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2008 BP MADRID FORUM ON ENERGY & SUSTAINABILITY

Promoting investment in low-carbon energy technologies

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Summary

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BP CHAIR ON SUSTAINABLE DEVELOPMENT

Comillas University

With the collaboration of

IBERDROLA

CLUB ESPAÑOL DE LA ENERGÍA
ENERCLUB

Santander

Foreword

This summary accounts for the authors' interpretation of the major conclusions of the recent BP Forum on Energy and Sustainability "Promoting investment in low-carbon energy technologies" (http://www.upcomillas.es/catedras/bp/Foro_08.asp). The Forum was organized by the BP Chair on Sustainable Development of Comillas University, with the collaboration of the Spanish Energy Club, Iberdrola and Banco Santander.

The objective of the 2008 BP Forum has been to discuss which are the best ways in which low-carbon energy technologies can be specifically promoted from the regulatory point of view, and within a global climate change regime. We examined specific promotion policies for energy efficiency and savings, renewable energies, clean coal, and nuclear. We also addressed the interactions between technology policy and climate change policies.

The emphasis of all sessions were placed on trying to identify preferred policies, both from the academic and the industrial point of view and to provide practical recommendations for policy makers on the design of these policies.

Examples of the questions we were expecting to answer are:

- Which appear to be the more efficient and effective policies for the promotion of low-carbon energy technologies, if possible based on actual experiences?

- How to take advantage of market instruments?

- Which are the requirements of firms to invest in low-carbon technologies, and how can these requirements be incorporated in promotion policies?

- How should carbon policies and technology policies be harmonized to take advantage of the synergies and avoid duplications and negative interactions?

- Which are the technology-specific issues which should be addressed?

- How much emphasis should be placed on public support of research and development and which are the interactions with other promotion measures?

- Which are the differences in the recommended approaches for all these issues between industrialized and developing countries and how to address the transfer of technology?

1. Introduction

Technology policies are a major component of the future global climate regime, and their importance has been stressed repeatedly in past negotiations. In fact, some countries chose them in a first moment as their sole approach to reducing carbon emissions (relevant cases may be Japan or the US). Technology policies came out as one of the four key elements of the Bali roadmap, where it was acknowledged that all possible means will be needed to cope with climate change[1].

In fact, climate change poses a formidable challenge to human ingenuity and consensus building capability. It is already clear that a quick transition to a future economy with a drastic reduction in GHG emissions is needed to stabilize the concentration of GHG at levels that are compatible with the objective of the UNFCCC. There is also an increasing consensus that the 2 degree centigrade threshold should not be trespassed, and that this may require to reduce global GHG emissions in 2050 to at least 20% of the current ones.

Although current technologies with some innovations could suffice to meet the aforementioned objectives during the first two decades, it is uncontroversial that there is the need to develop and massively deploy new and/or still technically unproven technologies in the longer term. Since there is no silver bullet at hand and no real prospective of having one in the mid-to-longer term, the effort should be addressed towards a portfolio of diverse promising technologies. Thus, the major issue now is how to achieve the development and the massive deployment of these new low carbon technologies as soon as possible.

This judgement has gained more momentum recently, with some authors[2] stressing the limitations of carbon pricing approaches and the need for specific technology policies to push for technology change and to achieve the reductions in emissions that are required to comply with the climate objectives. Indeed, carbon taxes (or equivalent emission trading regimes) of the right strength to meet the above mentioned long-term carbon reductions are presently considered politically unacceptable, and therefore the signal provided by the current carbon prices for reducing emissions may be too low.

Some technologies with promising potential have been identified already. The Fourth Assessment Report of the IPCC makes an inventory of emissions-reducing technologies in different sectors of the economy, presently available and in the future, and also provides a preliminary evaluation of their potential and costs. The recent IEA 2007 World Energy Outlook catalogues several technologies as potential major contributors to a drastic reduction in carbon emissions.

[1] The other key elements were mitigation, adaptation, and financing for these actions (particularly in developing countries).

[2] See e.g. Pielke, R., T. Wigley, C. Green (2008). Dangerous assumptions. Nature **452**, 531-532.

However, the critical issue is how to make them happen. In broad terms the process should consist of three basic steps:

a) Identification of the technical processes, costs and GHG reduction potential of existing and new promising low carbon energy technologies.

b) Design of adequate regulatory policies to promote the required drastic technological changes.

c) Make these regulatory policies fit into any global climate regime that may be agreed, which hopefully will properly integrate the development, diffusion and deployment of low-carbon technologies. Technology oriented agreements (TOAs), as complements or substitutes for carbon commitments, will surely be needed.

When trying to design regulatory instruments to promote low-carbon technologies one needs to address the following aspects:

- The volume of effort: global & for each technology.
- The timing for massive deployment of any given technology: when & for how long.
- The specific format of the regulatory scheme to be used to minimize the cost of meeting some objective.
- How to encourage cost reduction.
- How to harmonize regulatory schemes in different neighbouring markets.
- How to account for potential side-effects.

This summary addresses these open questions, discusses the preferred approaches to foster low-carbon energy technologies from a regulatory point of view, within a global climate change regime, both from the academic and the industrial point of view, and provides practical recommendations for policy makers on the design of these policies. Specific promotion policies for energy efficiency and savings, renewable energies, clean coal, and nuclear are examined, as well as the interactions between technology policies and climate change policies.

2. Energy efficiency and conservation

Energy efficiency is the single largest potentially deliverer of GHG savings, both due to its potential and to its low cost compared to other alternatives. And it is genuinely sustainable. In Europe, for example, they represent the single realistic option in the mid term (2020), followed by the massive deployment of renewable energy. The European Commission considers it economically viable to achieve reductions in energy consumption larger than 20%.

But why, if it is such a low-hanging fruit, are people not taking it? This is particularly relevant in developing countries, where energy efficiency and conservation might contribute to two thirds of all GHG emissions reductions, and in which there is a large absence of support policies for them. It seems that, as in other fields, the key in the discussion should be not on technology, but on how to deploy it and take into account the existing market failures or market barriers which prevent such a socially efficient technology to be widespread. One good example is the low energy price resulting from the lack of internalisation of environmental costs, which results in a too-low incentive to save energy.

There are many instruments to address market barriers/market failures regarding energy efficiency. The question is, which combination of traditional and conventional instruments to use, and how do they interact. For example, using very ambitious standards may not leave room for other instruments, and cause inefficiencies. Here an interesting idea is that, in addition to the usual carrots and sticks, companies may need tambourines, or marketing tools, to help them participate into these programs.

White certificates have recently come out as an interesting way of promoting energy efficiency measures in an economically efficient way. Italy and France are the most prominent examples, and very interesting ideas may be extracted from their experience, the main ones of which are summarized below:

- Transaction costs should be minimized, in order to encourage participants and realize savings. However, this may create some problems regarding accountability and certification of real savings.

- These new instruments may promote the creation of new energy service companies (and therefore jobs), and also of an increased social conscience on the need to save energy, as has happened in Italy.

- Sometimes, white certificates may be interesting just to provide flexibility to companies, even if they are not finally used, as in France.

- Another advantage is that white certificates may create the contract that is missing from the market, and therefore bridge the information gap. Eventually, this may make it unnecessary to provide economic support.

- Finally, these instruments may bring about additional benefits regarding information, market transformation and professional dynamics. Companies have taken them as a strategic opportunity, and as a trigger of dynamics of knowledge and capability.

But, besides from the choice or interaction of instruments, there is a need to integrate all this in the overall electricity market design. Here the relevant question raised was about the agent on which to impose the obligation to reduce demand.

In principle, effective energy conservation policies should focus on the consumers, as happens in Sweden, where the obligation is imposed on them. This seems the most sensible approach. But it also seems unrealistic. Therefore, the real discussion is on whether to assign it to distributors (DSO) or ESCOs. On the one hand, imposing the

obligation on DSOs is much easier, because they do not change. But the real incentive may only appear when it is assigned to ESCOs, which are also more agile. ESCOs may accompany these programs with commercial strategies, without the need to mess up with tariffs and cost-recovery systems. In Italy ESCOs are responsible for 90% of the energy efficiency actions.

3. Renewable energy

The development of renewable energy is currently a priority in most developed countries, but there is much discussion on the extent of the desirable and acceptable penetration, as well as on the specific regulatory instrument to achieve any prescribed objectives. Regarding the latter, the critical issues are: setting objectives, economic incentives, credibility for investors, and costs.

One of the critical components of the regulation is the treatment of new investments. The diversity and different level of maturity of the different technologies has to be recognized, and the regulatory schemes should be capable of promoting a broad technological portfolio. For any given technology, the key issue is how to foster R&D and manufacturing experience so that production and installation costs can be significantly reduced, without spending too much money subsidizing large volumes of investment in technologies that still are too expensive for massive deployment.

The choice of the right instrument will depend on the specific policy objectives: short *versus* long term targets, existence or not of trading systems, broad-scale deployment or not, etc. The most popular contenders are feed-in tariffs (FIT) and tradable green certificates (TGC). Conceptually, tendering seems to be very well adapted to the problem, although previous implementation failures such as the NFFO in the UK have for the most part excluded this method from practical consideration. A careful revision of tendering could be in order.

Regarding the first two, experience has shown that a well-designed (dynamic) FIT system is well suited to provide a significant deployment of RES fastest and at lowest costs for society. Its strongest point is the predictability of revenues for prospective investors, and therefore, the low level of risk in a credible regulatory environment. In addition, FITs are better suited to account for the local benefits of RES. However, this is not to say that current FIT systems are perfect: there are some difficulties which should be solved regarding transparency and information, market responsiveness, and flexibility.

Whatever the adopted scheme, the predictability of the regulatory support and the targets to be met is critical to attract the confidence of the investors. Stop-and-go approaches or the use of retroactivity in the application of the norms should be completely avoided. However, some adaptation of the level of financial support to the evolution of the costs of each technology is necessary to avoid incurring in excessive charges to consumers.

This cost reduction is important by itself, and therefore more efficient instruments should be developed. The lower the implementation costs of any regulatory scheme, the

higher will be the public acceptance, and the larger the total amount of deployed renewable energy sources (RES). The effectiveness of the regulatory measure is therefore enhanced by any improvements in efficiency.

The sheer volume and the dispersed nature of the most popular RES for electricity generation (RES-E), such as wind (both on and off-shore) and solar, are creating new challenges in the utilization and development of electricity grids. Unbundling of the transmission grid and clear connection rules for both transmission and distribution networks are a precondition for large scale RES-E integration. Existing tools, such as network connection charges, priority rules and locational signals in use-of-network charges will have to be refined and adapted to the new circumstances.

The linkages with other policies are also significant regarding large RES deployment. For example, biomass must also play a large role in Europe, and this requires accounting for changes in the common agricultural policy, or creating a new industry, which have not been satisfactorily addressed up to now.

Finally, another critical issue is how these considerations can be translated and adapted to the specific contexts of developing countries, in order to jumpstart renewable energy development in the larger scale required.

4. Carbon capture and sequestration

There are still many good reasons for considering coal a major part of the energy picture for a long time (at least the next decades). Coal is well distributed among the world, and therefore more secure than gas and oil (not only more secure, but also less vulnerable). It has competitive costs, and essentially, there is a lot of coal to fuel the large amount of power plants to be replaced in the immediate future in the OECD countries, and those to be newly built in China and India.

However, for it to be acceptable, this coal should be coupled with carbon capture and sequestration (CCS) technology. As such, it might contribute to 20% of the expected carbon emissions reductions. Of course, risks may still exist. But if we do nothing, CO_2 will keep going out to the atmosphere from non-CCS coal power plants. In fact, NGOs are more positive towards CCS than before, looking at the gap to be filled in. A critical point then is to manage expectations correctly. But CCS is necessary.

However, achieving successful CCS projects will require answering may still open questions: Is technology already available? What is the economic viability of CCS? Would trial plants deliver learning spillovers justifying additional support? Where best to promote investment? How best to promote it? Who should pay?

There are some technical issues not yet solved concerning CCS: The loss of efficiency of CCS power plants is around 20-40%, although coal technology is improving, so the starting point is higher; it is impossible to build a CCS-ready plant, you have to build the whole system; and the storage issue is not so simple, given that the scale required is enormous.

However, CCS is not happening yet, not because of technology, but because of high cost, and lack of an adequate policy framework. Costs should be reduced by 40-50% in order for CCS to become competitive. Or alternatively, a carbon price of at least 35€/t CO_2 should be attained. Since neither of these are present right now, some level of public support for installing CCS equipment may be warranted, at least transitionally (given that carbon prices are expected to increase if carbon target are kept stable).

As for CO_2 transport and storage, there is widespread agreement in that public support will be required for building the infrastructure needed (pipelines and storage). CO_2 transport has to be a regulated activity, and storage has to be a general interest activity. A national authority should supervise transport and storage, and the long-term liability of storage.

Then, another large political challenge is how to finance the huge investments required. There is a need to catalyze finance for CCS and, for Europe, there is not that much money in Brussels. Sources for financing include: industrial commitments, member states involvement, and EU level financing.

Here the proposed EU flagship programme is essential to pull all possible developers together and ensure a learning process, spread results, and accelerate learning.

5. Nuclear energy

The beginning of a nuclear renaissance is under way. Some governments have already expressed their desire to promote nuclear as a component of their climate strategy, and others are considering this option seriously. In fact, second-hand nuclear plant prices have been increasing recently, what shows the increasing interest of investors in this technology.

The arguments for nuclear are basically its lower carbon emissions compared with coal; its possibly competitive cost (although this is a controversial aspect, everything else is becoming more expensive, so the comparative economics of nuclear are only improving), and its contribution to security of supply. Therefore, GHG emissions reduction policies will be critical for the eventual development of nuclear.

In turn, the disadvantages mostly have to do with risk: those already known (accidents, high-level waste, and nuclear proliferation), and also economic risks due to the systematic uncertainty about the real investment costs, the availability of fuel, the new pricing mechanisms lied to liberalised electricity markets, and also GHG reduction policies themselves. Most of these risks apply to new plants, not to existing ones. So it seems that we have two different issues here, one regarding the extension of life of existing power plants, or even replacing old plants with new ones in the same sites; and another one regarding increasing nuclear share (and therefore needing new sites).

Regarding this latter aspect, it is controversial whether nuclear energy may be broadly deployed without difficulties in liberalised electricity markets, beyond some particular cases which may be considered as “demonstrative” ones. In the UK for example, it is expected that large utilities will be able to assume the risks and start building new

nuclear power plants, in old sites. Anyway, what looks unavoidable is the need for a previous social and political consensus, which may reduce regulatory risk to acceptable levels. This to some extent implies a particular regulatory regime for this technology.

The final question, albeit complicated, is how to extend this model to developing countries, and the implications on the non-economic risks previously mentioned of such a massive deployment: more than a thousand new nuclear plants would be required for the impact of nuclear on GHG emissions is to be significant, between 10 and 20% of the total reduction effort.

6. Conclusions

Future climate agreements must incorporate both carbon price instruments and technology policies.

The former will not do the job alone, since they are one-size-fits-all instruments, which leave many technologies behind, and do not promote enough innovation (which is crucial in the long term). However, they do have a role to play, in that they may scare investment away from carbon-intensive paths. In addition, they help change behavior. And we cannot rely exclusively on technological progress if we first do not change our consumption patterns, since that would only imply delaying the answer. Therefore, carbon pricing instruments are still relevant.

Technology policies, in turn, must play a larger role in future climate agreements. All low-carbon technologies must be supported, and must contribute to emissions reductions. In a clear first place, priority should be given to energy efficiency and conservation, and then to renewable energies. Then, at least in a first stage, we may also need carbon capture and sequestration, and, for developed countries, nuclear.

Anyway, the key to ensure investment in low-carbon technologies is to provide a level playing field for all technologies, and particularly, to provide certainty and predictability to investors. We must also address these investments with a global perspective: the newly developed or marketed technologies must reach developing countries, if large GHG emissions reductions are to be achieved. In these countries, for example, the potential for energy efficiency and conservation is even larger than in developed countries; and the large-scale use of coal in countries such as China or India makes it especially interesting to use CCS technologies.

However, we must be realistic about the possibilities of developing countries: although their potential for reducing emissions is huge, this will not be achieved without significant financial and technological support from developed countries. This is probably the key to a future climate agreement, and also to the evolution of GHG emissions: if we want to reduce emissions significantly, we must pay for it, and transfer the required technology to those countries from which the largest part of energy increase, and therefore the largest emissions reductions will come, developing countries.

Annex I: Program

Wednesday April 16th

8:30 – 9:00. Registration and coffee

9:00 – 9:15. Welcome and participant introductions

9:15 – 9:45. Introduction

- The issues to be addressed. Presentation of the agenda of the 2008 Forum.
  Ignacio Pérez-Arriaga
  Director, BP Chair on Sustainable Development, Comillas University

9:45 – 11:15. SESSION 1: PROMOTING INVESTMENT IN RENEWABLES

- *Chair: Domingo Jiménez Beltrán*
  Advisor, Spanish Sustainability Observatory; former Director of the EEA
  Spain

- First perspective. Regulatory instruments to deliver the full potential of renewable energy sources efficiently *(20 min. presentation)*
  Reinhard Haas
  Energy Economics Group (EEG), Vienna University of Technology.
  Austria

- Second perspective. Universal energy access & rural electrification in developing countries. Promoting investment in clean energy technologies *(20 min. presentation)*
  Ivan Nygaard
  UNEP RISØ Center
  Denmark

- Discussion

11:15 – 11:45. Coffee break

11:45 – 13.15. PROMOTING INVESTMENT IN ENERGY EFFICIENCY & CONSERVATION

- *Chair: Andrew Warren*
  Director, Association for the Conservation of Energy
  UK

- First perspective. The Italian experience. White certificates in electricity and gas. The regulatory viewpoint. *(20 min. presentation)*
  Arturo Lorenzoni
  IEFE, Bocconi University
  Italy

- Second perspective. The French experience on policy instruments to promote energy efficiency. *(20 min. presentation)*
  Dominique Finon
  Centre International de Recherche sur l' Environment et le Dévelopment (CIRED), CNRS-Paris.
  France

- Discussion

13:15 – 14:15. Lunch

14:15 – 15:45. SESSION 3: PROMOTING INVESTMENT IN CLEAN COAL

- *Chair: David Newbery*
  University of Cambridge
  UK

- First perspective. *(20 min. presentation)*
  Simon Worthington
  BP

- Second perspective. *(20 min. presentation)*
  Eloy Álvarez Pelegry
  Unión Fenosa

- Discussion

15:45 – 16:15. Coffee break

16:15 – 18.00. SESSION 4: SESSION 4: PROMOTING INVESTMENT IN NUCLEAR

- *Chair: Jacques de Jong*
  Clingendael Institute
  The Netherlands

- First perspective. *(20 min. presentation)*
  William J. Nuttall
  Electricity Policy Research Group
  University of Cambridge
  UK

- Second perspective. *(20 min. presentation)*
  Félix Alonso de las Fuentes
  Iberdrola

- Discussion

20:00. Dinner

Welcome address
Alfredo Barrios
Chairman of BP Spain

Thursday April 17th

9:00 – 10:30. SESSION 5: INTERACTION BETWEEN CARBON POLICIES & TECHNOLOGY POLICIES

- *Chair: Christian Egenhofer*
  Centre for European Policy Studies (CEPS)
  Belgium

- The perspective of the technology policies *(30 min. presentation)*
  <based on the presentations of the preceding day>
  Pantelis Capros
  National Technical University of Athens
  Greece

- The perspective of the carbon policies *(30 min. presentation)*
  Michael Grubb
  UK Carbon Trust and Cambridge University
  United Kingdom

- Discussion *(30 min.)*

10:30 – 11:00. Coffee break

11:00 – 12:45. SESSION 6: PANEL ON THE ROLE OF THE TECHNOLOGY PATH IN THE FUTURE CLIMATE REGIME

- *Chair: Frank Convery*
  University College of Dublin
  Ireland

- *Panelists*
  - Henry Derwent, IETA, UK
  - Christiana Figueres, Center for Sustainable Development in the Americas, Costa Rica
  - Bo Kjellen, Stockholm Environmental Institute, Sweden
  - Teresa Ribera, Spanish Office for Climate Change, Ministry for the Environment, Spain
  - Jiahua Pan, Research Centre for Sustainable Development, China

- Discussion

12:45 – 13:00. Closure of the Forum

- Final comments and wrap-up. Feedback from participants and plans for future Forums.
  Emilio Estrada, BP

  Ignacio Pérez-Arriaga, Comillas University

13:00 – 14:00. Lunch

PUBLIC SESSION

Venue: Comillas University

Friday April 18th 12:30 – 14.15

Welcome

José Ramón Busto Sáiz

Rector, Comillas University

Summary of the Internal Sessions of the 2008 BP International Forum on Sustainable Development

- Promoting investment in low-carbon energy technologies
  Ignacio Pérez-Arriaga

  Director of the BP Chair on Sustainable Development, Comillas University

Assessing the world's efforts in climate change

Christiana Figueres

Center for Sustainable Development in the Americas

Closure

Annex II: Participants

1. Jesús Abadía, Director for Environment and Sustainable development, Endesa, Spain.
2. Monica Alessi, Research Fellow, Centre for European Policy Studies, Belgium.
3. Félix Alonso de las Fuentes, Director for Risk and Development, Iberdrola Generation, Spain.
4. Eloy Álvarez Pelegry, Director of Quality, Environment and R&D, Unión Fenosa, Spain.
5. Alfredo Barrios, President of BP-Spain, Spain.
6. Teresa Cavero, Policy Researcher, Intermón Oxfam, Spain.
7. Frank Convery, Professor, Dublin University, President of the European Association of Environmental & Resource Economists, Ireland.
8. Loren Cox, MIT Joint Program on the Science & Policy of Global Change, USA.
9. Henry Derwent, President and CEO, International Emission Trading Association, IETA, UK.
10. William D'Haeseleer, Professor, University of Leuven, Belgium.
11. Christian Egenhofer, Senior Research Fellow, Centre for European Policy Studies, Belgium.
12. Emilio Estrada, Vice-president for Institutional Relations and Communication, BP-Spain, Spain.
13. Nils-Henrik von der Fehr, Professor, Department of Economics, Oslo University, Norway.
14. Dominique Finon, Researcher at CIRED (Centre International de Recherche sur l'Environment et le Dévelopment), former Director of the French Energy Economics & Policy Research Center, France.
15. Christiana Figueres, Independent consultant, Center for Sustainable Development in the Americas, Costa Rica.
16. Noriko Fujiwara, Research Fellow, Centre for European Policy Studies, Belgium.
17. Carlos García Barquero, IDAE (Spanish Institute for Energy Diversification & Efficiency), Spain.
18. Michael Grubb, Associated Director of Policy at the UK Carbon Trust and Professor of Climate Change and Energy Policy at the Imperial College, UK.
19. Reinhard Haas, Professor, Energy Economics Group (EEG), Vienna University of Technology, Austria.
20. Domingo Jiménez Beltrán, former Director of the European Environmental Energy Agency, advisor to the Spanish Sustainability Observatory, Spain.
21. Jacques de Jong, Clingendael Institute, former President of the Dutch Energy Regulatory Commission, The Netherlands.
22. Pantelis Kapros, National Technical University of Athens, former President of the Greek Energy Regulatory Commission, Greece.

23. Sivan Kartha, Stockholm Environmental Institute, Director of the Climate and Energy program, USA.
24. Bo Kjellen, Stockholm Environmental Institute, Former Chief Negotiator for Environment, Sweden.
25. Vivek Kumar, Research Associate, Centre for Global Environment Research at The Energy and Resources Institute (TERI), India.
26. Arturo Lorenzoni, Head researcher, Institute of Energy and Environment Economics and Policy (IEFE), Bocconi University, Italy.
27. María Mendiluce, Cabinet of the Spanish Government Presidency, Spain.
28. David Newbery, professor of Applied Economics and former Director of the Department of Applied Economics at Cambridge University, UK.
29. William Nuttall, Director and Lecturer, MPhil in Technology Policy, Cambridge University, UK.
30. Ivan Nygaard, UNEP RISØ Center, United Nations Environmental Program, Risoe, Denmark.
31. Clara Poletti, Director, IEFE, Center for Research on Energy & Environmental Economics & Policy, Bocconi University, Italy.
32. Alberto Pototschnig, CEO Mercados Energy Markets International, former CEO of the Italian Electricity Market Operator and Director for Electricity at the Italian Energy regulatory Commission, Italy.
33. Teresa Ribera, Director of the Spanish Office of Climate Change, Spain.
34. Franco Romerio, professor at CUEPE, Switzerland.
35. Marcos Sebares, Managing Director, Santander Bank, Spain.
36. Antonio Soria, IPTS, EU DG JRC (Joint Research Center), Spain.
37. Surya Sethi, Principal Adviser Planning Commission Government of India, India.
38. Peter Sweatman, Climate Change Capital, UK.
39. Simon Worthington, BP.
40. Andrew Warren, Director of the Association for the Conservation of Energy, UK.

COMILLAS BP CHAIR & ENERCLUB

- Julián Barquín, Professor, Comillas University, Spain.
- Carlos Batlle, Researcher, Instituto de Investigación Tecnológica, Comillas University, Spain.
- Ignacio Hierro, Coordinator of the BP Chair on Sustainable Development, Comillas University, Spain.
- Pedro Linares, Deputy Director of the BP Chair on Sustainable Development, Comillas University, Spain.
- José Luis Martínez, Director of the Spanish Energy Club, Spain.
- Ignacio Pérez-Arriaga, Director of the BP Chair on Sustainable Development, Comillas University.