renewable energy.”

The 2001 report of the G8 Renewable Energy Task Force goes further, stating that “Re-addressing them [subsidies] and making even a minor re-direction of these considerable financial flows toward renewable energy, provides an opportunity to bring consistency to new public goals and to include social and environmental costs in prices.” The Task Force recommends “G8 countries should take steps to remove incentives and other supports for environmentally harmful energy technologies, and develop and implement market-based mechanisms that address externalities, enabling renewable energy technologies to compete in the market on a more equal and fairer basis.”

- Internalise social and environmental costs of polluting energy

The real cost of energy production by conventional energy sources includes expenses absorbed by society, such as health impacts, local and regional environmental degradation – from mercury pollution to acid rain causing environmental, infrastructure and human health damage – as well as

global impacts from climate change. For example, more than 30,000 Americans die prematurely every year due to emissions from electric power plants. It also includes the waiving of nuclear accident insurance that is too expensive to be covered by the nuclear operators; for example the Price-Anderson Act, which limits the liability of US nuclear power plants in the case of an accident amounts to a subsidy of up to $3.4 billion annually. As with the other subsidies, such external costs must be factored into energy pricing if the market is to be truly competitive. This requires that governments apply a "polluter pays" system that charges the emitters accordingly, or applies suitable compensation to non-emitters. Adoption of polluter pays taxation to polluting electricity sources, or equivalent compensation to renewable energy sources, and exclusion of renewable energy from environment related energy taxation is important to achieve fairer competition on the world's electricity markets.

Electricity Sector Market Reform

For the power sector specifically, essential reforms are necessary if new renewable energy technologies are to be accepted at a larger scale. These reforms have to remove barriers to renewable energies.

Current energy legislation on planning, certification and grid access has been built around the existence of large centralised power plants, including extensive licensing requirements and specifications for access to the grid. This favours existing large-scale electricity production and represents significant market barriers to renewable energy. Furthermore it does not recognise the value of not having to transport decentralised power generation over large distances.

Among other measures, the reforms needed to address market barriers to renewable energy include:

- Streamlined and uniform planning procedures and permitting systems and least cost network planning;
- Fair access to the grid at fair prices and removal of discriminatory access and transmission tariffs;
- Fair and transparent pricing for power throughout a network, with recognition and remuneration for the benefits of embedded generation;
- Unbundling of utilities into separate generation and distribution companies to avoid exclusion of third party generators or green power retailers;
- The costs of grid infrastructure development and reinforcement must be carried by the grid management authority rather than individual renewable energy projects;
- Disclosure of fuel mix to end-users to enable consumers to make an informed choice of power source.

Liquid and Gaseous Fuel Sector Market Reform

Renewable fuels can be created directly from sustainable biomass or transferred into energy carriers such as hydrogen. The *ERJ Model* uses hydrogen, but does not rule out the role of biofuels. In either case, reforms are required in the liquid and gaseous fuels sector to facilitate the transition to renewable based fuels.

- Removal of Market Distortions

As with the power sector, any market distortions must be identified and removed if emergent technologies are not to be held out of the fuel market. Typical distortions include the use of subsidies to lower the price of fuel – often used to stimulate economic activity, but with serious environmental consequences.

- Full Cost Pricing

A second type of indirect subsidy is the absence of applying externality or pollution costs to the use of fossil fuels. In addition to localised environmental and health costs, which are usually paid for by the taxpayer, the most pressing environmental impact is climate change. The use of a carbon tax on liquid fossil fuels is a useful corrective tool. Note that the UK Non Fossil Fuel Obligation was a carbon tax that also recycled the collected levy to promote renewable energy.

- Infrastructure Development

As with the power sector, the current fuel distribution system has been designed around fossil fuel distribution and will have to be adapted for use for liquid biofuel distribution and the distribution of hydrogen (liquefied or gaseous) in a decentralised energy supply system. The research, development and implementation of these infrastructure changes need to be supported by government incentives and information exchange.

8.3) Transport

Efficient Vehicles

Low fuel prices generate very poor incentives for car manufacturers to create light and efficient vehicles. Taxation law that is tied to the fuel consumption of a vehicle would favour small and light automobiles. One of the reasons the fuel efficiency of passenger cars has not improved much in Japan is that the tax reform of 1989 abolished tax on large passenger cars of over two litres and since then the so-called “3-number plate” cars have continued to increase. Even though the efficiency of individual vehicles has improved, larger cars mean greater fuel consumption, and the

effect of this efficiency is negated. Tax reform is therefore required in order to create a clear deterrent to the use of high consumption personal vehicles.

Public Transport

In order to minimize the use of private vehicles, the preparation of a public transport network is essential. Bold measures should be taken such as government assistance for public transport and making public transport highly functional and low or zero cost.

Low Transport Requirement Town Planning

The provision of walking and cycle paths for short distances must also become standard in city planning. As must the design of new dwelling areas that reduce the amount of transport that resident must undertake to live there.

Hydrogen Economy Transition Policies

As this report demonstrates, there is ample renewable energy to meet Japans' needs. However, a critical requirement in order to make renewable energy suitable for demand is that it can be converted into a storable and transportable 'energy carrier' to supply the demands of the transport sector and for balancing differences between electrical loads and supplies. Hydrogen and fuel cells have emerged as one of the simplest and universally available systems with which to achieve a 100% renewable energy infrastructure.

Hydrogen can be created though the electrolysis of water, stored, pumped through pipelines like gas, carried in tanks in vehicles, and converted into electrical power on demand.

For the full transition to a renewable energy system, a clear long-term political strategy is required for the delivery of the energy carrier infrastructure as well as the harnessing of the renewable energy systems that will supply it.

Political support is vital for the creation of a hydrogen infrastructure as the private sector is focused on short-term financial returns. In addition, cooperation is required on a worldwide level. The transition would be aided by creating a level playing field for renewables, such as the removal of subsides for fossil fuels and nuclear power. There are ten key elements<107> that would aid the transition:

- Research and development
- Demonstrations

107.Dunn, S. (2001).

- H2 economy target dates
- Development of hydrogen infrastructure
- Public-private partnerships
- Full-cost energy pricing;
- Environmental regulations
- Tax incentives
- Codes and standards
- Public education

Much interest in centred on pilot projects, especially in Iceland, where a transition to a hydrogen economy is already underway assisted by Shell, amongst others. Many lessons will be learned from such schemes.

In Japan, the World Energy Network (WE-NET) is investing considerable sums into hydrogen initiatives. Current research is focusing on efficiency improvements, storage systems and infrastructure development. The short-term focus is on hydrogen production using gas reformation, transitioning to hydrogen production from renewable sources over the long-term.

Another important tool for decision makers is scenario building. This will help facilitate short-term and longer-term paths to a hydrogen economy. Scenarios range from a utopian view of full adoption through to a scenario where hydrogen use remains the same as today. The direction taken will largely rely on the extent to which the above ten points are adopted.

According to Shell, the transition in to a hydrogen economy can take two paths: a carbon-free supply using the electrolysis of water, or making the transition through the use of the existing fossil fuel system. The problem with the former is the cost of the renewable energy sources, conversion to hydrogen, plus the infrastructure required for delivery of the fuel. This can only be made possible by incorporating the full environmental costs of fossil fuels and nuclear power. According to Shell, however, „(this approach).. is clearly the best possible system—completely emission free and environmentally benign. The question is how to get there," Mark Moody-Stuart, Shell CEO.