

**SWOT-analysis on common strategic issues on
research programmes on innovative energy systems
for the ERANET INNER**

Final report

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SWOT analysis of the INNER national programmes

STRENGTHS

- The bottom-up approach or the top-down approach (or a mixture of both) were almost always well-adapted to the programmes
- Criteria for selection of projects are satisfactory and adapted to the objectives
- Many programme managers already have some experience in international cooperation
- Networking different actors is a success

WEAKNESSES

- Relations between different types of actors in spite of being effective are sometimes insufficient
- Involvement of national researchers in interdisciplinary projects is too weak
- Programmes have some difficulty to conceptualise instruments able to invariably detect innovative projects
- Programmes are not sufficiently flexible

OPPORTUNITIES

- The ERANET will increase exchange of information on national programmes between participants
- The ERANET is an opportunity to collectively design innovative instruments
- International cooperation will provide the participants with access to foreign researchers
- Trans-national cooperation is a way to gather national strengths
- Trans-national cooperation will reduce research duplication
- Trans-national cooperation will increase the visibility of innovative energy research

THREATS

- Large differences in expectations of the participants towards trans-national cooperation may be an issue
- Differences of research priorities amongst countries is also problematic
- National money has to go to national researchers
- Cooperation will raise difficulties as regards daily management
- Lack of energy researchers
- IPR has to be addressed at the beginning
- Trans-national cooperation needs confidence in one another and reciprocity of efforts

1 Introduction

In the past years, several countries have implemented innovative energy research programmes. The main reasons to support innovative energy research are of three (non-exclusive) types:

- The support to national energy and/or to technology endowment on the one hand and the support to national industrial sectors on the other hand
- The search for energy independence for security issues as well as the result of the increase of oil prices
- The contribution of energy research and technological development to sustainable development policies.

In this context, an ERANET was established in the energy area in 2005, gathering 13 public institutions in charge of research programs in this area. The objective of this ERANET is to establish cooperation between European research programmes, or parts of programmes, that aim to identify and stimulate innovative energy technologies and unexpected breakthroughs in conventional energy technology fields. This means research into new energy technologies in the very first stages of their development.

The INNER project contributes to strengthening European efforts to define a policy and sustainable approaches to find new ways (energy technologies) to meet the challenges of European energy economy; to establishing a secure energy supply, which is environmentally sound, while decreasing our dependence on imports.

Exhibit 1 The participants in the ERANET INNER (Management organisation, Name of the programme and Country)

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| 1 | Forschungszentrum Jülich (Jülich Research Centre), Networks of basic research into renewable energy and energy conservation, Germany |
| 2 | ADEME (French Agency for Environment and Energy Management), ADEME's R&D Framework programme, France |
| 3 | CNRS (Centre National de la Recherche Scientifique), Energie and ECODEV, France |
| 4 | SenterNovem (Dutch Agency for Innovation and Sustainability), NEO and EOS LT, the Netherlands |
| 5 | NER (Nordic Energy Research), Research Portfolio 2003-2006, Nordic countries |
| 6 | RCN (Research Council Norway), RENERGI, Norway |
| 7 | MSHE (Ministry of Science and Higher Education), NRFP, Poland |
| 8 | EC BREC/CLN, Poland |
| 9 | INETI (National Institute of Engineering, Technology and Innovation), PIDDAC, Portugal |
| 10 | SEA (Slovak Energy Agency), ŠP – 006/03, the Slovak Republic |
| 11 | MEC (Ministry of Education and Science), Energy National Programme, Spain |
| 12 | STEM (Swedish Energy Agency), Swedish Energy R&D Programme, Sweden |
| 13 | NERC (Natural Environment Research Council), UKERC and TSEC, UK |

2 The SWOT analysis of the INNER national programmes

2.1 Introduction

The ERANET INNER has the objective “to establish cooperation between European national research programmes that stimulate innovative energy research”. This cooperation will contribute to the coherence and coordination of the European Research Area, through benchmarking of approaches and a set of joint trans-national programme activities. The activities are designed to allow a durable collaboration, beyond the duration of the INNER project.”

In order to identify cooperation schemes between the national programmes, the Working Package 3 is focused on the “identification and analysis of common strategic issues”. The aim of the task 3.1 of the Working Package 3 is to “identify and analyse common strategic issues on research programmes on innovative energy systems” through a SWOT analysis.

A SWOT analysis is a strategic planning tool used to evaluate Strengths, Weaknesses, Opportunities and Threats involved in a programme or in a business venture or in any other situation requiring a decision. It can be simply understood as the examination of an organisation’s internal strengths and weaknesses, and opportunities and threats attributable to its environment.

Building on the results of the previous Working Package that has collected factual information on the national programmes, this report aims at highlighting:

- Internal factors, that is strengths and weaknesses of national programmes regarding management of the programmes and research achievements
- External factors, potential benefits (opportunities) and potential barriers hindering international cooperation (threats).

2.2 Objectives for identifying strengths and weaknesses

Once these elements are identified for each of the national programmes, the report will also identify several schemes for trans-national cooperation that may be envisaged within the ERANET INNER. These realistic schemes will help to make relevant parts of national programmes ready for international co-operation.

National strengths may be seen as cornerstones for trans-national cooperation. One may consider that what is identified as a best practice in a national programme could be a good starting point for trans-national cooperation schemes. One may also assess the extent to which national best practices can be as effective for a trans-national programme as they are for national programmes.

On the other hand, regarding the international cooperation, weaknesses have to be clearly identified in order to design relevant and realistic cooperation schemes. Trans-national cooperation may be useful for overcoming threats. For example, cooperation will give access to a pool of researchers on themes that may not be sufficiently dealt

with and advanced at a national level. This is particularly true for those small countries which have difficulties reaching critical mass. On the other hand, weaknesses may be barriers to trans-national cooperation. The identification of this type of weakness is necessary to identify cooperation mechanisms that are desirable and cooperation mechanisms that are feasible.

2.3 The methodological approach

In order to carry out this task, we have conducted semi-directive interviews with the managers of the programme. The aim of the interviews was to lead national programmes' managers to emphasis the main strengths and weaknesses of their programmes on the one hand and to identify opportunities and threats of international cooperation on the other hand.

- Firstly, they were explicitly requested to provide as much information as possible on the successes of their respective programme and on the difficulties that were encountered during the inception phase and/or the implementation phase of the programme.
- Secondly, they were asked to mention, if possible, one characteristic of their programme that may be identified as a “best practice” and spilled over to the other national programmes. The idea was to set up a set of instruments that have proved their efficiency and that may be used during the phase of identification of trans-national cooperation mechanisms.
- Thirdly, national programmes' managers were questioned about their expectations regarding trans-national cooperation. The purpose was to identify the opportunities they see in trans-national cooperation. In parallel, they were asked to describe the main potential barriers that may hinder trans-national cooperation.
- Fourthly, the interview ended up with questions regarding the mechanisms that may be implemented in the future in the context of the ERANET INNER to actually have trans-national cooperation.

2.4 Main results of the SWOT analysis

Some characteristics may have been identified by programmes' managers as a relative strength while others would consider the opposite characteristics as a main strength. For instance, it is not possible to say that the bottom-up approach is better or worse than a top-down approach. Programmes are not structured in the same manner. Most of the time, the inception phase was focused on a top-down approach or a bottom-up approach or a mix of both and the implementation phase confirms that it was the right choice in this context. However, it is not possible to say that one approach is better than the other whatever the context. It is a question of how the programmes are shaped and designed which is dependent on the objectives of the programmes.

Generally, strengths and weaknesses are often specific to the programmes. Hence, the consolidation of national strengths and weaknesses has to take these specificities into

account. This being said, the fact that strengths and weaknesses are programme-specific does not prevent commonalities from being found.

2.4.1 Overview of the main strengths of national programmes

2.4.1.1 The bottom-up approach or the top-down approach (or a mixture of both) were almost always well-adapted to the programmes

For the different programmes, it was often mentioned that the choice for a bottom-up approach or a top-down approach was eventually a good choice. Very few programmes' managers underlined that a bottom-up approach may not be adequate seeing the weak level of scientific proposals. This is actually related to the quality of the pool of national researchers in the thematic fields that were chosen. Apart from this case, countries which have adopted a bottom-up approach for the identification of promising innovative energy research projects were rather satisfied. It was often mentioned that the level of quality of projects' proposals was very satisfactory. In the meantime, this approach provides the programme managers with a good overview of what is going on in energy research.

In contrast, managers of programmes based on a top-down approach underlined their ability to identify interesting research topics. This relies on a good knowledge of the research teams in the field of energy. Once a topic is identified, the most fitted research teams may be funded to conduct the research activities.

However, it should be noted that most of the programme managers do not consider necessarily that the bottom-up approach or the top down approach should be replicated in a trans-national cooperation scheme. One of the reasons advanced for justifying this statement is that the ERANET INNER has to identify innovative schemes for selecting research energy projects. For the programme managers, the trans-national cooperation does not necessarily have to be identical to the national programmes or even should not be identical. The objective of the ERANET INNER is not to replicate what is done at national level but to put into action new approaches. But the method or instruments chosen have to meet the existing conditions within the national frameworks.

2.4.1.2 Criteria for selection of projects are satisfactory and adapted to the objectives

Criteria used for the selection of projects are often the same from country to country. A first phase is aimed at assessing scientific excellence of the proposals. It involves researchers and sometimes representatives from the industry. A second phase is dedicated to identify the projects that will be actually funded. At this stage, depending on the programmes, managing organisations have varying weight in this decision process. In some cases (Germany for example), the Ministry has the final word.

An original mechanism is used by the Natural Environment Research Council (UK) which gives the possibility to the applicants to reply to and comment on anonymous referee comments. Applicants have a second chance to highlight the main characteristics of their projects.

Some countries also use panels for selecting projects. In general, programme managers are satisfied with their existing procedures. An important advantage of panels is that discussion may be fruitful in the view of selecting promising projects. Projects may be collectively evaluated and this reduces the probability that a promising project is not identified as such.

Again, some of them underline that the ERANET INNER should help managers to design original schemes for detecting those projects that are really innovative. In the meantime, selection should ensure that risky projects are not systematically rejected.

2.4.1.3 Many programme managers already have some experience in international cooperation

For many programmes, trans-national cooperation is already something that has been happening. Most of the management organisations already have cooperative projects with other countries. For those countries that have international energy research activities, the experience would be useful for trans-national cooperation in the context of the ERANET INNER.

The experience of the Nordic countries in the context of the Nordic Energy Research is a good example of cooperation between different organisations. Identification of problems that have been faced with by this programme would be helpful to avoid making the same errors.

2.4.1.4 Networking different actors is a success

Most of the programmes have the objective to strengthen linkages between energy research and other actors within the R&D system. In some cases, these actors are companies. In order to reinforce these links, eligibility criteria of the projects may impose a share of the expenses to be financed by private funds. In other cases, programmes are rather focused on networking basic researchers with energy researchers. Whatever the types of actors that are to be connected to each other, many programmes have demonstrated their ability to succeed in it. Transversal research activities are needed for innovative energy research. The success of the INNER ERANET will be based on the capacity of the cooperation schemes to connect actors from different countries and from different activities.

2.4.2 Overview of the main weaknesses of national programmes

2.4.2.1 Relations between different types of actors in spite of being effective are sometimes insufficient

As noted above, programmes often put the emphasis on networking between energy research on the one hand and industry or basic science on the other hand. Even if many programme managers underline this as a strength *per se*, they also note that in reality they would have expected stronger relations between actors. It was often mentioned during the interviews that stronger efforts have to be done to go a step further regarding collaboration between actors of the energy R&D system.

As an example, valorisation of research outcomes by industry was sometimes qualified as being a weak characteristic of the programmes. In some cases, the

industry was held responsible for that. The point is that industry has difficulty to take risk. In other cases it was mentioned that it is sometimes difficult to make researchers' activities converge with industry needs even in the case of collaborative projects between public research teams and companies.

For these reasons, cooperation with other countries is often perceived as a good opportunity to have access to foreign researchers and/or industrialists more keen on participating in cooperative research projects than national ones.

2.4.2.2 Involvement of national researchers in interdisciplinary projects is too weak
Something that was often mentioned is that it is rather difficult to make things change. Typically, the German programme manager highlighted that it is not easy to identify and motivate basic researchers to contribute to applied research and to accept different practices regarding publication of results etc. They do not have enough incentive to have research activities in thematic fields that go beyond their core research activities. The issue here is that “business-as-usual” seems to be the rule. The problem is not related to the quality of the national pool of basic researchers but is connected to the capacity to inform them on the innovative energy research projects and to increase their involvement. Again, the design of original instruments within the ERANET INNER is identified as a good way to overcome this issue.

2.4.2.3 Programmes have some difficulty to conceptualise instruments able to invariably detect innovative projects
Several partners have emphasised the need for new instruments which may enable programme managers to identify potential original ideas. Some countries have stressed their difficulty to have instruments that ensure that innovative promising projects are detected. The core problem is that programme managers are not sure that they are able to detect new ideas. As noted above, most of the time, programme managers are rather satisfied with the current procedures to select projects that will eventually be supported. However, the fact that current schemes apparently function well does not mean that they are optimal. Since innovative energy research projects are innovative, traditional schemes may be inappropriate.

2.4.2.4 Programmes are not sufficiently flexible
Some countries have emphasised that once budgets have been distributed to the projects, it is not possible to fund new projects that may come up afterwards. If the programme and the related budget were scheduled for a period of three years, once started, programme managers do not have any possibility to provide potential promising projects with funds. If they want to finance these projects anyway, they have to find other sources of funding.

2.4.2.5 Budgets are sometimes too small
Some countries have relatively small budget for innovative energy research. Most of the time, such countries are the ones for which INNER related activities are part of a larger energy research programme. In this context, programmes have real difficulties to reach critical mass.

Besides, because of the small budget devoted to innovative energy research, trans-national cooperation would be given few resources. One may also argue that pooling resources, even if few resources, will lead to larger budgets than the national budgets anyway. Even if the level of resources would be weak, the powdering effect would be reduced.

2.4.3 Overview of the main opportunities offered by trans-national cooperation

2.4.3.1 The ERANET will increase exchange of information on national programmes between participants

All programme managers consider the ERANET INNER as a good opportunity to exchange information on how national programmes are run. By the way, this was the core of the previous Working Package. The tasks falling under it were motivated by the following statement: “This comparison of national INNER participating programmes is a necessary step in the INNER programme which aims to enhance collaboration and structuring of European efforts on innovative energy research.” However, it was also noticed that this was one of the tasks aimed at providing basis “for decision-making on joint trans-national activities”.

But still, for some countries, exchange of information and sharing of experience is something very important to justify their participation in the ERANET INNER. Some programme managers claimed their willingness to learn more about the foreign programmes. They want the ERANET to share experience, to identify what worked well and if possible to attempt transferring best practices into their own programmes.

2.4.3.2 The ERANET is an opportunity to collectively design innovative instruments

In the meantime, for several programme managers, even if exchange of information and identification of potential best practices are important, they are not the core objective of this ERANET. Identification of best practices, exchange of experience, and presentation of national programmes’ characteristics and so on are only a step towards more ambitious cooperative activities. In any case, this may justify the ERANET on its own. For some countries hence, the ERANET INNER is an opportunity to design international projects, and to introduce innovative approaches. The core argument is not to do business-as-usual (as compared with what was said below regarding national actors). The underlying argument is that innovative projects cannot be built on traditional schemes. In order to enable national actors to go beyond their core activities, original instruments have to be designed.

The interest of the trans-national cooperation is to design such original instruments. Some programme managers have emphasised their willingness not to focus too much on thematic issues but rather on instruments for effective cooperation. From this point of view, the aim of the cooperation is not to identify on which topics to work but how to work.

2.4.3.3 International cooperation will provide the participants with access to foreign researchers

For those countries that have difficulties to reach and to involve national actors, trans-national cooperation is seen as a good means to have access to larger pools of

researchers and as a matter of fact to find the actors the programmes look for. This point is however related to advantages of cooperation for the solely national programmes. However, trans-national cooperation benefits were seldom attached to national programmes only. Trans-national cooperation is rather perceived as an instrument for strengthening innovative energy research *per se* not only national innovative energy research.

2.4.3.4 Trans-national cooperation is a way to gather national strengths

Another point which was mentioned several times is that cooperation with countries having (hopefully) complementary knowledge in specific research areas would normally increase the available set of competences. In turn, this would most likely enhance the number of potential fruitful alliances between actors. Each country has research areas in which it is specialised and internationally recognised. Putting together national strengths could enlarge the potential for promising energy research projects (providing that adequate instruments are designed).

2.4.3.5 Trans-national cooperation will reduce research duplication

Secondly, by putting resources together and by identifying common research projects, duplication of research would be avoided. This would give the opportunity to programme managers to focus resources on specific thematic areas instead of powdering resources on a large range of thematic areas.

2.4.3.6 Trans-national cooperation will increase the visibility of innovative energy research

In some countries, because the responsibility of innovative energy research is not clearly identified or because budgets are so often frozen, the visibility of the programmes is not very good and as a matter of fact so is the visibility of the INNER related research. International projects would raise awareness of this field of research in the scientific community and increase knowledge of funding researchers may apply for and hence their involvement.

2.4.4 Overview of the main threats of trans-national cooperation

If trans-national cooperation is associated with many benefits either for the national programmes or for the implementation of the ERA in the domain of innovative energy research, several barriers were identified by the programme managers.

2.4.4.1 Large differences in expectations of the participants towards trans-national cooperation may be an issue

As already noticed in the previous Working Package, the programmes are very heterogeneous:

- In terms of budget
- In terms of approach (some programmes are based on a bottom-up approach whereas other have chosen a top-down approach)
- In terms of focus (some programmes are aimed at networking science and industry links, while other programmes have put the emphasis on the links

between basic research and applied research or on the links between scientific research and energy research, etc.)

- In terms of research areas
- In terms of time-schedules: programmes are not synchronised with each other

However, as far as cooperation is concerned, another point has to be mentioned. It is related to the level of expectations of programme managers. For this aspect too, heterogeneity is the rule. Basically, one can identify two different types of programmes according to the expectations of the managers towards international cooperation in the context of the ERANET INNER:

- Some managers have very strong expectations and are very ambitious as far as cooperation is concerned. Clearly, according to them, the ERANET INNER should give the framework for original cooperation schemes. These participants want that at the end of the ERANET, an ambitious cooperation mechanism would have come up.

This high level of expectations is often associated with a very good knowledge of other ERANETs in the field of energy. Managers already know the different cooperation schemes that could be implemented in these networks and show their willingness not to do “business as usual”. They want to identify and implement innovative cooperation schemes.

- Other managers consider that the first objective of the ERANET is to provide them with examples of best practices. Hence, for them, the participation in the ERANET is rather aimed at understanding how other programmes are managed on a daily basis and how best practices may be introduced in their own programmes.

However, in any case, this means that the participants have a lower motivation in cooperating with foreign programme managers. Again, the difference is in terms of expectation.

2.4.4.2 Differences of research priorities amongst countries is also problematic

The team responsible for the Nordic Energy Research underlines that the programme can only deal with research priorities that are shared by the constitutive countries of this cooperative programme. By the way, this is the reason why nuclear research is not covered by the programme (which is not only focused on INNER related activities). The same will occur in the context of the ERANET INNER. Working Package 2 identified the main research energy areas country by country. Let us remind ourselves of the main outcomes:

- Most programmes support research aimed at energy efficiency (15 programmes out of 17)
- Fossil fuels are relatively seldom except for the topic CO₂ capture and separation (12 programmes)

- Renewable energy sources get ample attention, especially “photovoltaics”, “production of biofuels”, “application of biomass for heat and electricity” (15 programmes are active in that research area)
- Nuclear fusion and fission are weakly supported research themes
- Hydrogen and fuel cells are amongst the most popular research areas (15 programmes)
- Power and storage technologies received a strong emphasis (10-13 programmes)
- Energy system analysis is covered by 12 programmes.

For the trans-national cooperation, countries will have to agree on the thematic areas they consider as the most important. In the meantime, it was said by one programme manager that cooperation should not restrict too much the research fields that will be covered. At this point, it must be underlined that arguments will inevitably come up regarding these two options: narrow focus on agreed research areas vs. large focus with a potential risk of powdering of resources.

2.4.4.3 National money has to go to national researchers

For a specific country, it is not possible to participate in a common pot because of regulation rules that forbid outflows of money. Additionally, some countries have underlined that most of the time, cooperation schemes are based on an implicit rule which is that national money is devoted to national researchers. However, since the ERANET INNER is aimed at being innovative, such a rule may prevent the outcomes from being innovative in practice. The risk is that the potential cooperation schemes designed in the future may be restricted by this constraining rule.

On the other hand, some existing programmes are open to funding projects outside national boundaries and carried out by foreign researchers. At some point, there will most likely be two groups of countries depending on their ability to fund research activities out of their territories.

2.4.4.4 Cooperation will raise difficulties as regards daily management

Apart from small budget, some programmes suffer from insufficient room for manoeuvre to participate in international programmes. This may be due to a lack of human resources that already raises difficulty for the follow-up of current projects. In this context, it will be difficult to implement new activities, including trans-national cooperation.

Furthermore, it was mentioned that innovative energy research projects because they are interdisciplinary by nature need more resources for the follow-up than traditional projects.

2.4.4.5 Lack of energy researchers in the future will have to be coped with

There is agreement among programme managers on the fact that energy research in Europe is nowadays of a high quality. Some research areas may be more advanced in some countries than in other, but all in all Europe is good in energy research. However, some countries have pointed out that in the future this situation could change dramatically. The ageing of researchers in general and in energy research in particular will become an issue. There are not enough young energy researchers to

compensate for the retirement of elder researchers in the coming years. Some programme managers underlined that there are currently few PhD researchers in the field of energy. Moreover, it seems that these young researchers are on average keener on working in the industrial sector than in the research sector. It was also emphasised that this is particularly true for the best PhD holders.

2.4.4.6 IPR has to be addressed at the beginning

Most of the programme managers said few words about IPR on their own initiative. They claimed for a clear framework for regulating IPR. It was often underscored that IPR should be discussed at the beginning of the project otherwise it may become an issue.

2.4.4.7 Trans-national cooperation needs confidence in one another and reciprocity of efforts

Obviously, for cooperation to be effective and efficient, partners should trust each other. Due to the small number of participants, this seems not to be an issue. In the meantime, another point may be problematic: it is related to reciprocity. Each partner should do similar efforts. Once a target (i.e. a cooperation scheme) is identified, efforts will have to be shared between the partners. Beforehand, each partner should be confident in the capacity of the other to carry out what he has to do. A related issue, already discussed, is about the financial efforts each programme will be able to commit itself to, and the time-scales.

3 Tentative schemes for trans-national cooperation between the national INNER programmes

3.1 A non-exhaustive list of reasons for international cooperation

TAFTIE (The Association for Technology Implementation in Europe) is a European Forum for exchange and cooperation between its Members. In 2005, TAFTIE presented a typology of collaboration models between national RTD programmes¹.

This report reviewed the main reasons justifying international R&D international collaboration. They are as follows:

- to supplement own area of knowledge
- to supplement own research and development (R&D) capacity
- to increase skilled R&D resources
- to ensure unbroken R&D activities within the value chain in international business processes
- to operate with R&D in the vicinity of production in international business processes
- to ensure the priority position in getting knowledge from becoming norms and standards, or even to act in sketching contents for them
- to find partners for production and marketing
- to improve market position
- to learn about international operations
- to launch new products onto the markets
- to create business image...

3.2 Incompatibilities between national programmes and how to cope with them

In January 2006, CISTRANA (Coordination of IST Research and National Activities) organised a conference on Best Practice in Multinational Programme Collaboration. CISTRANA is a project initiated by a European Research Area (ERA) working group of Member States of the European Union and Associated States.

The final report of the conference² surveyed the main incompatibilities between national programmes that may affect trans-national cooperation. It also provides the readers with some clues to overcome them.

Incompatibilities

National legal structures are not generally prepared for the support of multi-national collaborative programmes. Language barriers are the most obvious, and some programmes have had to get changes to national procedures so that joint proposals can be submitted in just one language rather than in each language of the participating countries.

¹ http://www.taftie.org/Reports/upload/TAFTIE_eBook.pdf

² http://www.cistrana.org/files/cistrana_ws_3_report_dlr.pdf

Cultural differences can also pose problems

The interpretation of concepts, such as timeliness and ‘commitment’ for instance, vary from region to region both outside and within Europe, and differences of interpretation can lead to serious misunderstandings that jeopardise programme co-operation.

Multi-national programmes often require governmental support – or at least ministerial support within government. The volatility of the political landscape must be considered and programmes – and the agreements supporting them – designed to be resilient to change.

Smaller and less-developed economies can align their national priorities to support multi-national collaboration with relative ease. A corollary is that larger economies with more developed scientific, technological and industrial policies and strategies can be less flexible.

Countries that have their own national R&D programmes can diminish the support for multi-national collaboration by absorbing the R&D capacity of their national R&D organisations and the attention of their own officials, even if those national programmes do not yield equivalent benefits. This is especially the case if the procedures for gaining support within multi-national collaborations are much more convoluted and take much longer than those for national programmes: the gain for participants must be worth the pain of the administrative process.

Moreover, if a country has its own national processes to review and revise their policies and strategies, then the difficulty of fitting multi-national collaboration into them is compounded by the rigid ‘meta-process’ within which such matters might be considered.

Some ideas to cope with previous difficulties

To overcome the difficulties posed by incompatible policies, processes and procedures it is important, for success, to establish clear visibility of the collaborators’ intentions, and of their long-term commitment.

The first step is to establish a clear, shared understanding of WHY the parties want a multi-national collaboration, and its technical and sectoral scope.

To avoid confusion – and conflict – the potential actors should be engaged in the appropriate order:

- first, the problem owners – typically industrial players, but they could also be other ‘users’ of technology, such as national health ministries – so that they have a clear ‘story’ to tell to both funding authorities and the research community
- then the funding authorities, to get ‘buy in’
- and only then the main body of the research community, so that they are not distracted by earlier unclear and undecided intentions.

3.3 Schemes for trans-national cooperation between countries

The TAFTIE report on “collaboration models between national research and technological development programmes” proposed the following types of collaboration models:

The simplest and most practical way to finance European RTDI collaboration is, in principle, through a European institution with a legal basis. However, most collaborative schemes between national RTDI programmes are of fixed-term duration. Time-limited, institutionalised, pan-European financing schemes could, of course, be organised, but the effort required for their creation and subsequent closedown would be out of proportion to the advantages.

The financial models which can be utilised in collaborations between national programmes can be grouped roughly as follows:

- a) centralised common pot
 - aa) without guaranteed “fair return” (“juste retour”)

- ab) with adjustment of return
- b) decentralised common pot with mutual follow-up of separate national financing
- c) simultaneous national funding
- d) preferential access funding

3.4 Potential trans-national cooperation schemes within the ERANET INNER

The SWOT analysis of the national programmes has raised some provisional conclusions on the future of the ERANET INNER. Based on the interviews with the programme managers as well as on the discussions that took place during the sessions organised in Oslo, it appears that some ideas regarding cooperation are largely shared, either explicitly or implicitly.

3.4.1 Some elements to be considered for the design of cooperation schemes

Programme managers share a common view on what has to be taken into account when designing cooperation schemes.

1. A mix of the top-down and bottom-up approaches should be considered in order to benefit from advantages of each of both approaches. As already noticed, each approach has its own advantages and disadvantages. Some programmes already combine the two approaches. This provides managers with a good overview of the needs, expectations, and research advancement of the scientific community as well as of the industry while giving them the initiative to decide which research thematic areas to support and which research projects to fund. This approach seems to be relevant in the case of innovative energy research.
2. A hybrid of peer reviews and panels may be envisaged. Systems of peer review are associated with the notion of scientific excellence. However, since some INNER related projects may be very far from traditional research, their potential may be not perceived in the right way by referees. A system of panels can overcome this failure and can avoid research projects for which the potential is not straightforward at a first glance being rejected. Two rounds for selecting project (panel and peer review) may be a good option.
3. The project should adopt an incremental approach. Effective cooperation would be reached only through step-by-step actions. Characteristics of the different programmes are so different that it is not possible to envisage a full integrated programme in a short period of time (providing by the way that is desirable). Cooperation should start with feasible schemes and should be expanded and increased over time.
4. The project should be based on several strategies and not on a single one in order to take the diversity in terms of needs, expectations and possibilities amongst partners into account. Strategies may differ regarding the technologies that have to be supported. Basically, there are two options: the focus may be put either on breakthrough in technology areas that are already

known or on new technology areas that have not emerged so far and that have to be supported.

5. The two last points imply that it may be envisaged cooperation schemes between a limited numbers of participants. Some projects would be launched by a few partners, the ones that share objectives and means. Afterwards, other partners may join the core team.
6. Innovative energy research relies largely on interdisciplinary. For some programmes, it is even their raison d'être. Hence, to increase innovative research activities, interdisciplinary have to be valorised in order to incite researchers (especially young researchers) to increase their interest and involvement in interdisciplinary programmes.
7. Mobility has to be supported. Researchers must receive incentives to go and work in other research lab and in other countries. By the way, it was underlined that a means to increase international mobility may be to give a greater recognition during recruitment to the international experience of the candidates. Along geographical mobility, the mobility between scientific disciplines must receive a specific attention. Researchers have to open their research activities to scientific fields they are less familiar with. This is the corollary of the previous point, that is innovative energy research relies on interdisciplinarity. Innovative energy research needs interdisciplinarity that at its turn needs mobility of researchers between scientific disciplines.
8. Industry has to be involved. For several participants, it is clear that the involvement of industry has to be strengthened. Representatives from the industry has to be involved during the identification of the research activities that has to be carried out in the future, during the period when research is performed and after the research projects have been finished. The objectives are to enhance research valorisation but also to reduce the time for valorisation of research outcomes after research has been done.

3.4.2 Some cooperation schemes that may be implemented

In order to start implementing cooperation schemes, some ideas were proposed and discussed during the two sessions organised in Oslo:

1. A joint foresight group on innovative energy systems may be set up. This would permit to have a common view about the future of the innovative energy research amongst countries.
2. A roadmap could also be imagined. In this case, this would mean that a common strategy would be built. Different steps would be identified and each partner would participate (or not) in the steps according to the respective strengths of the research teams of their country.
3. Implementation of regular international meetings between researchers and industrialists in energy research would also be a good initiative to permits long-run and perennial interactions. Most likely, some thematic fields may

receive a larger attention. The idea would be to identify an existing organisation or to create a club where ideas are exchanged and shared, and where strategies for the long-run are identified, ...

4. In the same line, a club for developing strategy in innovative energy systems may be created. There is a need to break free from “techno-nationalism” in the area of energy research and a need too of a third arena (besides EC and IEA) to discuss about innovative energy research. The club would gather high-level decision makers in order to discuss cooperation and distribution of roles.
5. A reciprocal presence during the inception phase may be a good starting point because very simple to implement. Partners would be informed about the thematic areas that are and will be supported in the other countries. This would increase the knowledge of the partners about what is done and what will be done in terms of thematic areas in the other countries. This mutual presence in foreign countries would also diffuse information regarding management procedures of the programmes. This would also be an opportunity for the inviting part to benefit from the experience of external and foreign experts. To some extent, some successes may be replicated while some failures may be avoided.
6. The diffusion of information about ongoing activities is another good starting point. It would also provide the partners with ideas as regards what to do and what to avoid, which barriers are associated with each type of projects, and so on. Again, on the other hand, inviting partners would benefit from the experience of other programme managers. Original and good ideas would be diffused among countries while failures would be identified and perhaps avoided if projects would be replicated in another country/another context.
7. Since it is difficult to catch up with a project that has already started, a map of excellence in the domain would permit to identify who is doing what and where in each country. This map would enable each partner (but not only) to know which research is carried out where, what technologies are supported by whom, which research teams are the most efficient for each technology areas...
8. Summer schools may be used as a pretext for cooperation. Such an event would diffuse information about innovative energy research activities performed in different countries. It would also strengthen the relationships between researchers from different countries. There are basically two (non exclusive) options: national summer schools may be opened to foreign experts/students or an international summer school may be put in place.
9. An international contest on very-focused projects/concepts with a prize may be an interesting tool to detect and support innovative ideas. The results would be to reinforce emulation amongst researchers while testifying that ambitious research projects may be supported by public money if there have high potential outcomes.

10. A multilateral call for proposals may be launched. A focused call may be designed as a pilot project to initiate multilateral cooperation. If it is successful, it may be expanded to other partners. In any case, the multilateral call should not be a “one shot” initiative. Maybe, the extension may put a specific effort on involving partners from new Member States. Two elements would have to be taken into account: the need to enhance science-industry cooperation in these countries and the need to enhance the level of technological level of industry to comply with EU regulations.
11. One original project may be envisaged on the basis of “open spaces” where researchers are put together to work on the field they want in the way they want. No objective would be assigned to them apart from working together. This would create an interdisciplinary environment favourable for new ideas and new concepts.
12. International grants for young researchers may also be envisaged in order to increase both visibility and attractiveness of innovative energy research. This would be one of the solutions to fight against the lack of young researchers in innovative energy research in the future.

4 Forschungszentrum Jülich (Jülich Research Centre), Networks of basic research into renewable energy and energy conservation, Germany

Gillian GLAZE
Sabine SEMKE

The design of the programme did not raise any major problem since the relationships with researchers are long-time and well-established.

The programme has very little contact with industry insofar as its aim is to connect basic research with energy research. However, by definition, the programme does not exclude industry.

4.1 Strengths

The main strength of the programme relies on the reinforcement of relationships between researchers. The objective of the programme is to increase these links: each project (corresponding actually to a network) has to connect basic research with energy research.

Within the programme, like any other programme by the way, each project is evaluated during its execution. At the time being, it is difficult to see the impact of the projects or to evaluate the time before the results would become visible. However, the design of the projects based on networking ensures that many partners are involved in the project increasing the chance of the results being applied at the end of the project. From this point of view, market success is always achieved. The issues are to set up networks not to achieving market success (see below).

The general R&D policy of the German Government includes international projects, and considers co-operational research in many cases as an appropriate measure. If such international co-operations are intended, details of funding are usually determined in the specific programme calls. The present INNER related R&D projects do not comprise international components, because the opportunity was not offered by the related programme call.

4.2 Weaknesses

An important recurrent problem is the diverse responsibility of Ministries for the various parts of energy research, affecting the development of a consistent strategy covering energy research from basic science to applied research and market oriented aspects. However the 5th Energy R&D programme comprising all elements of governmental funded research was published in 2005.

Germany has a long history of development of applied energy as well as scientific research. The latter is usually funded institutionally and only to a minor extent by project funding of the DFG (Deutsche Forschungsgemeinschaft) with its individual

funding processes. As a result of the different funding conditions, the identification and motivation of scientists to contribute to energy projects could be improved. As a consequence, interactions between both communities (energy and science) are mostly dependent on the individual researchers. The aim of the INNER related energy R&D programme is to foster the networking of energy researchers with researchers from other fields (mathematics, physics, computational science, etc).

The programme is basically very flexible, with some rather strict elements. The conceptual work on the formulation of specific calls as well as the preselection of projects is performed by the manager of the programme (PtJ); decisions on programmes as well as final funding decisions are made by the Ministry. The final decision and responsibility for the programme can in some cases be entrusted to PtJ. This has not yet been considered for the INNER related energy research although it is normal practice in other basic research programmes to reduce administration costs in project management.

4.3 Opportunities offered by trans-national cooperation

The main opportunity for international cooperation is to identify in a collective way new ideas in terms of new direction for research. In order to increase knowledge regarding energy research, new approaches have to be designed. Cooperation with other countries would enable the participants to identify new schemes for identifying and funding new ideas.

The selection of projects to be funded is not an issue for Germany. The existing mechanisms are well established. The challenge is rather to find an original scheme to instigate original ideas to be proposed for selection.

Because of the innovative character of the INNER related activities, costs and risks should be supported by several countries. Most national programmes cannot support everything within their own such activities.

Exchange of information amongst countries will maybe end up with the identification of best practices. However, objectives of the international cooperation are rather to collectively participate in the identification of new and better projects.

5 ADEME (French Agency for Environment and Energy Management), ADEME's R&D Framework programme, France

Karine FILMON
Daniel CLEMENT

5.1 Strengths

ADEME's research programme on energy is geared to the development of technologies and the setting up of partnerships. Its main strength lies in its capacity to make connections between societal challenges and research communities.

In the thematic areas that are traditional for ADEME, the organisation of the programme is very good. ADEME has built up networks between researchers, industries, funding agencies, public actors, users... For instance, for some projects, industrialists may be involved in the evaluation of the proposals.

5.2 Weaknesses

A relative weakness is that ADEME does not have instruments to evaluate *ex ante* projects which do not deal with classical thematic areas. The issue is the lack of methods and tools to detect amongst the pool of innovative projects the ones that may be promising and the ones that may not. Whereas ADEME is good at evaluating the potential of projects based on classical thematic areas, it does not have enough experience to assess innovative projects in non-traditional thematic areas.

ADEME supports projects which followed paths that are well established, for which there is a consensus. For these thematic areas, there are virtuous cycles because a lot of experience has already been accumulated, because people know each other, etc. The problem is that in reality, ADEME's activities are limited to these thematic areas.

Another limit of the programme is that it is sometimes difficult to ensure that the objectives of the researchers converge with the objectives of the projects. Because researchers are evaluated according to their publications, they may be tempted to orient research projects rather towards the production of scientific outcomes that may be published in academic journals instead of the development of research outcomes that may be applied afterwards within industry. From this viewpoint, it is sometimes difficult to oblige researchers to stick to the terms of reference of the projects they work on.

5.3 Opportunities offered by trans-national cooperation

There is room for progress for early detection and development of emerging concepts. This is the main driving force behind ADEME's participation in the INNER project. ADEME's programme managers want to see which instruments are used by their counterparts to evaluate those innovative projects in thematic areas that go beyond ADEME's core activities.

Expectations of the programme managers are related to the design of instruments. Cooperation is seen as an opportunity to collectively invent innovative instruments aimed at detecting emerging concepts in the fields of energy research. From their points of view, the point is not to identify on what they will work but rather how they will work. The most important is to conceive instruments for cooperation.

The ambition of the programme managers is to do more than a common pot. According to them, a common pot is only one element of the cooperation schemes they would implement.

5.4 Threats of trans-national cooperation

The definition of the scope of the innovative energy research is not clear. The ERANET INNER still lacks a common understanding of what is covered and what is not.

The current framework of the ERANET INNER does not necessarily provide enough flexibility to go into ambitious actions. Ambitions and objectives are maybe not clear enough.

6 CNRS (Centre National de la Recherche Scientifique), Energie, France

Jean-Bernard SAULNIER

The programme Energie is a CNRS programme launched in 2001 after a consultation and dialogues with different stakeholders from the industry and other institutional partners (about 20 seminars). The first call for proposal dates back to 2002. The Energy project is entering its final phase this year and a new version is being launched.

The programme was divided into 12 Thematic Analysis Groups (GATs) in 2002. Today, 5 GATs are operating: hydrogen, cells; building efficiency and PV; energetic efficiency; combustion, biomass CO₂; nuclear research.

There are two types of call for projects:

- Large projects with substantial funding (150-200K €) and definite objective
- Exploratory projects with smaller funding that are supposed to be achieved faster

A scientific committee and a steering committee manage the selection of projects. The steering committee validates ideas and research orientations.

6.1 Strengths

The inception phase of the programme is characterised by a coordination phase involving all stakeholders (research institutions, companies and industries) to carry out a reflection on tracks to investigate. Even though industries do not receive any funding, they are involved in the preparation and launching phase and in the steering committee. This organisation underlines the effectiveness of the links between research and industry. This organisation is being institutionalised within the CNRS with the recent creation of an industrial policy department in charge of improving valorisation and dedicated to reinforcing links with the industry sector.

Main strengths of the programme:

- Promotion of inter-disciplinarity and networking between teams
- The main contribution is coming from the engineering and chemical sciences departments (e.g. hydrogen production and storage, fuel cells, energy efficiency). To a lesser extent, proposals came from the Biomass related energy production. Involvement of cross cutting research fields (economics and technology oriented research, energy and building) increased while further progress is expected in the field of life cycle analysis (LCA) and comparing technologies.

- Successful connection between socio-economical sciences and engineering
- Contribution to foresight studies and parliament debates

A permanent activity of foresight and watch is ensured by the GATs (about 10 individuals) that permits programmes to stay up to date on energy and research topics.

- Improved coherence and structuring of research projects
- Involvement of researchers in call for proposals and in GATs, (1000 individuals, 250 teams, 120 laboratories, 65 projects accepted for 3 times more submitted)

From the 2002 batch of call for proposals, 22 projects were selected, new scientific results were discovered and 10 new patents were registered.

6.2 Weaknesses

Weaknesses are mainly related to human resources in research. One of the main issues concerns employment. Even though temporary solutions are found now with doctorate and post-doc positions, there are difficulties to appoint new permanent positions.

Even if the renewal of the researchers' community is less problematic in the non-nuclear research field than in the nuclear research field, it may become an issue. Efforts are being made to foster young researchers' interest within the "grandes écoles" for instance.

Another weakness is the difficulty to promote geographic mobility, which may hinder the development of new platforms.

6.3 Opportunities offered by trans-national cooperation

The opportunities offered by INNER and trans-national cooperation are twofold. As regards the managing side, the exchange of best practices in management as well as the possibility to identify strengths and weaknesses of partner countries are seen as the advantages of the ERANET. On the scientific side, cooperation is a tool to avoid research duplication and to prepare calls for proposal at the European level.

Benefits identified:

- Transfer of management skills
- building a relevant INNER-related research strategy
- identify relevant INNER related research areas
- reach critical mass (in terms of researchers)
- having access to a better scientific pool
- Increase co-operation between researchers

As regards European cooperation, the CNRS has already planned various structuring instruments such as European laboratories. Already 40 such international associated laboratories and 30 Research groups exist. Cooperation already exists at the level of laboratories, or even teams, sometimes without the general CNRS management being aware of it.

6.4 Threats of trans-national cooperation

The main threats of trans-national cooperation identified are the differences between research programmes' objectives and instruments among countries.

One of the main barriers to trans-national cooperation is probably the funding issue since a clear and transparent coordination policy is not yet established. There must be some degree of reciprocity in the cooperation. According to the programme manager, the success of trans-national cooperation relies on an effective participation of all the partner countries.

7 CNRS (Centre National de la Recherche Scientifique), ECODEV, France

Francis YGUEL

The programme finished in 2001. It was the oldest interdisciplinary research programme handled by the CNRS. From its early days in the 1970s until 2001, the programme has continuously evolved (the name of the programme also has changed by the way). ECODEV was running from 1997 to 2001.

7.1 Strengths

The main characteristic of the programme and its main strength was the structuring effect it has on energy research. Because it was a long-time recurrent well-established programme, it had a strong effect on the way research energy was shaped in France. This meant that the managing organisation knew the research actors very well. On the other hand, this implied that the different actors knew each other as well. For these two reasons, the programme was able to reach consensus regarding research projects and was able to mobilise public and private funds. For specific projects, final consumers were also involved.

A strategic steering committee defined the strategy of the programme. The top-down approach enabled a clear identification of the objectives of the programme. The pool of research labs was very well known. Calls for proposals were targeted in order to reach the research labs that were the most suited to perform research according to the objectives. In other words, depending on the objectives, the best research teams were chosen.

Participation of private companies in the programme was an outstanding characteristic of it. These were involved in the design of the projects through continuous meetings and workshops. Some companies were also involved in the projects they decided to provide funds for. Some projects that were primarily financed by the CNRS were given funds by some companies. The programme did not distribute funds to private companies but in contrast, it happened that some private companies were interested in participating in a research partnership. Hence, some projects put together several research teams as well as industrial partners.

Companies were also involved through an *ad hoc* club (CLIP – Club Initiative et Perspectives). Apart from putting different actors around common projects, the main interest of this Club was the foresight activities it handled.

The diversity of instruments to fund research in energy was a remarkable strength. The programme was organised around:

- Research projects carried out by Universities and/or Public Research Organisations
- Research projects carried out by Universities and/or Public Research Organisations and partially funded by industrial companies

- Legally-established consortia (either Research Group or Concerted Research Actions). These consortia were led by a scientific committee and resulted in several coordinated research projects. Those consortia may be implemented for a long period of time (up to eight years) which implied that research projects were not just a one-shot.

7.2 Weaknesses

The main weakness of the programme relied on its fundamental principle, that is interdisciplinarity. The programme manager underlined that it is not easy in practice to bring researchers together from different research fields. For this reason, a bottom-up approach was not seen as something relevant. To a certain extent, people have to be forced to work together. The only way is hence to decide at the top what research has to be performed.

For young researchers, interdisciplinarity is not a promising field with the perspective of finding employment afterwards. For a young researcher, the necessary scientific recognition will not be reached through interdisciplinary activities. As a matter of fact, such projects most often involved only senior well-established researchers.

Another weakness, still associated with interdisciplinarity, is that such research projects may suffer from delay.

The organisation built upon few and very well-known research teams and maybe was hindering the emergence of young teams. It was difficult for a new team to be perceived as reliable. From this viewpoint, the programme was rather conservative.

7.3 Opportunities offered by trans-national cooperation

A call for projects would be the minimum. Other instruments have to be identified.

The main objective of the cooperation would be to strengthen transfers from research to industrial applications.

The cooperation should firstly identify research thematic fields and secondly define management instruments accordingly.

7.4 Threats of trans-national cooperation

The main problem that is associated to a common pot is that once the project has ended up, coordination most often stops. Any mechanism guaranties continuity in the coordination between countries and between managing organisations.

The main problem would be to fight against reluctance of researchers to carry out interdisciplinary research activities.

Follow-up of interdisciplinary research projects should not be underestimated. These projects need more resources for this activity than “normal” projects.

8 SenterNovem (Dutch Agency for Innovation and Sustainability), NEO and EOS LT, the Netherlands

Gerdi BREEMBROEK

The EOS (Energy Research Strategy) programme started in 2005. The two INNER relevant programmes (EOS LT and NEO) target basic research in the field of energy. About 10 % of the EOS LT is INNER relevant and NEO projects aimed at fostering non-conventional and innovative energy research which is 100% INNER relevant.

8.1 Strengths

EOS LT:

- The budget is significant : 30.000.000 €
- The long-term visionary approach: research projects are estimated to reach the market not before 10 years.

NEO:

- Low barrier for participation, high reward (90% subsidy),
- The “idea-service” that gives advice to individuals willing to present an energy research project and reorient them if necessary.

8.2 Weaknesses

EOS LT:

- Basis for selection of spearhead and knowledge import themes is unstable (number and quality of respondents is sometimes questionable)
- The EOS programme does not cover the entire chain, from fundamental advances to successful pilot plant. The situation is expected to change.
- There is little involvement of the industry sector in EOS LT (because of the long term horizon).

NEO:

- The programme can contribute to the development of emerging energy research projects but is too small to build actual research infrastructure
- The bottom up approach is considered as a weakness since the managing organisation is passive (dependant upon the quality of proposals)

Even though NEO and EOS LT may be complementary, NEO projects do not turn systematically into EOS LT projects.

8.3 Opportunities offered by trans-national cooperation

The main opportunity and benefit offered by international cooperation is first (via INNER) to exchange and learn about other countries' management methods.

As regard formal cooperation, it would be easier to start cooperating on small cooperative activities rather than on one large experiment (step by step approach).

8.4 Threats of trans-national cooperation

The main threat to trans-national cooperation is the difficulty to open up programmes in Netherlands as a general rule.

There are no privileged partners identified yet although some cooperative activities exist with Germany at the federal level and Belgium.

9 NER (Nordic Energy Research), Research Portfolio 2003-2006, Nordic countries

Mikael FORSS

When the programme was launched in 2002, the focus was put on project applications with broad areas. A lot of applications replied to the call. Since 2003, 15 projects have been running. From the beginning, the programme was oriented towards R&D projects in general but not necessarily INNER-related. Hence, among the 15 running projects, only three or four of them are relevant to INNER. Some R&D projects are very traditional in the sense that they are based on traditional research problems.

9.1 Strengths

The programme covers the full chain of activities from research to commercialisation. However, most of the activities are close to applied research. Depending on the project, from 15 to 50% of the costs must (in the next R&D period 2007-2010) be financed by external funds. This ensures a good networking between science and industry.

The programme is a good example of an effective trans-national cooperation. The programme has a visibility in all participating countries. As a matter of fact, the programme has a broad access to researchers in each of these countries.

The management structure is very simple. In spite of problems in reporting from time to time, no fundamental problem has been encountered so far.

9.2 Weaknesses

The budget is not very big. The rate of success of project applications is rather small (15 projects were selected among 60 proposals in 2002 and 15-20 projects will be selected among 115 applications in the end of 2006).

Human resources are also an issue since small resources imply difficulties in the management of all the activities. Ambitions are high for the current human resources.

Once the programme has started (for a period of two-four years), it is difficult to support interesting activities that may emerge.

A limit of the trans-national Nordic programme is that all activities of the programme have to be of a common Nordic interest.

Some bureaucratic problems may appear in getting reports and financial statements "in time". Trans-national cooperation based on different accounting and reporting systems needs a strong project leader.

9.3 Opportunities offered by trans-national cooperation

The main interest of trans-national cooperation is the identification of instruments that would enable involved persons to detect those research projects that really are innovative.

9.4 Threats of trans-national cooperation

The main issue will be to identify new research activities that may end up with outstanding outcomes.

Differences of national priorities may be a barrier for cooperation in some thematic areas.

The risk is to be too ambitious: coordination should be progressive. A first step would be coordinated projects. A common call at project level would be the most realistic way to start cooperating.

10 RCN (Research Council Norway), RENERGI, Norway

Trude DYPVIK

The objectives for RENERGI, based on government policies and the Research Council's prospects are to develop knowledge and solutions as the basis for environment-friendly, efficient and effective management of the country's energy resources, highly secure supplies and internationally competitive businesses related to the energy sector.

10.1 Strengths

The mechanisms that were implemented in order to select projects among proposals are very effective. Depending on the programmes, it could be peer-review examination with national and foreign referees or panels involving representatives from the industry and from the science.

The programme covers the value chain from basic research to development and from energy production to use. This enables an excellent overview of the energy field. This permits us to clearly identify which thematic areas have to be supported. The Renergy programme is flexible and can join common activities like calls based on a board decision.

There are already established cooperation among Norwegian researchers and colleges from other INNER partners.

10.2 Weaknesses

Due to traditional scientific merit systems, it is difficult to connect researchers from different research thematic areas.

The recruitment of researchers is a challenge in Norway as in many other countries, due to a lack of interest in science and technology among young people.

10.3 Opportunities offered by trans-national cooperation

Traditional solutions are no longer enough, and there is a need for new ideas/solutions. These might be found by combining traditional research subjects and disciplines. By combining the competence and strength of the different research communities, programme managers expect higher possibilities for science achievements than for each research group alone.

The mechanisms put in place for selecting the projects, even if very effective for the INNER national programme, may not be as useful for cross-sectional projects. This might lead the way to the development of more effective ways for selection of innovative projects.

10.4 Threats of trans-national cooperation

The differences between the national programmes, according to objectives and instruments as well as management, decision procedures, legal matters and financing, pose challenges with regard to trans-national cooperation.

11 MSHE (Ministry of Science and Higher Education), NRFP and EC BREC/CLN, Poland

Agnieszka MIERZYNSKA (AM) from Ministry of Science and Higher Education
Magdalena ROGULSKA (MG) from EC BREC (EC Baltic Renewable Energy Centre)

The NRFP is the strategic document published in 2005 that sets the national research priority in different research fields. The NRFP comprises a strategic research area entitled Energy and Energy resources strategic programme of which two priorities are INNER relevant: “New energy technologies” and “Renewable energy sources and biofuels”. The project has not started yet. The Ministry of Scientific Research and Information programme funding is done through grants to researchers that reply to the calls. There are three types of grants allocated to projects: the first type of grants is co-financed by industry; the second type is funded by the Ministry of Scientific Research and Information with possibilities to involve international participation; the third type co-financed by the European Union.

There are, as a general rule, two types of projects. Projects following top-down procedures where large projects are conceived and announced by the Ministry of Scientific Research and Information or Ministry of Environment. Those commissioned projects are rewarded with large amount of money. The second type of project concerns smaller ones and follows a bottom-up approach with three different types of grants: grants for public research (PRO or Universities), SME projects and projects supported by the EU framework programme.

The EC BREC is mandated by the Ministry of Scientific Research and Information to implement national policy in the field of renewable energy sources. The EC Baltic Renewable Energy Centre is a scientific research institution set up in 1994 under the fourth framework programme.

11.1 Strengths

(AM) One of the strengths of the programme is that procedures are transparent.

The dissemination of information about the research programme is well organised. Information can be found on the webpage of the Ministry of science and through the journal published by the Ministry.

(MG) The bottom-up approach is a good way to find new ideas.

11.2 Weaknesses

(AM) One outstanding weakness of the NRFP is its dependency on the EU funding.

(MG) The main weakness is probably the funding issue. The government defines orientations but these are not always followed by programmes or measures. Poland is also too much dependent on EU funding and the delay for the EU budget approval is a risk for the programme.

Although there are links between basic researchers community and industries, industries are reluctant to finance research because it is cheaper to perform research within the industry.

11.3 Opportunities offered by trans-national cooperation

(AM) The opportunity offered by a trans-national cooperation is first of all to learn about other countries' management procedures. The Ministry, as a funding agency, expects to learn about how to improve procedures and to become more flexible. The international cooperation is also a way to foster scientists and researchers interests in this field.

(MG) The main opportunity of trans-national cooperation and the ERANET is to share knowledge and share research topics. The best option for trans-national cooperation is to share know-how on the first stage of a programme. The idea would be to design a common programme and to find an agreement on a common content.

Poland already has bilateral links with countries like Sweden and the Netherlands.

11.4 Threats of trans-national cooperation

(AM) Poland cannot finance external cooperation today, so cooperation through a common pot financing procedure is excluded.

(MG) An integrated programme would be very interesting although very hard to set up.

12 INETI (National Institute of Engineering, Technology and Innovation), PIDDAC, Portugal

Isabel CABRITA

12.1 Strengths

The program is designed with a high level of freedom based on a bottom-up approach. Every researcher is asked to give his/her viewpoint on what to do. The objective is then to identify commonalities and to respond in the meantime to public research priorities. Projects' thematic areas are identified and proposed by researchers. Because projects are selected through an agreement between researchers, the programme is definitively able to identify new promising ideas. The call for proposals based on research priorities identified beforehand by the science community is framed by the programme managers.

The programme already set up cooperative activities between Portuguese researchers and foreign researchers. A coordinated project was for instance put in place with the German Research Centre Jülich. Research has already been done; the project is currently at the stage of a demonstration project. It is innovation but still at prototype level.

12.2 Weaknesses

The permanent risk for the programme is that the annual budget committed for the projects can be reduced at any time. Almost every year, there are budget cuts due to budget constraints. Obviously, researchers are aware of this and this affects the credibility of the programme and as a matter of fact it reduces most likely their involvement in it. Researchers do not have a strong confidence in the programme even if the contracts were signed. Again, they most probably restrict themselves from sending proposals.

Another issue is that once the projects have been selected and funded, it is impossible to fund new projects that may come up. The programme is organised as follows. The first step consists of identifying energy research thematic areas to support. The second step consists of funding projects. There is no room for supporting new ideas during five years which is the duration of the programme. The programme is not flexible enough to getting new ideas once it has entered the implementation phase. In order to finance these projects, external funds have to be found.

Another weakness is related to the fact that once projects have finished, nothing really happens as regard industrial development. The follow-up of research is made during the execution of the projects. Projects that are funded have a phase devoted to demonstration to potential industrial partners. A part of the demonstration is funded by the programme. However, there is any mechanism oriented towards the commercialisation and dissemination of outcomes of the projects. Due to the fact that industry in Portugal is reluctant to take risk, the industrial phase is really an issue. Practically, that means that technical as well as economical risks have to be covered

by the programme. Hence, the programme has to provide technical and financial schemes.

A less important weakness is the absence of incentive mechanisms for researchers. At the end of the projects, there is any recognition for those researchers who have worked a lot. In parallel, there is any mechanism to penalise those who did not do the efforts they have committed to. A pay-off mechanism would be a good thing to better stimulate researchers.

At the time being, travelling for the manager is rather difficult since an authorisation is needed to go outside Portugal.

12.3 Opportunities offered by trans-national cooperation

The manager is very ambitious. Ideally, she wants the ERANET to be able to identify/target a project based on integrated technologies. Because different countries have different knowledge, each of them would provide technologies that are well advanced. An international team could be built up with different disciplines. The idea would be to avoid to run similar projects but to launch complementary projects which may add up in order to have a larger project embedding the sub-projects in a coherent way.

For example, a new concept would be identified through a roadmap. Different partners would come with their own knowledge and would participate in the programme accordingly.

Another expectation is to be able to implement instruments for identifying outstanding fundamental research papers. Sometimes very good papers are published but are not followed by industrial outcomes. The idea would be to better link fundamental research with applied research. The first step would be to identify these research papers. Maybe, workshops may be organised or a tender for the best research papers. The second step would be to support the application of basic research results.

This project could provide some guidance in order to harmonise financing schemes for research projects or management structure.

12.4 Threats of trans-national cooperation

The ageing of researchers may be an issue in the future. The number of researchers in the energy field may decrease significantly in the near future. Nowadays, there are few PhD students. Furthermore, there is another threat due to the (too) high mobility of young researchers into industry. It is very difficult to attract young researchers in fundamental research since they are often more keen on working for the industrial sector.

In the context of international cooperation, different financial schemes among countries may be a barrier. In the meantime, the project could be an opportunity to harmonise financing schemes.

It could be difficult to put all the partners in a common project since expectations may significantly differ from one country to another.

IPR may be an issue if it is not addressed at the beginning of the programme. A common understanding of IPR is needed to avoid any problem afterwards.

13 SEA (Slovak Energy Agency), ŠP – 006/03, the Slovak Republic

Pavel STARINSKY

13.1 Strengths

Projects are currently running. It is hence difficult to point out any major success the programme may be responsible for.

13.2 Weaknesses

The main problem of the programme is the bureaucracy. However, it is difficult to say if this has an impact or not on researchers' behaviour. Maybe, this bureaucracy prevents researchers from proposing projects.

Rules have changed during the execution of the programme: criteria of eligibility were modified and become more restricted.

There is a high degree of uncertainty regarding the near future. Maybe, as the follow-up of the election mid-June, the Ministry of Industry will be spited up. The status of the Slovak Energy Agency which is under its aegis may change too. This testifies the lack of visibility for energy research in Slovak Republic.

This programme is part of the Structural fund programme. The country hence does not have a long experience of innovative energy research.

Cooperation between national actors in the production and innovation system is weak in Slovak Republic. Relation between researchers and companies were traditionally rather good but after the partition of Czechoslovakia in 1993 into two independent countries, these relations have been deteriorated. The aim of the programme is to restore these good relations in order not to invent something new without any possibility to use the results in practice. New schemes have to be found to reinforce relationships between fundamental research and applied research. This statement applies in general and as a matter of fact for energy research.

Another point is that it is difficult to reach the scientific community in spite of its interest in the programme. The reason is that researchers cannot receive donation directly but only through enterprises as research consultants or advisors.

13.3 Opportunities offered by trans-national cooperation

The first main reason to participate in a trans-national cooperation is to avoid redundancy of energy research within European countries. Designing common programmes would enable waste of resources.

The second main reason is to improve the national management. The programme manager wants to increase agency's know-how regarding management in order to give a new impetus to cooperation between national research actors. The national scientific base underwent dramatic transformation from national planned economy to

market economy and the programme does not have too much experience in management.

13.4 Threats of trans-national cooperation

The programme manager expects low involvement of national research actors in trans-national programmes. A related problem is due to the language problems since many researchers from eastern countries, especially older ones, had not many opportunities to learn English or other foreign languages except Russian.

Differences between research programme's objectives and instruments may be an issue.

Legal barriers as well as administrative governance may create problems for cooperating.

Finally, the programme manager thinks that differences in scientific level between countries could be a strong barrier for cooperation.

14 MEC (Ministry of Education and Science), Energy National Programme, Spain

Raquel MORENO CARRASCO

14.1 Strengths

The aim of the programme is to increase the coordination between researchers and companies. The Strategic and Exceptional Projects' calls for proposals have actually increased the level of cooperation. All projects could not have been carried out without cooperation.

The follow-up of the projects has been formalised through a systematic process. The aim is to analyse and to reduce the gap between research and application. For the first time, in 2005, there has been an expert committee that has participated in the follow-up of the project's process and, with its contribution, a document of exploitation of results has been drawn up.

There is a close relation with the beneficiaries of the funds. PSEs are exceptional projects, and because of their magnitude and complexity, for some of them, the participation of MEC (Ministry of Education and Science) was needed in the early stage. MEC participates in executive committee meetings and is in touch with the coordinators of the projects.

14.2 Weaknesses

Even if the projects that have been supported rely on cooperation, more efforts are required to strengthen effective cooperation.

The programme is characterised by a lack of flexibility. This appears at the level of the daily tasks (a lot of information is required even from other Public Administrations), to practically fund the projects and to adapt the budget. Still regarding management, the Ministry does not have sufficient human resources to carry out the tasks it is committed to.

The programme suffers from a low budget. In addition, the budget is mostly composed of credit budget along with a few grant budgets.

14.3 Opportunities offered by trans-national cooperation

Expectations regarding trans-national cooperation are related to science achievements. The objective of cooperation is to improve the Spanish R&D.

Cooperation is also seen as a mean to share information with other countries as well as identify common thematic areas to promote.

14.4 Threats of trans-national cooperation

For Spain, the establishment of a common-pot would be difficult, such as the evaluation of national activities in technical research by foreign experts. This being said, within the context of the national calls for proposals, some actions are already opened to international assessments, especially those related to fundamental research.

15 STEM (Swedish Energy Agency), Swedish Energy R&D Programme, Sweden

Peter ROHLIN

There is one large R&D energy programme, the Swedish Energy R&D programme that is owned and managed by the Swedish Energy Agency. There are no specific INNER related projects as such today although parts of exiting projects already comprise INNER related topics. The overall strategy of the programme is evaluated every 3 years by the Parliament.

15.1 Strengths

STEM decides freely upon the projects within the programme. It can decide on the start or end of a project. Once the Parliament has decided over the overall budget dedicated to the programme, STEM is free to allocate credits wherever it has chosen to do it. There is a great flexibility in terms of management and there is no problem in terms of financial resources. The scientific community is already working abroad a lot and there is a real possibility for STEM to share scientific resources.

15.2 Weaknesses

The main and major weakness concerns the links between communities of researchers. The link between research and industry is weak and a trans-national cooperation would be useful to share good practices as regards how other countries manage to bridge the gap between basic research and the industry sector.

15.3 Opportunities offered by trans-national cooperation

Expectations towards the ERANET INNER are not related to financial or human resources issues. The main expectation towards the ERANET INNER is to learn from other countries (exchange of best practices) in particular as regards other countries' management of links between research and industry.

15.4 Threats of trans-national cooperation

There would be no problems in designing a common programme with partner countries except for the financing part of the programme.

The IPR issue is not considered as a threat even though legislation is different from one country to another. Considering IPR issues are defined at the beginning of the programme, there should be no problems.

16 NERC (Natural Environment Research Council), UKERC and TSEC, UK

Chris BAKER

UK Energy Research Centre (UKERC) is part of the wider Towards a Sustainable Energy Economy (TSEC) programme.

16.1 Strengths

The main strength of the programme is the promotion of interdisciplinarity research. Results are very satisfying.

A large proportion of the proposals received for TSEC (including those for UKERC) were of high quality.

The selection process is original in the sense that applicants can reply to anonymous referee comments. The final stage in the process was use of the referee comments and applicants' responses in assessment and recommendation on funding (or not) by the TSEC scientific advisory committee (SAC) of independent experts. This principle normally ensures that original promising projects are detected even if the first proposal was not precise enough.

16.2 Weaknesses

NERC led a cross-councils Programme Management Group (PMG) to co-ordinate and bring coherence to the running of a large programme that had separate allocations to each of three councils. The PMG arrangement worked very well but having to iterate discussion and documents around three councils inevitably makes for slower procedures.

The only real difficulty was the need to establish the UK Energy Research Centre (UKERC), a major part of TSEC, within a rather short time after the announcement of the programme. The tight timetable was unavoidable and resulted from Government announcement of the target date.

16.3 Opportunities offered by trans-national cooperation

The main expectation regarding trans-national cooperation is a mutual benefit for each partner.

Expectations regarding the scientific side are related to avoidance of research duplication, access to a better scientific pool and increase of cooperation between researchers.

16.4 Threats of trans-national cooperation

In the case of INNER, the UK Research Councils are in a somewhat different position from most of the other partners. Unlike a government department or ministry which may well have an innovative energy funding line running for a number of years, under

present arrangements the UK Research Councils have to bid to government for new funding every two [now three] years in the Spending Review. This makes planning to co-operate with other workers and countries rather difficult.

From a general point of view, differences in funding cycles between countries may be a problem for cooperation.

The experience of NERC's Rapid Climate Change programme (joint working with Norway, the Netherlands and the US) shows that much can be done to minimise problems associated with cooperation, often at a quite informal level through discussions between colleagues in advance of their making formal suggestions to their respective separate research councils.