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DIRECTORATE FOR SCIENCE, TECHNOLOGY AND INDUSTRY
COMMITTEE FOR SCIENTIFIC AND TECHNOLOGICAL POLICY

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GOVERNANCE OF INTERNATIONAL CO-OPERATION ON SCIENCE, TECHNOLOGY AND INNOVATION FOR GLOBAL CHALLENGES

Draft Case Study Report: The International Energy Agency Implementing Agreements

22-23 November 2010, Seoul, Korea

This draft report was prepared by Aurelia Figueroa (German Development Institute, DIE).

Delegates are invited to comment on this paper and in particular indicate if there are gaps, errors or omissions; as well as what the emerging lessons are that can be drawn for the governance of international co-operation on STI for global challenges.

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NOTE BY THE SECRETARIAT

1. In this document delegates will find a draft report on the International Energy Agency Implementing Agreements. It is one of the core case studies prepared by nominated external experts for the CSTP project on Governance of International Co-operation on Science, Technology and Innovation for Global Challenges. The core case studies were chosen to provide lessons on how existing institutions operate and to highlight the main strengths and weaknesses in their governance [DSTI/STP(2010)5].

2. Proposals were prioritised and clustered into four groups: *a)* climate change; *b)* food security and agriculture; *c)* global health; *d)* energy; and *e)* miscellaneous to facilitate the selection of examples from each of the fields [DSTI/STP(2010)6]. The shortlist of proposed core case studies was discussed at a project steering meeting on 17 March 2010 [DSTI/STP/AH/A(2010)2]. The following case studies were chosen and have been carried out so far:

Case study	**Carried out by**	**Draft report**
Group on Earth Observations (GEO)	South Africa	DSTI/STP(2010)28
Consultative Group on International Agricultural Research (CGIAR)	France, China	tbc
Private Foundations as exemplified by the Gates Foundation	Norway	DSTI/STP(2010)32
International Atomic Energy Agency (IAEA)	Korea, Germany	DSTI/STP(2010)29
International Energy Agency Implementing Agreements	Germany	DSTI/STP(2010)30
Joint Programming Initiative (JPI) on Agriculture, Food Security and Climate Change	Austria	DSTI/STP(2010)31
Inter-American Institute for Global Change Research (IAI)	Germany	DSTI/STP(2010)27

3. In addition to the core case studies, scoping work was undertaken on the "European and Developing Countries Clinical Trials Partnership (EDCTP)" and two mini case studies were developed by Australia and the United States respectively: "The Global Carbon Capture and Storage Institute" and "Sharing of plant genome information as exemplified by the International Arabidopsis Research Project". The outcomes of that work, together with a summary of the findings of the core case studies, are brought together in document DSTI/STP(2010)26.

What happens next

4. The seven core case study reports will be further revised with a view to eventual declassification. They will then serve as analytical resources. They will not be published as they stand.

5. A separate single publication will be developed drawing on the core case studies, mini case studies, synthesis document and other research as inputs. This publication, once completed and declassified, will provide part of the analytical basis for the development of guidelines.

6. Finally, the key lessons learned from the case studies will provide the basis for developing good practices (as well as pointing to "bad" practice) for institutional governance of STI for global challenges.

7. Delegates are invited to discuss the following:

    a. Are there major gaps across the overall analytical body of case studies?

    b. Which main lessons for governance can be drawn from across the set of case studies?

    c. What are the emerging messages from each of the individual cases that you would like to see fed into the development of thinking on governance?

    d. Are there any omissions or errors in the individual draft case study reports that you would like to point out?

    e. Do you have further comments on the details and the form of the draft case study reports?

Acknowledgments

This report was invaluably contributed to by several people who gave of their time and expertise.

At the IEA Secretariat, Carrie Pottinger and Nancy Turck, and at the IEA Bioenergy Secretariat, John Tustin contributed significantly to the research of this report.

Formerly of the IEA Secretariat and currently at the United States Department of Energy, Carmen Difiglio provided useful inputs.

Also at the United States Department of Energy, several individuals contributed to this report. Kristin Abkemeier, James Ahlgrimm, James Barnes, Nancy Garland, Paul Grabowski, Imre Gyuk, Richard Karney, Eric Lightner, Lawrence Mansueti, Jay Nathwani, Alexandra Pressman, Carole Read, Kevin Stork, and Frank Wilkins gave this report greater context by sharing their experiences with IEA Implementing Agreements.

The contributions of all these individuals are sincerely appreciated.

Abbreviations

BTP	Building Technologies Program
CERT	Committee on Energy Research and Technology
CF	Common fund
CP	Contracting Party
CTI	Climate Technology Initiative Implementing Agreement
DSM	Demand-Side Management Implementing Agreement
EC	European Commission
ECBCS	Energy Conservation in Building and Community Systems Implementing Agreement
ECES	Energy Conservation through Energy Storage Implementing Agreement
ECG	Energy Coordination Group
ENARD	Electricity Networks Analysis, Research and Development Implementing Agreement
ETDE	Energy Technology Data Exchange Implementing Agreement
EUWP	Working Party on End-Use Technologies
ExCo	Executive Committee
FAO	United Nations Food and Agricultural Organization
GB	Governing Board
GBEP	Global Bioenergy Partnership
GHG	Greenhouse Gas
HEV	Hybrid and Electric Vehicle Implementing Agreement
IA	Implementing Agreement
IEA	International Energy Agency
IEP	Agreement on an International Energy Programme
MC	Member Country
MOU	memorandum of understanding
NEET	Network of Experts in Energy Technology
NGO	Non-governmental organization
NT	National Team

OA	Operating Agent
OECD	Organisation for Economic Co-operation and Development
R&D	Research and development
RD&D	Research, development, and demonstration
RED	Renewable Energy Division
REWP	Working Party on Renewable Energy Technologies
SF	Secretariat fund
SLT	Standing Group on Long Term Co-operation
SolarPACES	Solar Power and Chemical Energy Systems Implementing Agreement
SP	Strategic Plan
STP	Directorate of Sustainable Energy Technology and Policy
TC	Technical Coordinator
TL	Task Leader
TNU	Technology Network Unit
USDOE	United States Department of Energy

1. Introduction

1. In 1973 the world faced growing political tensions that would culminate in an oil embargo placed on the United States and other countries. The urgency of the oil crisis that resulted brought goals including, inter alia, energy efficiency, reduced energy consumption, and alternative energy sources to the fore. It was in the wake of this, the 1973 oil crisis, that the Energy Co-ordination Group (ECG) was created within the framework of the Organisation for Economic Co-operation and Development (OECD). The ECG met and discussed the terms, scope and activities of the Agreement on an International Energy Programme (IEP), the treaty which went on to establish the International Energy Agency (IEA) in 1974.

2. An intergovernmental organisation, the IEA acts as an "energy policy advisor" to its 28 Member Countries (MCs).[1] A staff of approximately 220 comprised primarily of energy experts and statisticians from its MCs contribute to the IEA work programme of "energy research, data compilation, publications and public dissemination of the latest energy policy analysis and recommendations on good practices." Through its work, the IEA aims to support the efforts of MCs to ensure "reliable, affordable and clean energy for their citizens." The mandate of the IEA has broadened to address three aspects (the "Three E's") of "balanced energy policy making: energy security, economic development and environmental protection." The work of the IEA is currently focused on "climate change policies, market reform, energy technology collaboration and outreach to the rest of the world, especially major consumers and producers of energy like China, India, Russia and the OPEC countries" (*About the International Energy Agency).*

3. To accomplish its goals, the IEA works through various means to support international energy cooperation. One of these avenues is Implementing Agreements (IAs), a framework which allows for multilateral collaboration on topics related to energy technologies, research and policy. It is on these IAs that this paper will focus its inquiry. In précis, an IA is an energy technology research initiative embarked upon by at least two IEA member countries with the consent of the IEA Governing Board (GB), the "supreme institutional organ" of the IEA. The Governing Board maintains authority over IAs, and has the final say on the creation of new and extension of existing IAs (Scott, *IEA History Volume 1,* 157). The creation of an IA is generally supported when their political push behind a "hot topic" (Pottinger).

4. IAs are decentralised from the perspective of the IEA, as the administration of them is devolved to the particular IA. All activities that may be undertaken by IAs occur under national rather than IEA authority. Furthermore, all financing of these activities is procured by the individual IA, not by the IEA (Scott, *IEA History Volume 2,* 266).

5. As of September 2010, there are 42 IEA IAs. The agreements focus on five areas: cross-cutting activities (i.e., data exchanges), end-use technologies, fossil fuels, fusion power, and renewable energies and hydrogen (*Energy Technology Initiatives*). Participants include IEA Member and non-MCs, businesses, international and non-governmental organisations. Some agreements may address a single project, while others cover numerous projects (Scott, *IEA History Volume 2,* 278). Some are made up primarily of industry participants while others are comprised mainly of researchers (*International Collaboration in Energy Technology,* 9).

6. The work of IAs typically includes a combination of some of the following activities: scientist exchanges, information exchange on research results and programs, databases, basic and applied research, technology development and pilot plants, technology assessment, feasibility studies, market analysis,

1 Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Luxembourg, the Netherlands, New Zealand, Norway (participates under a special Agreement since 1974), Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, UK, US.

environmental impact studies, expert networks, modeling and systems analysis (*Energy Technology Initiatives*, 97).

7. This report will review the IEA IA structure overall in the first half. Given that the research associated with IAs is carried out in MCs, the framework for this cooperation contains few provisions regarding the administration of the collaboration (Scott, *IEA History Volume 2*, 278). As a result, the existing IAs are flexible and respond to the needs of the participants, thereby varying significantly in their structure, governance, funding, and other aspects key to the analysis of this research project. The second part of this paper will focus on one IA, the Bioenergy IA, one of the oldest IAs still operating today, having been founded in 1978. By reviewing the Bioenergy IA, this paper will aim to consider the structure of an individual IA in greater detail to better glean information as it relates to multilateral governance in science, technology and innovation.

2. Establishment and historical development

2.1 The main context conditions when IEA IAs were formed

8. At the genesis of the IEA, energy security was of paramount concern. In addition to addressing the aim of securing sustainable oil supplies in the wake of the then-recent oil crisis, the IEP Agreement made provisions for "exploring alternative sources of energy and energy conservation measures through long-term co-operation" (Energy Technologies at the Cutting Edge, 98). The IEP Agreement (Chapter VII, Article 41) provides the groundwork for international cooperation, stating: "The Participating Countries are determined to reduce over the long term their dependence on imported oil" and to achieve this "will undertake national programmes and promote the adoption of co-operative programmes, including, as appropriate, the sharing of means and efforts".

9. IEA founders and early policy makers placed a high priority on the objective of the Agency to establish research and development (R&D) projects. From the outset, it was decided that this co-operation would be most worthwhile if the results "would ultimately be destined for the marketplace." It therefore seemed that a business-like approach would be the most appropriate, as it would demand a "commitment of resources among equal partners, with provisions for both Government and industry participation, and for the protection of intellectual property" (Scott, *IEA History Volume 2*, 257).

10. Member governments which had been assigned lead responsibilities for given technology sectors were often the initiators of IAs during the IEA's formative years. Later a broader membership base put forth the initiatives along with other sources, channeling proposals through the R&D management structure, the Secretariat, and the Working Parties of the IEA (Scott, *IEA History Volume 2*, 264).

11. As noted in the IEP Agreement (Article 42), activities are to be carried out through various means, including the exchange of national experiences and information, jointly financed projects, and general studies (*Energy Technologies at the Cutting Edge*, 98). Through the IEP Agreement (Chapter IX, Article 64) the provision was made to address the funding of special activities: "Special expenses incurred in connection with special activities carried out pursuant to Article 65 shall be shared by the Participating Countries taking part in such special activities in such proportions as shall be determined by unanimous agreement between them." Article 65 further clarified special activities and specifies the oversight of the IEA GB:

> *1. Any two or more Participating Countries may decide to carry out within the scope of this Agreement special activities, other than activities which are required to be carried out by all Participating Countries under Chapters I to V. Participating Countries which do not wish to take part in such special activities shall abstain from taking part in such decisions and shall*

> *not be bound by them. Participating countries carrying out such activities shall keep the Governing Board informed thereof.*

12. Article 65 is very important, as it allows for collaboration with a group that may be less than the entire membership of the IEA and therefore allows for greater flexibility and adaptability. It also provides the link between the IA and the IEA Secretariat (Scott, *IEA History Volume 2*, 262).

2.2 Main objectives and mission statement and the evolution of these

13. In the first 20 years of the IEA roughly sixty IAs were developed and administered. Through its framework, IEA IAs aim to create

> *A flexible and effective framework for IEA member and non-member countries, businesses, industries, international organisations and non-government organisations to research breakthrough technologies, to fill existing research gaps, to build pilot plants, to carry out deployment or demonstration programmes – in short to encourage technology-related activities that support energy security, economic growth and environmental protection [Energy Technology Initiatives, 13].*

14. In addition to this overarching mission, primary objectives of IEA IAs can be discernible over the decades. In the 70's, the focus was primarily on fossil fuels (oil and coal), cement and industry activities. In the 80's, the focus moved toward energy conservation and renewable energy sources. In the 90's, the focus became the reduction of greenhouse gas (GHG), demand-side management, and technology transfer. As an indicator of more recent trends, the two most recently created IEA IAs were Electricity Networks Analysis, Research & Development (ENARD), established in 2006, and Efficient Electrical End-Use Equipment (4E) which was established in 2009 (Pottinger).

15. The noted capacity of new IAs to be advanced when they are "hot topics" supported by political will indicates that IAs will most likely be largely indicative of key contemporary challenges facing the energy industry and policy makers. As such, the main objectives and mission statement of individual IEA IAs are constantly undergoing change and adapting to current scenarios.

2.3 Main milestones

16. The structure of IEA IAs has gone through a number of changes since the creation of the IEA "Guiding Principles" (the associated rules and regulations of IEA IAs) in 1975. The primary focus of these changes has been to increase participation in IEA IAs by non-MCs and non-MC entities. At the creation of the IEA Guiding Principles in 1975, four categories of participation were provided for: IEA MC Governments; national agencies, public organisations, private corporations, companies or other entities "designated by their governments as the vehicles of their participation"; the European Communities; OECD Members (that were non-IEA MCs), with GB approval. The first non-IEA Member Country IA participant, Finland (which became an IEA MC in 1992), joined the Nuclear Safety IA in 1976 (*Energy Technologies at the Cutting Edge,* 101-102).

17. In 1985, the objectives of, and basic approach to, IEA collaborative projects were summed in a two-fold manner: "To provide a framework in which Member countries can achieve the advantages of sharing costs and benefits from technology development activities of common interest" and "To demonstrate a cohesiveness in the individual approaches of Member governments to the longer-term objective of reducing dependence on oil" (*Energy Technologies at the Cutting Edge,* 101-102).

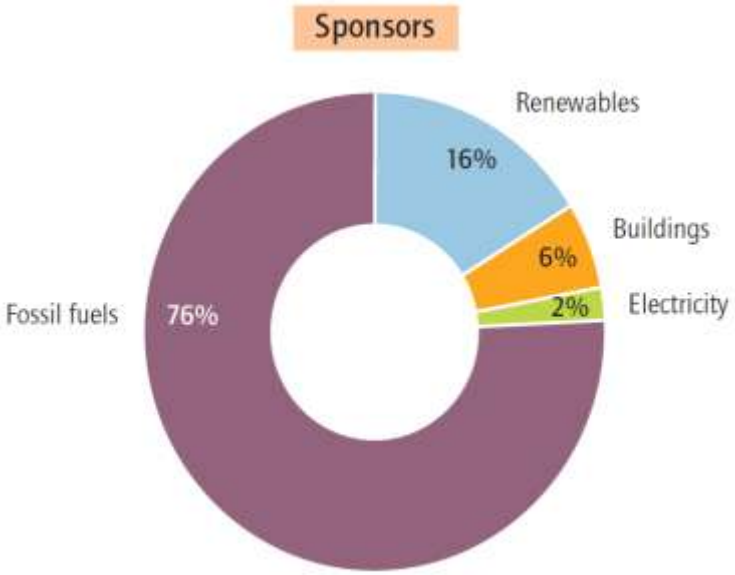
18. In 1990, a new participant category, "Sponsor", was created to allow for the participation of non-governmental institutions from MCs "when the Member government was not ready, for internal reasons, to

make the designation in the normal way, but had no objection to this participation." In 1993, the GB detailed procedures for Sponsor participants (Scott, *IEA History Volume 2, 272*).

19. In 1991, the admission process for IEA non-MCs to IAs was formalised by the GB through the establishment of "Associate" participation. The corresponding rules were adopted as amendments to the Guiding Principles. In 1993, the "IEA Shared Goals" adopted by Ministers noted the potential contribution of new energy technologies and encouraged co-operation with non-MCs. Also in 1993, the category of "Sponsor" for IEA MC entities was established by the GB. One or two IAs have clauses stating that sponsors may pay for activities, but not have a vote (Pottinger).

20. In 2003 the Guiding Principles were revised and were then called the IEA Framework for International Energy Technology Co-operation, or in short, "the Framework." 2003 also saw the decision of the GB to open membership in IAs to all countries (Member and non-Member alike) as well as to industry to a greater extent, through the creation of the "Sponsor" category for non-MC entities as well (Pottinger).

Graphic 2.3



21. These changes were spurred by several different factors. Originally, IAs were intended to be government-led initiatives. Over time, it was realised that more industries wanted to be involved. However, there was not yet a voting mechanism or legal stature for industry. The same applied to IEA non-MCs. Until the GB decision in 2003 they had no voting mechanism or legal stature. In addition, the category of "Sponsor" in IAs was created, "so that all participants could have equal rights and obligations as member country participants." Graphic 2.3 (*Energy Technology Initiatives*, 78) illustrates the sectors in which industry participates in IAs, and Table 2.3 (*Energy Technology Initiatives*, 87), the industry participants. As of July 2010, 10% of IEA IA participants are from non-MCs, and 10% are from industry. "Bringing together government and private sector experts is a particular benefit of participation – they learn the needs and constraints of the other" (Pottinger).[2]

2 While a framework was created whereby participants could have equal status, it should be noted that IAs can create their own voting structures. In some, this means that a company can be a sponsor but cannot vote within the IA.

Table 2.3

SPONSORS

As of 31 March 2010

	Headquarters	Cross-Cutting	End-Use				Fossil Fuels	Fusion Power	Renewables & Hydrogen	TOTAL
			Buildings	Electricity	Industry	Transport				
Alstom Power Technology AG	France						1			1
Australian Coal Industry Consortium	Australia						1			1
Babcock & Wilcox	United States						1			1
BG Advance	United Kingdom						1			1
BG International	United Kingdom						1			1
BP International Ltd.	United Kingdom						1			1
Canadian Electrical Ass.	Canada						1			1
CanGEA	Canada								1	1
CEZ, a.s	Czech Republic						1			1
Chevron Corporation	United States						1			1
Coal Industry Advisory Board	France						1			1
Coal Association of New Zealand	New Zealand						1			1
Conoco-Phillips	United States						1			1
Danish Power Group	Denmark						1			1
E.ON UK	United Kingdom						1			1
Electric Power Research Institute	United States						1			1
Energesis Ingeniería	Spain		1							1
ENI Tecnologie ApA	Italy						1			1
European Photovoltaic Industry Ass.	Belgium								1	1
European Wind Energy Ass.	Belgium								1	1
ExxonMobil Corporation	United States						1			1
Geodynamics Ltd	Australia								1	1
Geothermal Group of APPA	Spain								1	1
Green Rock Energy Ltd	Australia								1	1
IF Technology b.v	Netherlands		1							1
Japan Facility Solutions	Japan			1						1
JGC Corp.	Japan						1			1
National Power	United Kingdom						1			1
NIC	Netherlands						1			1
ORMAT Technologies, Inc	United States								1	1
Orme Jeotermal	Turkey								1	1
PowerGen	United Kingdom						1			1
Repsol YPF	Spain						1			1
RWE Aktiengesellschaft	Germany						1			1
Schlumberger Cambridge Research	United States						1			1
Schlumberger Carbon Services	United States						1			1
Shell International BV	Netherlands						1			1
Shaw Consultants, Intl., Inc.	United States						1			1
Statkraft Development AS	Norway						1			1
Statoil	Norway						1			1
Total	France						1			1
Vattenfall AB	Sweden						1			1
Warsaw University of Technology	Poland		1							1
Located in IEA member countries			3	1			31		8	43
Anglo Coal	South Africa						1			1
Banpu Plc.	Thailand						1			1
Bharat Heavy Electricals Ltd.	India						1			1
Beijing Research Inst. Clean Coal	China						1			1
EKSOM Holdings Ltd	South Africa						1			1
Eletrobrás	Brazil						1			1
SUEK	Russia						1			1
Located in IEA non-member countries							7			7
TOTAL			3	1			38		8	50

Note: This table represents participation by industries that are signatories to Implementing Agreements (Sponsors). It does not include those cases where governments ask industry to represent them in the Agreements, nor does it include industry participation in the research tasks or in-kind contributions – estimated at well over 500 companies.

22. Changes in membership and outreach strategies to encourage greater membership have also been driven from outside the IEA. At the 2005 G8 meeting in Gleneagles, the IEA was asked to expand IAs to include more non-MCs. The IEA soon followed this request with an initiative to expand membership through the Network of Experts in Energy Technology (NEET). This initiative allows for stakeholders in non-MCs to meet with IEA IA experts and discuss technology R&D and international collaboration (Pottinger). As of 2010, NEET workshops have been held in China, Brazil, India, Russia and South Africa (*Directorate of Sustainable Energy Policy and Technology)*.

23. In summary, these are the key points covered above in the evolution of the IEA IA Framework:

- 1975: Creation of the IEA "Guiding Principles"
- 1990: Participant category of "Sponsor" is created for MC entities

- 1991: Admission process for IA non-MCs formalised by the GB through the establishment of "Associate" participation

- 1993: IEA Shared Goals note potential contributions of new energy technologies and encourage co-operation with non-MCs; Sponsor category for IEA MC entities is established by the GB

- 2003: Guiding Principles revised and named the IEA Framework for International Energy Technology Co-operation; GB decision to open IA membership to all countries and industry to a greater extent, through creation of "Sponsor" category for IEA non-MC entities

- 2005: Following the G8 meeting in Gleneagles, the IEA is asked to expand IAs to include more IEA non-MCs, IEA responds with the NEET initiative

2.4 The contribution of IEA IAs to a solution for global challenges, the extent to which responses are co-ordinated with other initiatives, and other challenges or goals taken into consideration

24. The major contributions made by IEA IAs address challenges related to energy and climate change. Depending upon the individual IA, other global challenges are considered and response mechanisms are coordinated. As an example of this, the Climate Technology Initiative (CTI) IA Private Financing Advisory Network was launched in cooperation with the United Nations Framework Convention on Climate Change Expert Group on Technology Transfer in 2006. This project works to assist "project developers in IEA non-Member Countries to develop, plan, finance and implement small- and medium-sized environmentally sound projects" (*Energy Technology Initiatives*, 28). This work is carried out through project financing and regional workshops that connect project developers in emerging economies with banks and venture capitalists, something that has been "very effective" (Pottinger).

3. Governance dimensions, description, analysis and assessment

Because of the varied nature of the 42 IAs, generalisations in regards to the dimensions reviewed in Section 3 are not possible. Similarly, to cover the aspects of all 42 IAs would not be feasible in the space available. As such, Section 3 is reviewed from a broader perspective, without the elaboration that will come in the second half of this paper. Interviews conducted among IEA IA participants at the US Department of Energy assist in our understanding of this section.

3.1 Partnerships, stakeholder involvement and co-operation relationships, outreach

25. Various branches of the IEA play key roles in coordinating the efforts of IAs and extending participation to non-MCs and non-MC entities. In 1975, shortly after the founding of the IEA, the Committee on Energy Research and Technology (CERT) was created by the IEA GB.[3] The stated role of the CERT is "to examine and report on co-operative action in the conservation of energy, including co-operative programmes including: the exchange of national experiences and information on energy conservation; and ways and means for reducing the growth of energy consumption" (*Energy Technology Initiatives*, 12).

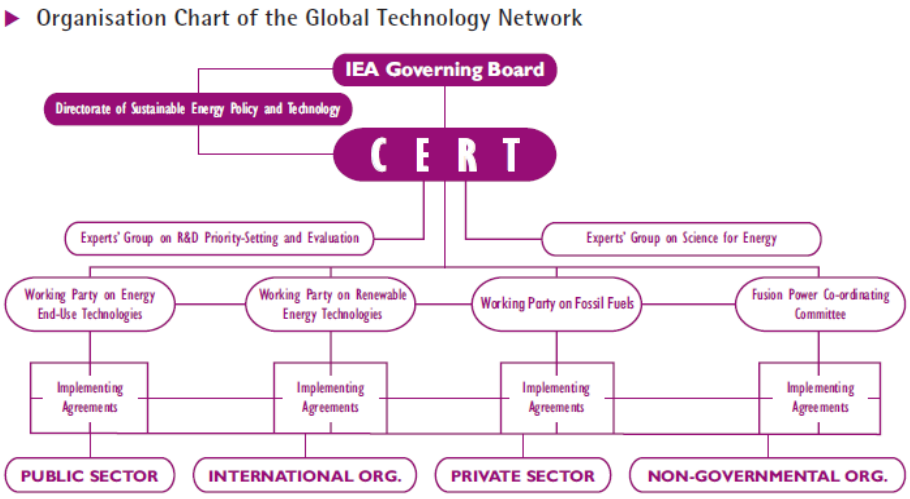
26. The CERT is one of five standing groups and committees of the IEA. It is charged with the task of coordinating and promoting "the development, demonstration and deployment of technologies to meet

3 The CERT began with the name of the Committee on Energy Research and Development (CRD), with the name being changed at a Governing Board meeting in March 1992 (*Energy Technologies at the Cutting Edge).*

challenges in the energy sector."[4] Four expert bodies have been established by CERT: the Working Party on Fossil Fuels; the Working Party on Renewable Energy Technologies (REWP); the Working Party on Energy End-Use Technologies (EUWP) and the Fusion Power Co-ordinating Committee (*Standing Groups and Committees*), all of which interact with IAs pertaining to their area of work.

27. One of the key roles of the CERT is "to provide leadership by guiding these groups to shape work programmes that address current energy issues productively, by regularly reviewing their accomplishments, and suggesting reinforced efforts where needed." IAs are at "the core of a network of senior experts" made up of the CERT, the four working parties and two expert groups (*Energy Technology Initiatives*, 12). Communication among IAs is fostered through biannual meetings of the REWP and EUWP (Difiglio). The following graphic (*Energy Technology Initiatives*, 13) illustrates the organisational structure.

Graphic 3.1



The Director of Sustainable Energy Policy and Technology

28. The IEA GB oversees the CERT and the Directorate of Sustainable Energy Policy and Technology (STP). The Director of the STP serves as Chief IEA Technology Co-coordinator and has the responsibility of "ensuring linkages between the CERT, the IEA Implementing Agreements and the Secretariat in terms of technology issues" (*Directorate of Sustainable Energy Policy and Technology*). Through the STP Energy Technology Policy Division (ETP), the Technology Network Unit (TNU) of the ETP provides the framework for countries, business, non-governmental organisations (NGOs) and international organisations to collaborate on IAs.

29. Hosted at the Directorate of Energy Markets and Security, the Renewable Energy Division (RED) was known prior to its division status as the Renewable Energy Unit (REU) within the IEA Energy Technology Office. The REU was formed in 1999 with the goal of providing support to the REWP. The REU was also charged with acting as an interface with IEA renewable energy technology IAs. The RED is still tasked with supporting the REWP and renewable energy related IAs and supporting IA pursuit of

4 *Standing Groups and Committees.* The five standing groups and committees are: Emergency Questions (SEQ), Oil Market (SOM), Long-Term Co-operation (SLT), Global Energy Dialogue (SGD), and the CERT.

technology development and deployment along with outreach to non-MCs (*Directorate of Energy Markets and Security*).

30. At the national level, several countries including the US have created coordinating bodies called national teams (NTs). These NTs help guide and organise activities as they relate to an IA or Task. They aim to facilitate "more cohesive national participation" and "provide a forum for interactions and collaboration among participants on other projects as well." NTs are made up of representatives from "industry, research institutions, government agencies, national laboratories, and universities." NTs are most beneficial when the volume of work and time frame warrant the effort required to assemble the team and when "there is a critical need to share information with industry" (Evans 2008, 5-6).

31. In IAs, CPs would communicate among themselves to define new projects. However, when a non-CP would like to undertake a new IA or Task, this country may suggest the development of such to existing IEA MCs or IA CPs (Scott, *IEA History Volume 3*, 302-304). The Demand-Side Management (DSM) IA is one example of this type of collaboration, and is reviewed in section 3.6. Industry associations serve an important role of communicating priorities of industry players to the IA (Ahlgrimm).

32. Collaboration among IAs can also be beneficial, as some research areas may overlap. A challenge to this type of collaboration is that some governments may not be willing to fund two IAs, or to participate in similar work through two different IAs (Barnes). However, some IAs have pursued such collaboration. In example, the Energy Conservation in Building and Community Systems (ECBCS) IA has a joint meeting every three years with the Solar Heating and Cooling IA, as some overlap occurs between the work of these two IAs. It was noted that such collaboration is fostered when similar structures (i.e., cost or task-sharing) prevail in the IAs in question (Stork). IEA Working Parties are an existing structure that provides a valuable forum to connect IA Participants (Difiglio).

33. In summary, there are key structures at the IEA Secretariat and at the country level that participate in overseeing, coordinating, and/or contributing to IA efforts. They are:

- The GB, CERT, the Working Parties, the STP, ETP, and RED at the IEA Secretariat
- At the national level, some countries use National Teams to coordinate the efforts within their country on a particular IA

3.2 Agenda and priority setting

34. A commonality among all IAs is that an Executive Committee (ExCo) supervises IA activities (Evans 2008, 4). The ExCo is made up of representatives of each of the IA signatories (Energy Technology Initiatives, 102). Agenda and priority setting within IAs occurs at the highest level at the ExCo, with Tasks also conducting agenda and priority setting.

35. With meetings occurring twice per year at the ExCo level in the Wind IA, activities sometimes don't happen quickly enough between meetings. To address this without adding more travel requirements and costs to the busy schedules and budgets of IA CPs, other modes of agenda and priority setting are pursued. The Wind IA employs video conferencing, webinars, and email to conduct business in between meetings to encourage efficiency. Voting will sometimes occur by email (Ahlgrimm). Many USDOE IA participants noted that having ExCo meetings more than twice per year would be very difficult to organise.

36. A challenge to IAs in regards to priority setting is time and space. IA Participants are spread across the world and ExCo meetings occur one to three times per year depending on the IA. Furthermore, the majority of IA Participants have full-time jobs that make contributing to the work of the IA outside of

the regular meetings difficult. As a result, "it takes more time to discuss and move issues forward between meetings than if the members worked in the same building." This is less of a challenge for larger, cost-sharing IAs with dedicated secretariats. Some IAs choose ExCo chairs on a rotating basis, "a process which may not always result in the most qualified leaders" (Pottinger).

37. A challenge to the semiannual ExCo meeting structure was noted by Jay Nathwani and Alexandra Pressman, participants in the IEA Geothermal IA. In many cases, they noted, technology does not move fast enough to justify semiannual meetings. At the same time, they noted that at the Task level closer communication usually translates to success. As Carole Read of the IEA Hydrogen IA noted, the current ExCo meeting format in this IA (two meetings a year last one and a half days each) might be improved to just one meeting a year, lasting three days. A challenge noted during interviews is turnover in representatives to ExCo meetings. Whenever possible, interviewees stressed, the same person should be sent to ensure continuity.

38. At the HEV IA ExCo meetings, substantial information exchange occurs. Among other methods of information exchange, one half day of each ExCo meeting is dedicated to a special topic (i.e., infrastructure issues). ExCo meetings can also serve a double purpose. The responsibility of hosting ExCo meetings may be awarded to a country the IA wishes to strengthen or highlight. ExCo meetings may also be scheduled to be in the same location of major industry events (Barnes). Frank Wilkins of the SolarPACES IA noted the value of ExCo meetings for information exchange, especially from a technology perspective.

39. Wilkins also noted that for IAs to endure administration changes at the federal level, bonds must be fostered not only at the official level, but also at the practical level (i.e., among non-appointed officials) as well. Several interviewees stressed the importance of continuation (and reduced turnover in membership) among ExCo representatives in this respect. Imre Gyuk also noted practical solutions in this regard—allowing time for IA Members to socialise and fostering an informal environment in the ExCo, something which has led to a collegial environment in the Energy Conservation through Energy Storage (ECES) IA and effective collaboration. An example of the collaboration that resulted from this, Gyuk said, was a researcher from an ECES IA CP went on sabbatical at a US National Laboratory, collaborating there with US researchers.

40. Turnover in membership was noted as a potential barrier to collaboration by several USDOE IA participants, including Nancy Garland of the Advanced Fuel Cells IA. Kevin Stork cited the long-standing participation record in the Advanced Motor Fuels IA as one of its primary advantages. He also noted that site visits during ExCo meetings helped to foster an atmosphere of collegiality. Site visits can also demonstrate real-world application of a concept that participants may have otherwise seen as impossible or challenging. Through these site visits, it becomes easier to visualise potential future developments (Grabowski).

41. A challenge to priority setting, Barnes noted, is hard and fast targets (i.e., by 2015, 15% of all vehicles should be hybrid or electric). If this was introduced he said, "people would run for the door." He further noted the importance of flexibility. Whereas hard and fast goals can set a focus point, they can also restrain and be a source of frustration or criticism.

42. Regarding evaluation mechanisms, Richard Karney of the ECBCS IA noted the value of thorough review of Task progress reports at ExCo meetings. A review mechanism that is complete and carefully considers the creation of new Tasks will likely be benefited by positive growth that contributes to the mission of the IA. He noted the ExCo must recognise its responsibility to be a thorough and unforgiving reviewer of current and proposed activities. He said that when reports are not complete, they

are sent back after review with comments for further improvements. ECBCS also places importance, he noted, on analyzing whether proposed Tasks would work towards fulfilling the IA Strategic Plan (SP).

43. It is important to consider whether agenda and priority setting, along with other business, will be conducted in a formal or informal setting, noted Eric Lightner of the Electricity Networks, Analysis, Research and Development (ENARD) IA. Imre Gyuk of the Energy Conservation through Energy Storage IA noted that this IA operated on an informal basis, and went on to cite it as one of its key advantages which has led to useful and meaningful collaboration, long-standing membership and a collegial environment.

44. Some IAs have a dedicated Secretariat which is paid to conduct the administration of the IA, including keeping accounts, arranging meetings, and other responsibilities. ENARD is one of these IAs, with EA Technologies serving as the Secretariat. Eric Lightner, a USDOE Participant in this IA, noted the efficiency of the Secretariat, but also that when participating countries may fail to propose work plans, the Secretariat will take a stronger role. This highlights that the responsibilities of CPs and the Secretariat must be balanced.

45. In sum, the following points are key in agenda and priority setting:

- The ExCo is the highest level within the IA at which priority and agenda setting occurs. For specific projects (Tasks), agenda and priority setting will also occur at this level.
- Generally, two meetings per year are useful, though technology may not always advance fast enough to justify two meetings. Increased meeting frequency would be a challenge from a time and funding perspective.
- Membership spread across the globe, usually with other full-time positions can make coordination challenging.
- Closer communication between meetings usually translates to success.
- ExCo meetings may be arranged to promote a MC or event.
- Bonds must be fostered at both the political and practical level for long-term success.
- Membership turnover is a challenge to effective collaboration.
- Site visits foster collegiality and can be a useful demonstration of new technologies.
- Flexibility in target-setting is advised.
- Thorough review mechanisms (particularly in regards to growth and project reports) are important.
- It must be considered whether administration will be conducted on a formal or informal basis—informal formats can have advantages.
- When operating with a dedicated Secretariat, it is important to balance the role of the Secretariat with that of the Membership.

3.3 Funding and spending arrangements

46. IAs operate under a cost or task sharing scheme, or some combination of both approaches. Philibert (2004, 10) aptly sums the frameworks of each scheme:

> *Under task sharing, collaborating entities manage to undertake separately various tasks from a common agenda. They do not only share results – they work in a coordinated manner from the onset to avoid duplicative efforts, saving time and money. Under a cost sharing scheme, they contribute to a common fund for conducting an experiment or equipment purchase, operation of a single facility, or information exchange and processing in an international centre, or operation of a secretariat.*

47. For those IAs that are cost-sharing, various methods of determining financial contributions exist. Sometimes contributions will be determined by Member GDP, with contributions being a per cent of this. In another cases it would be a percentage of the IEA contribution made by the Member (when the Member is also an IEA MC), or a portion of the relevant national R&D expenditure of the Contracting Party (CP). Contributions would then be placed in a common fund (CF) to cover IA costs. For those IAs that establish a CF, audits and other oversight reviews of financial integrity are provided for in IAs (Scott, *IEA History Volume 2,* 267).

48. Task sharing is likely best used for IAs with many different concepts that will be researched by multiple participants in parallel. Cost sharing is appropriate in cases of funding for a "single joint activity or experiment." While some IAs operate under one of these modes, others may combine the two. For cost-sharing IAs, money is usually used for central administration and information-sharing activities, whereas projects are carried out through task sharing (de Coninck *et al*, 18). The work of an IA is often carried out through Tasks (an appendix to the main IA text, called an Annex, outlines Task activities and is the framework under which the work programme of a Task is carried out) which has proven to be an efficient and useful process. Information exchange, technological research, and other activities take place within Tasks (Scott, *IEA History Volume 2,* 278).

49. A USDOE evaluation found that program managers in the Building Technologies Program (BTP) "strongly believe that international collaboration through IEA Implementing Agreements delivers significant value to BTP, DOE, and U.S. industry for relatively small commitments of resources." This USDOE evaluation noted the value of IEA IAs from a cost perspective: "In the absence of such a framework, the transaction costs associated with the start-up of international collaborative projects can easily be prohibitive" (Evans 2008, 3).

50. The IA structure has proven very effective in terms of cost reduction. Individual countries costs are reduced by 50 to 95% through this cooperation in comparison with what would have been spent were countries to act alone. These results are achieved by cost sharing and data pooling, among other methods. Data that is pooled can be used "to build improved mathematical models to replace expensive physical experiments." When costs are shared, the costs to a single country of constructing pilot plant facilities, for example, are reduced. The improved rate of technological progress along with the increased flow of information resulting from IA activities and the networks created thereby are added benefits. The research network also allows participants to focus on areas of expertise, as they have access to research they may otherwise have to also undertake *(International Collaboration in Energy Technology,* 7, 13).

51. Taking the Wind IA as an example, the cost of aerodynamic testing at five laboratories in four countries cost an estimated USD 2 to USD 4 million. The cost to each country acting alone would have been USD 3 million. In addition, data collection carried out in parallel with a variety of wind and

atmospheric conditions that were not readily available to individual countries accelerated the progress of the research *(International Collaboration in Energy Technology*, 13).

52. Barnes noted that the self-funding model for Tasks can be "creaky." Frank Wilkins of the SolarPACES (Solar Power and Chemical Energy Systems) IA noted that most barriers to collaboration have to do with funding. One benefit to SolarPACES in terms of funding has been a biannual conference which now even generates a profit that is distributed to Task leaders. Eric Lightner of the ENARD IA identified a useful budgetary implement. When coordinating international research, this particular IA arranges for the costs for Task-related costs to be spent within the home country, with special accounts created within countries to house funds dedicated to IA projects. In this manner, money does not have to cross borders, avoiding potential complications.

53. To summarise the points in this section:

- IAs operate under a task and/or cost sharing scheme. When cost sharing is involved, several different methods are used by IAs to determine contributions.
- The IA Framework reduces costs by pooling resources.
- Funding has presented a barrier to effective collaboration in some instances.
- Conferences can be a source of funding.
- When possible, arranging for funds to be spent in the home country can reduce barriers that may arise with cross-border funding.

3.4 Institutional and access arrangements

54. A noted advantage of the IA Framework is its treatment of IPR. "According to the Framework, IA participants have equitable rights and obligations, including any IP that may be a result of the work of the IA. However, IAs may have more specific clauses with regard to IP." With the exception of IPR issues resulting during the close of an IA (when all property must be divided among Participants), the IEA Secretariat "is not aware of any problems with IP." Usually, as a technology progresses from research to deployment (this is also the point where industry tends to become interested), more specific, separate IPR contracts will be developed (Pottinger).

55. As Philibert (2004, 28) notes, no "unique set of provisions" exist for addressing intellectual property rights (IPRs) in IEA IAs, other than for the protection of the IEA copyright. IPR issues are left to the IAs to formulate, and vary among the IAs and within IA Tasks. Many agreements require participants that publish information resulting from their IA work not profit from such publication. Patents owned by Task Participants needed for a Task "shall be licensed to participants responsible for that task at no cost."

56. Patents resulting from work may be filed in countries as appropriate by the inventing participant, and participants may be required not to disclose information related to these patents for a six-month period. Some IAs suggest to participants to license inventions resulting from IA work in their country, and on "reasonable terms and conditions" in other countries (Philibert 2004, 28). As an example, the HEV IA publishes an annual report, but delays the electronic release of this by one year (with only physical distribution in the first year), something Kristin Abkemeier noted was done "to demonstrate the value of membership"--as only members would have access to the written report in this year. The electronic copy is published only the year after to limit the possibility of the report being shared electronically on a broader basis.

57. The relevance of IPR concerns is dependent upon a number of factors. Industry characteristics as they apply to the particular technology and its maturity would impact this consideration. Also, the more removed a project is from marketplace deployment, the less concerned participants would likely be regarding a loss of competitive advantage (*International Collaboration in Energy Technology, 47*). Tirpak (2009, 13) writes that "In general, collaborative approaches are more straightforward for knowledge sharing and pre-competitive research, than for near-commercial processes and products."

58. A USDOE study noted that IAs play particularly important roles for projects that are "less likely to yield proprietary intellectual property" (Evans 2008, 3). Frank Wilkins of SolarPACES noted that the closer a technology is to market deployment, the greater the likelihood of intellectual property (IP) being or becoming an issue. In SolarPACES, most information dissemination to the broader public occurs at their biannual conference. In the ECBCS IA, where much of the work is closer to market deployment, IP issues have been a recurring challenge (Karney).

59. The Wind IA disseminates its results through newsletters on Task work and joint actions, recommended practices, policy analysis, and conferences and forums. Still, the dissemination of results was noted by many USDOE IA Participants as a challenge because of the time dimension. Karney noted the IA could do more to promote itself, a challenge frequently noted by USDOE interviewees.

60. To review the key points in section 3.4:

- The IPR framework varies among IAs, and within IAs also varies among Tasks.
- The challenges presented by IPR issues typically increase *pari passu* with the advancement of a technology to market deployment.
- Conferences and newsletters are important forums for information exchange to the broader public.
- Information dissemination still presents a challenge to IAs, particularly as the time required to do this is hard to dedicate, given the full-time positions IA Participants typically have.

3.5 Putting research into practice

61. The work of IAs can directly contribute to new technology development and deployment. Industry participation in IAs can help to deliver new technology developments to the marketplace directly. As an example of this, the Multiphase Flow Sciences IA "led to the development and patenting of new non-invasive probes that measure the concentration and velocity of solids near the wall of industrial facilities at temperatures up to 1000°C. These probes are expected to become standard in coal combustors and gasifiers, and petrochemical units" (*International Collaboration in Energy Technology,* 24).

62. MCs have also made policy decisions based on the information resulting through the work of IAs *(International Collaboration in Energy Technology*, 8). As an example of this, the Energy Technology Systems Analysis Program (ETSAP) IA developed the MARKAL model which the USDOE is now under official US Congressional direction to use in its analyses (Difiglio). Developed over an almost 20 year time frame, MARKAL "is a generic model tailored by the input data to represent the evolution over a period of usually 40 to 50 years of a specific energy system at the national, regional, state or province, or community level." The ETSAP IA reports users of the MARKAL family of models are in 37 countries at 77 institutions (*ETSAP: MARKAL).* ETSAP also holds modeling workshops in emerging economies, allowing knowledge transfer to these countries, while ETSAP is then able to gain access to data for that country (Pottinger).

63. An example concerning research dissemination stems from the Wind IA. A study on the impact of rotating turbines on birds, a public image concern for the industry was conducted by a Wind IA CP. This study found that birds in fact flew around the turbines and this research was shared through the IA.

64. These are just a few examples of how the IA framework has fostered effective collaboration. In review, IAs have exhibited effective collaboration in regards to:

- Technology development and deployment.
- Modelling systems development and deployment.
- Impact studies on key issues in energy sectors.

3.6 Capacity building and technology transfer to create absorptive capacities to address global challenges through multilateral STI co-operation

65. USDOE IA participants frequently noted that technology and knowledge transfer occurs within IAs through Tasks in meetings and other types of exchanges, both in-person and virtual. To share information with the general public and beyond the IA, a number of methods are employed. These include conferences, various methods at the national level including email alerts on the progress of IAs, distribution of reports and numerous other manners.

66. As IAs are not aid agencies and are knowledge based, they must "take advantage of the multiplier effect...each person must bring knowledge or expertise to the table." In example, a South African government expert noted that participating in as many IAs as possible would be advantageous, but the issue would be resources, as they could not always bring something to the table and there would be no return, as sufficient research was not being conducted in many areas (Pottinger).

67. The CTI, ETSAP, and Energy Technology Data Exchange (ETDE) IAs are exceptions to this framework as their focus is on technology and knowledge transfer to developing countries (Pottinger). Similarly, The DSM IA is less typical as it has a developing country, India, as a CP. After joining this IA, India proposed an energy efficiency branding project which became Annex 20. The Annex Participants, including the US, are sharing information from their experiences in similar work with India. The US is participating in this Task and will be providing funding and a country expert for this project (Mansueti).

68. The ETSAP IA is focused on creating and renovating an energy technology model. By holding modeling workshops in emerging economies, this IA "allows each country to become independent and knowledgeable" while gaining access to data for that country (Pottinger).

69. To sum section 3.6:

- The majority of IAs do not directly engage in technology transfer to developing countries.
- The CTI, ETSAP, and ETDE IAs are key examples of IAs that do conduct knowledge transfer to developing countries in the course of their work.
- The DSM IA is an example of a developing country (India) reaching out to an IA to conduct a specific work program (energy efficiency branding).

4. Summary and conclusions

4.1 Implications and lessons for governance that can be learned from the overall history

70. Originally designed to be government-led initiatives, IAs have grown to include a diverse array of participants. That the IA structure has been able to adapt and respond to these and other needs is a key lesson to be learned from its history. By responding to these requests coming from outside (i.e., G8 declarations) or from within, the IA framework has been able to address challenges facing policy makers and the energy industry alike.

71. A key advantage of IAs is the potential for governments and industry stakeholders to work together towards a common goal. While industry maintains more short-term oriented goals, government is more focused on long-term oriented goals, i.e., "increasing the knowledge base". Further, IAs provide a non-competitive environment for industry to collaborate. In two IAs there is nearly 50/50 government/industry representation (Pottinger).

72. Article 65 of the IEP Agreement set the framework for a flexible platform of multilateral collaboration for only those countries interested in participating in a particular energy technology research initiative. IAs follow this useful route in also delineating from the IA as a whole to more directed programs of work (Tasks) that, again, include only those wishing to be involved. In short, the autonomy afforded participants in multilateral collaboration through the IA framework appears to have fostered a flexible structure that adapts well to the specific needs of a given work program.

4.2 Implications/lessons for governance learned from the findings of the analysis, elements of governance that are assessed as crucial for success or failure, effectiveness and efficiency

73. Multilateral collaboration is benefited by efficient growth in project selection. The oversight mechanisms associated with IAs and the extent to which they can ensure efficient growth will be a benefit to effective multilateral collaboration. At the IEA Secretariat, through five-year reviews of IAs and required reports from IAs, this is conducted. At the IA level, as the ECBCS IA has demonstrated, an ExCo that is "unforgiving" in its reviews of Task work is a useful evaluation mechanism (Karney).

74. The structure of meeting twice per year is found by the vast majority of interviewees to be well balanced. To meet more often would for many interviewees be prohibitive. Meetings of the ExCo can serve purposes beyond conducting IA business. As IAs have demonstrated, these can also be used to highlight a specific country, awarding the responsibility of hosting an ExCo meeting to a new member or in the city of a concurrent conference in the industry relevant to the IA. Site visits connected to ExCo meetings have proved a useful implement in encouraging collegiality among participants and demonstrating successful implementation of a new or advanced technology.

75. To address questions between ExCo meetings, exchanges over the web, including email voting, online message boards, or other media can be used to fill gaps without overcrowding the busy schedules of IA participants with face-to-face meetings. Using technology to address time gaps in agenda and priority can reduce response times. However, the primary challenge to this (in the case of live video conference, for instance) remains the time difference. Some IAs have CPs spread across more than ten time zones. One potential avenue to circumvent this is to make use of message and discussion boards for collaborative activities that could allow a continuing live discussion stream despite time differences.

76. The effectiveness of the ExCo and the IA can be reduced when there is not continuity in ExCo representatives. Continuity helps to create solid networks among participants that are beneficial to multilateral collaboration within and without the IA. To some extent this is a by-product of having IA participants that have challenging, full-time work schedules and numerous commitments to their home

institution. Priority-setting at a national level can help to address this, and ensure continuity among IA ExCo Representatives. The benefits of continuity are manifold. First, networks are created and fostered, spanning new government administrations at the national level and providing more permanent points of contact for participants.

77. At the USDOE, IA participants repeatedly noted in an evaluation the difficulties they have had in securing travel funding and authorisation to attend ExCo meetings and other related activities. Research has suggested that the problems encountered by IA participants in this respect may result from "communication barriers" between project and upper level managers, particularly in regards to "an insufficient level of understanding of the benefits of IA-related activities on the part of upper level managers" (Evans 2008, 11).

78. A challenge commonly noted by IA participants is the dissemination of IA activities and findings. Success in this respect has been found through holding and participating in conferences. One potential solution to this could be working within the existing structures at the IEA Secretariat to promote IA activities, including through the IEA OPEN Energy Technology Bulletin (Difiglio). A communication plan, in addition to, or as part of a SP, could also be a useful implement at the IA level to assist in the coordination and promotion of IA activities and events. NTs can be a useful implement in disseminating information by coordinating the efforts of all national actors in the IA. This helps to share information from the IA (centre) to stakeholders outside the IA (periphery).

79. Additionally, as SolarPACES has demonstrated, conferences may even become a valuable source of funding. Given that IAs are in contact with the leading experts in their respective fields, they are in a position of privilege to conduct high-level technical conferences that deal with technologies and policies of the most current nature. This could also serve as a valuable communication, knowledge exchange, and promotional tool. Another possibility to increase IA visibility is to request of IA Participants to include their IA affiliation in their presentations at conferences and other venues or to make presentations in their region on behalf of the IA (Lightner).

4.3 Lessons to be learned with regards to mechanisms that successfully address the technology gap

80. Only some IAs engage in technology transfer to developing countries and developing country entities. As the IA Framework in general has no net-takers, addressing the technology gap is not always a direct focus.

4.4 Additional information and final considerations, suggestions for further case studies as appropriate

81. To better review the contribution of IAs to narrowing the technology gap, a case study of the CTI, ETSAP and/or ETDE IAs would be warranted. The ETDE IA, "a storehouse of energy technology research papers" collects all national research documents of the current 15 members. Each member gains access to the research documents from the other MCs. ETDE also gives free access to 87 non-MCs in "an effort to build capacity in developing countries" (Pottinger). The CTI IA and ETSAP IA also engage in knowledge transfer to developing countries and the CTI in particular and its cooperation with the UNFCCC could present a useful case study.

82. In review, the key take-away points from this section of the case study are:

- **The utility of the IA framework:** while interviewees noted challenges to collaboration, none questioned the value of the Implementing Agreement framework (this is echoed by the USDOE study conducted by Evans).

- **Autonomy:** afforded by the Implementing Agreement framework, and at the Implementing Agreement level by the Task framework fosters a flexible framework between participants that have chosen to participate in a specific energy technology research initiative.

- **Thorough evaluation:** of proposed work plans, projects, and budgets contributes to meaningful, efficient and sustainable growth.

- **Communication between meetings:** adopting web-based options to address arising questions without increasing the number of face-to-face meetings reduces response time without burdening participants with the need to travel to more face-to-face meetings.

- **Priority setting at the national level:** affects the quality of the Implementing Agreement. This is important to ensure, inter alia, continuity in Executive Committee Representatives, quality financial commitments, and quality in-kind contributions.

- **Fostering both political and practical connections:** key to creating enduring co-operative relationships that continue despite changes in government administrations at the federal level. Stable, long term networks, reduced membership turnover and continuity among Executive Committee Representatives is key in this respect and is linked to priority setting at the national level.

- **Dissemination of results:** this is a challenge oft-noted by interviewees, and is often a by-product of Participants also having demanding, full-time positions. This presents an important challenge in terms of knowledge transfer to the broader public.

83. The variety of issues addressed through IAs and the flexibility afforded IAs to conduct their work has led to an adaptive framework. To better understand in detail how IAs operate, a case study of the IEA Bioenergy IA (IEA Bioenergy) follows. Originally signed as the IEA Forestry Energy IA in 1978 (it was renamed IEA Bioenergy in 1986 when municipal waste was included in the work of the Agreement), IEA Bioenergy has more than 20 CPs, including IEA non-MCs that engage in both cost and task sharing to conduct their work programs. A dedicated Secretariat with a paid Secretary and Technical Coordinator administer the IA. Industry also participates in the work. Work programs (Tasks) are organised under Annexes. As of October 2010, the Bioenergy IA is operating 12 Annexes. IEA Bioenergy cooperates with other organisations on its work and its more than 30-year history, along with the previously mentioned aspects of its work make it an interesting IA for the purposes of this review.

IEA BIOENERGY CASE STUDY

1. Introduction and brief description of the case

84. IEA Bioenergy is focused on "overcoming the environmental, institutional, technological, social, and market barriers to the near- and long-term deployment of bioenergy technologies" (*End of Term Report 2004-2009*, 3*)*. As of September 2010, biomass supplies roughly 50EJl globally, representing 10% of annual worldwide energy consumption. Most of this is traditional biomass, used for heating and cooking (Tustin).

85. Bioenergy is defined by IEA Bioenergy as material "directly or indirectly produced by photosynthesis and which is utilised as a feedstock in the manufacture of fuels and substitutes for petrochemical and other energy products." Organic waste from forestry and agricultural crops and municipal solid waste are included in the collaborative research. Additionally, IEA Bioenergy undertakes cross-cutting studies on: techno-economic aspects, environmental and economic sustainability, systems analysis, bioenergy trade, fuel standards, greenhouse gas balances, barriers to deployment, and management decision support systems.

86. The work of IEA Bioenergy is directed by the ExCo, which acts as the board of directors for IEA Bioenergy. A Chairman and Vice Chairman are appointed by the ExCo annually. The Secretariat of IEA Bioenergy is based in Rotorua, New Zealand. At the Secretariat, fund administration for the ExCo Secretariat Fund (SF) as well as Task funds takes place, along with the production of ExCo publications, including the annual report, newsletter and website maintenance (Tustin).

87. The ExCo also produces "technical and policy-support documents, workshops, and study tours for the Member Country participants." In addition, it "scrutinises and approves" the work programmes, progress reports, and accounts of the IEA Bioenergy Tasks. The budgets for the ExCo SF and Tasks are approved annually by the ExCo (Tustin). All budgets are in US dollars and all funding is handled by one office. The ExCo unanimously voted in July 2009 to extend the work of IEA Bioenergy until December 2014 (*End of Term Report 2004-2009*, 3*)*.

88. IEA Bioenergy Contracting Parties (CPs) are governments, international organisations, or parties designated by their governments that have chosen to take part in the work of IEA Bioenergy. Each CP must designate one member and one alternate member to serve on the ExCo in the case that the member is unable to attend. Currently, 23 countries and the European Commission (EC) participate in IEA Bioenergy. Each of these 24 Members has one vote in the ExCo. Meetings of the IEA Bioenergy ExCo are held semiannually and the duty of hosting these meetings is rotated among the CPs (Tustin interview). A table of CPs as of September 2010 is provided below (*IEA Bioenergy 2009 Annual Report*, 6, Tustin).

Table 1.1

Country	Contracting Party
Australia	Rural Industries Research and Development Corporation
Austria	The Republic of Austria
Belgium	The Government of Belgium
Brazil	The National Department of Energy Development of the Ministry of Mines and Energy
Canada	Natural Resources Canada
Croatia	The Energy Institute 'Hrvoje Pozar'
Denmark	The Ministry of Transport and Energy, Danish Energy Authority
n/a	The European Commission
Finland	Tekes, Finnish Funding Agency for Technology and Innovation
France	L'Agence de l'Environnement et de la Maîtrise de l'Énergie (ADEME)
Germany	Federal Ministry of Food, Agriculture and Consumer Protection
Ireland	The Sustainable Energy Authority of Ireland
Italy	Gestore dei Servizi Energetici (GSE)
Japan	The New Energy and Industrial Technology Development Organization (NEDO)
Korea	Ministry of Knowledge Economy
The Netherlands	NL Agency
New Zealand	The New Zealand Forest Research Institute Limited
Norway	The Research Council of Norway
South Africa	South African National Energy Research Institute (SANERI)
Sweden	Swedish Energy Agency
Switzerland	The Swiss Federal Office of Energy
Turkey	Tubitak Marmara Research Center Energy Institute
United Kingdom	Department of Energy and Climate Change
United States	Department of Energy

2. Establishment and historical development

2.1 Main context conditions when IEA Bioenergy was formed

89. On 28 June 1977, the IEA Governing Board (GB) approved IEA Bioenergy as a "special activity under Article 65 of the I.E.P. Agreement." The Agency "recognised the establishment of the Programme

as an important component of international co-operation in the field of biomass conversion research and development" (*IEA Bioenergy IA text*, 6).

90. At the time of its founding, IEA Bioenergy was "one of the few mechanisms that facilitated collaboration between the bioenergy R&D community in North America (USA and Canada) and their European counterparts." This factor was a "very strong driver" of the IEA Bioenergy Agreement, as the opportunity was "enormously attractive to both sides" (Tustin).

91. When the Agreement began in 1978, the main focus areas were cooperative research, development, demonstrations, and information exchanges on bioenergy, particularly the coordination of MC national R&D programmes. The driving forces were concerns of energy supply security and the "need for the Member Countries to become less dependent on imported fossil fuels (oil and coal)" (Tustin).

2.2 Main objectives and mission statement and the evolution of these

92. IEA Bioenergy has "evolved from predominately information exchange to facilitating commercialisation and deployment of bioenergy technologies worldwide." Currently, there is "a strong emphasis on providing independent and objective advice to policy makers and stronger involvement with industry and other stakeholders" (Tustin). IEA Bioenergy has vision, mission, and strategic statements which guide their operations. They are listed below in that order.

- *To achieve a substantial bioenergy contribution to future global energy demands by accelerating the production and use of environmentally sound, socially accepted and cost-competitive bioenergy on a sustainable basis, thus providing increased security of supply whilst reducing greenhouse gas emissions from energy use.*

- *To facilitate the commercialisation and market deployment of environmentally sound, socially acceptable, and cost-competitive bioenergy systems and technologies, and to advise policy and industrial decision makers accordingly.*

- *To provide platforms for international collaboration and information exchange in bioenergy research, development, demonstration, and policy analysis. This includes the development of networks, dissemination of information, and provision of science-based technology analysis, as well as support and advice to policy makers, involvement of industry, and encouragement of membership by countries with a strong bioenergy infrastructure and appropriate policies.*

93. In 1995, IEA Bioenergy published its first Strategic Plan (SP) which was envisioned as a "living document" that would be amended "to reflect the changing needs and aspirations of IEA Bioenergy and its Members." The 2003-2009 SP emphasised "market deployment of technologies for sustainable energy production from biomass." The drivers of the most recent plan (2010-2016) include issues related to energy supply and governance. On the latter part, it was noted that the strategic role of IEA Bioenergy needs to be increased to support the development of energy policy. It was also noted that there is a "need to enhance the support of IEA bodies in promoting their global energy and environment strategy" (Tustin).

94. The 2010-2016 SP "continues to emphasise the strong technology platforms and networks but in addition signals a more strategic and proactive approach to the provision of policy advice, bioenergy deployment, and effective communication." At the May 2009 ExCo meeting, it was agreed that priorities included issues of sustainability, the impact of bioenergy on land use change, R&D needs and priorities for various emerging bioenergy technologies, the evaluation of new potential crops and conversion technologies, and issues related to the "practical implementation of bioenergy systems" (*End of Term Report, 2004-2009*, 3). This SP includes the following drivers:

- Greater emphasis on energy supply security by MCs and the need to reduce fossil fuel dependence.
- Greater emphasis on GHG mitigation through the utilisation of bioenergy technologies by MCs.
- The need to develop sustainable and non-food biomass resources for use in bioenergy applications that are both environmentally sound and socially acceptable.
- The need for development and deployment of new or improved bioenergy technologies on a large-scale, to increase the strategic role of IEA Bioenergy and support the development of energy policy, and to support IEA bodies in their promotion of the IEA global energy and environment strategy.

2.3 Main milestones

95. Between 2004 and 2009, membership increased, adding new members South Africa and Germany. Korea and Turkey also recently joined. Three new Tasks were also created in this same period, "Sustainable International Bioenergy Trade – Securing Supply and Demand" (Task 40), "Bioenergy Systems Analysis" (Task 41), and Biorefineries: Co-production of Fuels, Chemicals, Power and Materials from Biomass (Task 42) (Tustin).

96. In January 2007, the ExCo created a new position, that of Technical Coordinator (TC). The need for this position arose from "the rapidly increasing requests from IEA headquarters and also the need to provide a coordinating mechanism between the Tasks and the ExCo and a link between Tasks for projects where more than one Task was contributing" (Tustin). The need to assist the Chairman "in answering external requests" also led to the creation of this position (*End of Term Report 2004-2009,* 5*)*.

97. The TC reports to the ExCo Chair. The outcome expected from this appointment is "a significant improvement in the development and momentum of policy-relevant outputs from the Tasks." The TC will also produce an overall communication plan. Following an ExCo meeting at IEA headquarters in May 2006, information sharing, networking, outreach, and specific project collaboration "intensified." The TC facilitated this intensification (*End of Term Report 2004-2009*, 28). Agreement was also reached on the need for a communication plan, a focus on sustainability, the publication of appropriate technology briefs, and collaboration on projects of mutual interest (Tustin).

98. The position of TC is benefited by a solid understanding of the bioenergy industry (to effectively foster inter-Task cooperation and keep up with the work of bioenergy). Additionally, the TC should be able to network with Task Participants effectively and have a good relationship with the Participants. The first TC (Adam Brown) had a PhD in chemistry, had worked in the renewable energy industry, and was a former UK ExCo Representative and a former chair of IEA Bioenergy. As such, he had a close association with the Agreement and from a technical standpoint was able to keep up with the Tasks. The current TC (Arthur Wellinger) has worked in renewable energy for most of his life and is a former TL (Tustin).

99. Many of the changes to IEA Bioenergy were triggered by internal aspects. However, "ongoing interaction" with IEA headquarters and a wider range of stakeholders, who provided constructive input, also contributed to the development and evolution of IEA Bioenergy. These stakeholders include CPs from each country, industry from each country, then researchers and demonstration people in each country, then people who are going to use the technologies—energy consumers. These stakeholders operate in a type of hierarchy in order listed (Tustin).

2.4 The contribution of IEA Bioenergy to a solution for global challenges, the extent to which it coordinates with other initiatives, and how it considers other global challenges in its work

100. As noted in the 2010-2016 SP, IEA Bioenergy has made increasing interactions with other global, multilateral energy and environmental programmes an objective. The coordination of IEA Bioenergy with other bodies is ongoing and in some cases has expanded considerably. Existing networks are collaborating in the areas of technology development and demonstration and communication.

101. Other global challenges have a close link with the deployment of bioenergy. As an example, to the extent that bioenergy can provide GHG savings along with other environmental benefits, while positively contributing to energy security, and improving trade balances, the management of resources and wastes, and provide opportunities for economic and social development within rural communities, it can address other global challenges. Depending on the form of deployment, gender balance, education, and increased economic activity are all potential benefits (Tustin).

102. However, the sustainable production of bioenergy "is under review due to undue competition for scarce land and water resources" (*Energy Technology Initiatives*, 64). A report on the future of bioenergy published by IEA Bioenergy (Bauen, et al. 2009, 14, 22) notes that given "the complexity of the sustainability issue, future policy making and the development of standards will need to focus on integrated approaches, in which the complex interactions with aspects such as land use, agriculture and forestry, and social development are taken into account."

103. The potential that bioenergy has to contribute to global energy supply must be balanced with the ways it must be employed to ensure other problems are not exacerbated – these challenges further illustrate the utility of a Bioenergy IA to research these related issues. IEA Bioenergy has collaborated with our relevant groups (i.e., the FAO) to address these questions. This collaboration will be addressed in greater detail at a later section.

3. Governance dimensions, description, analysis and assessment

3.1 Partnerships, stakeholder involvement and co-operation relationships, outreach

3.1.1 How partnership has evolved over time

104. At the time of the founding IEA Bioenergy in 1978, there were four MCs (Canada, Ireland, Sweden and the US; Belgium attended the first ExCo meeting but did not sign then). New Zealand and Austria joined in 1978 and in 1979 Norway, Denmark, and Belgium joined. This has grown to include 23 countries and the EC as of 2010. Though the Agreement itself represents collaboration between the governments of the MCs, the CPs are from government departments, research laboratories, and industry organisations (Tustin).

105. The proposed activities and structure of IEA Bioenergy is laid out in its IA text. The operations of IEA Bioenergy are governed by the IA Text and Annex documents. Most of the work of IEA Bioenergy is carried out through "Tasks" which have carefully defined objectives, budgets, and time frames. Each of the Participants shares the costs of managing the Tasks and providing in-kind contributions to support the funding of national personnel participating in the Task work. IEA Bioenergy as a whole or one of its particular Tasks may hold meetings to address business, conduct workshops or expert meetings, or other activities. In each task, a Task Leader (TL) manages the activities and is responsible to an Operating Agent (OA), the OA being an ExCo Member from the same country as the TL (Tustin). For the 2010-2012

period, IEA Bioenergy has a total of 12 Tasks,[5] with each Task lasting three years (*Our Work: Tasks)*. As of September 2010, the range of participation by country is one to twelve tasks; average participation is approximately five tasks (Tustin).

106. As Article 10 of the IEA Bioenergy IA text states, admission of new CPs occurs by unanimous ExCo decision. New participants in Tasks must also be confirmed at the ExCo level. A CP may be replaced by another party designated by the same government, with the new CP assuming the rights and obligations of the prior Party. Any CP can withdraw from IEA Bioenergy by giving 12 months written notice to the Executive Director of the IEA with the unanimous approval of the ExCo (Tustin).

107. Article 10 of the IEA Bioenergy IA text also states that CPs (excluding governments and international organisations) must notify the ExCo of any "significant change in its status or ownership, or of its becoming bankrupt or entering into liquidation." Based on this, the ExCo may decide to terminate the participation of the CP (this requires a unanimous decision). A CP that has not fulfilled its obligations may also be removed through unanimous ExCo decision. Article 11 provides for Sponsor participation. Acting by unanimity, the ExCo may submit to the CERT approval for sponsor participation. The CERT may condition its approval, and if conditions are provided, the ExCo will either adopt the conditions, or choose not to invite the Sponsor.

108. Industry has become increasingly involved to a significant degree through a "wide variety of mechanisms" that IEA Bioenergy offers. This includes the representatives and companies that are nominated as 'National Team Leaders'. Industry also participates in the Task work, seminars and workshops, technical sessions at conferences, study tours, site visits and industry days. A strong "element of outreach to industrial stakeholders" exists (*End of Term Report 2004-2009*, 29).

109. A type of "hierarchy" exists among IEA Bioenergy stakeholders. This hierarchy starts with CPs from each IEA Bioenergy MC, then industry from each IEA Bioenergy MC, then researchers and demonstration people in each IEA Bioenergy MC, and then energy consumers—the people that will use the technologies (Tustin).

3.1.2 Involvement of government and non-government actors, linkages to other multilateral science and technology/political organisations

110. Participation in IEA Bioenergy is open to government and non-government actors alike. IEA Bioenergy maintains connections to those organisations that share a mission common to the work of IEA Bioenergy. At an Annex level, further connections are fostered. As an example, Annex 29 (Socio-economic Drivers in Implementing Bioenergy Projects) has linkages "with complementary FAO, IEA, EU and World Bank projects and programmes" (*IEA Bioenergy ExCo 65 Annex Documents for 2010-2012,* 7).

111. Cited as the best example of collaboration (Tustin), the EC is a CP to the IA and functions as would any member country (MC). Another example is a memorandum of understanding (MOU) signed with the United Nations Food and Agricultural Organization (FAO) in 2000. In 2004, a successful meeting between the ExCo and the FAO occurred in Rome, and reviewed initiatives undertaken and explored how to intensify the collaboration. The FAO collaborates with three IEA Bioenergy Tasks focusing on forest

5 Tasks for the 2010-2012 period are: 29: Socio-economic Drivers in Implementing Bioenergy Projects; 32: Biomass Combustion and Co-firing; 33: Thermal Gasification of Biomass; 34: Pyrolysis of Biomass; 36: Integrating Energy Recovery into Solid Waste Management Systems; 37: Energy from Biogas; 38: Greenhouse Gas Balances of Biomass and Bioenergy Systems; 39: Commercialising Liquid Biofuels from Biomass; 40: Sustainable International Bioenergy Trade: Securing Supply and Demand; 41, Project 3: Collaboration with AMF; 42: Biorefineries: Co-production of Fuels, Chemicals, Power and Materials from Biomass; 43: Biomass Feedstocks for Energy Markets.

biomass as a feedstock, sustainable international bioenergy trade, and biomass production from sustainable forestry (*End of Term Report 2004-2009*, 19-22). A recent very significant output from this collaboration was the book titled 'Criteria and indicators for sustainable woodfuel' (FAO, 2010).

112. IEA Bioenergy also collaborates with other IAs with work plans germane to its work, including the Renewable Energy Technology Development IA with which it is working on a project called "Better Use of Biomass for Energy." Through this collaboration, IEA Bioenergy contributes major in-kind support (technical information from current reports, particularly the Bioenergy Technology Review and co-financing). At the 63rd ExCo meeting, the decision was made to initiate discussions with the Global Bioenergy Partnership (GBEP) regarding the possibility of working together on information exchange, joint events and other joint projects (*End of Term Report 2004-2009*, 20).

3.1.3 Relationships between members and non-members where these exist

113. In terms of IEA Membership, three non-MCs participate in the work of IEA Bioenergy: Brazil, Croatia, and South Africa. Apart from this, in order to communicate the work and results of IEA Bioenergy, publications reach non-members, and IA CPs attend conferences and other related events, thereby fostering relationships between non-Members (Grabowksi). Non-governmental organisations (NGOs) also participate in the work of IEA Bioenergy. As an example of this, Task 40 (Sustainable International Bioenergy Trade: Securing Supply and Demand) includes NGOs in its work to contribute "to the development of sustainable bioenergy markets" (*IEA Bioenergy 2009 Annual Report*, 73*).*

3.1.4 Role of different actors

114. The IEA Bioenergy IA text provides the framework for collaboration among actors, stating that CPs shall "co-operate in co-ordinating the work of the various Tasks and shall endeavour, on the basis of an appropriate sharing of burdens and benefits, to encourage co-operation among Participants engaged in the Tasks" to advance "the research and development activities of all Contracting Parties in the field of bioenergy." Each CP "shall implement the Programme by undertaking one or more tasks...each of which will be open to participation by two or more Contracting Parties." Those CPs who participate in a Task are referred to as "Participants."

115. Individuals and groups may become involved in IEA Bioenergy in various ways. The formal ways to become involved are: at the ExCo/CP level, the Task level, and the national network level through the National TLs in the Tasks. Informally, involvement may occur through various IEA Bioenergy workshops, conferences, industry days, websites, newsletters and other mechanisms. Each Annex is binding only upon the Participants and the OA, and will not affect the rights or obligations of other CPs within IEA Bioenergy (Tustin).

3.1.5 Strengths, weaknesses, threats and opportunities of partnerships and stakeholder involvement

116. As noted in the 2010-2016 SP, the opportunities for research are to exchange information on and find opportunities for collaborative R&D. For industry the opportunities are to be kept abreast of technological progress and new projects, to collaborate on database development, handbooks or models and to be early participants in RD&D work. For policy and decision makers the opportunities are to gain an international perspective on progress in bioenergy and compile guidelines and standards along with policy support and strategies; for the private sector the opportunities are to identify and assist with the removal of "technical and non-technical barriers to accelerated deployment" (*Strategic Plan 2010-2016*, 7).

117. As an example of the objectives accomplished through partnerships and stakeholder involvement, Task 40 (Sustainable International Bioenergy Trade: Securing Supply and Demand) has FAO collaborators as "key authors of the Task deliverable on sustainability criteria and certification systems." National TLs

from IEA Bioenergy (from Germany and the Netherlands) were also "heavily involved" with the FAO on its biomass and food security project. The output of this was an analytical framework "to calculate the effect of policy decisions on the food security of a country." This analytical framework will be field-tested in Peru, Thailand, and Tanzania and results will form key case studies (*End of Term Report 2004-2009*, 22).

118. In 2005, Task 40 co-organised a workshop with the Energy and Poverty Thematic Group of the World Bank and IEA Bioenergy 29 during the Annual Energy Week of the World Bank. Through this, participation from developing country representatives "that might directly benefit from the work of these Tasks" was facilitated. The work of IEA Bioenergy was also presented in several forums in 2009, including to German NGOs at a meeting in Bonn, the Heinrich Boell Stiftung and European Climate Forum in Berlin, the Global Environmental Fund meeting in New Delhi, and the 14th European Biomass Conference in Paris. These are some examples of the outreach conducted by IEA Bioenergy (*End of Term Report 2004-2009*, 22).

119. An identified strength is the "good working relationship" IEA Bioenergy has with the Editor of the IEA OPEN Energy Technology Bulletin. IEA Bioenergy has also "been supportive of the NEET initiative, with representatives attending and presenting at NEET events. To improve the work of partnerships within IEA Bioenergy, changes have been made to address its structure. As an example of this, the change was made to organise the work of IEA Bioenergy "in a larger number of Tasks, each with very focused objectives." Through close communication with the IEA Secretariat, IEA Bioenergy has been able to adapt its work plan to reflect other needs, for example, sustainability (*End of Term Report 2004-2009*, 27-28).

120. In summary, the key points on partnership and stakeholder involvement are:

- Participation in IEA Bioenergy has expanded from 4 in 1977 to 24 as of October 2010.
- Three IEA non-MCs participate in the work of IEA Bioenergy.
- Participants include governments, international organisations, NGOs, research institutions, and other entities.

3.2 Agenda and priority setting

3.2.1Mechanisms to define agenda and priorities for STI co-operation

121. In terms of governance dimensions, all decisions related to the admission of new members and financial elements must be unanimous among the ExCo. The ExCo meets semiannually and through its decisions guides the Agreement. The ExCo makes all decisions affecting IEA Bioenergy as a whole, whereas participants at the Task level make or participate in making the decisions affecting these aspects of the Agreement.

122. The ExCo and meetings at the Task level are the primary mechanisms in place to define the IEA Bioenergy agenda and priorities. The ExCo plans for the future, appoints persons to undertake the work and approves the budget. Additionally, through its Members, the ExCo raises the funds for the programmes of IEA Bioenergy and to administer IEA Bioenergy. The ExCo acts as a management board and runs the Agreement (Tustin).

123. Tasks make decisions concerning their activities, and the rules for Task decision making are laid out in both the IEA Bioenergy IA text and Annex documents. Annex documents detail for each Annex: Definitions and objectives, scope of the Task, responsibilities of Participants, Task Leader, Associate

Leader, and National TLs, means, OA responsibilities, results, time schedule, funding, OA, and Participants. Technology and knowledge transfer mechanisms are also laid out in these documents and include workshops, seminars, website presentations, country and progress reports, along with various other implements appropriate for the work program at hand.

124. The SP is the highest level at which the direction of the Agreement (in five year increments) is set. A strategic workshop which occurs at each provides input to this on a continuing basis. Since 2004, the ExCo has increased the time for strategic subjects at its meetings, including one day strategic workshops mentioned above. At these workshops, external experts are invited to "share their knowledge of a key topic with the Members" (Tustin). Additionally, the creation of a strategic fund provides "flexibility and resources for new projects." At the Task level, priorities and directions are set for each program. The first SP of IEA Bioenergy was published in 1995. A 'living document', the SP can be amended to reflect any changes in the objectives and/or needs of IEA Bioenergy and its Members (*End of Term Report 2004-2009*, 3).

3.2.2 The IEA Bioenergy policy cycle and mechanisms for adjusting priorities over time and in response to emerging situations

125. Each IA is subject to a five year review of its accomplishments and determine whether it should continue (Scott, *IEA History Volume 2*, 281). They may be dissolved at the request of IA CPs, or in extreme situations of mismanagement at the behest of the IEA (to date this has not occurred). The IA is responsible for presenting the IEA with detailed reports reviewing the activities of the IA and its progress and results. During this review process, IAs are "rated according to a set of qualitative criteria (Pottinger).

126. From the perspective of IEA Bioenergy, the policy cycle is largely focused around the three yearly Task cycle and the semi-annual ExCo meetings. As stated in the IEA Bioenergy IA text, the ExCo adopts annually, acting by unanimity, "the Programme of Work and Budget for each Task, together with an indicative programme of work and budget for the following two years". The ExCo may make adjustments within this framework of the Programme of Work and Budget as required. Every three years the ExCo has a fresh look at the Task structure and calls for new proposals. At this point the old Tasks may continue and new Tasks commence.

127. An IEA representative and a representative of each OA may attend ExCo and subsidiary body meetings in an advisory capacity. Special meetings are convened upon CP request when the need is demonstrated. Quorum in ExCo meetings is defined as one-half of the Members plus one. Additionally, decisions may occur between ExCo meetings, through a written procedure which is organised by the Secretary. Typically, there are two or three instances of such written procedures each year (Tustin).

3.2.3 How priority setting works and how diverging interests are dealt with

128. The systems used by IEA Bioenergy have worked well overall. Should any two MCs wish to begin a new Task, they may pursue doing so through the ExCo. Most decisions are made by majority vote (excluding new membership and funding). Thus far, diverging interests have not been a problem — normally, they are accommodated (Tustin).

3.2.4 and 3.2.5 Participants in priority setting and the level at which priorities are set

129. The highest level at which priority setting takes place is at the ExCo. This includes all CPs. At the Task/Annex level, all Task Participants take part in priority setting (Tustin).

3.2.6 Turning priority setting into practice: impact on financing and staff assignment

130. Priority setting is turned into practice in IEA Bioenergy. Should the ExCo identify a priority action it provides the resources to bring the action to fruition. For example, strategic funds would be mobilised and/or action would be taken at the Task level. At the ExCo level, there are only two paid staff (the Secretary and the TC) (Tustin).

3.2.7 Ex-post evaluation of priority setting within and without the institution

131. The work of IEA Bioenergy is evaluated regularly by the IEA CERT and the REWP, and reported to the GB. IAs are reviewed by the IEA every five years, at which time major reports must be presented. Additionally, IAs must provide progress reports annually. The work of IEA Bioenergy Tasks is "reviewed continuously and formally" at each meeting of the ExCo, after which a status report is sent to the REWP (Tustin).

3.2.8 Strengths, weaknesses, threats and opportunities of current modes of agenda/priority setting

132. A strength of the current modes of agenda and priority setting is that the membership of the ExCo is "relatively stable." Members are experienced individuals from MCs that have "learnt to work productively as a team." From a leadership perspective, strong Chairs have stayed in the position for periods of at least two to three years. This has resulted in consistent policies "and only gradual evolution", allowing the strengths of the Agreement to be added to rather than being lost. Similarly, the Secretary position has tended to be "very stable", thereby assisting with "corporate memory and good knowledge of what works best" (Tustin).

133. A successful element of outreach the ExCo has engaged in is to invite Task OAs to report on the Task twice a year at ExCo meetings. The ExCo has continued a policy of inviting some TLs to each ExCo meeting so that they can make this presentation personally. This has shown to improve communication between the ExCo and the various Tasks (Tustin).

134. To summarise section 3.2,

- IEA Bioenergy carries out its work through specific programmes called Tasks.
- IEA Bioenergy is subject to five-year IEA Secretariat reviews to determine whether the IA will be extended and must submit annual reports of its progress to the IEA Secretariat.
- The ExCo is the highest level at which agenda and priority setting occurs. ExCo meetings occur semi-annually. A quorum is defined as one-half of the Members plus one.
- Agenda and priority setting also occurs at the Task level. The rules for Task decision making are laid out in both the IEA Bioenergy IA text and Annex documents.
- Admission of new Member Countries and annual budget decisions require unanimous consent from the ExCo.
- The SP is a "living document" that is produced approximately every five years.
- IEA Bioenergy has two paid staff, the Secretary and the TC.
- Stable membership and leadership is a strength of IEA Bioenergy.

3.3 Funding and spending arrangements

3.3.1 Stakeholder budget contribution: amounts, trends, institutional and project-based financing

135. Over time, the trend has been for the budget to increase. In 1998 the total IEA Bioenergy budget was USD 1,044,080; in 2010, the budget is USD 2,153,659 (Tustin). As stated in the IEA Bioenergy IA text (Article 6), the ExCo decides (acting by unanimity) the "size of the common fund and the apportionment of contributions" from each CP. At present each CP pays a fixed component ($6,700) and a variable component ($1,000) for each Task participation into the SF per year. In addition they pay an agreed amount for each Task participation into the Task Funds. Both funds are managed by the Secretariat. The Tasks funds are distributed as they are received. Each CP bears all costs it incurs in participating in the Agreement, including costs of travel and work connected with the Task programmes it participates in. 2009 contributions are illustrated below (*End of Term Report, 2004-2009*, 11).

Table 3.3.1: Budget for 2009 by Member Country (USD)

Member country	Total ExCo funds	Total Task funds	Total Funds
Australia	11 700	76 800	88 500
Austria	14 700	108 500	123 200
Belgium	9 700	41 500	51 200
Brazil	8 700	29 300	38 000
Canada	16 700	138 620	155 320
Croatia	8 700	26 000	34 700
Denmark	12 700	82 000	94 700
Finland	14 700	118 500	133 200
France	9 700	41 820	51 520
Germany	16 700	146 320	163 020
Ireland	9 700	40 500	50 200
Italy	12 700	82 120	94 820
Japan	9 700	43 000	52 700
Netherlands	15 700	126 620	142 320
New Zealand	8 700	26 800	35 500
Norway	12 700	85 320	98 020
South Africa	7 700	16 000	23 700
Sweden	15 700	128 120	143 820
Switzerland	9 700	39 000	48 700
UK	14 700	113 620	128 320
USA	13 700	106 300	120 000
European Commission	13 700	97 820	111 520
Total	**268 400**	**1 714 580**	**1 982 980**

136. Any income that accrues from a particular Task will be credited to the budget of that Task but it is unusual for Tasks to generate income. The accounting system used by the Task is based on ExCo guidelines The Task must maintain complete and separate financial records that clearly account for all funds and property that come into the custody or possession of the Task. Task accounts are audited each year and the accounts are submitted for ExCo approval (Tustin).

137. The Task has no obligation to commence activities until at least 50% of the cash due has been received. Each Participant has the right "to audit the accounts of any work in a Task for which common funds are maintained" at its own cost, in accordance with stipulations outlined in the IEA Bioenergy IA text (13).

138. In order to preserve tax-exempt status in the country of the IEA Bioenergy Secretariat, several rules are in place regarding finances. No income or other IEA Bioenergy funds may be made "available for the use of private pecuniary profit of any proprietor, member or shareholder." In the event of the

conclusion of IEA Bioenergy, surplus funds would be transferred to a tax exempt organisation with similar goals (*IEA Bioenergy IA text*, 15).

3.3.2 Funding sources, the extent to which a conditionality is linked to funding and the impact of this on priority setting

139. Table 3.3.1 above illustrates the funding sources of IEA Bioenergy. CPs must make a contribution to the SF and join at least one Task, and most Tasks require an annual financial contribution. For those with annual contributions, the 2009 budgets ranged from USD 55,119 (with each participant contributing USD 18,373), to USD 240,000 (each participant contributed USD 16,000). Task funds totaled USD 1,769,699 in 2009. Overall CP contributions ranged from USD 23,700 (South Africa) to USD 181,393 (Germany) (*IEA Bioenergy 2009 Annual Report*, 11*).* Task budgets are approved annually by the ExCo and Tasks last for three years, with extension possible upon agreement of the ExCo (Tustin).

140. The TL and OA manage the detailed expenditures of the Tasks with the agreement of Task Participants. Audited Task financial accounts "are vetted and approved" annually by the ExCo (Tustin).

3.3.3 and 3.3.4 Dynamism and responsiveness of funding and spending arrangements, matching spending to prioritisation and turning financial commitments into actual availability of funds

141. Financial commitments are turned into actual availability of funds, and dynamism and responsiveness of spending arrangements have not presented a problem (Tustin). IEA Bioenergy has a strategic fund, amounting to 10% of Task funds which may be directed to arising strategic pursuits.

3.3.5 The timeframe of funding agreements

142. The IEA Bioenergy financial year is 1 January to 31 December. In January, invoices are sent and payments received over the next six month period. Task funds are distributed to Tasks as they are received. On one occasion, a MCs membership was terminated on account of non-payment, though it "subsequently paid the outstanding funds and rejoined. CPs belonging to only one or two Tasks and that have "less than robust" national RD&D programmes are generally seen as the riskiest MCs in regards to default on contributions. It is vital that contributions are received in a timely manner as Task work relies on these funds (Tustin).

3.3.6 and 3.3.7 Mechanisms for resource spending and decision makers, mechanisms and instruments for monitoring and evaluation

143. The overall IEA Bioenergy budget is managed by the ExCo, including decisions on the Task funds. The funds of each Task are managed by the TL with oversight from the OA and Task Participants. The SF is managed by the Secretary on behalf of the ExCo. The SF financial accounts are audited by KPMG annually (Tustin). The variety of reports due and presentations made at ExCo meetings and at IEA headquarters serve as mechanisms and instruments for monitoring and evaluation.

3.3.8 Strengths, weaknesses, threats and opportunities of funding and spending arrangements

144. The existing mechanisms in regards to funding, accountability and audit are defined as "robust." Through ExCo guidelines for Task accounts, a professional approach is ensured. This current system is an evolution from the history of IEA Bioenergy. Slow payment submission by a few MCs represents a small problem (Tustin).

145. The willingness of CPs to provide "supportive levels of funding" for Tasks and the Secretariat alike has resulted in total funding for 2010 of USD 2,153,659. That the fund is operated using a single

currency, the US dollar, has proven to be helpful. This was not always the case, and prior to the adoption of this framework, "things got very complicated." Each financial year, funds at the ExCo and Task level are professionally audited (Tustin).

146. To summarise the key points of section 3.3:

- The trend over time has been for the IEA Bioenergy budget to increase.
- Each CP bears all costs it incurs in the implementation of the Agreement, including the cost of travel to meetings (Task and ExCo), and work connected with the Tasks it participates in.
- Each Task has a formally approved annual budget (CF) for its activities.
- IEA Bioenergy has a strategic fund, amounting to 10% of Tasks funds, which may be directed to arising strategic pursuits.
- Accounts are professionally audited annually.
- Slow payment of contributions by CPs represents a small problem.
- Operating the IA in a single currency (the US dollar) has proved helpful.

3.4 Institutional and access arrangements

3.4.1 and 3.4.2 The institutional arrangements to prepare and take decisions, how institutional and access arrangements work

147. IEA Bioenergy, though formed under the auspices of the IEA, is not a legal part of the IEA. IEA Bioenergy is an independent organisation, and decisions are taken at the highest level by the ExCo. Decisions on membership and finance are made by unanimity, while all other decisions are made by majority. Comprehensive minutes for each ExCo meeting are kept and are widely available and transparent (Tustin). By participating in the IEA IA Framework, IEA Bioenergy is still able to benefit from the network of the IEA and visibility of the IEA in both attracting membership and sharing its results.

148. The role of industry in Task work is vital to facilitating knowledge and technology transfer. Industry takes the results of the collaboration and incorporates it in its laboratories and factories in the home country, facilitating knowledge diffusion. National TLs (particularly as they relate to industry) also play a vital role. It is the role of National TLs to share information from national programs with other Participants and at the same time to diffuse the results of IEA Bioenergy within their country. Therefore, the quality of the work of National TLs plays an important role in determining the benefit a country will gain from its participation in IEA Bioenergy (Tustin).

149. Each Annex must prepare a report on its progress for the ExCo at six month intervals (Tustin). Normally, Annexes will conduct two business meetings per year along with technical workshops that take place in a range of small groups up to major conferences. Each year, "a large number of seminars and workshops are arranged" by Tasks. This has proven to be a very effective exchange mechanism between stakeholders (*End of Term report 2004-2009*, 11).

3.4.3 and 3.4.4 Provisions to support full-range stakeholder participation, stakeholders involved in the internal governance structures, mechanisms to address knowledge and benefit sharing

150. The wide range of stakeholders in IEA Bioenergy are represented by the CPs and ExCo Members. At the Task level, they are also represented by TLs, and National TLs. At the Task level,

outreach to appropriate organisations and initiatives is also pursued. Several different mechanisms are used to conduct knowledge and benefit sharing, from conferences to online exchanges (Tustin).

3.4.5 Accountability mechanisms, who they involve and how they work

151. CPs are "accountable to their respective governments who have decided to join the IA." From the Task perspective, the OA and TL must report to the ExCo at six month intervals, usually in person at ExCo meetings. At the IEA level, the work of IEA Bioenergy is evaluated regularly by the CERT via the REWP, and reports made to the GB (Tustin).

152. Article 10 of the IEA Bioenergy IA text states that CPs (excluding governments and international organisations) must notify the ExCo of any "significant change in its status or ownership, or of its becoming bankrupt or entering into liquidation." Based on this information, the ExCo may decide to terminate the participation of the CP (this must be done by a unanimous vote). Similarly, a CP that has not fulfilled its obligations may be removed by the ExCo through unanimous decision. Article 10 is a valuable mechanism in an overall effort of maintaining quality of Members.

3.4.6 Strengths, weaknesses, threats and opportunities of institutional and access arrangements

153. A noted strength is that the "current ExCo does not support uncontrolled growth in membership from countries which will not bring (add) genuine benefits to the work programme." The current ExCo is "conscious of 'freeloading' on the national programmes of the major players, i.e. when CPs are 'net takers' from the Agreement and only join a very minimum number of Tasks." It "is felt that this effort could be severely diluted if there was an influx of emerging countries which have considerably less to contribute and only join one or two Tasks" (Tustin).

154. Currently, the ExCo is working to improve and "significantly" expand the work of IEA Bioenergy on strategic policy issues, to include "increased publication of position papers and other material." These activities have required increased financial contributions on the behalf of CPs to the ExCo SF. Financial decisions require unanimous decision on behalf of the ExCo and the possibility exists that small MCs "may veto such decisions and thereby paralyse the new direction the ExCo has decided to take." Considering this is vital, as it could result in reduced benefit and major players in IEA Bioenergy may then make the decision to terminate their involvement which "would be the end of the IA in its present form and strength." The resulting policy of only admitting countries "with a strong RD&D programme and bioenergy implementation strategy" is brought about by these issues (Tustin).

155. However, Bioenergy is "strongly in favour of sharing information and outreach to countries which are still developing their national bioenergy programmes" and hopes to "evolve to a structure which enables it to welcome emerging countries so they can learn from" its work. It is because countries with high research, development and demonstration (RD&D) capacities contribute to its work that IEA Bioenergy is able to make stronger contributions to these countries and other entities at an earlier stage in their bioenergy programmes. These high-capacity countries "participate in IEA Bioenergy because they benefit from other leading countries developing 'cutting edge' knowledge." Therefore, "it is in the interest of all parties that IEA Bioenergy remains a high quality IA, being able to attract the most advanced countries and experts to its programme" (Tustin).

156. In summary of section 3.4:

- National TLs have a vital role of sharing information from national programs with other Participants and to diffuse the results of IEA Bioenergy within their country.
- Each Task must prepare a report on its progress for the ExCo at six month intervals.

- At the IEA Secretariat level, the work of IEA Bioenergy is evaluated by the CERT via the REWP, and reports made to the GB.
- The ExCo may decide to terminate the participation of a CP through unanimous decision.
- IEA Bioenergy is very concerned with maintaining the quality of its membership and notes a related strength: "the current ExCo does not support uncontrolled growth in membership from countries which will not bring (add) genuine benefits to the work programme."

3.5 Putting research into practice

3.5.1 Mechanisms to detect and determine demand and solution requirements, reach out to potential users, and engage product/solution developers

157. By engaging a wide number of participants in Tasks that branch across governmental departments, research institutions, universities, and industry, a network is created that facilitates technology transfer. This is a key mechanism of technology transfer for IEA Bioenergy. Meetings, workshops, online exchanges and numerous other media and events arranged by Tasks contribute to a useful exchange with stakeholders (*IEA Bioenergy 2009 Annual Report*).

158. As an example of this, at the October 2009 meeting of the IEA Bioenergy ExCo in Liege, Belgium, a workshop entitled "Algae – The Future for Bioenergy?" was held in conjunction with this 64th ExCo meeting. Conducted with the purpose of informing the ExCo "of the potential for using algae for energy purposes by stimulating a discussion with experts working both within and outside the Agreement," the workshop sought "to assess the current state-of-the-art, to consider the potential in the medium and long term, and to identify the major research and commercialisation challenges." The TC had the lead role in organising this workshop (*Algae – The Future for Bioenergy?).*

159. Additionally, active participation in, and sponsorship of, major conferences has been identified as "one of the best mechanisms for increasing the profile of IEA Bioenergy" and its work (Tustin).

3.5.2 Is a supply and demand balance achieved to generate an accessible, affordable and useful product?

160. The entirety of IEA Bioenergy is focused on achieving the deployment of bioenergy technologies worldwide and on a large scale. The first objective of the 2010-2016 IEA Bioenergy SP is to "promote the market deployment of technologies and systems for sustainable energy production from biomass." To achieve this objective, actions are centered on identifying and characterising priorities, technologies that are ready for market deployment, appropriate RD&D strategies for these technologies, and investigating "technical and non-technical barriers to the market deployment" of these technologies. Actions for other objectives include continually adjusting Task work programs to respond to industrial needs, and to promote industrial cooperation (Tustin).

3.5.3 Special budgets to translate science and technology into practice, products or policy advice

161. Activities related to the translation of science and technology into practice, products or policy advice are "woven into the current budgets." Technology is typically handled at the Task level, while policy advice is addressed at the ExCo level. There are special budgets to allow for translating science and technology into practice, products or policy advice – they are the budgets developed for a Task or Annex.

3.5.4 Strengths, weaknesses, threats and opportunities of existing transfer mechanisms

162. IEA Bioenergy addresses technology transfer through its Task work, publications, the conferences in which it participates, online exchanges, and other mechanisms. The transfer mechanisms of IEA Bioenergy are supported by the role of the TC, who is able to dedicate his work to ensuring that knowledge and technology transfer occurs effectively. Communication of IA activities and results was noted as significant challenge in the first part of this case study. That this challenge has not surfaced in this part may be a testament to the utility of the TC post, particularly as it relates to knowledge and technology transfer.

163. To review section 3.5,

- Workshops and focused conference sessions are important tools used to determine stakeholder needs and to resolve any issues.
- To achieve the deployment of bioenergy technologies, actions are centered on identifying and characterising priorities, technologies that are ready for market deployment, appropriate RD&D strategies for these technologies, and barriers to market deployment.
- Technology is typically handled at the Task level, while policy advice is addressed at the ExCo level.
- IEA Bioenergy addresses technology transfer through its Task work, publications, the conferences in which it participates, online exchanges, and other mechanisms.
- The TC plays a key role in coordinating effective knowledge transfer.

3.6 Capacity building and technology transfer to create absorptive capacities to address global challenges through multilateral STI co-operation

3.6.1 Special programmes carried out to assist the build-up of capacities

164. The structure of IEA Bioenergy, like that of many IAs, is not one based primarily on aid administration. The extent to which IEA Bioenergy engages in capacity building is a type of organic growth, resulting from the actions of IEA Bioenergy rather than being an intended consequence. To that end, IEA Bioenergy collaborates with the FAO, the World Bank and other entities. IEA Bioenergy hopes to develop a system whereby countries less advanced in their bioenergy programmes may participate in the IA (Tustin).

3.6.2 Mechanisms used for technology transfer

165. Through IEA Bioenergy Updates, provided to the Biomass and Bioenergy Journal, news from the ExCo, Task progress overviews, Task technology reports, and short articles from MCs are provided. In the IEA Bioenergy annual report, a report from the ExCo, and detailed Task progress reports are presented. Key information including Task participation, CPs, contact information and budget tables along with a list of the publications are made available (*End of Term Report 2004-2009*, 23). As noted in the 2010-2016 SP (5), technology transfer through industry will occur "through focused reports, case studies, industry days, seminar and workshops, and the internet."

166. IEA Bioenergy has a feature on its website whereby members of the general public can pose questions to IEA Bioenergy CPs, who respond free of charge. Currently, about 170 inquiries are received annually and responded to by the IEA Bioenergy Secretary where possible and appropriate Task Leaders where necessary (*End of Term Report 2004-2009*, 24).

3.6.3 and 3.6.4 Focus areas for capacity building and technology transfer

167. The Task programmes are the focus area for technology transfer, along with the publications and conferences of IEA Bioenergy. However, no special arrangements for capacity building for IEA Bioenergy CP countries exist. As there are no "net-takers" from IEA Bioenergy, no special arrangements exist for this type of support (Tustin).

3.6.5 The IEA Bioenergy IPR regime

168. IEA Bioenergy has an extensive and detailed IPR framework in its IA text. This states that the OA "shall hold, for the benefit of the Participants, the legal title to all property rights which may accrue to or be acquired for the Task" (Article 4b (2)). As stated in Article 7b of the IEA Bioenergy IA text:

> *Publication, distribution, handling, protection and ownership of information and intellectual property provided under or arising from the Programme, shall be determined by the Executive Committee, acting by unanimity, in conformity with this Agreement and the laws of the countries of the Contracting Parties and Operating Agent. The Contracting Parties favour the widest possible dissemination of information provided to, exchanged or arising under the Programme, subject to the need to protect proprietary information.*

169. In the case of Annex activities, each Participant will "hold the copyrights for its own work" (Article 7c). Each CP and OA is responsible for identifying which information is proprietary and ensuring it is appropriately marked. In regards to proprietary information, the OA and CPs shall "take all necessary measures in accordance with this Article, the laws of their respective countries, and international law to protect proprietary information" (Article 7e). This is important, as IEA MCs are encouraged by the OA to make available all information relevant to the Task that may be confidential (Article 7h):

> *Such information shall be communicated to the Operating Agent at no cost in accordance with an agreement between the Operating Agent and the specific Participant setting forth the terms and conditions for such acceptance; but the confidential information shall not become part of reports, handbooks or other documentation, nor be communicated to the other Participants except as may be agreed in writing between the Operating Agent and the Participant which supplied such information.*

170. Article 7i notes the responsibility of the OA to promptly identify arising proprietary information and report to the ExCo on arising information in regards to inventions along with a recommendation regarding the countries in which patents should be filed. Then, acting by unanimity, the ExCo will determine the plan for patent application. Patents that are obtained will then be owned by the OA, who will "hold the patent in trust for and for the benefit of the Participants." Article 7p address technology transfer:

> *Participants in each Annex shall be entitled without charge to have access to, to reproduce and, in accordance with the rules determined by the Executive Committee, to distribute to nationals of its country, the information and reports produced by the Operating Agent of that Annex. The Executive Committee may lay down guidance as to the use any Participant may make of the information and, where appropriate, the charges to be imposed, and may establish guidelines to determine what constitutes a "national".*

171. In general, the Task OA has the responsibility of deciding IP issues relating to the Task. The OA would have to keep the ExCo informed of these decisions. In practice, very few problems regarding IP have been encountered over the years (Tustin). Tustin was unable to point out a specific reason for this. It would seem that one potential explanation would be that since the duty of determining the IPR framework

lies with the Annex itself, the resulting IPR guidelines are well-tailored to the needs of the specific program or that there are better mechanisms for addressing IPR problems that surface in the course of the collaboration. The fact that in Annex activities, each Participant will holds the copyrights for its own work is also likely a key implement in this respect.

3.6.6 How IEA Bioenergy approaches developed–developing country concerns

172. As IEA Bioenergy "is a collaboration for developed countries with significant bioenergy RD&D infrastructure and appropriate policies" this question is not relevant. However, the ExCo is "concerned with outreach to developing countries" (Tustin).

3.6.7 Strengths, weaknesses, threats, opportunities of capacity building and technology transfer

173. The structure of IEA Bioenergy is not one based primarily on aid administration, so aspects of capacity building and technology transfer are for the time being relevant only as they relate to transfer to IEA Bioenergy members. Tasks and Annexes are the focus area for technology transfer, along with the publications and conferences of IEA Bioenergy. Tasks focus on very specific subjects, avoiding complications that may arise from a broader, less focused work plan.

174. IEA Bioenergy has an extensive and detailed IPR regime that is detailed in its IA text. While other IAs cited IPR issues as a challenge to collaboration, IEA Bioenergy did not. This is likely due to some specific aspects of the IEA Bioenergy IPR regime. First, the Task OA typically has the responsibility of deciding IP issues relating to the Task. This autonomy likely fosters an adaptive framework that better addresses IPR issues in a given research project. Also, that each Annex Participant holds the copyrights to their own work is likely also a key aspect of what appears to be a successful IPR framework.

4. Summary and conclusions

4.1 Implications/lessons for governance that can be learned from the overall history of IEA Bioenergy, its milestones, mission and objectives etc.

175. Given that IEA Bioenergy has been active for 32 years, it has "considerable experience in dealing with Contracting Parties and it knows what works well and where problems can arise." This experience plays a role in the success of IEA Bioenergy today and has created a framework that has attracted quality participation. The strength of IEA Bioenergy membership is a key advantage: through the CPs, a "relatively stable and active" ExCo and Secretariat has been in place. The "cutting edge" work of IEA Bioenergy also attracts quality participation. CPs have also "ensured satisfactory funding for the programmes to be robust and able to tackle the priority projects with good success" (Tustin).

4.2 Implications/lessons for governance that can be learned from the findings of the analysis of the governance dimensions, key elements of governance

176. Continuity has proved valuable in IEA Bioenergy, particularly in leadership positions (Chair and OA). To foster communication, IEA Bioenergy has also invited Task OAs/TLs to present the Task at the semi-annual ExCo meetings, something which has shown to improve communication between the IEA Bioenergy ExCo and its various Tasks. National TLs play a vital role in linking IA activities with entities in their home countries.

177. IEA Bioenergy has developed several strategy-related tools to its benefit. Specifically, a strategic fund, a "living" SP, and the reservation of time at each ExCo meeting for items of a strategic nature. From a funding perspective, the ability to adjust quickly to changes in policy and technology is benefited by a strategic fund. The fund totals 10% of the Task funds, and can be dedicated where necessary. The potential

value of this is very high, not requiring participants to re-work existing, fine-tuned finance structures, but rather having to simply approve new spending from a dedicated strategic fund. Similarly, a "living" SP allows swift responses to arising shifts in the strategic course and the inclusion of new strategic issues. At the Task level, the "continuous adjustment" to respond to industrial needs and promote industrial cooperation also allows for responsive flexibility (Tustin).

178. The autonomy afforded the Tasks/Annexes of IEA Bioenergy allows work programs to be adjusted to fit specific needs. The variety of individuals that play a role in technology transfer, coordination and so on help to share the burden of the work. Additionally, some Annexes have both Administrative and Technological leaders. This separation is useful as it allows each leader to focus exclusively on one aspect of the Task at hand.

179. Another key development is the creation of the TC position. The TC is a person with expertise in the field of bioenergy and a good rapport with IA Participants who acts as a connector between the Tasks of IEA Bioenergy and works to ensure effective knowledge transfer.

4.3 Lessons to be learned with regards to addressing the technology gap

180. IEA Bioenergy makes a strong effort to communicate the benefits of its work to countries with less advanced bioenergy programmes. Outreach activities occur at both the ExCo and Task levels. At the ExCo level there is a well-developed suite of reports produced on an annual or biannual cycle, *viz.* Annual Reports, Status Reports, Newsletters, Updates, plus regular contributions to IEAHQ's projects and publications. The latter includes participation in the NEET initiative, contributions to the OPEN Energy Technology Bulletin, and preparation of ETE Briefs. The Tasks make a major effort to reach their stakeholders through a variety of mechanisms. Examples are Task 32 with its effort in China and its international workshops; and Task 40 with its very active, worldwide programme of meetings, workshops, and conference presentations. The global availability of IEA Bioenergy work is facilitated through the IEA Bioenergy website and the Task websites.

4.4 Additional information and final considerations, including suggestions for further case studies

181. To better review the collaboration of IEA Bioenergy with other groups, a brief case study on Annex 40 would be useful, as this Annex is one that engages in a significant amount of collaboration with outside organisations.

182. Many aspects have contributed to the success of IEA Bioenergy. The key lessons from the IEA Bioenergy case study are as follows:

- **Effective communication within and outside the IA:** a Technical Coordinator can be a useful catalyst to facilitate internal and external communication, by providing a staff position dedicated to this pursuit. National Team Leaders are also important, working to coordinate efforts from their country in the IA and spreading the results of the work of IEA Bioenergy among the stakeholders in their country.

- **Strategic implementation:** creating a Strategic Fund equal to 10% of the Task funds and a "living" Strategic Plan allow for a framework that can adapt to changing needs.

- **Flexibility in respect to IPR:** Allowing Tasks to formulate IPR framework allows for a more tailored structure.

- **Maintaining quality membership:** this fosters more effective collaboration, ensuring there are no "net-takers" and ensuring that the stimulation from 'cutting edge' colleagues is maintained.

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