



**EREF-2008 Preparatory Workshop on
PPP in Research Priority Setting – particular emphasis on Energy**

**ČEZ Group, Prague, Czech Republic
12 May 2008**

Compendium of Relevant Documents

Proposed Agenda Topics

- 1. State of the Art, Key Issues, and Problems**
- 2. Recommendations**

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State of the Art, Key Issues, and Problems

1. Europe is facing an energy crisis. We now live in an era of energy uncertainty. The days of cheap and abundantly available energy are over. Current trends and their projections into the future show that we are not on a pathway to meet our energy policy objectives. The easy availability of resources, no carbon constraints and the commercial imperatives of market forces have not only left us dependent on fossil fuels, but have also tempered the interest for innovation and investment in new energy technologies. This has been described as the greatest and widest-ranging market failure ever seen. (*"Towards a European Strategic Energy Technology Plan"*, pg. 3)

Europe is running out of indigenous energy resources at a time of increased prices, diminishing resources and their concentration into fewer, more geopolitically sensitive regions, and greater international competition for energy resources. (*"Europe's Energy Crisis, The No Fuel Solution"*, pg. 1)

At the same time demand for power is increasing, and many power plants will be retired, so combined the total demand for new electricity generation capacity across Europe is predicted to increase by 760 GW by 2030. (Idem)

2. European countries depend heavily on energy imports and are highly vulnerable to global energy shocks. The EU is the world's largest importer of oil and gas. It imports 82 percent of its oil and 57 percent of its gas. Imports are projected to rise to 93 percent of its oil and 84 percent of its gas over the next 25 years. (*"Europe's Strategic Dependence on Russian Energy"*,

Europe is an energy intensive region heavily reliant on imports; already today, it imports 50% of its energy needs, projected to increase to 70% within two decades. By 2030, oil imports would rise from 76% to 88% and gas imports from 50% to 81%, compared to 2000. Indigenous fossil fuel resources, such as the North Sea oil and gas reserves, are in rapid decline. Actually, the UK's North Sea oil reserves are running out, and the UK must spend billions to boost nuclear and alternative energy supplies. (*"Europe's Energy Crisis, The No Fuel Solution"*, pg. 1)

Europe's dependency on imported fossil fuels has become a **threat to economic stability** because of the impact of increased fuel prices on the cost base. (Idem)

Europe is highly dependent on foreign energy supplies. North Africa and the Middle East are major suppliers, but all of Europe knows Russia has to be the long-term source of gas and oil, given its huge reserves.

The problem is that Europe does not trust the Kremlin's intentions ever since it turned the gas off to the Ukraine after the Orange Revolution. Still, Russia needs to sell its gas and oil to Europe just as much as Europe needs to buy.

3. With energy reserves within the EU limited, nuclear and alternative energy are playing an increasingly important role in providing electricity for the continent.

Some of the world's most innovative companies are based in Europe: Germany, Denmark and Spain lead the way in alternative energy, France is the undisputed nuclear champion (generating 80 percent of its electricity from nuclear power), and Germany is a market leader in wind and solar energy. European oil companies like Shell and Total are at the forefront of high-cost liquefied natural gas projects.

Europe is wealthy in wind energy resources – there is enough resources to power the entire continent. Wind energy has made rapid progress in recent years - in technology, in costs and in market deployment. Yet its exploitation remains low in Europe.

Wind energy ensures that the economic future of Europe can be planned on the basis of known and predictable cost of electricity derived from an indigenous energy source free of all the security, political, economic and environmental disadvantages associated with oil, coal, gas and nuclear.

A prevailing myth is that wind cannot be mainstream because it is intermittent. The capacity of European power systems to absorb significant amounts of wind power is determined more by economics and regulatory rules than by technical or practical constraints.

A large contribution from wind energy to European power generation is feasible in the same order of magnitude as coal, gas or nuclear.

Wind energy is ready to serve as one of the leading solutions for European energy needs – for security of supply, for energy independence, as well as meeting climate goals and rising demand for energy.

4. The disappointing progress towards a European Research and Innovation Area is accompanied by the historically declining research budgets in the energy sector. For reasons mainly related to the specificities of the sector, energy research budgets (public and private) in OECD countries have halved in real terms since the 1980s and it is paramount that this trend be decisively reversed, certainly in the European Union. Given the uncertainties and risks inherent in low-carbon technology innovation, increased public investment and a stable, predictable policy framework will play a vital role in leveraging increased private investment, which should be the main driver of change. (*“Towards a European Strategic Energy Technology Plan”*, pg. 6)

Public and private energy research budgets in the EU have declined substantially since peaking in the 1980s in response to the energy price shocks. This has led to an **accumulated under-investment in energy research capacities and infrastructures**. If EU governments were investing today at the same rate as in 1980, the total EU public expenditure for the development of energy technologies would be **four times the current level** of investment of around 2.5 billion euros per year. (Idem)

The increased budgets of the Seventh Framework Programmes of the European Union, as well as the Intelligent Energy-Europe Programme, are steps in the right direction. **In FP7 the average annual budget dedicated to energy research (EC and Euratom) will be**

€886m, as compared to the €574m of the previous programme. Nevertheless, the contrast with the planned sharp increases in the centrally managed research programmes of global competitors is still stark. For example, the 2005 US Energy Bill proposes in the Federal budget \$4.4 billion for energy research in 2007, \$5.3 billion in 2008 and \$5.3 in 2009, sharply up from the \$3.6 billion dedicated in 2005. (Idem)

In order to be able to compete in global markets, **the European Union and its Member States have both to increase their investment, public and private, and to mobilise all these resources much more effectively to address the mismatch between the sheer magnitude of the challenge and the underlying research and innovation effort.** All Member States have their own research programmes on energy, mostly with similar objectives and targeting the same technologies. In addition, public and private research centres, universities and dedicated agencies complete a picture of scattered, fragmented and sub-critical capacities. Working together will benefit all, exploiting the federating role that the European Union can play in the field of energy. (Idem)

5. The potential of enhanced international cooperation must also be harnessed in a more effective way. Energy security and climate change are global issues with solutions that can be deployed globally, giving rise to huge markets but also to severe competition. Finding the right balance between cooperation and competition is vital. ITER and fusion have provided a model for large-scale international cooperation in research to meet global challenges and such an approach may have potential in other areas. The European Union and many of its Member States also participate in multi-lateral co-operation initiatives, such as the **International Partnership for the Hydrogen Economy (IPHE), the Carbon Sequestration Leadership Forum (CSLF) and the Generation IV International Forum (GIF)**, whose potential has still to be fully realised. Synergies in the development of efficient and low carbon technologies should be further enhanced by closer and result-oriented cooperation with international partners, e.g. the United States. (Idem)

6. A collective endeavour to deliver results

Meeting the targets in 2020 and the vision for 2050 is a significant challenge that can be tackled most effectively as a collective endeavour.

Some technology challenges require critical mass and large-scale investment and bring with them a risk which cannot be met by the market, by Member States acting individually or by the current model of European collaborative research. The EU can respond to this challenge by evolving towards a new model of focussed cooperation, making use of the full potential of the European Research and Innovation Area and the Internal Market. (*“Towards a low carbon future”*, pg. 6)

Member States, the Community, industry and research organisations all have different roles to play within a coherent overall effort. Achieving our ambitious goals will require a fundamental **departure from current practice throughout the innovation system, striking the right balance between cooperation and competition** at national, European and global levels. (Idem)

7. Action by the private sector

The private sector is at the forefront of these efforts. The industrial revolution that will be catalysed by the move towards world-wide low carbon growth represents a unique

opportunity for European industry. A long term and stable policy framework is essential, but to take best advantage of this opportunity, industry should be prepared to increase investment and take greater risks. (Idem)

Setting up strategic alliances is necessary for industry to share the burden and benefits of research and demonstration. There is room for better exploiting the synergies between technologies (e.g. in the automotive sector, between hybrid vehicles, fuel cells, biofuels and gas). Industry should also join forces to take a more pro-active stance on the elaboration of global regulations and standards and to overcome the often complex issues surrounding the public acceptance of new technologies. (Idem)

Recent studies show that there is still **room for substantial growth in private capital being invested in European clean energy.** The financial sector, including private equity and venture capital, needs to adapt their risk profiles to invest more in potentially high-growth small and medium size enterprises and spin-offs, to benefit from the huge prospects for low carbon technologies. (Idem)

8. Action at national level

Member States have to deliver their contributions to the 20% targets agreed for 2020, and to put their energy systems on a pathway toward decarbonisation by 2050.

A dedicated and substantial effort on energy technology can help achieve the targets in a way that maximises the benefits for Member States and limits the costs.

The actions of the Member States should aim at increasing investment and provide clear market signals to reduce the risks and stimulate industry to develop more sustainable technologies. For example, by designing smart incentive schemes that stimulate innovation and create value chains, rather than unduly distorting competition or subsidising technologies that have the highest short term potential. (Op.cit, pg. 7)

Tax incentives and Community instruments implemented at national level, such as Structural Funds, can be used to strengthen the research base, build innovation capacity, promote excellence and increase the human resources available to the sector. Strengthening the implementation, monitoring and review of national programmes and measures and seeking out a better coherence and alignment with other Member States and Community efforts would also pay dividends. (Idem)

9. Action at Community level

A new Community approach in the field of energy technologies is crucial to achieve the objectives of the SET-Plan. The Community is the vehicle that can:

- Enable the pooling of resources and sharing of risks to develop new technologies that offer huge potential but are currently far from market competitiveness and are beyond the means of individual countries.
- Facilitate strategic planning at both the technology and energy system levels to ensure a common approach to problems that have a cross-border dimension, such as networks, as well as to optimise the transition towards the energy system of the future.
- Permit a better gathering and sharing of data and information to support sound energy technology policy making and guide investment decisions.
- Ensure coherence and critical mass in international cooperation efforts.
- Address common problems and non-technological barriers, such as public acceptance and awareness of new technologies, to arrive at common solutions with wide applicability. (Idem)

The Research Framework Programmes and the Competitiveness and Innovation Framework Programme are the main tools through which actors across the EU currently work together on technological innovation projects.

These Community programmes should be better used to catalyse the actions of Member States and the private sector, taking them to new dimension by evolving towards a paradigm of steering and co-financing joint programmes rather than projects. This calls for a change in the way these programmes are implemented. The proposed Fuel Cell and Hydrogen Joint Technology Initiative⁶ is a prime example of such a change, with Community Research Framework Programme funding being used to co-finance a programme of research and demonstration with industry in a new, European public-private partnership. (Idem)

10. Action at global level

In a world in which energy demand is still increasing and Europe's share of greenhouse emissions is set to fall from 15% to 10% by 2030, a global effort and cooperation are needed to address the global challenges.

We need to take our international cooperation on energy technology to a new level, in the same way as the Emissions Trading Scheme is being used to catalyse the development of a global cap and trade system for carbon. If we are unable to create a global market appetite for low carbon technologies and ensure their widespread take-up, then achieving our ambitious goals could result in much wasted effort and resources – a high cost strategy for our business and society. (Op.cit, pg. 8)

11. European Industrial Initiatives

European Industrial Initiatives aim to **strengthen industrial energy research and innovation** by **mobilising the necessary critical mass of activities and actors**. Geared towards measurable objectives in terms of cost reduction or improved performance, they will focus and align the efforts of the Community, Member States and industry to achieve common goals. They will target sectors for which working at Community level will add most value – technologies for which the barriers, the scale of the investment and risk involved can be better tackled collectively. (Op.cit, pg. 9)

Based on the results of the consultation process, the Commission proposes to launch the following new priority initiatives, starting in 2008:

- **European Wind Initiative:** focus on large turbines and large systems validation and demonstration (relevant to on and off-shore applications).
- **Solar Europe Initiative:** focus on large-scale demonstration for photovoltaics and concentrated solar power.
- **Bio-energy Europe Initiative:** focus on 'next generation' biofuels within the context of an overall bio-energy use strategy.
- **European CO₂ capture, transport and storage initiative:** focus on the whole system requirements, including efficiency, safety and public acceptance, to prove the viability of zero emission fossil fuel power plants at industrial scale.
- **European electricity grid initiative:** focus on the development of the smart electricity system, including storage, and on the creation of a European Centre to implement a research programme for the European transmission network.
- **Sustainable nuclear fission initiative:** focus on the development of Generation-IV technologies. (Op.cit, pg. 10)

The European Industrial Initiatives will be implemented in different ways, depending on the nature and needs of the sector and the technologies. For technologies with a sufficient industrial base across Europe they may take the form of public-private partnerships, while for other technologies which are prioritised by a few countries, they may take the form of joint programming by coalitions of those interested Member States. Where appropriate, a combination of 'technology push' and 'market pull' instruments may be used. The European Technology Platforms will assist in the preparation phase. (Idem)

Two on-going energy programmes serve as illustrative examples of SET-Plan initiatives: the European fusion research programme and its flagship 'ITER' and the proposed Joint Technology Initiative on 'Fuel Cells and Hydrogen'. Other related industrial initiatives are the Single European Sky air traffic management research programme (SESAR) that will improve the energy efficiency of the aviation system and the proposed Joint Technology Initiative 'Clean Sky'8 that aims to enhance the energy efficiency of aviation engines. (Idem)

12. Creation of a European Energy Research Alliance

Europe has strong National Research Institutes for Energy as well as excellent research teams working in universities and specialised centres. However, even if they pursue similar objectives, they define strategies and work plans individually. Traditional instruments (e.g. projects and networks) to coordinate their efforts are no longer sufficient. Greater cooperation at Community level will deliver a more effective use of resources. (Idem)

The Commission proposes to create a European Energy Research Alliance. To launch the process the Commission will, in the first half of 2008, open a structured dialogue with the CEOs of the National Research Institutes and bodies of a similar character (e.g. higher education establishments) with significant programmes. The mandate will be to bring about a move from today's model of collaborating on projects towards **a new paradigm of implementing programmes**. The aims are to align these programmes with the SET-Plan priorities, network existing but disperse capacities and build durable partnerships with industry. (Op.cit, pg. 11)

Examples of potential joint programmes that could be channelled through the Alliance include basic energy science, enabling and breakthrough technologies and advanced energy efficiency. The European Institute of Technology could provide an appropriate vehicle to realise this ambition, through a Knowledge and Innovation Community on energy and climate change. (Idem)

13. Trans-European energy networks and systems of the future

To achieve a sustainable, interconnected European energy system will require massive energy infrastructure change as well as organisation innovation. It will happen over decades, transforming the energy industry and infrastructures, and represent one of the most important investments of the 21st century. Very diverse sectors will be affected, not only energy, environment and transport, but also information and communication technologies, agriculture, competition, trade and others. This will require a **multidisciplinary approach** to issues that are increasingly interconnected. (Idem)

To plan and develop future infrastructures and policies, it is essential to have a good **understanding of the full implications and logistics of new energy technology options**.

The Commission proposes to initiate in 2008 an action on European energy infrastructure networks and systems transition planning. It will contribute to optimise and harmonise the development of low carbon integrated energy systems across the EU and its neighbouring countries. It will help the development of tools and models for European level foresight in areas such as smart, bi-directional electricity grids, CO2 transport and storage and hydrogen distribution. (Idem)

The European Commission has adopted two proposals today that will mark a step forward in the development and marketing of clean and safe hydrogen vehicles. The first is the setting up of the Fuel Cells and Hydrogen Joint Technology Initiative (JTI), an ambitious industry-led integrated programme of Research, technology development and demonstration activities. This Public-Private Partnership driven by European industry will be implemented over the next 6 years with a financial contribution from the EU of € 470 million, to be matched by the private sector. The JTI should accelerate the development of hydrogen technologies to the point of commercial take-off between 2010 and 2020. Secondly, a number of hydrogen cars are already ripe for market introduction today. Thus, the Commission proposes to simplify their approval so that they will be seen more often on Europe's streets. Both proposals will now be considered by the European Parliament and the Council of Ministers. (*“Commission promotes take-up of hydrogen cars and the development of hydrogen technologies”*, pg. 1)

In September 2006, a prospectus was issued for the **Energy Technology Institute** which the UK Government believes to be the most important development in the country's energy research and innovation for decades. The work of the Institute will primarily occupy the middle ground between the longer-term research funded by the UK's Research Councils and the deployment of proven technologies. Core funding will be provided on a 50:50 public private partnership basis, with the ambition, when fully operational, to inject some £100 million per year into UK-based energy research. The Government will provide 50% of the core funding of the Institute, up to an agreed limit. The Institute will have a lifetime of at least 10 years. Seven major companies (BP, Caterpillar, EDF Energy, EON.UK, Rolls Royce, Scottish and Southern Energy, and Shell) have pledged a total of £32.5m to support the ETI project. (*“The Conduct of Energy RD&D”*, website)

Recommendations

A – General

1. Participation of private sector in designing adoption and execution of national research programmes should be encouraged by EC, and national regional authorities. In energy domain the companies in the sector can properly select the priority technologies and topics deserving priority in public funding, and they will be more motivated to contribute their own funds. Private sector should be more proactive.
2. Private sector's RTD funding at the level of 2% of GDP can become a more realistic target if companies will be involved to a larger extent in funding basic research. National and regional authorities should adopt effective tax incentives to encourage companies additionally for funding basic research.
3. PPP offers most beneficial instruments for linking public and private funding through cofinancing of RTD programmes and projects, bridging finance between research outputs, demonstration, first validation studies and industrial applications. EC and national and regional RTD funding schemes should be more flexible to facilitate effective research results uptake and successful application, with more continuous calls, more demonstration and promotion support, and provisions for training activities.
4. Relevant DGs (specially RTD, ENTRE, and REGIO) should collaborate more closely to achieve synergies and optimal results of their support activities
5. **National and regional energy R&D Policy Framework should strengthen the following elements:**
 - **Clarify the allocation method** (how, how much, in which fields and to which institutions) for **public spending on energy R&D**.
 - Define a **clear energy R&D policy** that supports government **long-term energy objectives**, particularly in the fields of **transport, energy efficiency and renewable energy**.
 - **Assess the effectiveness of R&D programmes in a broader concept of energy policy**, for example in comparison with the effectiveness of public budget allocated to market introduction of renewable energy.
 - **Monitor R&D expenditure in the industrial sector**.

B – Specific Recommendations

1. **Ensure - whenever appropriate - that RTD projects involve energy companies in the research consortia applying for EC grants** (*“Innovation and transfer of Results of energy RTD in National and European Community Programmes”*, pg. 54)

The co-funding of part of the total RTD costs means that their internal innovation review process has considered the topic as a candidate option for operations in the future (5 to 10 years ahead). (Idem)

Deregulated energy companies are and will be under competitive pressure: successful work within public-supported projects brings these projects within strategic scope of industrial implementation. (Idem)

Even though their **participation** should not be considered as a **full guarantee of future field use**, successful RTD outputs can then be taken up more easily by energy companies, since they have **access to demonstration sites** and are **knowledgeable in assessing demonstration costs and benefits** more accurately than any technology manufacturer. (Idem)

In the event that public funding is required for demonstration, energy companies are able to bring the internal funding resources requested to **bridge funding gaps between the end of the technology development cycle and the beginning of demonstration work**. Moreover, providing the bridging funds shows that energy become more and more committed to future exploitation. It is with the intention of encouraging such early adoption that Spain has implemented dedicated participation rules in the National Strategic Technological Research Consortiums (CENIT) and PROFIT programmes. The rules of the CENIT programme (Spain) establish that **only private companies can be considered as partners** in the proposals; the participant companies have then to subcontract more than 25% of the project budget to technology centres and universities. The same rule applies to the **PROFIT Energy programme** (Spain), where projects have to be led by companies, allowing technology centres to participate as project partners or subcontractors. (Idem)

So far, **new energy technologies** are **validated** by energy companies **quite late** in the innovation cycle. For the technologies considered in this study, support mechanisms, such as **feed-in tariffs** or **renewable obligation certificates**, are required to ensure higher visibility of financial returns. They provide assurance of legally guaranteed revenue streams. Yet they are subject to short-term changes in national policy, outside of the control of technology performance and independent of the technology performance. Energy companies have more political power to prevent from such upturns, even though the recent Danish example reveals the weaknesses of energy companies in the face of political changes. (Op.cit, pg. 55)

2. **Energy foundation or association projects should be systematically supported by regional, national and EU policies as they better guarantee both continuity of funding and maximum impact directed toward their industrial members** (Idem)

Examples of association or energy foundations (54) are VGB (Verband der Großkessel Besitzer) in Germany, and more recently, the Building and Energy Foundation in France. Beyond specific fiscal measures that help large industrial groups invest more in research, such **organisations** are **built around private companies that have specific interests in contributing to innovation in the energy sector**. (Idem)

The **access to Framework Programme funds from such organisations, as single or multiple players, appears as another route to secure the continuity of funding** to reach market applications. Large energy companies or technology manufacturers that contribute to early research steps, while complementing national or international projects with EC funds, would probably accelerate the pace of the existing RTD

activities. In case of **funding gaps** between **research outputs** and **first validation studies**, the **industrial partners** would have the capability to **bridge these gaps** slowing down the work progress. Large energy companies can play an active role in RTD activities involving other stakeholders, and mobilizing EU funding resources. (Op.cit, pg. 56)

3. Support schemes for large-scale demonstration of energy technologies should be made available to provide funding continuity at EC level (Idem)

The links between technology development and technology early adoption must be clarified through continuous, public and private funding made available in support of demonstration activities. There is room for improvement, combining a set of simple implementation rules: (Op.cit, pg. 57)

EU demonstration funds must address only **EU-wide markets demonstration activities** at EU and Member State level must use the same risk assessment tools:

- **Demonstration will be 50% funded in FP 7**, acknowledging that ENERGY TECHNOLOGIES AT THE DEVELOPMENT STAGE are still far from market applications,
- But **demonstration funding should not compensate** for a **lack of national market incentives** at Member States level; (Idem)

Demonstration activities at EC level should become again funded through **continuous calls** for proposals, in harmony with existing or future national market incentives; (Idem)

Third-party financing, like the Spanish example developed by IDAE, must be envisaged at EU level, since it would **allow funds from the European Investment Bank to complement EC funds** (DG RTD, DG TREN, DG REGIO); the issue is to fund the appropriate organisations, like an energy agency, that would be able to play the role of IDAE in Spain (it addresses projects with high capital investments; the user avoids upfront cash-flow problems and their impact in the balance sheet; IDAE provides the appropriate technical expertise; access to new technologies is allowed without further increasing the risk level). (Idem)

4. A European Demonstration label should be developed by the public funding organisations that supported successful development projects, in order to facilitate wider deployment of beneficial innovation with the help of demonstrations funding measures. (Op.cit, pg. 58)

A European Demonstration label would definitely help innovators in constructing their technology learning curve **without much complexity being added to EC funding rules**:

- there is already a similar label, delivered by the EUREKA programme, which allows the combination of public Member State funding in view of supporting technology development projects: the template has seen more than 20 years of field experience;
- the label, if delivered by the public funding bodies at the end of the funding measure, will send **positive signals to investors and early adopters**, whereas today, any positive output of a research project has to be promoted by the innovator alone. This

added value (sending positive signals to investors) is currently used by the SBIR programme in the US;

- the Demonstration label can then either **trigger some additional public money** to complete the learning curve understanding before private players take the lead, or trigger private investment right away since the potential business models are better understood by incoming players;
- it can be delivered under the control of outside experts involved in project selection, monitoring and assessment;
- it would also demonstrate that the EC does care about result exploitation, beyond the production of a contractual deliverable called the 'Plan for Using and Disseminating Knowledge'. (Idem)

5. Encourage, through **adequate ranking of RTD proposals, more research on the early removal of interfacial barriers, such as improved regulatory models, economic behaviour of energy stakeholders and the development of new business models: these studies must be integrated into technology-based research in order to identify which nontechnological barriers might impede the take-up of promising new energy** (Op.cit, pg. 61)
6. Specific support actions at EU level should be launched to **study recent major innovation failures in the EU-25 energy sector**. Such studies will shed light on the **barrier combinations**, which, since 1996 (the date of the IEM Directive implementation) **may have prevented innovative ideas from reaching market applications**. (Op.cit, pg. 62)
7. **Dedicate support actions to package and market research results that can be considered as 'future technology nuggets' along with technology programmes focused on areas such as fuel cells** (Op.cit, pg. 67)

In the past, several attempts were made to support the packaging and dissemination efforts for technology 'nuggets' developed within research projects (national or EC funded). This was, for instance, the role of the **Organisations for Promotion of Energy Technologies (OPET)** network or of the **THERMIE B programme**, which have not led to indisputable performances. (Idem)

A work with similar objectives is ongoing within the EC Nanosciences, nanotechnologies, materials and new production technologies (NMP) Directorate, through the European Strategic Seminar (ESS), within the French Environment and Energy Management Agency (ADEME), on dedicated technologies related to wind farm development (see below), or, within the IP group for UK universities or Cambridge University Enterprise in other areas. (Idem)

8. **Adequate finance should be provided** with the help of support actions, **to industrial players of Technology Platforms** capable of **specifying long-term technology needs** of the energy industry, in order to **better anticipate the interplay between energy and cross-cutting technologies**. (Op.cit, pg. 72)
9. **Financial support should be provided for more coordination actions involving public and private researchers in the energy sector to identify and work on**

crosscutting technologies to the benefits of end-users in the energy sector. (Op.cit, pg. 74)

Catalyse collaborative thinking of companies in areas where companies are regulated monopolies on their areas of operation (gas and electricity transport, gas and electricity distribution). Collaborative thinking may involve topics of interest to several regulated companies, but also technology development that requires interactions along the innovation chain. (Idem)

Identify research agendas that could be of **benefit to all players**, relying on existing public research institutes to provide part of the missing workforce in network companies. (Idem)

Specify cross-cutting technology needs (materials and ITC are prime candidates here) for which manufacturers would perform development work. (Op.cit, pg. 75)

10. **Encourage the development of disruptive, breakthrough innovation through two-steps dedicated RTD calls involving SMEs as technology pioneers, start-ups and research laboratories with a focus on the use of cross-cutting technologies in the energy sector.** (Idem)

The SMEs that deserve the most attention are the ones that strive to '**escape**' from the **SME 'world'**, in order to become large-scale industrial organisations. Paradoxically, public funding of research projects should address SMEs that want to 'escape' from the SME world, i.e. the ones with internal technology development capabilities. (Idem)

11. **Adjust the selection criteria of research and demonstration projects so that proposals with indisputable needs for training tasks get both a higher grade and 100% funding** of the training costs (Op.cit, pg. 81)

12. **Assessment of the strengths and weaknesses of the new Member States, not only from the point of view of the technologies but also in terms of socio-economic factors. This would give a fair indication of exploitable strengths and restraints on further development of research.** The most active countries in Europe have set priorities for their energy future reflecting their natural potential, knowledge base (research and industry) and the competitiveness of their industrial structures. **Priority setting** and the **definition of a clear energy policy** at new Member State level is important, and EC RTD could contribute to this approach, helping the new MS in their research strategy prioritisation exercises. (*"The State and Prospects of European Energy Research Comparison of Commission, Member and Non-Member States' R&D Portfolios"*, pg. 95)

Bringing the research together will be a key milestone in the process of integrating MS RTD activities. Industry associations, government ministries and central/state research institutions should come together and define research priorities, and assess the budgets available and required. **This process is under way with the ERA-NET scheme** where energy RTD portfolios in specific technology areas are being analysed: but the tasks should be widened to permit comprehensive research into how to implement the new technologies – for instance in environments where, due to formally

centralised economic planning, energy production was almost exclusively devoted to the industrial sector and energy supply, despite being cheap, was highly inefficient. (Idem)

Once the priorities for research have been set, the EC will be able to play a major role in facilitating the development of research by bringing in other Western European partners and funding. Throughout this process, the EC will be able to exchange experience and facilitate the task by sharing Western countries' best practices on **internal evaluation procedures** and the **management of research**. (Idem)

13. The Commission should continue to progress the EERA through a mix of top-down initiatives and support, and through creating opportunities for bottom-up initiatives. (*"Towards the European Energy Research Area"*, pg.43)

13a. The European Commission should:

- **Promote the establishment of a greater number of ERA-NETs in the energy area. Identify and remove the barriers to regional or national coordination.**
- Establish and maintain a web-based database of energy research actors and the ways they are structured.
- **Strengthen the role of CREST** with respect to use by Member States of the Open Method of Coordination.
- As early as possible in the development of TPs, **identify opportunities for initiatives for Joint Technology Initiatives** and the use of Article 171 of the EU Treaty. One or two should be 'fasttracked' in order to establish the process, and to serve as examples for further initiatives.
- **Consider separate programmes for very large/complex projects** (e.g. construction of an advanced fission reactor, or a zero-emissions coal-fired plant/CO₂ sequestration).
- Advance its consideration of a Loan Guarantee Scheme.** This is especially important in energy research.
- Encourage early use of the 'Support for Research Infrastructure' programme for the **development of large-scale energy research infrastructures** (Idem)

13b. Member states should:

- ensure that commitments made regarding research funding are translated into national and regional policies leading to action;
- **provide the resources necessary for full participation in ERA-NETs within the energy** research field;
- ensure an **adequate level of coordination of energy research programmes within their own boundaries** (Op.cit, pg. 44)

13c. Greater use should be made of **Coordination Actions for larger networks** whose main aim is 'coordination through networking'.

- **A new flexible instrument** should be considered to offer the **possibility, within a single contract, of networking, development and implementation of a research work programme, and development of infrastructure.**
- ensure **even closer coordination of energy** and the **other elements** of the Framework Programmes necessary for achieving energy research goals (the research needs of a particular topic should not be confined to the priorities of a thematic programme);

- consider the **use of the new flexible instrument** as a means of ensuring that important cross-cutting research needs are addressed. (Idem)

13d. Regional and national administrations should make greater use of Structural Funds for the **creation of ERFs and energy research infrastructures**. (Op.cit, pg. 45)

13e. The Commission should:

- initiate a **dialogue between the education sector** and representatives of **energy research**; strengthen the linkage between the **Marie Curie trainee** scheme and the **specific programme on energy**;
- ensure that the **training requirements in NoEs and IPs are taken seriously by consortia**; development and implementation of **training plans should be closely monitored**; ensure that consortia take seriously their obligation to address resource imbalances in areas such as age and gender. (Idem)

13f. The Commission should:

- increase the **emphasis on socio-economic research linked to energy technologies** by broadening the scope of social research carried out within the energy programme, and strengthening the link between the **energy programme** and **Science and Society**;
- act to raise understanding and appreciation of the importance and **benefits of the EERA** to society. (Op.cit, pg. 46)

13g. The Commission should:

- act to **remove any barriers to participation by third countries** in the Framework Programmes, in order to encourage a greater take-up of the funds available for international co-operation;
- **ensure maximum flexibility** in the **application of instruments to third-country participation**. (Idem)

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