3 Policies and Finance

Policies have a major impact on the speed and extent of renewable energy development. The International Energy Agency observed in 2004 that significant market growth has always resulted from combinations of policies, rather than single policies, that longevity and predictability of policy support is important, that local and state authority and involvement are important, and that individual policy mechanisms are evolving as countries gain more experience /IEA 2004/, /EEA 2004/. By mid-2005, all EU 25 countries had a national target for renewable energy supply. The European Commission has set a Europe-wide target for renewables of 21 percent of electricity and 12 percent of total energy by 2010. However, present European energy policies are still far away from being sustainable.

3.1 Discrepancy of Awareness and Action

The EurEnDel Delphi questionnaire of 2004 has assessed the opinion of about 1000 international experts from 48 countries about their expectations of the socio-economic impacts of 19 innovative technologies in the energy sector (Delphi statements, left side in Figure 3-1), and the time frame of their possible achievement /EurEnDel 2004/, in order to provide a guidance for the identification of research, development and demonstration efforts (RD&D) that should be supported by public funding. The assessed impact categories included Wealth Creation, Environment, Quality of Life and Security of Supply (Figure 3-2).

A high share of 25 % of renewable energies in Europe around 2030 was the statement ranking as number one for the achievement of positive impacts in the four impact categories, with a broad consensus of 96 % of the experts believing that this will happen sooner or later. On the other hand, the realisation of large international electricity grids for the intensified use of renewable energies in Europe was not considered realistic before 2020, with 16 % of the experts totally neglecting this option. Nuclear fission and fusion are both ranking within the last 5 places, with 20 % of the experts totally neglecting their long-term importance.

In principle, the TRANS-CSP scenario in Chapter 2 confirms the Delphi results, both regarding the importance of renewable energies for socio-economic sustainability and also with respect to the time frame required for the necessary changes of the energy system. According to the TRANS-CSP scenario, it will take at least until 2020 that renewables really become visible in the European electricity mix, but they will have a considerable, increasing importance in the long term perspective. Import solar electricity from MENA will not achieve a share over 15 % before 2050.

On the other hand, the Delphi expert opinions clearly contradict past and present energy research and development policies, that have fixed a share of renewable energies of less than 10 % of the total government energy RD&D funding in the IEA member countries (Figure 3-3).

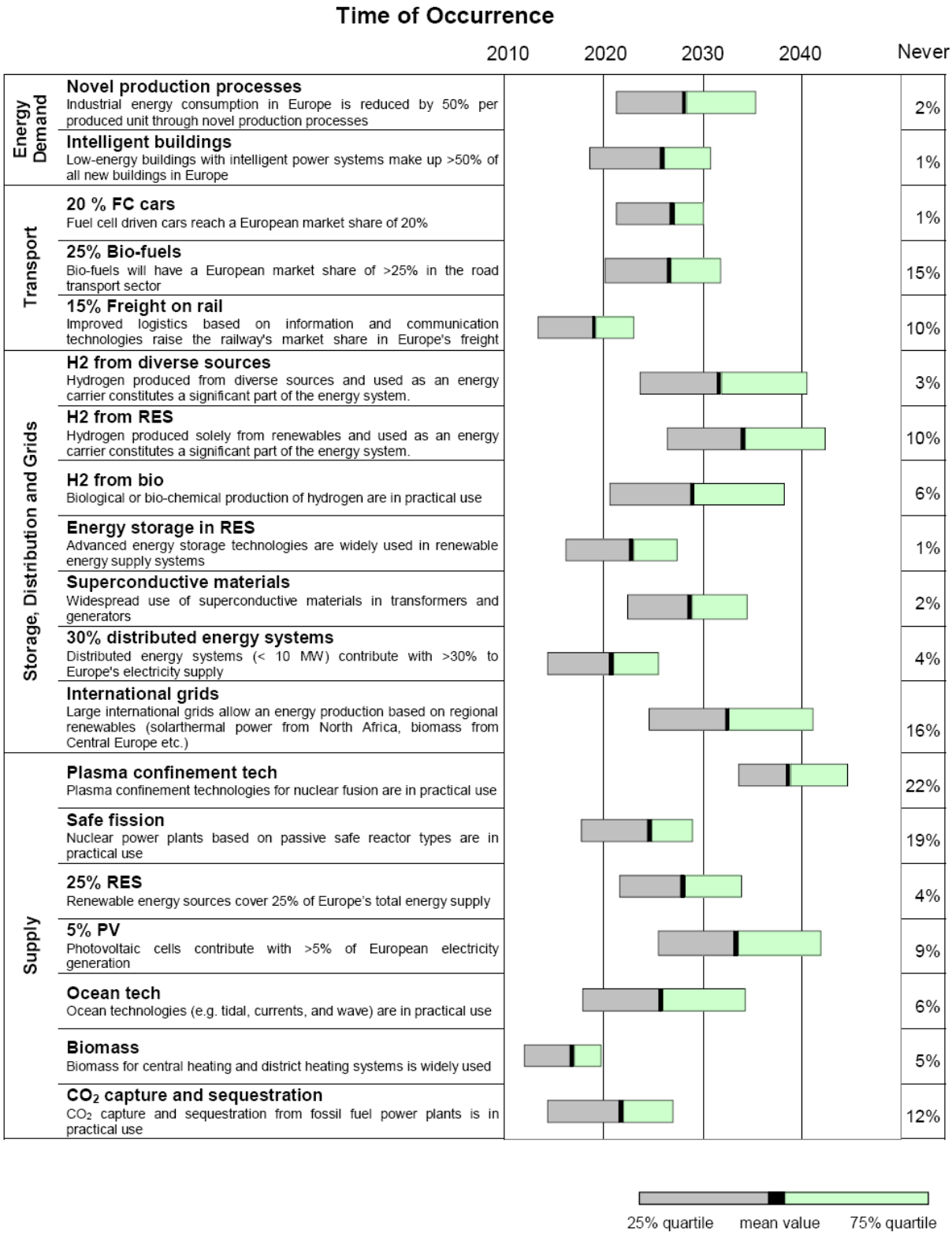

Figure 3-1: Mean value of time of occurrence of the 19 EurEnDel technology statements in the Delphi project in the opinion of the interrogated experts. Left side of the bar indicates 25% quartile, right hand side 75%. The share of experts that never expect the achievement of the statements is given at right /EurEnDel 2004/.

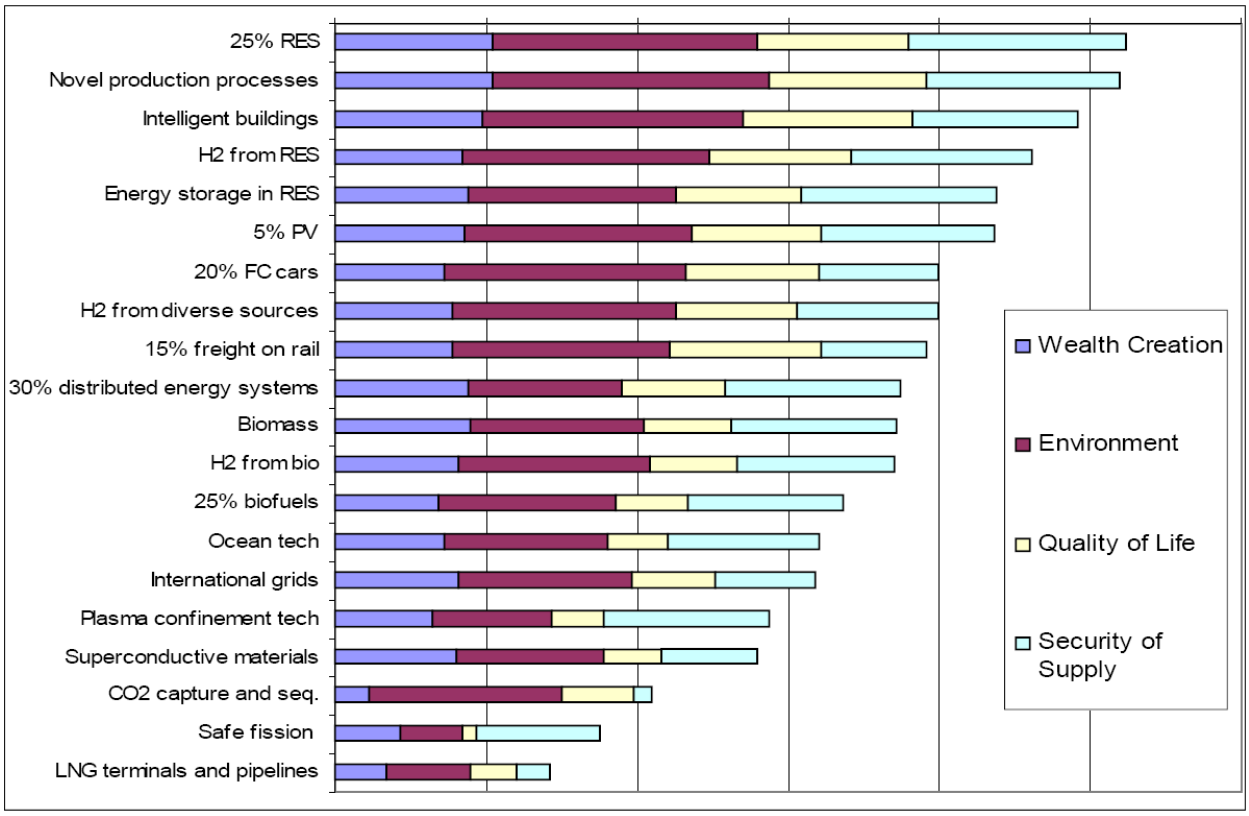

Figure 3-2: Impact ratings of 19 Delphi statements (at left) for four impact categories assessed in the Delphi questionnaire /EurEnDel 2004/. The statements are ranked according to the average impact rating which is proportional to the length of the bar.

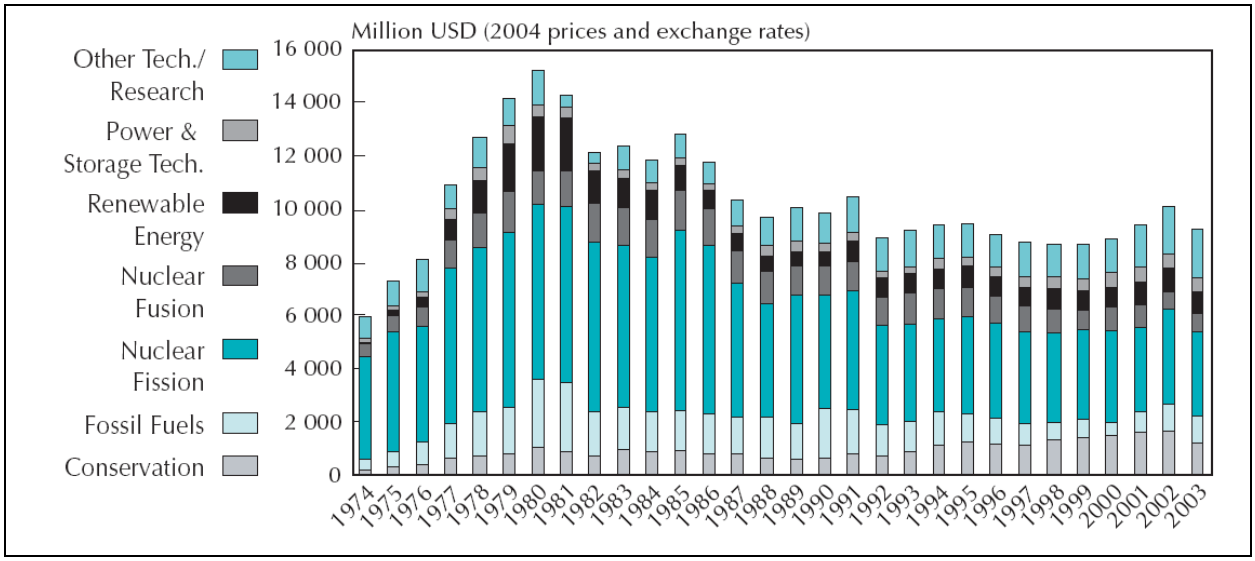

Figure 3-3: Reported government energy research, development and demonstration (RD&D) budgets in member countries of the International Energy Agency, 1974-2003 /IEA 2006-1/.

From 1974-2003, reported renewable energy RD&D budgets of IEA member countries totalled about USD 27.4 billion, some 7.6 % of total energy RD&D funding of USD 308 billion. Expenditures for renewables RD&D grew rapidly in the late 1970s and peaked in 1980 at more than USD 2.1 billion. Then, expenditures halved in the early 1980s, but have been relatively stable since in the range of USD 666 million to USD 1.09 billion. Annual expenditures on renewables RD&D for all IEA member countries averaged about USD 752 million from 1990-2003, or 8.2 % of total government energy RD&D budgets. This funding is distributed among 9 renewable energy technology mainstreams, as shown in Figure 3-4, that means that energy R&D funds for each renewable energy source are in the order of 1 % of the total energy R&D budget. RD&D funding was similar in the EU 15 member countries (Figure 3-5).

Considering the international expert opinion documented by the Delphi report, the large available renewable energy potentials (Chapter 2), the great importance of renewables for energy cost stability (Chapter 4), the increasing dependency on energy imports in Europe, and last but not least the threat of irreversible global climate change (Chapter 5), the present distribution of energy RD&D budgets as well as the overall reduction of energy RD&D funds since 1980 – as if everything was fine with respect to energy supply – are both a clear misallocation of public funds and a serious failure of the energy policies of the past, with considerable negative socio-economic impacts affecting the quality of life and the security of supply of present and future generations as shown in Chapter 4.

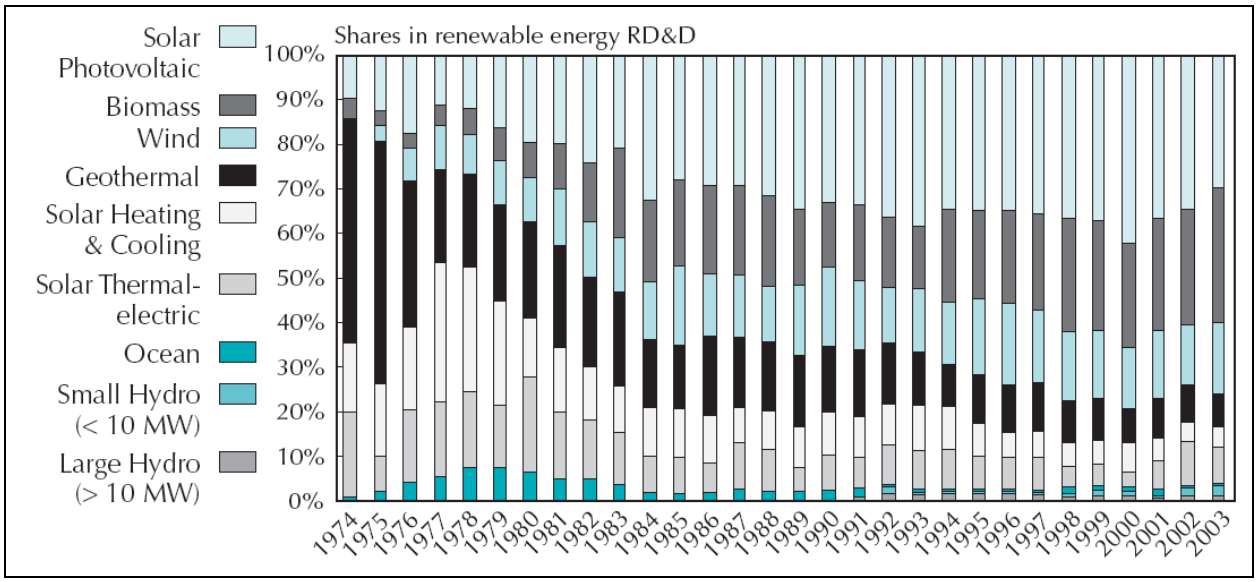

Figure 3-4: Shares of renewable energy technologies in public renewable energy RD&D spending in IEA member countries, 1974-2003 /IEA 2006-1/

In terms of security of supply, the allocation of the scarce funds for renewables was not optimal ether (Figure 3-4 and Figure 3-6). Within the present renewable energy RD&D budget, much too

less emphasis is given to the provision of firm (on demand) power capacity, that could be provided best by e.g. geothermal hot dry rock systems and by concentrating solar thermal electric power stations, which at the moment have a share of less than 0.5 % of the total energy R&D budget, each. Innovative energy storage systems for renewables are also of major concern, ranking on places 4 and 5 of the Delphi report, but their funding is negligible. No funds are dedicated at present to the development of base-, intermediate and peaking capacity from long distance renewable electricity transfer, which however is ranking higher according to Delphi than the highly funded nuclear fission and fusion technologies. Again here, a considerable reallocation and extension of RD&D funds for renewables is over due. Present renewable energy RD&D has mainly the goal of cost reduction, already heading for competitiveness with the conventional energy sources available today. As the cost of electricity from renewables depends mainly on investments, not on fuel resources, the price of renewable energy is effectively lowered by learning. Therefore, R&D in renewables is a public investment into low cost energy resources rather than a long-term subsidy as in the case of nuclear and fossil power.

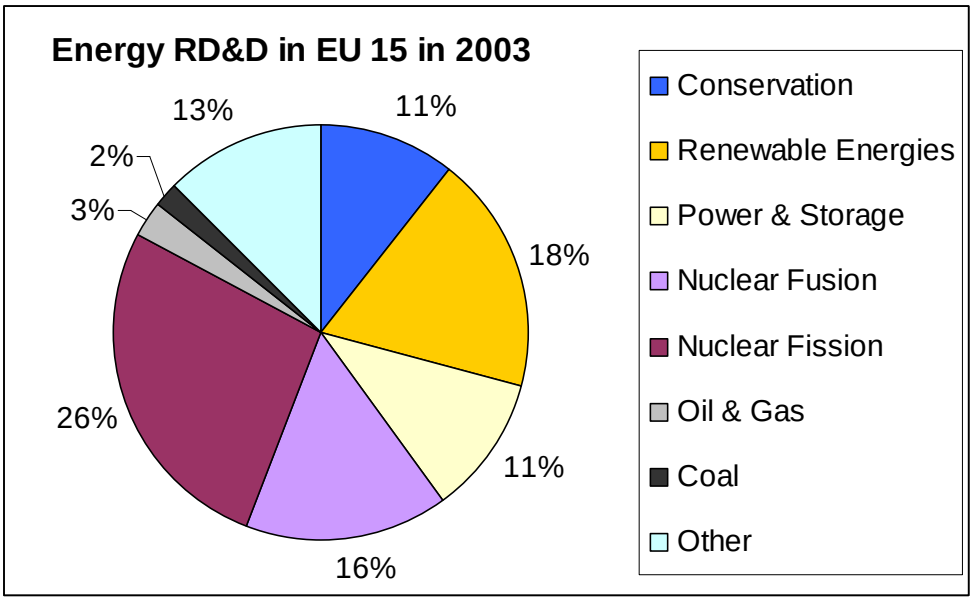

Figure 3-5: Reported government energy research, development and demonstration (RD&D) budgets in EU 15 member countries in 2003. Based on /IEA 2006-2/ and own calculations. The figure does not account for funding through the European Commission (EC) that however has a similar structure.

The Green Paper on Sustainable, Competitive and Secure Energy of the European Commission published in March 2006 is a first step to diversification which should be followed consequently and decidedly. Cooperation with North Africa and the Middle East to establish a EUMENA partnership for energy security based on the plenty renewable and fossil energy resources of this region should also be taken into account in this process.

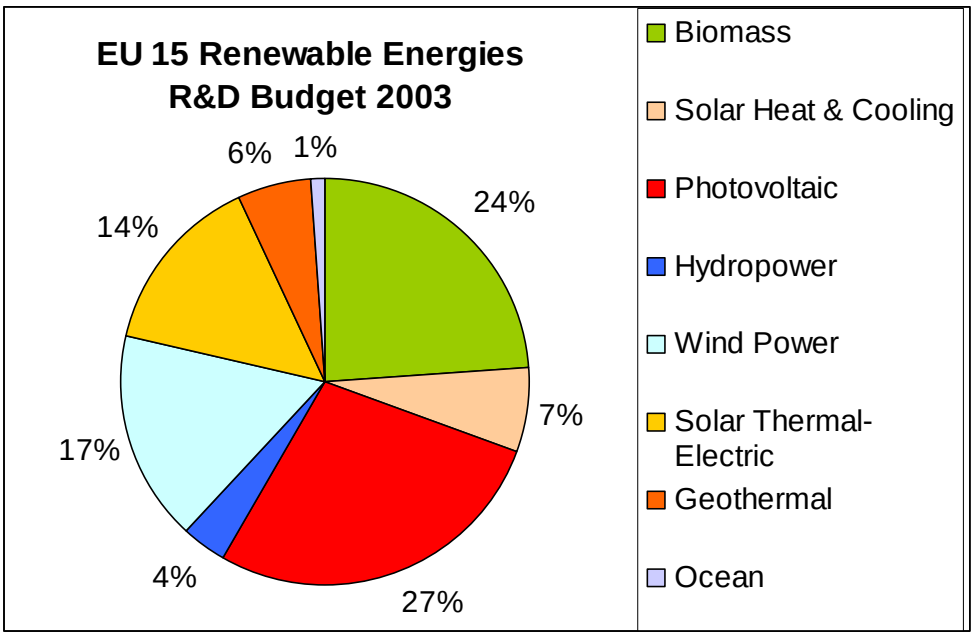

Figure 3-6: Shares of renewable energy technologies in public renewable energy RD&D funding in EU 15 member countries in 2003 from /IEA 2006-2/ and own calculations. Does not include EC funding.

3.2 Concepts of Financing Renewable Energies

An overview of renewable electricity funding and tariffs in the EU 15 is given in /EWEA 2002/, pp. 2005. In the following we provide a brief description of present support policies for renewables /REN 2005/:

Feed-in Tariffs

The most common existing policy for electricity from renewables is the feed-in law, which has been enacted in many countries and regions in the past years. Feed-in tariffs have fostered innovation, increased interest and investment most notably in Germany, Spain, and Denmark. E.g. power from renewable generation under Germany's renewable energy act grew between 2000 and 2004 from 14 TWh/y to 37 TWh/y /BMU 2005/. Due to the relatively high status of maturity of the technology, feed-in policies have had the largest effect on wind power capacities. Spain's feed-in tariff has also helped new investment plans for solar thermal power generation.

Feed-in tariffs vary in design from country to country. They apply to specific technologies and sometimes have a maximum capacity threshold. Most policies establish different tariffs for different technologies, usually related to the cost of generation, for example distinguishing between off-shore and onshore wind power. Some policies also differentiate tariffs by location/region, year of plant operation, and operational season of the year. The tariffs usually decline over time to motivate learning, but last for the typical lifetime of the plants. Some policies provide a fixed tariff (Germany) while others provide fixed premiums added to market- or cost-related tariffs (or both, as in the case of Spain).

Long term power purchase contracts guaranteed by feed-in laws reduce the required revenues and interest rates of investors, as they constitute a high security component of their investment portfolio. Within the German feed-in law, renewable energy projects are usually financed with a typical project rate of return (PRR) of 6-7 %/y, while the average demanded PRR of conventional power investments in the OECD is at least 15 %/y (of which 9 %/y are achieved on average /IEA 2001/). The reduction of risk surcharges on capital investments by feed-in laws is a significant contribution to reduce the cost of market introduction, because in the case of renewables, the capital cost is the dominating component of the overall generation cost.

Renewable Portfolio Standards

Sweden's Renewable Portfolio Standards RPS requires consumers, or electricity suppliers on their behalf, to purchase a given annual percentage of renewable shares, which increases yearly, through either electricity purchases or renewable certificate purchases. Sweden sets penalties for non-compliance at 150 percent of the average certificate price of the prior period. Poland's RPS will reach 7.5 percent by 2010.

Renewable Energy Funds

Some countries have established renewable energy funds used to directly finance investments, provide low-interest loans, or facilitate markets in other ways, for example through research, education, standards, and investments in public facilities. The largest funds of this type are the so-called "public benefit funds" in 14 states of the USA. These funds, often applied to energy efficiency as well as to renewable energy, are collected from a variety of sources, with the most common being a surcharge on electricity sales. These funds are collecting and spending more than $300 million per year on renewable energy. It is expected that they will collect upwards of $4 billion for renewable energy through 2012.

Net Metering

Net metering has been particularly instrumental in facilitating grid-connected solar PV markets in the United States and Japan. Laws exist in at least 7 countries, 35 U.S. states, and several Canadian provinces. Most recently, a 2005 U.S. federal law requires all U.S. electric utilities to provide net metering within three years.

Competitive Bidding

Policies for competitive bidding of specified quantities of renewable generation, originally used in the United Kingdom in the 1990s, now exist in at least seven other countries: Canada, China, France, India, Ireland, Poland, and the United States. China bid and awarded 850 MW of wind power in 2003–2004 and planned another 450 MW of bidding in 2005. The province of Ontario in Canada bid 1,000 MW of wind power in 2004, and other Canadian provinces were following suit. Utilities in many countries use competitive bidding to meet RPS requirements.

Renewable Energy Certificates

Other policies include tradable renewable energy certificates, typically used in conjunction with voluntary green power purchases or obligations under renewables portfolio standards. At least 18 countries had schemes and/or markets for tradable certificates. Many other regulatory measures, such as building codes, administrative rules and procedures, and transmission access and pricing, also serve important roles in promoting renewable power generation. Such regulatory measures can be steps towards future renewable energy markets, particularly in developing countries (Mexico and Turkey are examples of countries taking such regulatory measures). Policies for power-sector restructuring, carbon taxes, fossil fuel taxes, and many others can also affect the economic competitiveness of renewable energy. Eighteen European countries are members of RECS, a renewable energy certificates system founded in the late 1990s to standardize and certify renewable energy certificates and trading. By 2005, a cumulative total of 33,000 GWh of renewable energy certificates had been issued, with nearly 13,000 GWh of certificates used for consumer purchases of green electricity. In the United Kingdom, the distinction between voluntary green power purchases and renewable energy obligations by utilities has been questioned. There have been claims that green power voluntary purchases are not always additional to existing utility obligations.

Green Power Purchasing

In Europe, green power purchasing and utility green pricing have existed in some countries since the late 1990s. By 2004, there were almost 3 million green power consumers in the Netherlands, supported by a tax exemption on green electricity purchases. Other countries in Europe with retail green power markets include Finland, Germany, Switzerland, and the United Kingdom. Germany's green power market has grown steadily since 1998, with more than 600,000 consumers purchasing 2,000 GWh in 2004.

Kyoto Instruments

The present prices of carbon certificates in Germany can be found at http://www.co2-handel.de/. Today, the price of CO_2 certificates ranges around 25 €/ton. Assuming e.g. an avoidance of 0.5 tons of CO_2 per Megawatt-hour by renewable electricity (Chapter 5), this translates to an additional revenue of 1.25 €-cent/kWh for renewable electricity producers. Expectations of future prices have a wide range between 35 and 70 €/ton until 2020. In general, it can be expected that CO_2 avoidance will become more difficult and more expensive in the future, because the easy measures will be realised first, and because the baseline of allowances will be subsequently moved to lower emission levels. Carbon trading represents in principle a second income for renewable electricity producers, that will partially compensate the additional costs of renewable power generation. However, the need for initial support of renewables and carbon trade do not really match: while emission certificate prices are low today and will increase in the future, the need for additional funding of renewables is now high and decreasing. However, the

additional income generated from carbon trading will help market introduction and accelerate the break-even between renewable and conventional electricity prices.

Other Support Mechanisms

There are many other forms of policy support for renewable power generation, including direct capital investment subsidies or rebates, tax incentives and credits, sales tax and VAT exemptions, direct production payments or tax credits, direct public investment or financing. Some type of direct capital investment subsidy, grant, or rebate is offered in many countries. Tax incentives and credits are also common ways of providing financial support.

Country	Feed-in tariff	Renewable portfolio standard	Capital subsidies, grants, or rebates	Investment excise, or other tax credits	Sales tax, energy tax or VAT reduction	Tradable renewable energy certificates	Energy production payments or tax credits	Net metering	Public investment, loans, or financing	Public competitive bidding
Austria	✓		✓	✓		✓				
Belgium		✓	✓	✓		✓		✓		
Cyprus	✓		✓							
Czech Republic	✓		✓	✓	✓	✓		✓		
Denmark	✓			✓		✓		✓		
Estonia	✓				✓					
Finland			✓		✓	✓	✓			
France	✓		✓	✓	✓	✓			✓	✓
Germany	✓		✓	✓	✓				✓	
Greece	✓		✓	✓						
Hungary	✓				✓	✓			✓	
Ireland	✓		✓	✓		✓				✓
Italy		✓	✓	✓		✓		✓		
Latvia	✓								✓	
Lithuania	✓		✓	✓					✓	
Luxembourg	✓		✓	✓						
Malta					✓					
Netherlands	✓		✓	✓		✓	✓			
Norway			✓	✓		✓				✓
Poland		✓	✓		✓				✓	✓
Portugal	✓		✓	✓	✓					
Slovak Republic	✓			✓					✓	
Slovenia	✓									
Spain	✓		✓	✓					✓	
Sweden	✓	✓	✓	✓	✓	✓	✓			
Switzerland	✓									
United Kingdom		✓	✓		✓	✓				

Table 3-1: Renewable Energy Promotion Policies in Europe according to /REN 2005/

3.3 Necessary Political Framesets

This chapter is focused on political actions that could be helpful to make possible the North-South cooperation for renewable energy in EUMENA. It has been kindly edited by Prof. Abdelaziz Bennouna and Dr. Gerhard Knies, members of the Trans-Mediterranean Renewable Energy Cooperation /TREC 2006/. It reflects the first draft of a road map designed within the TREC initiative. Valuable information on renewable energy policies can also be found at /OECD 2004/, /REN 2005/ and /Martinot 2006/.

The TRANS-CSP scenario for renewable energy expansion is technically possible, but in order to become reality suitable political actions and regulatory frameworks are required. The TRANS-CSP scenario will not become reality automatically. In fact, some of the present political trends are pointing into different directions:

- The Arab Human Development Reports 2003 and 2004 indicate developmental stagnation in several MENA countries. A developmental path "enlarging the gap" is not an exotic fiction.
- At present the attention of the European Union is much more in the direction East than South. In the East there are large energy resources of high importance for Europe, and also new markets and new opportunities for European industries.
- The most striking feature of the 10-year Barcelona Summit in November 2005 was the absence of all Arab political leaders.

In view of these political indicators the development of EUMENA relations needs new momentum into the proper direction. This could in fact be generated by the synergies of a renewable energy co-operation between sun-belt and technology-belt. The overabundant solar energy resources in MENA and the developed solar technologies available in Europe hold the promise of solving the energy, water and climate problems for these regions and beyond, when they can be joined "as if there were no borders". Proper general conditions could generate considerable economic and ecological win-win configurations for all countries of EUMENA. In fact, a properly designed Free Trade Area for renewable energies could become a flag ship for the Barcelona Process, the Euro-Mediterranean Partnership, like the Community of Coal and Steel gave the early push towards European integration.

There are differences though: while the European integration was to overcome traditional hostilities between equally developed partners, the Barcelona process has to deal with overcoming developmental differences between neighbours of different cultural background.

Salient factors for the relations between EUMENA regions

The region of EUMENA is coined by tremendous differences between its parts. There are significant differences such as

1. level of literacy and vocational education
2. income per capita
3. religion
4. participation of population in public/societal matters
5. industrialization
6. significance of science and technology
7. gender equality
8. climatic living conditions

It is not exaggerating to say that the regions Europe on one side and MENA on the other are separated by a large cultural and infrastructural gap. But by history and by geography they are neighbours, and they have significant commons. The most important and challenging common however is their future. The process of globalization leaves no perspective for continued separation. Modern means of communication and transport irreversibly put an end to sealed societies. Problems, unrest and wars cannot be concealed. Globalization is a challenge to the Mediterranean riparian countries to pay careful attention to how they shape their common future. Are we doomed to a clash of civilizations, or can we use differences as complementing capacities for synergies, in support of achieving common goals? In fact, there are goals that either side would consider as an advantage:

1. peace within and between these regions
2. energy security
3. water security
4. environmental stability
5. sustainable and fair prosperity

The study demonstrates how cooperation for renewable energies could generate win-win configurations and bring all these goals into reach. Some remaining questions are:

1. Could the common goals overcome frictions and suspicions based on cultural differences?
2. Can these regions co-operate without endangering their cultural identities?
3. Can all countries become winners of a co-operation?

A positive answer to question 1 is the big hope for the common future of these regions. In fact, co-operation for the use of renewable energies bears the promise of enclosing or even of eliminating the frictions due to the present struggles for access to the limited fossil energy resources in MENA.

The answer to question 2 depends on the intention behind the co-operation. If the intention of one side is to impose its cultural values onto the others, then co-operation will no longer be embraced by the others. The absence of all Southern and Eastern Mediterranean state leaders from the 10 year anniversary convention at Barcelona may convey this message. Co-operation on renewable energies must not be abused as vehicle for other goals. The drive for any cultural

or societal development must be coming from inside the respective society. The frameset for co-operation on renewable energies must exclude its abuse for cultural, economic or political hegemony.

Based on the MED-CSP and TRANS-CSP studies question 3 can be answered with a clear yes if proper political and economic general conditions were in place.

In summary, a proper political framework for energy partnership must

1. enable feasibility and enhance productivity of the co-operation,
2. ensure advantages for all sides,
3. support stability of the interregional relations,
4. bar the abuse for hegemony and cultural domination.

Economic co-operation between Europe and South and East Mediterranean countries

Comprehensive co-operation between Europe and the Southern and Eastern Mediterranean Countries (SEMC's) is the aim of the Barcelona process. In 1995 the goal of an European-Mediterranean Free Trade Area (EMFTA) was proclaimed. The EMFTA is intended to be in place in 2010. So far EMFTA is under preparation for 3 sectors:

- Industrial products
- Agricultural products
- Services

There is however not much common enthusiasm among the partners of the EU and the SEMC's. In fact, there are a number of problems in merging those very different economies. /study../

EMFTA for industrial products

Why should production of cars, of computers or of computer software, or of components for them be transferred from Western Europe to a country in North Africa? The only advantage would be lower costs for wages. But there are a number of draw backs: low qualified labour force could endanger the whole production process and the reliability of the products, and so eventually render the enormous investment into the production facilities useless. In Eastern Europe, wages are also low, but vocational and general education and infrastructure are superior. Cheaper produced cars are already coming from Brazil, Rumania and soon also from China and Russia. Computers are largely produced in Eastern Asia. Except for some niche products MENA runs into stiff competition.

EMFTA for agricultural products

With Europe having over-production of agricultural goods, lower cost oranges or tomatoes from North Africa will put out of work European orange and tomato farmers. Unless Europeans

multiply their consumption of oranges and tomatoes we will face a win-loose configuration. Also in view of the mounting water scarcity in the South, the expansion of food production in MENA for export has narrow limits.

How to ensure a long-term win-win co-operation

The European integration represents a long-term win-win co-operation. Its success is based on economic or commercial win-win configurations, as in the "community of steel and coal", unleashing significant synergies. A similarly effective win-win configuration seems to be at hand for a EUMENA Renewable Energy Co-operation.

There are two basic factors for a win-win configuration:

1. The co-operating partners contribute supplementing and not competing capacities.
2. The co-operating partners have common and not conflicting goals.

How a solar or more generally a renewable energy co-operation between EU and MENA complies with condition 1 is subject of this study. Five common goals are summarized above. In addition, there are unilateral advantages, like technological and industrial development for MENA – even though economic growth may be taken as common goal – or cheaper electricity for Europe. Therefore, an EMFTA for renewable energies (RE-EMFTA) is a promising case for bringing more dynamics into the Barcelona process.

Policies should provide incentives for a quick start and for investment security in the long run. The problem to overcome is the competition with the only seemingly cheaper fossil energies, since they are not charged with their environmental costs and/or receive heavy subsidies. Therefore the EUMENA regions in their best self-interest in and in their responsibility for a sustainable future should create regulations that boost the use of renewable and in particular solar electricity, which is the gateway towards a secure, reliable, clean and least cost energy supply.

A Euro-Mediterranean Free Trade Area for Renewable Energies

In the following we present a proposal for a suitable political framework that would allow for the developmental path of the MED-CSP and TRANS-CSP scenarios for MENA and Europe, respectively: a Renewable Energy European-Mediterranean Free Trade Area (RE-EMFTA). RE-EMFTA is along the lines of EMFTA described above. Just the sector of trade area would be renewable energies and the members could be going beyond the SEMCs. How to achieve successfully a rapid expansion of renewable electricity production has been demonstrated by the method of a feed-in regulation with guaranteed tariffs as in operation in about 30 countries. The specific innovation to be made here would be a trans-national feed-in regulation, such that solar or wind electricity from a MENA country would be eligible for feed-in tariffs in the EU. The

tariff is to be designed to provide commercial viability and long-term security for the necessary investments in MENA countries. Another specific is that there are 2 feed-in modes: virtual feed-in (phase 1 before 2020) without and physical feed-in (phase 2 after 2020) with transmission from MENA to EU. This way production of clean electricity for MENA consumers can also be stimulated by the EU and eventually credited to its climate protection obligations.

Once the cost of solar technology has been brought down, solar power from the sun belt becomes attractive for import by EU countries. Thus the EU countries could save a lot of power cost in two ways,

1. by accelerating the solar cost reduction process thru early investments in solar plants in and for the MENA region (phase 1),
2. and by importing reliable and economical solar and wind power from the MENA region (phase 2).

For MENA countries production and export of clean power is a long-term source of income, and the local production of solar technology a driving force for scientific development and for industrialization. The transition to a knowledge based economy is the great challenge in the MED-CSP scenario /MED-CSP 2005/.

An additional incentive could be provided by a MENA Technology Development Fund, which would pay an additional charge per kWh proportional to the share of parts in the plant that are produced in MENA.

As key elements for making a RE-EMFTA operational and successful we consider:

1. A set of agreements stimulating production and ensuring free trade for RE
2. A mechanism to secure investments, at least in the early stage
3. A EUMENA board to set and to ensure the necessary pace for achieving the common goals.

Regulations of a RE-EMFTA

The RE-EMFTA could be based on the following or a similar set of agreements:

1. Renewable energy products (like power, hydrogen) can cross any border duty-free, without administrative restrictions and without discrimination in comparison with domestically generated renewable energy products.
2. Renewable energy technology can cross any border duty-free and without administrative restrictions.
3. Renewable energies (products, technology) are given in each country at least the same subsidies or financial support as is given directly or indirectly to competing fossil or nuclear energies.
4. Members cooperate on creating the infrastructure for RE transmission.
5. Each member establishes appropriate feed-in regulations.
6. Each member gives legal securities for investments from other countries.

7. The EU declares targets for renewable energy imports, based on recommendations by a EUMENA Panel on Energy, Water and Climate Security (PEWCS) and will set up a feed-in regulation that ensures compliance with these targets.
8. During phase 1 the EU makes purchase agreements for "virtual" clean power from selected solar power plants by providing the feed-in surcharge for a contingency recommended by the PEWCS to reach its own climate goals.

Membership: EU, and individual MENA countries (may be beyond present SEMCs).

The RE-EMFTA makes a win-win configuration of partners from sun-belt and from technology-belt accessible for investments.

EUMENA Energy, Water and Climate Security Fund

In addition, all members create a joint EMFTA Energy, Water and Climate Security Fund (EWCSF) . This fund guarantees power purchase agreements, and ensures tariffs for clean power and water that cover the investment costs and attract investors in a way that the energy, water and climate security goals will be achieved.

EUMENA Energy, Water and Climate Security Panel

The EWCSP is an advisory board to the EU commission and to governments in the MENA countries. Its function is to give recommendations to the political responsible bodies in EUMENA for measures required to ensure energy, water and climate security. It includes scientists with expertise in the fields of energy, water and global climate. It works in a style similar to the global IPCC. In the long run an EWCSP could become a driving force for an integrated sustainability region EUMENA and a nucleus of a regional governance structure for sustainable development.

The ideas described here are a first draft of a EUMENA renewable energy partnership that will require further intensive discussion on all levels of policy, industry and society in general.

3.4 Policies and Finance for Solar Electricity Imports

The cost of import solar electricity from MENA in 2020 will range between 5.5 to 6.5 cent/kWh as shown in Chapter 2 (for the individual cost in each country please refer to the Annex). If we assume a level of carbon certificate prices of 35 €/ton (today 15 €/ton)and the fact that solar electricity imports from CSP in MENA would substitute the burning of coal and gas resources for power generation in Europe with specific emissions of 0.5 to 0.9 tons/MWh (Chapter 5), the value of carbon trading would range between 1.5 and 3 €-cents/kWh, which can be subtracted from the electricity generation cost. This would fully cover the cost of electricity transfer of about 1.5 €-cent/kWh. Thus, the effective cost of solar electricity in Europe would equal it's generation cost in MENA of about 4-5 €-cent/kWh, assuming base load operation. If solar import electricity would be used for intermediate or peaking load with less full load hours, it's cost and revenues would be accordingly higher. Thus, solar import electricity would be highly competitive.

Solar electricity imports will contribute to the stabilisation of electricity costs and to grid stability, through their exceptional controllability and flexible performance. The solar electricity import potential of 65 TWh/y in 2020 growing to 700 TWh/y in 2050, that was identified by the scenario analysis in Chapter 2, can be taken as a plausible market potential for CSP import electricity. The scenario comprises a total cumulated investment volume of 47 billion € until 2020 and 395 billion € until 2050 for the necessary CSP and HVDC installations.

However, the realisation of the necessary power plant capacity and grid infrastructure in the proposed time frame requires to start immediately the following activities:

- preparation of an internationally accepted expert document that demonstrates the technical and economical feasibility, a possible roadmap and the impacts of such a Trans-Mediterranean renewable energy interconnection,
- preparation and realisation of the necessary international agreements among the involved EUMENA countries, possibly in the frame of the Barcelona process, to found a Trans-Mediterranean Renewable Energy Partnership that provides the necessary political and legal frame, establishing a Trans-Mediterranean Renewable Energy Free Trade Area,
- establishment of adequate financial frame conditions to trigger the necessary investments of 10 - 15 billion €/y from 2020 to 2050 in MENA and Europe,
- selection and thorough planning of the first power line, its technology, cost and impacts, and start of a well founded information campaign,
- realisation of about 5000 MW of installed CSP capacity world wide and the development of commercial large scale thermal energy storage facilities for CSP until 2015 to achieve the assumed cost reductions and economies of scale.

The realisation of these pre-conditions and the construction of the first 5 GW HVDC power line between MENA and Europe will take at least 15 years from now. Therefore, our scenario starting in 2020 with two 5 GW lines over several 1000 km length and 10 GW of CSP with 18 hour thermal storage capacity in MENA established and operating specifically for the purpose of power export, will be quite a challenge, if not unrealistic. Its realisation in due time will require a high motivation and engagement of many stakeholders from policy, industry and finance.

In the past, there has been a strong public resistance in Europe against large utility grid structures that must be overcome by thoroughly planning for minimized environmental impact and an adequate information campaign. Public acceptance and environmental concerns will be an important market delimiter for solar electricity imports. Therefore, the socio-economic and environmental impacts must be carefully evaluated and explained to the public (Chapters 4, 5).

3.5 General Conclusions for Policy and Finance

With respect to energy policy, we come to the following conclusions: (for comparison refer to /OECD 2004/ and /EU 2006/):

- Diversification of the energy portfolio with renewables is a key to energy security.
- Quickly reacting, gas-fired plants for peaking power combine well with renewables, while investments into constant base load power capacity should be reconsidered carefully.
- Energy RD&D budgets in Europe must be reallocated, RD&D for the cost reduction of renewables must be extended considerably and more emphasis must be given to renewables and storage technologies that can provide firm power capacity.
- Feed in tariffs for electricity from renewable energy sources that cover the cost difference to present market prices are very effective, as they foster energy diversification and reduce the risk surcharges on private investments. If tariff additions are gradually reduced to zero, they can be considered a public investment rather than a subsidy.
- A EUMENA free trade zone for renewables should be established in the medium term, political work in this direction should start immediately.
- The planning and evaluation of EUMENA electricity highways based on HVDC technology to increase the redundancy of power supply should start immediately.
- As a general principle, the subsidisation of energy technologies should be limited to a reasonable time span and should in all cases be subsequently reduced to zero.
- Present electricity pricing is not sustainable. With the growing, over-due need for new investments in the power sector, market prices will increasingly reflect full and not only marginal costs.
- European support for MENA for the market introduction of renewables can attenuate the growing pressure on fossil fuel resources that would otherwise origin from the economic growth of this region, thus helping indirectly to secure fossil fuel supply in Europe.