Independent Review of Asia-Pacific Partnership Flagship Projects

Prepared for the Department of Resources, Energy and Tourism on behalf of the Asia-Pacific Partnership on Clean Development and Climate (APP)

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Finally we wish to acknowledge that this report represents the views of a cross section of the private and public sector. The contributions were given with a generous spirit, as many of the Flagship Project Managers and stakeholders recognise that we have an urgent need to accelerate investment and deployment of technology to address climate change, and that improved knowledge sharing, new partnerships, and collaborations are vital. We hope the strategic actions recommended in this report can help to better connect the key stakeholders and achieve the aims of the APP.

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1. Background and Introduction

1.1 Background

The Asia-Pacific Partnership on Clean Development and Climate (***APP***) aims to accelerate the deployment and development of clean energy technologies within the Asia-Pacific region. The APP brings together the countries of Australia, Canada, China, India, Japan, the Republic of Korea (***Korea***) and the United States of America to voluntarily address issues relating to:

- climate change mitigation;
- energy security;
- air pollution;
- economic development; and
- the reduction of poverty.

This grouping of Partner Countries currently represents around half of the world's total energy use, gross domestic product (***GDP***), population and greenhouse gas emissions.

Within the APP structure, 8 public-private sector Task Forces have been established to focus on 3 energy supply sectors (cleaner fossil energy, renewable energy and distribution generation, power generation and transmission) and 5 energy intensive sectors (aluminium, buildings and appliances, cement, coal mining and steel).

During the 7th APP Policy and Implementation Committee (***PIC***) meeting in late May 2009, PIC members endorsed an Australian proposal to undertake an independent review of the achievements of the Flagship Projects as an indicator of the effectiveness of the APP's current Flagship Project portfolio. The Australian Steering Committee, comprising executives from the Department of Resources, Energy and Tourism (***DRET***), the Department of Climate Change and the Department of the Environment, Water, Heritage and the Arts have overseen the review on behalf of the Australian APP Secretariat.

1.2 Introduction

This Independent Report (***Report***) has been prepared for the Australian Government as represented by the APP Secretariat within DRET, by WSP Environmental Pty Ltd and their associates Baker & McKenzie and Clean Technology Australasia Pty Ltd. The Report presents the results, conclusions and recommendations drawn from an independent review of the progress, results and effectiveness of the APP's existing portfolio of Flagship Projects.

The existing portfolio of 20 Flagship Projects has been determined on the basis that the projects and associated activities collectively exemplify the vision and the objectives of the APP. The portfolio therefore includes a full range of actions intended by the APP, including:

- technology research and development;
- pilot projects;
- demonstration and deployment activities;
- skills enhancement; and
- best practice dissemination.

The Flagship Projects reviewed are listed in Appendix 1. The Report provides a detailed and robust review of each existing Flagship Project, and includes an examination of the current and potential successes of all Flagship Projects. The Report further documents (in Section 3) a list of key findings and recommendations for the PIC, having fully examined the relationships between the APP, its 8 Task Forces, and the project participants involved in developing, undertaking and delivering Flagship Projects.

The report also identifies and examines several key issues relating to the existing portfolio of Flagship Projects and also the APP as a whole, including:

- the Flagship Projects, and their successes and contribution to the APP vision (sub-section 4.1);
- APP structural and strategic issues (subsection 4.2);
- APP networks and capacity building (sub-section 4.3);
- barriers to success (sub-section 4.4);
- financing Flagship Projects under the APP (sub-section 4.5); and
- scale and deployment (sub-section 4.6).

The Report has given thorough consideration to the evolution of the APP, the Task Forces and Flagship Project roster, and the broader economic, political, regulatory and social objectives of the APP.

2. Methodology

2.1 Project Engagement

The Report has been commissioned by the Australian Government as represented by the Australian APP Secretariat within DRET. The contract has been administered in association with the requirements set out within the RFT RET 08/090025 “APP Flagship Review”.

2.2 Project Objective

The objective of the review undertaken for the purposes of this Report has been to examine the progress, results and effectiveness of the APP’s current portfolio of Flagship Projects. The analysis provides both a qualitative and quantitative assessment of each Flagship Project, as well as of the APP as a whole. The review provides recommendations to the PIC with respect to opportunities to improve the future success of the APP and its Flagship Projects.

2.3 Scope and Methodology

A. Initial Project Engagement

Positive engagement with key stakeholders was fundamental to the successful preparation of the Report. Initial discussions were undertaken with key stakeholders including representatives and project management from DRET as well as representatives from each of the 8 Flagship Task Forces. Details obtained through initial project discussion included:

- key APP Task Force contacts;
- relevant Task Force Chairs, Co-Chairs and Secretariats;
- project management, project locations and Partner Countries; and
- additional project stakeholders.

B. Desk Top Review

This task aimed to gain a baseline understanding of each Flagship Project and considered how success metrics would be applied. In addition, the project assessment team tailored each project meeting/site visit in order to optimise its ability to obtain relevant project information and provide an accurate assessment of the project status in accordance with the specific project objectives. Information was provided by the representatives of Task Forces for each Flagship Project in relation to:

- project description;
- registration;

- status updates;
- reporting and monitoring; and
- evaluations of each Flagship Project.

C. Evaluation Criteria / Project Metrics

As outlined in sub-section 2.2 the review provides both a quantitative and qualitative measurement of the Flagship Projects.

D. Quantitative Data

Where available, quantifiable metrics were examined for each Flagship Project and included:

- **Greenhouse gas emissions data**: actual or expected greenhouse gas emissions reductions from each Flagship Project including each project site and an overall project total.
- **Energy usage data**: actual or expected energy efficiency improvements and reductions in energy usage from each Flagship Project, including each project site and an overall project total.

E. Qualitative Data

In addition to measuring the quantitative success from each Flagship Project, qualitative input was gathered from Flagship Project stakeholders. In excess of 120 survey questionnaires were issued to various project stakeholders, including Task Force Chairs, Co-Chairs, Project Managers, additional project stakeholders and relevant industry associations. Respondent data collected from this survey questionnaire can be viewed at Appendix 3 of this Report.

Stakeholders were asked to provide qualitative responses in reference to the following aspects of each Flagship Project:

- barriers to success;
- clean development outcomes;
- project capacity building;
- ability to replicate the project across Partner Countries;
- ability to scale project;
- ability to attract public/private sector investment; and
- project funding.

F. Project Site Visits

Site inspections and/or stakeholder interviews were undertaken at the project site for all 20 Flagship Projects. The scope of project site visits spanned all 7 Partner Countries, and included:

- initial meetings and discussions with Project Managers;
- physical inspections of the project site;
- Flagship Project proponent interviews;
- additional documentation requests; and
- an invitation to participate in the survey questionnaire as outlined above.

An important element of the preparation of the Report was the holding of meetings and discussions with Project Managers and stakeholders in person. In total, in excess of 80 meetings in person were held across the 20 Flagship Projects (including meetings with all Project Managers). These meetings were supplemented by telephone discussions with an additional 40 stakeholders, where meetings in person were not possible in the context of the preparation of the Report.

G. Flagship Project Reports

Project reports have been completed in respect of each Flagship Project, examining the progress, results and effectiveness of the APP in the context of each Flagship Project. Summary reports include the following relevant project information:

- project overview;
- status;
- project outcomes;
- future potential;
- identified barriers to success; and
- key lessons learnt.

A list of Flagship Projects is included at Appendix 1 to this Report. The projects are referred to throughout the Report by their short titles, included in the list at Appendix 1.

Summary reports for each Flagship Project are included at Appendix 2 to this Report.

3. Key Findings and Recommendations

Review of the Flagship Projects for the purposes of preparing this Report has given rise to a number of key findings in respect of the Flagship Projects and the APP more broadly. These key findings have in turn been used as a basis for developing a set of focused recommendations as to:

- how the strengths and successes of the APP can be maintained and enhanced going forward; and
- how the potential areas for improvement identified in these findings can be addressed, in order to facilitate realisation of the objectives making up the APP's vision.

3.1 Key Findings

The key findings identified in the preparation of this Report are as follows:

(a) **The Flagship Projects have helped the APP to make progress towards achievement of its vision and intended actions**.

The outcomes contributing to the APP vision that are most strongly represented across Flagship Projects are:

(i) creation of an enabling environment for accelerated technology development, deployment and transfer;

(ii) enhanced collaboration between the public and private sectors; and

(iii) contribution to the development and demonstration of technologies with which to reduce greenhouse gas emissions from Task Force sectors.

Each type of intended action set out in the APP Flagship Guidelines is represented in the Flagship Projects reviewed.

(b) **The APP represents an important complement to market-based mechanisms under the Kyoto Protocol**.

Survey data and project reports indicate that Flagship Projects, by focusing on particular technologies and fostering their development, demonstration and/or deployment, have helped to bring a number of innovative clean technologies closer to commercialisation. This complements, but does not compete with or seek to replace, the financial support provided through market-based mechanisms also being used to pursue climate change mitigation and clean energy objectives.

(c) **Flagship Projects have contributed to the development and demonstration of new technologies, but these technologies have yet to be deployed at scale**.

The APP has played a catalytic role in creating and promoting Flagship Projects, many of which have the potential to be replicated and up-scaled. However, a number of Flagship Projects are currently suffering funding shortages, and the existence of a number of other project-specific barriers have to date prevented a more widespread deployment of technologies developed and/or demonstrated in Flagship Projects.

(d) **During the 4 years since its inception, the structures and strategies utilised by the APP have helped it to make progress towards achievement of its vision, including through the implementation of Flagship Projects**.

During this time, the APP has provided a unique opportunity for public-private collaboration, and has been successful in identifying and supporting clean development and climate saving technologies. The APP Task Force model has also been effective in aligning projects and sharing knowledge within the same sector across Partner Countries. In this context, the APP is well-positioned to facilitate both technology commercialisation and economic recovery following the Global Financial Crisis (***GFC***), by combining public and private funding initiatives with industry knowledge and expertise.

(e) **There is scope to increase coordination and communication within and between Task Forces and Flagship Projects**.

Increased coordination and communication could potentially give rise to a number of benefits that may not otherwise be captured, including:

(i) increased knowledge sharing, which would in turn facilitate identification of opportunities to apply technologies in other locations and industries; and

(ii) strengthening of relationship networks between Task Forces, which would in turn facilitate identification of synergies between Task Forces, Flagship Projects and individual stakeholders, and help avoid duplication of work, learning processes and expenditure.

(f) **Flagship Projects would benefit from stronger alignment between Partner Country domestic regulatory and policy measures and the vision of the APP**.

Public-private and international collaborative activities under the APP can be strengthened by domestic regulatory measures and policy initiatives that complement and further the APP's vision and objectives. Such domestic measures can:

(i) help create a “level playing field” for new technologies entering existing markets; and

(ii) promote the development and deployment of new technologies both by directly supporting project activities, and by increasing certainty as to how different activities will be treated, such that project participants and private sector investors can better understand projects risks and benefits.

(g) **Many APP Flagship Projects have been successful in securing private sector involvement and expanding and strengthening both public and private relationship networks**.

This development of networks has in turn:

(i) enabled project participants to share technologies, knowledge and resources in order to promote successful project implementation;

(ii) leveraged private investment into Flagship Projects;

(iii) helped achieve benefits beyond the scope of the original Flagship Project; and

(iv) facilitated broader networking beyond the APP, which should help to accelerate the deployment of new and existing technologies globally.

However, it will be important for the APP to continue its proactive ongoing interaction and collaboration with the private sector and to seek to engage direct involvement from the private finance and investment sector to enhance the prospects of success of APP projects.

(h) **Barriers to effective networking exist within the APP and Flagship Projects**.

In particular, networking in some Flagship Projects has been hampered by:

(i) communication barriers, including simple language barriers between participants from different Partner Countries, and technical barriers where managerial rather than technical staff were involved in projects; and

(ii) participants’ reluctance to share commercially sensitive and proprietary information.

(i) **Although a majority of Flagship Projects reported contributing to the APP's capacity building objectives, capacity building activities may in fact be underrepresented among Flagship Projects**.

Areas for future capacity building were identified in project reports, within both Task Force sectors and other sectors relevant to Flagship Projects. Survey

data indicated that the APP and Flagship Projects would benefit from capacity building amongst financiers, investors and policymakers.

(j) **Some Flagship Projects have helped create an enabling environment to assist in the achievement of development and deployment of clean technologies**.

Flagship Project outcomes included sharing of best practices through workshops, undertaking international site visits to conduct performance diagnoses, development of on-line resources to share technology resources and the production of best practice guides. For the most part, while many of these projects have been focused to date on knowledge sharing and best practices training, they have an important role within industry sectors to help identify commercially viable projects, bring key partners together and attract interest from private sector investors.

(k) **As many clean technologies utilised in Flagship Projects are of an emerging nature, the range and extent of technical impediments to scaling them up may be unknown**.

The technologies involved in demonstration project Flagship Projects can be expected to face significant but initially unknown technical barriers which become apparent only on commissioning of larger facilities or scaling up the technologies involved. There is also a gap between the demonstration plants and the full scale commercial plants required, making replication challenging.

(l) **APP Flagship Projects incorporate technologies at very different stages of technology maturity and scalability potential**.

Major technology breakthroughs are not necessarily required to accelerate the deployment and scale of clean technologies. Surveys and consultations revealed that there are some mature technologies employed within Flagship Projects that could be scaled significantly if they can be adequately financed and/or appropriate investment incentives created for their deployment.

(m) **Technology improvement projects for facilities such as major steel and cement plants and coal mines are generally of significant capital intensity**.

Due to the size of the proposed improvement measures, additional information, such as more detailed, plant-specific feasibility studies are required to evaluate the commercial viability of any investment. More detail on financing options and mechanisms to implement these measures is required in order to make the investment decisions required.

(n) **To fully realise the vision of the APP, significant investment will need to be captured from global capital markets and new avenues of funding channelled from government budgets**.

Attracting more funding to complete existing Flagship Project and to secure new financing for expansion of Flagship Project is a major barrier to achieving the vision of APP. The availability of finance and investment is a key challenge facing the scaling and accelerated deployment of Flagship Project technologies and processes. While significant private capital is now flowing to clean technologies worldwide and many government stimulus packages have a "green economy" component, it is not clear that APP projects are benefitting from these trends.

3.2 Recommendations

Recommendations as to how the APP can maintain and enhance its successes to date, and strengthen the Flagship Projects and broader APP structures and strategies into the future, are set out below.

Several of these recommendations relate to the need for a greater direct involvement from the finance and investment sector in APP projects (both Flagship and non-Flagship), and the development of more innovative and flexible financing mechanisms to scale the deployment of clean technologies being piloted by APP projects. Although other international initiatives are endeavouring to engage the capital markets in financing climate change solutions, the APP can build on its established model to undertake a proactive engagement with the private finance and investment sector to accelerate investment in, and commercialisation of, technologies that address climate change and clean development.

(a) **Establish a Finance and Investment Task Force under the APP**:

It is recommended that a Finance and Investment Task Force (***FIT***) (or similar body) be established under APP. The FIT would have invited representatives from the private finance and investment sector and have Partner Country representation particularly from government departments that have newly established budgets to implement "green economy" initiatives. The FIT would work across all APP Task Forces as well as interact with other international agencies to:

(i) identify current and future financing needs for existing APP projects;

(ii) identify APP projects that are further along the development and deployment stage so as to be attractive to private sector investors;

(iii) identify finance and investment needs for broader clean technology development and deployment needs in Partner Countries;

(iv) establish linkages and create new networks with sources of private finance and investment;

(v) align sources of public finance with government "green economy" initiatives; and

(vi) address and overcome the financial barriers related to the commercialisation and deployment of technologies deployed on APP projects.

The FIT would be the central coordination point between the APP and the finance and investment community, would build on the existing APP public-private collaboration model, and would create a new network of global financiers and investors. Importantly the FIT would be able to add value to existing Task Forces by playing a key coordinating role between Task Forces.

The FIT could also take responsibility for developing and implementing Recommendations (b) and (c), below.

(b) **Undertake a review and identify the specific financing and investment needs of Flagship Projects and all other APP projects to identify those that require funding, and present those projects to potential financiers**:

Many existing Flagship Projects require additional finance to successfully develop and deploy the technologies they utilise. A review of all projects under the APP across all Task Forces could be undertaken to determine:

(i) which projects require additional funding; and/or

(ii) what technology improvements and other steps towards deployment could be financed effectively based on existing outcomes from APP projects.

Each project or technology that requires finance and investment would develop a business/investment case and/or feasibility study suitable to be presented to potential financiers. Key stakeholders from the private finance and investment community would subsequently be engaged to review and potentially fund identified projects.

A possible means of implementing this recommendation is for each Task Force to review all projects and nominate one or several that are the most advanced in terms of commercial prospects and have the most potential to be attractive to private sector investors.

(c) **Conduct a forum under the auspices of the APP showcasing APP projects, technologies and investment opportunities to the finance and investment community**:

It is recommended that an APP Finance and Investment Forum be convened to present APP projects and clean technologies being deployed across Task Force sectors to the global finance and investment community. A range of the most promising, commercially viable technologies and projects would be shortlisted from the range of technologies being deployed on APP projects (possibly as a result of the work carried out in Recommendation (b)) and selected to be presented at the Forum. Technology entrepreneurs and project proponents would present attractive investment opportunities to forum attendees.

A global network of investors including institutional investors, corporate financiers, project financiers, private venture capitalists and development finance institutions would be identified and invited to participate. The forum would also involve Partner Country government departments responsible for delivering "green economy" initiatives, as well as other international agencies, such as the World Bank, Asian Development Bank and PFAN (who are working on funding climate change solutions), showcasing innovative finance and investment instruments being developed to fund clean energy and technology.

The forum would provide a platform for knowledge exchange and commercial interaction and act as the basis for the establishment of an ongoing private and public finance network. The forum could be facilitated by the FIT, as described in Recommendation (a).

(d) **Develop and implement intellectual property management plans for Flagship Projects**:

Flagship Projects should develop plans through which to manage the intellectual property rights contributed to and developed from Flagship Projects. Such intellectual property management plans would:

(i) include mechanisms to recognise and protect the intellectual property contributed by stakeholders to Flagship Projects within the domestic legal systems of the Partner Countries involved; and

(ii) ensure that suitable stakeholders' benefits are generated from the dissemination of intellectual property, in the context of the APP's knowledge sharing and technology transfer objectives.

In so doing, barriers to networking and communication arising from reluctance to share intellectual property and other proprietary information could be overcome, facilitating more effective project implementation and technology development and deployment.

(e) **Increase capacity building initiatives, within both Task Forces and relevant complementary sectors**:

Capacity building should become a point of increased focus for the APP and Flagship Projects, in accordance with the APP's Vision Statement and Flagship Project Guidelines. Future initiatives should seek to build capacity within both Flagship Project participants and Task Force sectors, and other sectors that, although outside the APP, are nonetheless relevant to APP and Flagship Project activities and objectives. Specific areas for future capacity building should include:

(i) initiatives directed at technology developers and providers, to build their capacity to communicate effectively with financiers and investors and develop their investment propositions; and

(ii) initiatives directed at financiers and investors, to increase their understanding of the investment opportunities and potential financial returns offered by technologies and projects developed and implemented under the APP.

These capacity building programs could be implemented in the form of master classes designed and developed specifically for the respective key stakeholder audiences.

(f) **Continue to support projects that contribute to the development of enabling regulatory and policy environments**:

The APP can help Partner Countries leverage the technology benefits and other outcomes achieved by Flagship Projects by continuing to provide APP support for projects that facilitate the development within Partner Countries of domestic regulatory and policy frameworks that:

(i) align with the APP vision and objectives; and

(ii) promote activities that utilise and exploit the technology and other benefits generated by Flagship Projects and the APP more broadly.

(g) **Adopt professional project management practices for all APP projects**:

All APP projects, as represented by the Flagship Projects, would benefit from more rigorous project management, including:

(i) disciplined management of scope, schedule and budget; and

(ii) stricter accountability for any deviation from agreed terms of project execution.

As part of this, quantifiable success metrics that align with the vision of the APP should be adopted for each Flagship Project and all APP projects more broadly and be regularly reported on by the project's management team.

In order for such project management measures to be adopted consistently by proponents, governments would need to lead with the development of administrative conditions for disbursement of funds and/or awards of projects.

It is difficult to gather reliable quantifiable benefit information once a project is relatively advanced, if there has not been rigorous data collection throughout the life of the project.

4. Key Issues

4.1 Flagship Projects

The 20 Flagship Projects reviewed for the purposes of this Report (the projects are listed in Appendix 1) demonstrate both successes to date as well as potential for further success, provided in some cases that particular issues and barriers can be addressed. Many of the Flagship Projects have achieved clearly defined goals that contribute to the broader APP vision, within their respective time and budgetary constraints. A range of quantifiable or otherwise tangible benefits have resulted, including:

- measurable greenhouse gas emission reductions and energy efficiencies;
- work products including studies, reports and handbooks; and
- construction and commissioning of major infrastructure.

A large number of less tangible but equally important benefits have also been achieved, including:

- creation of enabling environments for technology development and deployment;
- building and strengthening of relationship networks; and
- establishment of best practices and processes.

In most cases, replicability of the Flagship Projects and access to private sector networks means that, subject to the availability of finance, successful implementation of the projects could help to create and capture opportunities to deploy particular technologies more widely, both in Partner Countries and more broadly.

Review of the Flagship Projects has, however, revealed a number of barriers and other issues that will need to be addressed if the Flagship Projects are to achieve broader impacts. These barriers include a shortage of public and private sector funding (particularly in the context of the GFC), impediments to communication and information sharing, and the absence of clear and consistent long-term government policies regulating key drivers such as climate change and energy issues. The barriers to Flagship Projects identified in this Report are discussed in detail in sub-section 4.4.

These issues and related considerations are discussed in detail in the remainder of this sub-section 4.1.

A. Flagship Projects and the APP Vision

The Vision Statement of the APP articulates a number of objectives for the Partner Countries in participating in the APP. Broadly, these objectives include:

- the development, deployment and transfer of cleaner, more efficient technologies to meet national pollution reduction, energy security and climate change concerns, consistent with the principles of the UNFCCC;
- creation of an enabling environment for the development, diffusion, deployment and transfer of existing and emerging cost-effective, cleaner technologies and practices;
- the development, diffusion, deployment and transfer of longer-term transformational energy technologies;
- to help build human and institutional capacity to strengthen cooperative efforts; and
- to be consistent with and contribute to efforts under the UNFCCC, and complement but not replace the Kyoto Protocol.

Survey data obtained in the course of preparing this Report indicates that the Flagship Projects have delivered a number of outcomes that advance these objectives and the broader APP vision. Among the outcomes delivered, the most strongly represented in the survey data are (ranked by percentage of positive responses from Flagship Projects surveyed):

- reductions in emissions of carbon dioxide or other greenhouse gases (66.7%);
- creation of an enabling environment for accelerated technology development, deployment and transfer (59.1%);
- education, training, capacity building or knowledge sharing (56.1%);
- enhanced collaboration between Partner Country governments (53.0%);
- establishment of industry best practice procedures and processes (45.5%);
- enhanced public-private collaboration (42.4%); and
- enhanced energy efficiency (39.4%).

These outcomes indicate broad alignment between Flagship Projects, the APP vision and broader international concerns revolving around anthropogenic climate change, clean energy and energy security, and sustainable economic development.

More particularly, these outcomes demonstrate strong parallels with the dual climate change mitigation and sustainable development objectives of the UNFCCC and the Kyoto Protocol, showing the APP and the broader international climate change framework to be valuable complements of one another, in accordance with the APP's vision.

The survey data also demonstrates success in contributing to the development and deployment of new clean and energy efficient technologies, through the creation of enabling environments and successful demonstration of technology applications.

The APP's practical focus on technology development, demonstration and deployment represents an important complement to the market-based mechanisms currently being used to pursue climate change and clean energy objectives. By supporting a range of projects designed to foster specific technologies, the APP has achieved a range of successes in directly facilitating technology development and deployment, as evident in the survey data and project reports. This technology focus helps the APP to complement market-based instruments under the Kyoto Protocol, without competing with or seeking to replace them.

B. Flagship Project Portfolio

The APP Flagship Guidelines state that the portfolio of Flagship Projects designated under the APP should:

- collectively exemplify (i.e. illustrate and demonstrate) the vision and objectives of the APP; and
- include the full range of actions intended by the APP: technology research and development, pilot projects, demonstration and deployment activities, skills enhancement and best practice dissemination.

As mentioned above, the review of 20 Flagship Projects in preparing this Report confirms that the projects are contributing to the objectives comprising the APP vision as set out in its Vision Statement. Progress has been made towards the objectives of reducing greenhouse gas emissions, creating enabling environments for technology development and deployment, and knowledge sharing/capacity building, among others.

The Flagship Projects reviewed also include specific examples of each type of action intended by the APP, as set out below:

- Technology research and development:
    - (i) **Project CMT-07-07** (sub 3) (Hazardous Wastes in Cement Kilns).
    - (ii) **Project CFE-06-06** (Post-Combustion Capture for Coal-Fired Power Stations).
- Pilot projects:
    - (i) **Project RDG-06-01** (High Efficiency Solar Power Stations).
    - (ii) **Project BATF-06-27** (Chinese Green Buildings).
- Demonstration and deployment activities:
    - (i) **Project BATF-07-36** (CFL Quality Management).

(ii) **Project CLM-06-11** (Coal Mine Methane Use and Recovery).

- Skills enhancement:

  (i) **Project ATF-06-02 (**PFC Emissions Management).

  (ii) **Project CMT-06-05** (Cement Centre of Excellence).

- Best practice dissemination:

  (i) **Project STF-06-05** (SOACT Handbook).

  (ii) **Project PGT-06-01** (Power Generation Activity Plan).

These factors suggest that the current portfolio of Flagship Projects is consistent with the objectives and criteria for Flagship Projects set out in the APP Flagship Guidelines.

C. Project Successes

Flagship Projects have for the most part proceeded in accordance with projected timelines and budgets, and achieved a range of successes in their implementation. An array of milestones has been fulfilled, generating a range of beneficial outcomes.

Examples of key project successes include:

- **Project BATF-06-27** (Chinese Green Buildings): The Olympic Village Micro-Energy (Near Zero) Energy Building (***Micro-Energy Building***) was completed in August 2008, in time for the start of the 2008 Olympic Games held in Beijing. The Micro-Energy Building demonstrated the successful use of several green building technologies, and the Beijing Olympic Village (of which the Micro-Energy Building forms a part) received the Leadership in Energy and Environmental Design Gold Award from the United States Green Building Council. The Micro-Energy Building is now in the process of being converted to a kindergarten.

- **Project CFE-06-06** (Post-Combustion Capture for Coal-Fired Power Stations)**:** The Post Combustion Capture (***PCC***) program aims to further the science and the practical application of removal of CO_2 from flue emission of coal-fired power stations. The program has a targeted laboratory research component as well as pilot plant demonstration component with real flue gas conditions that feed into each other with the aim of achieving realistic and cost effective emission control technology by retrofitting existing coal power stations. There has been rapid progress and learning associated with the program over the last 6 months with significant increases in the percentages of CO_2 that can be captured. The application of this technology, once proven, may be applied to any coal-fired power station. Additionally, given the modular nature of the technology, the system can be added in stages. Currently pilot programs are running at the Munmorah power station, NSW and Huaneng power station, Beijing. A further pilot plant is in the design stage at Tarong power station, QLD.

- **Project PGT-06-01** (Power Generation Activity Plan): Development of the Green Handbook Peer Review Document (***Green Handbook***), which provides a framework for the evaluation of the thermal efficiency of coal-fired power plants and has resulted in significant sharing of best practices, the implementation of which has the potential to result in quantifiable greenhouse gas emission reductions and energy efficiency improvements. For example, initial efficiency improvement training and testing has already been completed at 2 Indian State-owned power plants, each of which has achieved greenhouse reductions in the order of 60,000 tonnes of carbon dioxide equivalent per year. Peer Reviews using the Green Handbook have been undertaken in Japan, India, Australia, the USA and Korea and have identified efficiency and emission reduction opportunities in each case, as well as generated high levels of demand for the Green Handbook among participants. Participants have continued to share knowledge and experiences following completion of Peer Reviews, and reviews of Chinese coal-fired power plants are scheduled to be undertaken in 2010.

- **Project STF-06-05** (SOACT Handbook): Version 1.0 of the State of the Art Clean Technology Handbook (***SOACT Handbook***), a comprehensive guide to the best available energy saving and environmental protection technologies and practices in the iron and steel industries, was published in December 2007. The SOACT Handbook seeks to provide industry decision-makers with a comprehensive information resource to guide capital improvement projects, while also creating a "live" clearinghouse to match technology suppliers and end users.

Survey data also suggests that a large proportion of Flagship Projects generate measurable, quantifiable benefits, such as greenhouse gas emission reductions and energy efficiencies. However, only a small number of projects have to date recorded data to measure these benefits.

D. Technology Innovation and Transformational Change

Both survey data and project reports indicate that the successes achieved by Flagship Projects thus far have contributed to the technical and commercial demonstration of innovative technologies, and dissemination of information regarding best available technologies and best practices:

- As mentioned above, 59.1% of survey respondents indicated that their Flagship Projects had created an enabling environment for accelerated technology development, deployment and transfer, while 45.5% had established industry best practice procedures and processes.

- 43.1% of survey respondents either disagreed or strongly disagreed that their technologies required further demonstration to achieve proof of concept, while 40.4% either agreed or strongly agreed that the APP has played a key role in moving technologies beyond demonstration and piloting of projects and catalysing deployment.

- The trialling of green building technologies at the Pararpur Business Centre in India as part of **Project BATF-08-49** (Green Spaces India) has demonstrated that it is technically and commercially viable to construct high performance green buildings far exceeding usual practices and standards, and achieve significant savings in energy use (74.4% reduction) and potable water use (50% reduction).
- Also in India, **Project RDG-06-16** (Renewable Energy Feasibility Study) has demonstrated the potential feasibility of renewable energy alternatives to diesel-fired generation to contribute to the country's rural electrification.

The technology development and demonstration outcomes achieved by the APP represent one of its key strengths, with the potential to generate large-scale economic, environmental and social benefits if the technologies involved can be deployed at scale. Scope for deployment is in turn increased by:

- **The replicability of projects**: 80.9% of survey respondents either agreed or strongly agreed that their Flagship Projects were replicable across sites and Partner Countries, while 74.6% of respondents either agreed or strongly agreed that the success of their Flagship Projects would encourage private sector investment in similar future projects.
- **Involvement of the private sector**: the involvement of the private sector in Flagship Projects creates the potential to deliver and deploy technologies to large national and international corporate groups and networks. For example, a stakeholder in **Project CMT-07-07** (Hazardous Wastes in Cement Kilns) (discussed above) is a subsidiary of one of the world's largest producers and distributors of cement. The potential to scale up and replicate the project through the stakeholder's broader corporate group is reported to be significant, with strong interest from the group in such action.

However, the survey data and project reports also indicate that although the Flagship Projects have contributed to the development and demonstration of innovative technologies, these technologies have yet to be deployed at scale within the Partner Countries (even with APP support):

- the vast majority of survey respondents considered that further funding from both public and private sources is required to accelerate deployment;
- 53.6% of survey respondents indicated that technology-specific barriers will not prevent the economic feasibility of future deployment;
- 46.2% of survey respondents neither agreed nor disagreed that the APP has played a key role in moving technologies beyond demonstration and piloting of projects and catalysing mass deployment, suggesting that the APP has not yet contributed significantly to the deployment of technologies applied in these respondents' projects;
- 87.5% of survey respondents agreed or strongly agreed that a key focus of the APP should be to help industries overcome barriers to accelerating development and deployment of clean technologies; and

- although the Flagship Projects have demonstrated that a number of innovative technologies are ready for the market, they have also demonstrated that in some cases the market uptake will be a staged process.

As an example of this final point, in China, although **Project BATF-06-27** (Chinese Green Buildings) was able to demonstrate the successful use of a number of green building technologies in the Micro-Energy Building within the Beijing Olympic Village, the consultations revealed that the lessons learned from the project will be applied in 2 new developments in southern China. However, at this stage, the application of the green building technologies is not able to be replicated and incorporated into the current practices of the majority of builders or developers.

Similarly, **Project CFE-06-05** (Callide A Oxyfuel Demonstration Project) reported a perception amongst the Australian coal industry, the broader public and political and regulatory circles that new technology is "too hard", and that this perception had presented a barrier to the project.

Scale and deployment are discussed in detail in sub-section 4.6.

These issues suggest that, in order to bring about the transformational change sought in the APP's Vision Statement, it will be important for the APP to:

- take steps to increase public and private funding in order to accelerate deployment of technologies successfully demonstrated in Flagship Projects;
- increase its focus on the identification and removal of barriers to the development and deployment of clean technologies that can help the APP realise the objectives comprising its vision;
- increase market readiness for new and innovative technologies, for example through increased education and information sharing, as well as targeted capacity building initiatives; and
- demonstrate key technologies individually (as well as in concert), such that they can be independently assessed and taken up by the market where viable.

4.2 APP Structure and Strategic Issues

The Review of Flagship Projects suggests that the structures and strategies employed by the APP since its inception in 2005 have helped projects to further the APP's vision. Nonetheless, opportunities for improvement remain, and if captured will enhance the ability of the Flagship Projects and the APP more broadly to realise this vision and the objectives that comprise it.

A. Strengths of the Current APP Structure and Strategy

Survey data broadly supports the current structures and strategies adopted by the APP, and suggests that these structures and strategies are conducive to realisation of the APP's vision (as discussed above):

- 86.5% of survey respondents either agree or strongly agree that the APP provides a unique opportunity for public and private collaboration to accelerate the development, deployment, diffusion and transfer of technology or processes;
- 79.3% of survey respondents either agree or strongly agree that the current structure of the APP has been successful in identifying and supporting clean development and climate saving technologies; and
- 61.6% of survey respondents either agree or strongly agree that the APP Task Force model has been effective in aligning projects and sharing knowledge within the same sector across Partner Countries.

These results are echoed in some of the project stakeholder consultations:

- in **Project STF-06-04** (Steel Plant Performance Diagnosis), Japanese steel makers and the Japan Iron and Steel Federation have worked effectively with the APP's Steel Task Force to build networks throughout the global steel industry (the contribution of the APP to relationship networking is discussed in detail in sub-section 4.3, below);
- in **Project BATF-07-36** (CFL Quality Management), stakeholders highlighted the value and utility of building cooperation and trust among stakeholders across the Asia-Pacific region; and
- a number of the Flagship Projects reported that without APP involvement, the project may not have commenced or proceeded to its current status, or may have been commissioned on a much smaller scale.

The above results suggest that the structures and strategies utilised by the APP to date have successfully enabled the APP to make progress towards achieving its vision, including through the effective implementation of Flagship Projects.

Important features of this success evident from the survey data are:

- **Unique opportunity for public-private collaboration**: Initiatives in which public funding and mandates are teamed with private sector knowledge are important in the current global economic circumstances (shortage of private capital, aversion to higher risk investment opportunities such as those presented by new technologies, use of public stimulus packages to build infrastructure, reinvigorate economies and protect private enterprise). The APP may be well-positioned to drive both technology commercialisation and economic recovery through public-private cooperation. A constant theme in feedback from consultations and the survey indicated that the

benefits offered by the public-private aspects of the APP need to be recognised and enhanced in future.

- **Support for clean development and climate saving technologies**: The importance of the APP's focus on technology development and deployment is discussed extensively in this Report. Specific support for new technologies is a benefit unique to the APP that is not offered through technology-neutral market-based mechanisms. This technology focus distinguishes the APP from other international initiatives addressing energy and climate issues, and helps the APP complement existing market-based regimes that focus more directly on environmental outcomes rather than technology solutions.

B. Opportunities for Improvement

Although the current structures and strategies adopted by the APP are broadly supported in the survey data and project reports, a number of areas for potential improvement can be identified. These encompass issues associated with the Task Force model, communication within and between Task Forces and individual Flagship Projects, and broader Partner Country policy and regulatory issues.

56.8% of survey respondents either agree or strongly agree that APP Task Forces are coordinated with each other in their selection and support of Flagship Projects and sharing of information. However, 41.2% of respondents neither agreed nor disagreed with this position, and a further 48.1% of respondents either agreed or strongly agreed that APP Task Forces should better coordinate with each other in such matters.

This survey data suggests that although the 8 APP Task Forces are already reasonably coordinated in their facilitation of Flagship Projects and knowledge sharing, there is scope to increase coordination between Task Forces. Increased coordination could potentially give rise to a number of additional benefits, including:

- increased sharing of knowledge and other benefits between Task Forces, which would facilitate identification of opportunities for the commercial application of new technologies in other industries;
- strengthening of public and private relationship networks between Task Forces, which would in turn facilitate the identification of potential synergies between Task Forces, Flagship Projects and individual stakeholders; and
- avoidance of unnecessary duplication of work, learning processes and expenditure.

Stakeholder consultations for a number of the Flagship Projects revealed that communication both within and between Task Forces could be improved. Comments received in the course of reviewing the Flagship Projects indicated that:

- the APP is missing value potentially derived from better communication and knowledge transfer within and across Task Forces, and that the current configuration

of the Task Forces and supporting infrastructure does not promote the wider transfer of knowledge and expertise;

- there remains a large and unrealised opportunity to more widely disseminate the findings of the Steel Task Force to date; and
- some projects have been completed somewhat in isolation of national or international networks.

The comments made by Flagship Project stakeholders emphasise that:

- communication within and between Task Forces could be improved (this will be partly a function of improved coordination between Task Forces); and
- such improvements will generate valuable benefits for the APP that will not otherwise be captured.

A key point for improvement of the APP's strategy in pursuing its objectives is its alignment with broader Partner Country policies and regulatory frameworks:

- 66.7% of survey respondents either agreed or strongly agreed that, in order for their respective Flagship Projects to secure further investment, improve project economics and/or the ability to scale, there is a need for clearer, more consistent long-term government policies.

These results demonstrate that, notwithstanding the successes of the APP and Flagship Projects, Partner Countries can further support clean technology deployment by introducing clear, certain and stable domestic regulatory frameworks and policy settings to govern activities in relevant sectors. Properly aligned, public-private and international collaborative activities under the APP can be complemented by domestic measures to promote the development and deployment of clean energy technologies, mitigation of climate change and promotion of energy efficiency and security within Partner Country jurisdictions.

Introduction of complementary domestic regulatory frameworks can also assist in creating a "level playing field" for new technologies developed and demonstrated through the APP, as discussed in sub-section 4.4.

4.3 Networking and Capacity Building

Survey data indicates that the delivery of APP Flagship Projects has been successful in facilitating the development of relationship networks and capacity building.

A. Development of Relationship Networks

In total, 58.6% of survey respondents either agreed or strongly agreed that the implementation of their Flagship Projects was instrumental in creating a new relationship network. Consultations also confirm the contribution of Flagship Projects to the expansion and strengthening of networks:

- in **Project ATF-06-02** (PFC Emissions Management), the relationship network established through the project was a major success of the initiative;
- in **Project BATF-07-36** (CFL Quality Management), the development and productive exploitation of networks is a critical and major aspect" of the project, and that collaborative partnerships and alliances have been forged and strengthened through the project;
- **Project PGT-06-01** (Power Generation Activity Plan) has been extremely successful at creating a network of technical power plant engineers from all participating countries; and
- **Project STF-06-05** (SOACT Handbook) has been pivotal in initiating communication networks with India and China.

Development of networks through Flagship Projects has enabled participants to establish relationships and share technologies, knowledge and other resources with one another in order to promote successful project implementation. It has also enabled achievement of broader benefits beyond the original project scope. For example, networking through **Project BATF-07-36** (CFL Quality Management) has been an important catalyst in the formation of the Asia Lighting Council, an independent, non-profit organisation established to facilitate harmonisation of testing and labelling of compact fluorescent lamps.

Task Force meetings have been an important forum for the creation of networks within sectors. Some Flagship Projects also reported networking beyond the APP, through the establishment of productive relationships with external stakeholders. Stakeholders from **Project CMT-06-05** (Cement Centre of Excellence) revealed the development of new networks between China and other developing countries seeking advanced technology at relatively low cost. Expansion of these external networks will help accelerate deployment of new technologies globally.

Flagship Projects have also provided a vehicle for the strengthening of public-private networks. **Project RDG-06-01** (High Efficiency Solar Power Stations) reported that stakeholder participation in the project was "instrumental in making strong connections between the public and private sectors in the REDG Task Force".

However, not all Flagship Projects experienced the same success in developing relationship networks, and a number of obstacles to networking can be identified from stakeholder consultations:

- **Effective communication**: several Flagship Projects reported that communication amongst project participants could have been more effective if there had been greater involvement of:

    (i) **Bilingual individuals**: in some cases, the need to work in different languages presented a basic barrier to effective communication and networking. For example, stakeholders in one project reported that it took considerably longer than anticipated to establish strong communication

between the “key project stakeholders” and the initial stages of the project would have been significantly easier if bilingual individuals had been involved.

(ii) **Technical staff**: a number of projects also reported that communication would have been more effective if more technical rather than managerial staff had been involved in the project.

- **Commercially sensitive information**: consultations also revealed that stakeholders were frequently reluctant to share commercially sensitive intellectual property and proprietary information, and that this limited either the level of networking between stakeholders, or the sharing of information within networks.

  Two comments included:

  (i) that the international collaborative approach of the APP across jurisdictions and cultures requires "an approach that relies on trust and transparency" in order to achieve positive outcomes; and

  (ii) that commercial sensitivity to the sharing of technical details behind quantification of efficiency benefits "has limited the potential take-up of [the relevant] technology by potential recipients."

The barriers to project success posed by these issues are discussed in detail in sub-section 4.4.

B. Capacity Building

The building of human and institutional capacity to strengthen the APP's cooperative efforts is one of the key objectives of the APP's vision.

As mentioned in sub-section 4.1, survey data suggests that Flagship Projects have contributed to the achievement of this objective. A total of 56.1% of survey respondents indicated that their Flagship Projects had contributed to training, capacity building or knowledge sharing. The following Flagship Projects also explicitly incorporate capacity building components:

- **Project CLM-06-09** (Coal Mine Health and Safety): coal mine hazard identification and risk management capacity building;
- **Project CLM-06-11** (Coal Mine Methane Use and Recovery): capacity building in advanced degasification and coal mine methane recovery techniques; and
- **Project PGT-06-01** (Power Generation Activity Plan): capacity building to assist power generators to improve coal-fired power plant thermal efficiency.

However, analysis of the stakeholder feedback and survey results suggests that dedicated capacity building projects may be underrepresented among the Flagship Projects. Project reports also identify a number of areas in which future capacity building would be beneficial. For example, consultations with **Project CMT-07-07** (Hazardous Wastes in Cement Kilns) identified a number of potential areas for capacity building within both the cement sector,

including at management level, and industries producing hazardous waste which could be used as fuel in the cement sector.

The survey data also indicates certain areas in which capacity building would be beneficial to the APP and Flagship Projects. Specifically, 39% of survey respondents either agreed or strongly agreed that that there is a lack of awareness and skills to accelerate development of the relevant technologies or projects amongst financiers, investors and policymakers.

The above results suggest that the role of capacity building in Flagship Projects and the APP more broadly should be increased in future. Capacity building initiatives could:

- be incorporated directly into, or up-scaled within, existing Flagship Projects;
- become a dedicated focus of new Flagship Projects; or
- be implemented at Task Force level or between Task Forces, where benefits would be derived from the sharing of knowledge between sectors.

Specific issues relating to capacity building in the context of scaling projects and deploying technologies are discussed in sub-section 4.6.

4.4 Barriers to Success

Survey data and project reports indicate that there are a range of barriers impeding the success of APP Flagship Projects. These include:

- technical barriers;
- commercial barriers;
- legal/regulatory barriers;
- organisational/cultural barriers; and
- financial barriers.

Some barriers restricting project success are specific to the particular Flagship Project, some are specific to the relevant Task Force or sector and some barriers relate to the APP more broadly. Where appropriate, we have referenced the Flagship Project to which a particular barrier relates.

It is also acknowledged that other non-Flagship APP projects, such as Project CFE-06-12 and Project RDG-06-10, have actively investigated Task Force-specific barriers. The discussion in this sub-section 4.4 relates to barriers identified as affecting the Flagship Projects reviewed for the purposes of this Report. Additional discussion on barriers relating to finance and investment is provided in sub-section 4.5, and barriers relating to scale and deployment are covered in more detail in sub-section 4.6.

A. Technical Barriers

As many of the clean technologies utilised in Flagship Projects are of an emerging nature, there can be technical impediments to their uptake, such as:

- cost-competitiveness of the technology;
- awareness of technology options;
- proof of concept underlying the technology;
- compatibility with existing technologies and practices;
- intermittency and electricity storage issues (in the case of clean electricity generation for example from renewable energy technologies); and
- measurement, monitoring and verification of relevant data.

The technologies involved in some of the Flagship Projects remain largely untested at a commercial scale at this stage, and there may be significant technical barriers to these technologies that only become apparent on commissioning of larger facilities or scaling up the technology in other locations. An example is **Project CFE-06-05** (Callide A Oxyfuel Demonstration Project), in which the biggest potential barrier to the success of the Oxyfuel technology (which reduces CO_2 generation during coal combustion) is considered to be the issues surrounding scaling the technology from the current non-commercial pilot facilities to a 250MW demonstration scale, or larger commercial scale operations.

The lead company in **Project RDG-06-01** (High Efficiency Solar Power Stations) is investigating a range of technical barriers in the APP funded 140kW Heliostat Concentrator Photovoltaic (***HCPV***) demonstration plant to attempt to overcome barriers such as research and development, engineering, construction, monitoring and verification, and operations and maintenance in order to progressively scale the design and output of HCPV solar power stations.

For a number of Flagship Projects to deliver effective, technically feasible technologies with which to reduce greenhouse gas emissions or deliver clean development outcomes, the establishment of baseline findings through testing, monitoring and evaluation is necessary. This needs to be done before defining performance measures of the technology and subsequently establishing statistically valid emissions reduction benchmarks**.** The **Project ATF-06-02** (PFC Emissions Management) has, for example, begun to inventory quantifiable data outcomes from aluminium facilities to facilitate the adoption of smelter-specific perfluorocarbon (***PFC***) emission reduction strategies.

Some technologies deployed in Flagship Projects have demonstrated their viability but not necessarily their ability to reduce greenhouse gas emissions. For example, **Project CFE-06-06** (Post-Combustion Capture for Coal-Fired Power Stations), in which the cost of capture and storage of the CO_2 is one of the major barriers to the PCC technology. The PCC technology currently requires approximately 25% additional power output from the

power station to drive the process. The capture cost needs to be lower than the cost of CO_2 emissions in order for PCC technology to become commercially viable.

Another technical barrier is that although some technology solutions are viable at large scales, they may not be viable at a smaller scale. This became evident in consultation with stakeholders in **Project CMT-06-05** (Cement Centre of Excellence)**,** where they indicated that smaller scale producers among China's 5,000-plus cement companies will face greater economic hurdles to investing in clean technology than the larger, integrated facilities.

When the gaps between demonstration plants and the complexity of full scale commercial plants are too great, replication is particularly challenging. This was discussed with stakeholders in **Project BATF-06-27** (Chinese Green Buildings) where the Micro Energy Building validated the use of a number of individual technologies; however, the "near zero" system as a whole was considered unsuitable for replication in China as it is too far from current mainstream practices.

B. Commercial Barriers

A major commercial barrier identified with the Flagship Projects is that industry is generally wary of sharing sensitive commercial information with government and/or with potential competitors. This was found to be the case in:

- **Project STF-06-03** (Steel Industry Performance Indicator Setting), where there was sensitivity over sharing commercially proprietary process information;
- **Project ATF-06-03** (Bauxite Residue Management), where data or research from proprietary company sources is predominantly confidential; and
- **Project STF-06-05** (SOACT Handbook), where private sector participants were enthusiastic about sharing knowledge and best practice for the development of the State of the Art Clean Technology Handbook**,** but more resistant if it is felt that specific technology transfer may help a potential competitor gain a competitive advantage.

For many Flagship Projects, accelerating the scale and deployment of the technologies involves identifying how technology solutions can be customised for the specific facility and the feasibility study undertaken to identify financing mechanisms for those technology solutions proposed. This is discussed further in sub-section 4.6.

Another key commercial barrier is the time commitment required for private sector stakeholders in APP Flagship Projects. Many private sector stakeholders in Flagship Projects have contributed their involvement in an "in-kind" capacity. As industry buy-in is critical for the success of many Flagship Projects, this private sector commitment must be maintained. This is not always the case and there is a risk that "in-kind" contributions may drop off.

For example, in **Project ATF-06-03** (Bauxite Residue Management), the success of the project is likely to be dependent on the success of the engagement with industry or government agencies during the latter stages of the project. Involvement of the private sector in this and other Flagship Projects cannot be taken for granted and must be justified on a commercial basis and worth the time commitment.

The pricing of carbon is also considered to be a key barrier to the commercialisation of certain technologies at the core of Flagship Projects. For example, in **Project CFE-06-05** (Callide A Oxyfuel Demonstration Project) carbon needs to be priced high enough to make projects such as this commercially viable. On current estimates for this technology to be viable, this is probably in excess of AU$50 per tonne of CO_2.

C. Legal & Regulatory Barriers

The policy and regulatory environment to facilitate deployment of clean technologies is rapidly evolving. However, there are a number of barriers to the development of the market-enabling environment necessary to ensure the success of a number of Flagship Projects.

A common perception from consultations was that there is not a “level playing field” between Partner Countries to provide for investment, freer trade across borders and a more enabling environment for deployment. The project economics and viability of the deployment of technologies is dependent on the policy and regulatory environment, which varies between Partner Countries.

Project proponents from **Project RDG-06-01** (High Efficiency Solar Power Stations) suggest that the APP has a role in creating this level playing field by providing input into government to government connections and policy developments. For **Project RDG-06-01** (High Efficiency Solar Power Stations) to achieve significant levels of HCPV deployment in Partner Countries, the market conditions for pricing of solar power must be consistent, otherwise the deployment will occur where the market conditions are the most favourable, which could be outside Partner Countries.

Without the development and establishment of global standards for technology deployment it is difficult to ensure commercial viability across Partner Countries. **Project BATF-07-36** (CFL Quality Management)**,** looking at harmonisation of testing procedures for compact fluorescent lamps, is an important project designed to facilitate global uptake of this technology and provide verification and quality control. However, stakeholders in this project indicated that the APP's remit is unclear if it is developing true global standards.

In some Flagship Projects it was found that lack of consistency and understanding of the regulatory environment in Partner Countries inhibited market uptake. For example, in **Project BATF-06-27** (Chinese Green Buildings), the lack of understanding of building code enforcement practices in China and how these relate to the market for new technologies, was a barrier to the success of the project.

The varying subsidies and incentives between APP countries have also caused barriers to Flagship Projects' technology diffusion. For example, consultations with **Project CMT-06-10** (Cement Industry Performance Diagnosis) revealed that, unlike in Japan, fly ash utilisation is less attractive in countries where it is cheaper to use it as landfill. In Japan, the Government subsidised the cement kiln to utilise fly ash as it was cheaper than funding more landfill capacity. From another perspective, the more favourable economics of land filling fly ash in a country with more landfill space such as China might represent a reason to prioritise other technology transfer projects rather than try to transfer fly ash reutilisation technology to China, given the difficulty of overcoming these long-term landfill-related market disparities.

D. Organisational and Cultural Barriers

A range of barriers discussed here extend the discussion from sub-section 4.4. These barriers relate more to the engagement and interaction of people on the Flagship Projects.

One particular type of barrier impacting on the ongoing success of Flagship Projects occurs where networks have been created but not maintained. For example, there is no planned ongoing interaction between the parties that have been part of the performance diagnosis under **Project STF-06-04** (Steel Plant Performance Diagnosis). The initial engagement between Japanese Steel experts and Indian and Chinese Steel facilities was a valuable knowledge sharing exercise but the future success of the transfer of knowledge and technology appears to be inhibited by a lack of coordination and network development.

Engagement with the right people and continuity of that engagement, both government and private sector, is critical to success of the Flagship Projects. There have been examples where better intergovernmental help and support to engage the right people and researchers, technology specialists and government department and private sector stakeholders would have been beneficial to the Flagship Projects. One consequence is that without the high level support and endorsement from government, project timelines have been delayed. This was the case in **Project ATF-06-02** (PFC Emissions Management) where, although the project objectives have remained consistent, the timelines associated with achieving key milestones have slipped, largely due to an underestimation of the time required to get appropriate buy-in from all Partner Countries.

There are communication challenges and barriers in working across international borders. For example, stakeholders in **Project ATF-06-02** (PFC Emissions Management) indicated that translation and technical discussions created challenges in the implementation of the project, and that the initial stages of the project would have been made significantly easier if bilingual individuals had been involved in knowledge transfer discussions.

Some projects would benefit from wider involvement of Partner Countries and not necessarily being restricted to a bilateral project. For example concerning future potential of information on coal processing technologies in **Project CLM-06-01** (Coal Processing Technology

Information Sharing) it was identified that India would be interested to communicate with each of the Partner Countries at the technical level and not just with the USA to identify other potential coal beneficiation technologies that could be used in India.

Although some Flagship Projects have delivered some excellent examples of knowledge sharing (see sub-section 4.3), there was feedback in consultations that there is a lack of an on-line platform for knowledge sharing required for specific Flagship Projects to optimise the access to technological solutions. With **Project CLM-06-01** (Coal Processing Technology Information Sharing) stakeholders suggested that there was no on-line platform for communication/knowledge sharing among all Partner Countries at the project level for submission and evaluation of potential new cleaner coal technologies that could serve India's needs. The lack of a comprehensive on-line database in some sectors is a barrier for the potential technology transfer under the APP Flagship Projects.

An intangible barrier that is evident in a number of Flagship Projects is that behaviour change is required with the implementation, adoption and successful application of new technologies:

- **Project ATF-06-02** (PFC Emissions Management) consultations revealed that there is considerable resistance to adopting 'automation' in smelter management in countries like China where manual methods are ingrained; and
- **Project CLM-06-09** (Coal Mine Health and Safety) consultations revealed that industry adoption of new health and safety practices requires a major behavioural change in order for the project to be successful.

E. Financial Barriers

Financial barriers to the success of the Flagship Projects are discussed further in sub-sections 4.5 and 4.6.

The main financial barriers are simply that for some Flagship Projects there is a current funding shortfall and for others there is a need for further funding. Projects which indicated that they have a current funding shortfall include:

- **Project BATF-08-49** (Green Spaces India): the total project cost is estimated to be US$263 million, and the project currently requires a further US$35 million equity investment.
- **Project CLM-06-01** (Coal Processing Technology Information Sharing): there is no budget for testing or implementation of various technologies that may have been identified through the information sharing process forming part of this project.
- **Project CFE-06-05** (Callide A Oxyfuel Demonstration Project): the project is currently facing a funding shortfall of around AU$12.5 million against the original budget of AU$62.5 million. If the shortfall is not rectified, the project scope may have to be reduced in order to proceed.

A very common component of the feedback from Flagship Projects stakeholders was that it was not clear what the specific financial contributions are that each Partner Country has made to the APP, and which avenues should be pursued in order to seek additional APP funding.

A major barrier to the success of the Flagship Projects and the APP in general is the lack of defined budgets for current and future projects.

4.5 Financing Flagship Projects under the APP

The availability of finance and investment is the key challenge facing the implementation and accelerated deployment of Flagship Project technologies and processes. As discussed in sub section 4.5, attracting more funding to complete an existing Flagship Project and to secure new financing for expansion of a Flagship Project is a major barrier. In broader terms, to achieve the aims of APP, significant investment must be mobilised from global capital markets and new avenues of funding channelled from government budgets.

Below is a discussion of issues that have arisen through consultations that relate to the financing of a Flagship Project through the APP.

A. APP as a Catalyst

Funding provided by APP has been instrumental in creating new projects and enhancing the success of some existing projects.

Many Flagship Projects may not have gone ahead without APP funding or may have gone ahead on a much smaller scale. Specifically, stakeholders from the following projects acknowledged that the APP funding was a catalyst to their Flagship Project:

- **Project CFE-06-06** (Post-Combustion Capture for Coal-Fired Power Stations);
- **Project CMT-07-07** (Hazardous Wastes in Cement Kilns); and
- **Project RDG-06-01** (High Efficiency Solar Power Stations).

B. Private Sector Involvement

A core element of the APP framework is public-private collaboration and engagement. Many Flagship Projects have demonstrated this collaboration and private sector companies have had central involvement in funding many of the Flagship Projects.

Flagship Projects that exemplify private sector investment and engagement in the APP include:

- **Project BATF-08-49** (Green Spaces India): where investment from technology partners like IBM and GE have helped position the project as one of the world's greenest commercial developments.
- **Project ATF-06-02** (PFC Emissions Management): where particularly Alcoa and Alcan have a vested stake in the project and have maintained funding for Aluminium Task Force initiatives.
- **Project RDG-06-01** (High Efficiency Solar Power Stations): where the proponent has received private investment from TRUenergy who are also a financial partner in the project to purchase electricity generated from Solar Power.

- **Project RDG-06-16** (Renewable Energy Feasibility Study): where Hyosung continues to make considerable private investment in the project in a 50/50 arrangement with the Korean Government.
- **Project PGT-06-01** (Power Generation Activity Plan): where a significant number of global private institutions have participated in or hosted site visit events – e.g. Hokkaido Electric Power Company, Tohoku Electric Power Company, Tokyo Electric Power Company, Chubu Electric Power Company, Kansai Electric Power Company, Chugoku Electric Power Company, Kyushu Electric Power Company, J-Power, FEPC Japan, AEP, Southern Company, Tampa Electric, GE, Ameren, Progress Energy, GTI/Synthesis Energy, Shell, Siemens, Alliant Energy, Korean Southern Power, Korean Midland Power, Korean South-East Power, Korean Western Power Company, Duke Energy, First Energy, PG&E, NextEra Energy Resources, China Guodian, NTPC, Arizona Public Service, Loy Yang Power and International Power.

For private sector investors to commit to projects such as the range of Flagship Projects, there needs to be a defined return on investment (***ROI***). Allocation of APP funds through Task Force selection of Flagship Projects, has not had the specific goal of requiring the project proponent to prove the business case for the investment in the technology. Without this requirement it is difficult to determine the ROI so as to encourage future investors. For many of the technologies deployed through the Flagship Projects, if the ROI can be determined for the technology it has the potential to attract significant private investment to commercialise and deploy the technology.

An example of where this is possible is **Project CFE-06-06** (Post-Combustion Capture for Coal-Fired Power Stations). There is already interest from companies to invest when the PCC technology moves beyond pilot plant stage. These companies include Siemens, GE, Mitsubishi, and Babcock & Brown. For them to commit there would need to be a business and investment case developed based on the pilot plant measurement and performance.

However, some Flagship Projects are a number of years away from proving the business case for the relevant technologies. In consultations regarding **Project BATF-06-27** (Chinese Green Buildings), measurable results from the operation of the Micro Energy Building will not be verifiable for a number of years, delaying the prospect for private sector investment to replicate or scale the technologies deployed in the project.

Some projects such as **Project RDG-06-01** (High Efficiency Solar Power Stations) have taken a markedly strategic approach, and are actively investing in data and measurement systems in order to prove the technology in demonstration form, with a distinct plan to subsequently attract further private sector investment.

Leveraging this involvement of the private sector and especially the private finance and investment is critical to the success of many Flagship Projects and the APP in general. Establishing incentives, maintaining an environment for mutually beneficial participation and

elevating the status of APP projects will help to secure ongoing participation from the private sector.

One key issue that became evident from the consultations and the survey is that there are very few stakeholders, project partners or investors in any of the Flagship Projects from the finance and investment sector. This is a key segment of the private sector that has not been engaged through the APP.

See sub-section 4.6 for more discussion on the role of private finance in scaling up Flagship Project initiatives.

C. Impacts of the Global Financial Crisis

The GFC has seen a constriction in funds invested in Flagship Projects and has affected project success and viability.

Some projects have been affected by funding restrictions and foreign exchange issues during the course of the GFC, which has in turn forced the reduction in the scale of the projects. 2 examples that cited these financial conditions as reasons affecting project deliverables and milestones are:

- **Project CFE-06-05** (Callide A Oxyfuel Demonstration Project): the CO_2 capture plant has been scaled down from an original 30,000 tonnes per annum capacity to 10,000 tonnes per annum. The project currently has a funding shortfall of around AU$12.5 million from the original budget of AU$62.5 million.
- **Project CMT-07-07 (Sub 2)** (Hazardous Wastes in Cement Kilns): Phase II of the project (Solvent Dewatering Plant) is currently on hold due to the economic conditions – the company Board of Directors have put a hold on the second phase of the project as they focus on consolidation rather than research and expansion.

D. CDM and Carbon Pricing

Clean Development Mechanism (***CDM***) projects implemented under the Kyoto Protocol have resulted in significant capital flows from developed countries to developing countries. There is an obvious link to the potential of linking APP projects to the CDM, and some Flagship Projects have identified that the opportunity exists to secure new revenue streams through the creation of CDM projects:

- A good example is **Project CLM-06-11** (Coal Mine Methane Use and Recovery), which involves recovery and utilisation of coal mine methane. Coal mine methane projects have good commercial viability and are attractive to potential funders.
- For **Project ATF-06-02** (PFC Emissions Management), carbon credits generated under the CDM are potentially available through verifiable PFC reductions. The importance of creating a baseline of data through this project opens up possible private finance for CDM projects.

- Another example where CDM revenues may be generated is **Project BATF-08-49** (Green Spaces India). This project is investigating how an additional revenue stream can be secured by establishing a baseline of emissions and incorporating best practice green building technologies.

Although only 33.3% of survey respondents indicated that uncertainties associated with the carbon price and international climate policy affect the viability of the Flagship Project, this number is significant considering the actual number of projects that may be eligible for registration under the CDM and able to generate carbon credits commensurate with the greenhouse gas reductions they achieve.

Carbon revenue streams under the CDM have not been realised to date under any APP Flagship Projects. If it could be demonstrated through Flagship Projects that such projects could be eligible for additional revenues resulting from the generation and sale of carbon credits, these projects could potentially attract more interest from the private sector.

E. Financing Options and Mechanisms

There is a need for finance and investment in many of the APP Flagship Projects and indeed many of the other APP projects. A key issue facing Flagship Project proponents is uncertainty as to the source of finance and investment required to fund the next stage of development and deployment. It is clear from global developments that there are new pools of capital that are being focused on and mandated to invest in clean energy and technology. The pools of capital are in both the public and private domain. Accessing this capital is the challenge for APP Flagship Project proponents.

There have been a number of reputable landmark studies that have detailed the scale of investment required to fund a Low Carbon Economy by 2020. A few examples are given below:

- *Stern Review (2006)*: English economist Nicholas Stern suggested committing 1% of GDP (US$350-480 billion per annum) to cut carbon emissions. In June 2008 Stern increased the estimate to 2% of GDP to account for faster than expected climate change, amounting to approximately US$9 trillion between now and 2020.
- *UNFCCC (2007)*: the United Nations Framework Convention on Climate Change said that to mitigate climate change, required investment of US$200 billion per annum or 0.3% of global GDP would be required until 2030. This amounts to approximately US$2.2 trillion between now and 2020.
- *OECD (2008)*: the Organisation for Economic Co-operation and Development estimated that climate change could be mitigated at a cost of 0.5% of estimated global GDP by 2030. This amounts to approximately US$2 trillion between now and 2020.
- *World Economic Forum (March 2009)*: found that investment needs to reach US$500 billion a year by 2020. Again, this would amount to approximately US$3.9 trillion between now and 2020.

Since the GFC began most developed nations have responded by implementing economic stimulus packages. In most of these policy announcements there have been commitments to invest in the “green economy”.

In April 2009, the ‘Towards a Global Green Recovery’ report was presented at the G20 Summit in London, which estimated that almost US$400 billion of the US$2.6 trillion in economic stimulus (announced by G20 nations) was allocated for clean technologies such as renewable energy, improvements in electrical grids and the promotion of cleaner cars. About 50% of these funds are expected to be invested in 2009.

APP Partner Countries figure prominently in the stimulus allocations to clean energy and technology. Achim Steiner, UN Under-Secretary General and UNEP Executive Director, said recently: "While many countries have factored some level of environmental investment in their economic stimulus packages, it is in Asia where the ‘green economy’ has seen the biggest green light. Indeed, two thirds of the global green stimulus packages have been in countries such as China, Japan, Korea and Australia."

Perhaps the most widely reported package was from the USA. On February 17, 2009, President Obama signed the American Recovery and Reinvestment Bill, placing cleantech as a key driver of economic stabilisation and job growth. The US$787 billion bill includes about US$83 billion for cleantech spending and tax plans. Korea launched its more than US$38 billion economic stimulus package in January this year with over 80 percent allocated to green investment and further expanded this "Green New Deal" into a full five-year US$83.6 billion Green Growth Plan. Australia's commitment to economic stimulus has been US$26.7 billion with 9 per cent committed to a range of measures to address climate change.

Other major policy initiatives driving investment in clean energy technologies include:

- Global climate initiatives: the Kyoto Protocol (including the CDM), the Bali Roadmap agreed at COP 13 to guide international negotiations leading to the December 2009 COP 15 meeting in Copenhagen, the G8+5 and the Major Economies Forum;
- Other international emissions trading schemes, such as the European Union Emissions Trading Scheme;
- Domestic emissions trading legislation (including draft instruments) such as the Waxman-Markey Bill in the USA and the Carbon Pollution Reduction Scheme in Australia;
- Solar feed-in tariffs like those adopted to great effect in Germany and Spain; and
- Renewable Portfolio Standards, which have now been adopted in over 50 countries.

In the private investment sector there is significant momentum in the growth of clean energy and technology investment. Some recent developments include:

- For the first time in 2008, global new investment in clean energy, US$155 billion, was more than new investment in conventional energy capacity (New Energy Finance).
- Private equity involvement in the cleantech sector has been expanding rapidly over recent years with the number of private equity funds that commenced making investments in 2008 nearly quadrupled from the number in 2004. This figure increased from 30 in 2004 to 117 in 2008. There are currently a further 17 cleantech focused infrastructure funds in the fundraising market, looking to raise more than US$6 billion between them.
- Despite the slowdown in the global economy, the cleantech sector seems set to continue its growth with a total of 78 cleantech focused funds currently in the market seeking investment, and with emerging markets such as India and China becoming important centres of cleantech activity for the private equity industry.
- Institutional investors have committed to taking climate change issues into account in their investment decisions. Initiatives such as the UN Principles of Responsible Investment representing signatories that manage over US$18 trillion; the US Investor Network on Climate Risk (***INCR***) with US$1.4 trillion in assets under management; the Australian Investors Group on Climate Change with AU$500 billion and the Carbon Disclosure Project (***CDP***) which represents over 385 institutional investors with over US$57 trillion in assets under management globally.
- The global carbon market almost doubled to US$118 billion in 2008. It is also predicted that the carbon market will still enjoy a growth rate of 27 per cent this year, despite the slowing global economy (New Carbon Finance).

In addition to the government stimulus packages and the private sector capital flows, there are significant new financing initiatives from development finance institutions such as the World Bank, the International Finance Corporation (***IFC***), the Asian Development Bank and Japan's Bank for International Cooperation.

Survey responses indicted that 66.7% of respondents considered that further government capital and funding will be required to accelerate deployment. In addition, 58.9% of respondents also suggested that further government funding will leverage more investment from the private sector.

It is clear that APP Partner Countries and Flagship Projects proponents (and other APP projects) need to connect better with the sources of public and private capital that are now looking to invest in clean development and climate.

4.6 Scaling up of Flagship Projects

A number of Flagship Projects reviewed for this report are examples of projects that have been endorsed by the APP as having the potential to generate large-scale economic, environmental and social benefits if the technologies involved can be deployed at scale.

Although the APP has the primary aim of accelerating the development and deployment of existing and emerging cost-effective, cleaner technologies, the APP is a voluntary initiative and the Task Forces do not have specific targets for deployment. Through consultations it was evident that project proponents believe that the APP has played an important role in creating networks and undertaking market enabling projects but now the success factor for APP needs to include a more practical focus on technology development and deployment.

A number of Flagship Projects have been market enabling and have achieved their aim of creating a platform for accelerated deployment. Technologies are at different stages of maturity but there are good examples of the scalability of existing technologies. Clearly additional funding is required to scale up the deployment of technologies as survey results indicate that both public funding (66.1%) and private funds (76.1%) will be required to accelerate deployment. Continued involvement of the private sector and public-private collaboration in an essential ingredient in the scaling up prospects for the Flagship Projects. Critical too are government policy settings and incentives.

A large majority of survey respondents (82.3%) stated that their project would be replicable across sites and Partner Countries. However consultations revealed that there were specific issues and barriers that needed to be addressed before "scaling up" could be considered.

The sections below discuss key issues and lessons learnt from Flagship Project proponents that currently influence how APP Flagship Projects can be implemented, replicated, scaled and deployed.

A. Market-Enabling Outcomes

A range of successful outcomes of a number of Flagship Projects have helped create an enabling environment to assist in the achievement of scaling and accelerating the development, diffusion, deployment and transfer of clean technologies.

These outcomes include:

- sharing of best practices through workshops;
- undertaking international site visits to conduct performance diagnoses;
- developing on-line resources to share technology resources; and
- producing best practice guides.

For the most part, to date, many of these projects have been focused on knowledge sharing and best practices training. They have an important role within industry sectors to help identify commercially viable projects, bring key partners together and attract interest from private sector investors.

The Flagship Projects that have helped create an enabling environment include:

- **Project CMT-06-05** (Cement Centre of Excellence), where a series of technical cement industry workshops were conducted to disseminate vest practice technologies that potentially have the greatest impact in reducing cement plant greenhouse gases;
- **Project STF-06-05** (SOACT Handbook), which created a State of the Art Clean Technology Handbook and a "live" clearinghouse matching technology suppliers and end users;
- **Project PGT-06-01** (Power Generation Activity Plan), which produced a Green Handbook that provides a framework for participating countries to use when evaluating the thermal efficiency of coal-fired power plants;
- **Project ATF-06-03** (Bauxite Residue Management), which developed a database of bauxite residues which had to be developed in order to be able to collate and compare the diverse and varied data sets that were discovered during the early stages of the project;
- **Project STF-06-04** (Steel Plant Performance Diagnosis), which involved a performance diagnosis conducted by Japanese experts on Indian and Chinese steel facilities in order to identify technologies that could improve plant efficiency, reduce greenhouse emissions and achieve other environmental improvements; and
- **Project CLM-06-01** (Coal Processing Technology Information Sharing), which involved conducting a workshop in India with internationally recognised experts to share knowledge on dry coal beneficiation.

B. Stage of Technology Maturity

Due to the diversity of the Flagship Projects, a combination of more and less mature technologies are being deployed. Each project has a different set of development issues, milestone objectives and market conditions that will impact on how quickly the technology can be further developed.

It became evident in consultations that breakthrough technologies are not necessarily the key to mass deployment of technologies as some of the technologies are at a mature level now and need other factors, such as finance and/or the right policy environment, to achieve scale. Survey results back this up as 43.9% of respondents disagreed that "the technology/service/process requires further demonstration/piloting to enable proof of concept", suggesting that these have proven technologies already. In addition only 25.4% of survey respondents thought that "technology specific barriers will prevent the economic feasibility of increased deployment".

Differing examples of the stages of technology maturity and scalability potential are demonstrated by the following examples:

- In **Project ATF-06-02** (PFC Emissions Management) at least 2 to 3 years is required to demonstrate tangible PFC emissions reductions directly resulting from the project. However, if commercial viability is proven the potential for large scale adoption in the Chinese Aluminium sector is considered high.
- The future potential of **Project CFE-06-06** (Post-Combustion Capture for Coal-Fired Power Stations) PCC technology is significant as it can potentially be retrofitted to all existing coal-fired powers stations, as well as being designed in to new plants. Additionally, given the modular nature of the technology, the system can be added in stages. However the energy and water requirements of the technology are significant and ongoing research into the reduction of these components is required before the PCC approach has the potential to become commercially viable.
- **Project BATF-08-49** (Green Spaces India) has trialled, technically proven and measured and quantified the environmental and commercial benefits of a range of green building technologies relating to energy efficiency, ventilation, water use, waste, lighting etc. These technologies are mature and ready to be implemented and integrated into the world's most energy efficient commercial building once funding is secured.

C. Implementing Technology Options/Solutions

In a number of Flagship Projects a performance diagnosis was undertaken to identify technological improvements that could be implemented to deliver economic and environmental benefits to, for example, steel and cement facilities. These performance diagnoses were written up into reports with a range of proposed technology solutions. Although the exchange of expert information was useful, it is not clear to those involved in the projects how the proposed measures can be financed and if governments of the APP will be involved in making financial contributions to fund the environmental and energy improvements outlined in the performance diagnosis.

This was the case with **Project STF-06-04** (Steel Plant Performance Diagnosis), for which the performance diagnosis is only the first step in achieving the objectives set out under the Flagship Project. For actual implementation of energy and environmental improvements, the

plants need to be able to prioritise recommendations, identify customised technology solutions which are then costed and appropriate financing mechanisms for those technology solutions proposed. The performance diagnosis is a useful first step in knowledge exchange; however, the reports produced may not be acted upon at all if there is not more work done on the technical feasibility of potential technologies and the ways those technologies can be financed.

The technical reports produced for Flagship Projects and indeed some of the technical solutions collated in some Flagship Project publications or on-line resources do not articulate the appropriate customised technology solutions and, at best, serve effectively as a pre-feasibility for any future potential investment in plant expenditure, rather than providing solutions that can be implemented immediately.

For Flagship Projects covering steel plants (**Project STF-06-04** (Steel Plant Performance Diagnosis)), cement facilities (**Project CMT-06-10** (Cement Industry Performance Diagnosis)), coal mines (**Project CLM-06-01** (Coal Processing Technology Information Sharing)) and hazardous waste facilities (**Project CMT-07-07 (sub 1)** (Hazardous Wastes in Cement Kilns)), technology improvement projects are generally of significant capital intensity. Due to the size of the proposed improvement measures, additional information, such as more detailed, plant-specific feasibility studies are required to evaluate the commercial viability of any investment. More detail on financing options and mechanisms to implement these measures are required in order to make the investment decisions required.

The APP can play a valuable role in helping to utilise these valuable reports and "pre-feasibility" assessments by moving from concept to realisation and implementation. The APP could help in providing the appropriate resources to undertake site specific technology feasibility studies and help to coordinate appropriate options and financing mechanisms for these projects. If some of these technology solutions, outlined in performance diagnosis reports, could be implemented in a commercially viable manner, there is significant potential to replicate and scale and deploy these technologies, particularly in Indian and Chinese steel, cement and coal facilities.

In consultations through **Project STF-06-03** (Steel Industry Performance Indicator Setting), one specific industry association felt the APP needed to take more responsibility for follow-up of technical transfer and funds creation opportunities. To achieve this, technology transfer needs to be more narrowly-focused on activities that lead to commercial results, perhaps focusing in the process on agreed "leadership" technologies that shift the entire paradigm of some aspects of steel production.

D. Government Policies, Incentives and Support

The policy settings of governments are key determinants of the future success of scaling up the Flagship Projects. As 66.7% of survey respondents indicated, for their projects to secure further investment, improve project economics and/or the ability to scale, there is need for

clearer, more consistent long-term government policies, in respect of issues such as climate change mitigation, clean energy and energy efficiency.

Policies such as the introduction of performance standards to establish a level playing field, establishment of carbon price mechanisms, the introduction (or in some cases the removal) of subsidies, and tax and fiscal incentives will help drive accelerated deployment of Flagship Project technologies. The APP, through the Task Forces and the PIC, has an established forum to address policy barriers that will facilitate greater diffusion of Flagship Project technologies.

Some Flagship Project proponents highlighted how government policy settings affect and influence the ability of their projects to scale up:

- For the harmonisation of testing procedures for CFLs in **Project BATF-07-36** (CFL Quality Management), standardisation promotes a more level playing field for companies competing across international boundaries.
- The implementation of energy efficient technologies in cement plants in China is a central government priority. **Project CMT-06-05** (Cement Centre of Excellence) revealed that the most energy efficient technology already represents 65% of the Chinese market by volume.
- Some of the recommendations of technology improvements by Japanese firms in reports to Indian and Chinese cement facilities from **Project CMT-06-10** (Cement Industry Performance Diagnosis) would be unrealistic to implement without substantial government subsidy in China or India.
- In **Project STF-06-03** (Steel Industry Performance Indicator Setting), the aim was to establish a calculation method of performance indicators for energy efficiency and environmental protection with regard to gaseous emissions such as CO_2 and SO_x in steel facilities. Project proponents stated that for the performance indicator settings to have an impact on the industry, they would need to be reflected in government or international standards or regulations applicable to the industry.
- In **Project BATF-06-27** (Chinese Green Buildings), it was suggested that a greater focus on influencing minimum building standards rather than tech transfer may be the better objective/outcome to create a market enabling environment.

2 projects highlight how government policies can provide incentives and policy direction to make Flagship Project technologies commercially viable. Implementing domestic policy changes will lead to greater investment certainty for capital project development.

- **Project CMT-07-07 (sub 1)** (Hazardous Wastes in Cement Kilns): Indian industries that are producers of hazardous waste need government policy direction with incentive programs to provide a reliable supply to cement kilns as a substitute material to substitute fossil fuels. With certainty of supply, the hazardous waste technology can attract private finance.

- **Project CMT-07-07 (sub 3)** (Hazardous Wastes in Cement Kilns): To ensure further investment in utilising biosolids in cement kilns and improve project economics, the Australian Government could provide more consistent long-term regulation or policy regarding mercury emission levels in waste treatment.

An example of government policy becoming a driver is **Project CLM-06-11** (Coal Mine Methane Use and Recovery). Here, the Chinese Government has introduced a policy requiring the recovery and re-use of methane. This policy has been a key driver for scaling methane recovery from mines in China.

The success of the APP in achieving its vision and objectives can be enhanced by capturing synergies with other Partner Country initiatives with common or complementary objectives. Any linkages between the APP and other initiatives should, however, focus on activities through which each initiative can add value to the other. Examples of other Partner Country initiatives with climate change and/or clean development objectives that could support, and be supported by, the APP include:

- Australia's Global Carbon Capture and Storage Institute;
- the Methane to Market Partnership (involving all Partner Countries);
- India's Solar Mission; and
- Korea's Low Carbon Green Growth Plan.

There is a clear opportunity to integrate a number of relevant Flagship Projects into these other complementary initiatives. As government funding is allocated to these programs, APP Flagship Projects could be included in the funding options in order to capitalise on the existing investment in these projects and to ensure they are aligned with the newer initiatives.

APP Task Forces could work with the Secretariats of these initiatives to develop national industrial technology roadmaps as a potentially efficient way to gain stronger government backing of Flagship Projects and alignment with core government projects (including gaining funding going forward). An example where this is happening is the Coal Mining Task Force where efforts are being undertaken to align the **Project CLM-06-11** (Coal Mine Methane Use and Recovery), Recovery of Coal Mine Methane with the M2M Partnership, an international initiative that includes all 7 Partner Countries. The efforts of this Task Force are intended to be complementary to efforts to promote coal mine methane project development under the M2M Partnership. APP Task Forces could help expedite the success of Flagship Projects by developing linkages and formal relationships with other complimentary initiatives to develop action plans requiring specific collaboration, technology and finance solutions.

Government funding mechanisms to accelerate the scaling up of Flagship Projects are discussed in sub-section 4.5.

E. Role of the Private Sector in Scaling Flagship Projects

The APP has been successful in engaging the private sector, and some private sector investment in Flagship Projects has been realised. However, to further scale up technologies deployed in these projects, the role of the private sector in investment, demonstration and distribution is paramount.

Global multinational companies from all Partner Countries are members of the Task Forces and are intimately involved in Flagship Projects, some as technology providers, some as investors, some as sponsors and developers. It is essential for the APP to continue ongoing interaction and collaboration to strengthen ties with the private sector.

Some examples from Flagship Projects illustrating the role of the private sector in scaling up the technologies are given below:

- In **Project BATF-08-49** (Green Spaces India), companies such as IBM, GE and Otis have invested in the project and/or are key partners so they can use the project to pilot and implement new technologies. IBM is developing a green data centre model, which following this pilot will be implement around the world.
- The **Project CFE-06-05** (Callide A Oxyfuel Demonstration Project) incorporates all the elements of a future commercial scale operation, and provides valuable experience and expertise to the joint venture participants. The Australian Coal Association (***ACA***) considers that the Oxyfuel technology itself and the lessons learnt from the project have strong potential for future developments, particularly within a carbon pricing regime. The ACA want to see the technology accelerated, with strong technical and commercial replicability. Their assistance and support for the project is considered to be important for export markets and therefore has international implications.
- Once the PCC technology in **Project CFE-06-06** (Post-Combustion Capture for Coal-Fired Power Stations) moves beyond the pilot plant stage, it is considered that there may be some interest from large manufacturing companies such as Siemens, GE, Mitsubishi and Babcock & Brown.
- The **Project CMT-07-07 (Sub 2)** (Hazardous Wastes in Cement Kilns) has the potential to scale up and be replicated globally throughout the Holcim group of companies, who are involved through a subsidiary in the Flagship Project.
- In **Project CLM-06-11** (Coal Mine Methane Use and Recovery), there is strong interest from private sector companies such as GE and Caterpillar who see the commercial opportunities associated with the wider application of the coal mine methane recovery technologies deployed in the project.

There are also potential benefits to the private sector stakeholders through engagement with the APP (in addition to project outcomes). In particular, there may be opportunities for APP governments to help private technology companies break in to the Indian or Chinese markets via licensing arrangements, introductions, or commercial opportunities outside of the APP.

F. Capacity Building

There is an ongoing need to disseminate information on the developments in the major industry sectors, policy innovations and new technological advances. This has occurred in some Flagship Projects and there have been some excellent examples of knowledge sharing, on-line communication and capacity building (although, as mentioned above in sub-section 4.3, capacity building currently appears to be underrepresented amongst Flagship Projects).

As has been identified through this project, capacity building programs need to be tailored differently for different stakeholders.

Technology entrepreneurs and project developers need the ability to communicate the value of their technology in multiple jurisdictions and across cultural barriers. They need to be able to customise the technology to different physical and policy environments. Project proponents need to better communicate their investment proposition more effectively to financiers and investors so investors/financiers are in a position to better analyse, appraise and subsequently invest in or finance a project. Essentially they need the skills to pitch their investment prospects to attract finance.

Financiers and investors need better access to and understanding of the technologies, policies and clean development principles that underpin the market opportunity. There is a lack of history and experience in investing in clean energy and technology and this lack of previous experience and unfamiliarity with the technologies and projects creates heightened perceptions of risk and may increase unwillingness to finance or participate in deals.

Policymakers would benefit from a better understanding of the needs of the private sector. There needs to be more open effective two-way channels established for the transfer of market and regulatory information between policymakers and the private sector.

The APP has an important role to play in investing in capacity building and best practice knowledge distribution amongst all key stakeholders in Partner Countries. This is a fundamental prerequisite to accelerate investment in and deployment of clean technologies.

Appendix 1

List of Flagship Projects

Project #	Title	Geographic Location	Task Force	Short Title
ATF-06-02	Management of PFC Emissions	China	Aluminium	PFC Emissions Management
ATF-06-03	Management of Bauxite Residue (Red Mud)	Australia	Aluminium	Bauxite Residue Management
BATF-06-27	Green Building Flagships in China	China	Buildings and Appliances	Chinese Green Buildings
BATF-07-36	Quality Assurance Program and harmonisation of CFLs	China	Buildings and Appliances	CFL Quality Management
BATF-08-49	Green Spaces TM- IT / ITeS Special Economic Zone	India	Buildings and Appliances	Green Spaces India
CMT-06-05	Cement Centre of Excellence	Australia and China	Cement	Cement Centre of Excellence
CMT-07-07	Hazardous Wastes – Best Practices for Co-Processing and Management in Cement Kilns	Australia	Cement	Hazardous Wastes in Cement Kilns
CMT-06-10	Performance Diagnosis	Japan	Cement	Cement Industry Performance Diagnosis
CFE-06-05	Callide A Oxyfuel Demonstration Project	Australia	Cleaner Fossil Energy	Callide A Oxyfuel Demonstration Project
CFE-06-06	Assessing Post-Combustion Capture for Emissions from Coal-Fired Power Stations	Australia	Cleaner Fossil Energy	Post-Combustion Capture for Coal-Fired Power Stations
CLM-06-01	Information Sharing on Coal Processing Technology	India	Coal Mining	Coal Processing Technology Information Sharing
CLM-06-09	Coal Mine Health and Safety	All Partner Countries	Coal Mining	Coal Mine Health and Safety
CLM-06-11	Increasing Recovery and	China	Coal Mining	Coal Mine

Project #	Title	Geographic Location	Task Force	Short Title
	Use of Coal Mine Methane			Methane Use and Recovery
PGT-06-01	Best Practices for Power Generation Activity Plan	All Partner Countries	Power Generation & Transmission	Power Generation Activity Plan
RDG-06-01	Building Critical Mass for Ultra-High Efficiency Solar Power Stations	Australia	Renewable Energy & Distributed Generation	High Efficiency Solar Power Stations
RDG-06-16	Feasibility Study and Development of Smart Energy Solution Using Various Renewable Energies	Japan	Renewable Energy & Distributed Generation	Renewable Energy Feasibility Study
STF-06-02	Status Review of Steel Industry Related Indicators for Energy Saving, etc.	Japan	Steel	Energy Saving in the Steel Industry
STF-06-03	Performance Indicators Setting	Korea	Steel	Steel Industry Performance Indicator Setting
STF-06-04	Performance Diagnosis	Australia	Steel	Steel Plant Performance Diagnosis
STF-06-05	State of the Art Clean Technology Handbook	USA	Steel	SOACT Handbook

Appendix 2

Flagship Project Summaries

Project Details	ATF-06-02 Management of PFC Emissions
Task Force	Aluminium
Project Location(s)	China, Australia, USA
Project Manager	Sally Rand, USA Environment Protection Agency

Project Overview

The aim of this project is to assist primary aluminium production facilities in Partner Countries to identify and implement cost-effective, technically feasible opportunities to minimise perfluorocarbon (***PFC***) emissions generated during anode effects in the electrolytic cell. The project will provide the relevant tools to develop PFC inventory and reporting regimes and to facilitate the development and adoption of smelter-specific PFC emission reduction strategies. There are also plans to incorporate a PFC emission management manual which will be translated into Chinese to compliment/supplement other on-ground components of the project such as the study tours. The Australian Government is contributing funding to both the study tours and USEPA work for this project.

Project Status

The project is currently targeting the collection of baseline emissions data from selected Chinese smelters and the implementation of an automated anode effect squelching routine at a Chinese facility. This project was originally expected to be live in February 2009 but this has been delayed by 6-9 months. The study tour scheduled to be held at Rio Tinto's Bell facility in February 2009 has been postponed until a future date.

Project Outcomes

A PFC measurement guidance document has been produced by Australia. This has been revised by CHALCO representatives and training within China has taken place. The project has to date focused on transferring knowledge from USA/Australia to the Chinese participants, training designated stakeholders in techniques for better operational management of smelters and attempting to establish baseline monitoring data for PFC emissions in Chinese smelters.

It is anticipated that once technology pilots have been successfully demonstrated and a statistically valid emissions benchmark has been achieved, emissions reduction targets will be

set. It will probably take another 2-3 years of work to demonstrate tangible PFC emissions reductions directly resulting from the project.

Future Potential

- Government pressure allied to the increasing desire of the private sector to optimise manufacturing efficiencies will be a growing driver for the adoption of PFC reduction technologies.
- CNIA sees a significant opportunity in CDM credits potentially available through verifiable PFC reductions.
- The potential for large scale adoption of technologies in the Chinese Aluminium sector is considered high.
- The baseline monitoring work carried out in China has identified non-anode affect continuous emissions of PFCs. The causal factors are to be further investigated and a mitigation plan developed.

Barriers to Success

- Chinese policy currently does not address measuring and reporting of PFC emissions, so this project represents a benchmarking exercise as well as technology transfer opportunity.
- The global aluminium industry is facing enormous commercial challenges, diverting focus from the project.
- Communication challenges exist, particularly in the translation of technical discussions between project participants from different Partner Countries.
- Industry representatives have been wary of sharing sensitive commercial information with government representatives.

Lessons Learnt

- While the project objectives have stayed consistent, the timelines associated with achieving key milestones have slipped, largely due to additional time required to incorporate cooperation of relevant Partner Countries.
- The successful application of new technologies to reduce PFC emissions requires a significant behavioural change in the operation of smelters. Considerable resistance to adopting "automation" in smelter management exists where manual methods are ingrained.
- The initial stages of the project would have been significantly easier if bilingual individuals had been involved in knowledge transfer discussions.

Project Details	ATF-06-03 Management of Bauxite Residues
Task Force	Aluminium
Project Location(s)	Australia
Project Manager	Dr Craig Kluber, CSIRO, Waterford, WA

Project Overview

The project aims to address the high volume of bauxite residue (red mud) produced during the processing of alumina from bauxite. It will identify, develop and deploy technologies and practices for the alternative use of bauxite residues or improved storage practices. The project will thus enable the development of best practice residue management options to reduce the reliance on stockpiling and storage, or to make stockpiling and storage more environmentally acceptable. The Australian Government is contributing funding to CSIRO to undertake the project.

Project Status

The BRADD (Bauxite Residue and Disposal Database) has been developed. The database is used to collate and compare diverse data sets on bauxite residues. A general literature review has been undertaken which has examined current technology, re-use options and associated residue chemistry.

Project Outcomes

The main outcome of the project will be a final report which will make recommendations as to the best practice technologies available for managing bauxite residues. The final report is scheduled for issue at the end of February 2011.

Future Potential

- There is significant future potential in this project. Successful options must be both technically feasible and commercially viable in consideration of implementation costs against currently available processes.
- The most promising options at the present time, which may be commercially viable, are in agronomy by conditioning of acid soils and use as alternative construction materials in the building and construction industry.
- The success of the most promising 2 options will be dependent on the success of the engagement with industry or government agencies during the latter stages of the project.

Barriers to Success

- The mining industry is risk averse which could inhibit the uptake of the trialling of the preferred options; to encourage uptake of the options some incentive may be required.
- Local community engagement around bauxite residue disposal sites.

Lessons Learnt

- There must be some flexibility in contract conditions if contract requirements change significantly. For example, the CSIRO supported the project by providing funding to develop BRADD to manage the large volume of data.
- Notwithstanding the point made previously, DRET has been supportive in allowing minor deviations to the contract where DRET has felt that this assisted in meeting project objectives.
- The project team is of the opinion that moving forward DRET could consider providing input in the early stages of developing relationships with Partner Countries to have government-level assistance in establishing contact with the most appropriate technical resources for the project.
- The project team is of the opinion that it is critical that the relationships between the most appropriate technical resources in these participating countries be established as a matter of priority.

Project Details	BATF-06-27 Green Building Flagships in China
Task Force	Buildings and Appliances
Project Location(s)	USA, China
Project Manager	Mark Ginsberg, US Department of Energy

Project Overview

The aim of this project is to transfer knowledge of advanced energy efficient green building technologies from the USA, Japan and Australia into the Chinese market. There are 3 elements to the project, (i) Mayors' Training Center, (ii) Olympic Village Micro-Energy (Near-Zero Energy) Building and (iii) Center of Excellence (***COE***).

Project Status

- Mayors' Training Center: energy-efficiency retrofit of an existing 1993 training center building is planned. A 1 month on-site training for City Mayors is reportedly planned and APP has added energy to the curriculum with an offer of support to Mayors if they commit to developing net zero carbon buildings.
- Olympic Village Micro-Energy (Near-Zero Energy) Building: completed in August 2008, in time for the start of the Olympic Games. The building was designed to consume only 4 W/m2 for heating compared with 27 W/m2 for a typical building of this type. The building is in the process of being converted to a kindergarten.
- COE: the current plan is to site this exhibit of advanced building technologies in the Science Museum of China, which is under construction near the Olympic Park in Beijing and would be open to the public.

Project Outcomes

- The Micro-Energy Building served the purpose of validating in China the use of a number of individual technologies.
- The Beijing Olympic Village as a whole received the Leadership in Energy and Environmental Design (***LEED***) Gold Award from the U.S. Green Building Council in recognition of its environmentally-friendly design.
- Seminars regarding the Micro-Energy Building and other promotions of the building may have been a catalyst for tightening building energy efficiency standards in China.
- It is not clear whether specific technologies have been successfully transferred, nor whether an overall, replicable model for green buildings in China has been developed.

Future Potential

- APP involvement in construction of a proposed new Flagship Mayors Training Centre will aim to reflect best practice in high performance or zero carbon technologies. The team has also been tasked with developing a new curriculum to educate and challenge the Mayors on energy efficiency policies and practices.
- Responsibility for the COE is believed to be shifting from the Ministry of Science and Technology (***MOST***) to the China Association for Science & Technology (***CAST***) in a move which will open the door to more commercial investment in the COE. Commercial support could also compromise the credibility of the COE.
- The activities of the COE and the Mayoral Training Centre, properly managed, could improve visibility to the public and local policymakers and accelerate the transition to more sustainable building practices in China.
- The Micro Energy Building developer (Guo Ao) expressed interest in further APP support for a new project in Guilin.

Barriers to Success

- Lack of a clear government focus or involvement or industry/association focus and a lack of understanding of building code enforcement practices and the market for new technologies.
- Accelerating a voluntary initiative in an increasingly mandated global environment.
- Lack of clear understanding of how to transfer new design and building practices.

Lessons Learnt

- A change in focus to influencing minimum building standards rather than focus on “near zero” technology may be more in line with China’s business and regulatory environment and deliver greater benefits in terms of clean development and climate change mitigation.

Project Details	BATF-07-36 Harmonisation of Testing Procedures and Quality Assurances – CFLs
Task Force	Buildings and Appliances
Project Location(s)	Australia, China, India, as well as Indonesia, the Philippines, Thailand, Vietnam
Project Manager	Melanie Slade, Australian Department of the Environment, Water, Heritage and the Arts; Norman Bath, US Department of State

Project Overview

In an effort to eliminate a major barrier to developing successful standards and labelling programs, this project will develop harmonised test procedures and will include the evaluation of existing standards and test procedures for Compact Fluorescent Lamps (***CFLs***). The Australian Government is contributing funding to the project.

Project Status

The level of cooperation and collaboration between stakeholders appears extensive and productive with numerous activities, events, testing programs and documentation milestones being reached. In March 2009, manufacturers and supporting members of the Manila Compact agreed to the formation of an independent, non-profit organisation the 'Asia Lighting Council' (***ALC***), whose mission will be to implement a product marking system for quality CFLs (and eventually other lighting products), and to foster harmonisation of CFL test standards and mutual recognition of CFL test results.

Project Outcomes

- The Manila Compact was developed and signed by the world's 4 largest lighting companies and several national lighting associations.
- Benchmark testing of CFL quality.
- Report on CFL standards in Asia comparing CFL performance standards and targets across Asian countries.
- Roundtable on CFL quality monitoring and compliance in India.
- Draft CFL quality standards to facilitate development of a set of guidelines for CFL quality for Asia.

Future Potential

- Public and private sector interests are aligned in this project therefore the potential to expand its remit is extremely high.
- Many of the outcomes to date, particularly the establishment of the ALC, represent a significant organisational response which will have a continuing role and legacy in the region to help meet specific goals and objectives associated with CFL testing, quality and consumer outreach.
- The methods and project collaboration formats are repeatable and scalable subject to the geographic, social and cultural requirements of different regions.

Barriers to Success

The barriers, if any, relate more to communication and cultural aspects of regional collaboration, than to any technical barriers. However, it would appear that the establishment of the ALC will play a key role in maximising ongoing harmonisation as well as fostering transparency and information exchange between government, industry and NGOs in the region.

The application of the project is not limited to APP countries, but has true global relevance. In this respect some tensions have been encountered in dealings with other international testing/certification bodies who have questioned the remit or jurisdiction of the APP.

Lessons Learnt

The project highlighted the value and utility of building cooperation and trust between and among stakeholders across the region. Further enhancing and maximising effective communication between partners from the outset of the project has been identified as a lesson learnt from BATF-07-36. This includes ensuring greater clarity about governance and decision-making, funding, as well as overall project priorities. A project based on collaboration and cooperation across jurisdictions and cultures requires an approach that relies on trust and transparency. Mutually agreed goals and objectives are a key part of being able to achieve positive outcomes.

Project Details	BAFT-08-49 GreenSpacesTM – IT / ITeS Special Economic Zone
Task Force	Buildings and Appliances
Project Location(s)	15/1, Main Mathura Road, Faridabad, Haryana, India
Project Manager	Mr. Kamal Meattle, CEO, Selecto Systems Private Limited

Project Overview

This project aims to deliver the world's most energy efficient commercial building measured by achieving the highest number of points, worldwide, in USGBC LEED 2.1 or 3.0 certification. The GreenSpacesTM project aims to help demonstrate that it is economically possible to reduce the energy use in buildings from 40% to 10% through technology, lifestyle changes and design. The project will seek to demonstrate that the GreenSpacesTM model is sustainable and thus can be replicated in other countries. The lead Partner Country for this project is India with the participating Partner Countries of USA, Australia, Japan, Canada and China.

Project Status

- Environment Impact Assessment (***EIA***) Approval from the Government of India and the Master Plan have been submitted to the Haryana Government.
- Potential funding equivalent to 86.5% - last status report (March 2009) identified AU$35.50 million short as equity (25%).
- Selection/Appointment of Design & Construction Team has been completed and an alliance formed between the owner, architect, MEP consultant and the construction company.
- The major outstanding issues to be resolved for the project to progress are the securing of additional funding and Master Plan approval from the Haryana Government.

Project Outcomes

- Innovations from the Green Spaces India project have been trialled at the Pararpur Business Centre which demonstrates that it is technically and commercially viable and profitable to make high performance building far exceeding "business as usual" practices e.g. a saving of 74.4% in energy use and zero waste during construction and operation.
- Innovative business model for delivering high performance building, learning from the Australian experience.

- A complete financial Alliance team that is going to produce the project with minimum upfront costs and collaborative initiatives.

Future Potential

- Innovations designed and implemented as part of the project include technological innovations (e.g. power generation systems), business model innovations (e.g. option to lease on shift basis or 24X7), financing innovations (e.g. renewable energy financing) and awareness innovations (e.g. zero emission vehicles leased to occupants).
- To achieve greater market uptake of technology or processes applied in the Green Spaces India project there will need to be economies of scale such as around 20m sft per year of “green buildings” in India required to get to 10% market share, which will involve investment of approximately US$2 billion year.

Barriers to Success

- Upfront global / strategic funding.
- SEZ requirements that need updating since global economic impact.
- Delays in getting local approvals - Master Plan, Building Plans.

Lessons Learnt

- The importance of establishing the right leadership and partnerships with a strong organisational team willing to work together. GreenSpacesTM utilises the Alliance agreement process, working towards an equal partnership, ownership, risk / reward system and responsibility for the owner, contractor and architect – all working together towards a common goal.
- International firms need to understand and consider the regional context and regulatory environment e.g. to understand the functioning of local agencies, availability of technology, business strategies, tender documents, as well as to understand the tax and business requirements of local government agencies.

Project Details	CFE-06-05 Callide A Oxyfuel Demonstration Project
Task Force	Cleaner Fossil Energy
Project Location(s)	Australia
Project Manager	Dr Chris Spero, CS Energy

Project Overview

The project is being conducted as part of an international effort to develop clean coal technologies and aims to demonstrate low emission electricity generation from a coal-fired boiler. This will involve retrofit of oxyfuel technology to Callide A Unit No. 4, capture of around 70 t/day of CO_2 from a flue gas side stream, and capture and storage of CO_2 by geosequestration as part of the second stage of the project.

Project Status

The project has been developing over a number of years, with the joint venture formally established in March 2008. It is anticipated that construction will be undertaken over the next 18 months, with plant being installed from April 2010 and the facility being fully operational by August 2011.

Geosequestration facilities are currently being assessed, with the 2 main options approximately 300km west of the Callide site being a depleted gas field with 50-70,000 tonnes capacity and a deeper saline aquifer with approximately 100,000 tonnes storage capacity.

This is a self funded project; however, its status as an APP Flagship Project facilitated its access to funding from Japan in particular.

Project Outcomes

When completed, it is anticipated that the project will be the largest oxyfuel combustion facility in the world at 30MW electrical output linked to carbon capture and storage facilities.

The main element of the project is a demonstration scale oxyfuel boiler process, which aims to significantly reduce CO_2 generation during combustion. The process will generate approximately 200,000 tonnes of CO_2 per year, with the intent to capture and store approximately 10,000 tonnes of $C0_2$ per year (5%).

Future Potential

The project incorporates all the elements of a future commercial scale operation, so will provide valuable experience and expertise. In particular, the oxyfuel boiler modifications

undertaken by the Japanese company IHI are likely to be replicable and scalable for situations outside the Callide A project.

The visibility of the project and publication of some of the general information and technical data from the project is anticipated to encourage other, similar, larger projects to be initiated around the world.

Barriers to Success

- The technology is largely untested at this stage, and there may be significant technical barriers which only become apparent on commissioning of the facility at Callide or in scaling up the technology for commercial applications.
- The pricing of carbon is a key barrier to the project as this will influence the commercial viability of the technology.
- Industry, public, political and regulatory perception that new technology is ‘too hard’.
- Taxation issues are complicated for the project, particularly surrounding the importation of plant and equipment from Japan, with the ATO currently using the situation as a test case.

Lessons Learnt

- Issues resulting from the joint venture agreement, where the various participants clearly had different views on the projects and different drivers for involvement. Getting the understanding, working relationships and alignment of interest’s right is crucial to the success of this and future projects.
- Difficulties experienced in dealing with government funding requirements, including the amount of initial financial reporting and then ongoing reporting and dialogue.

Project Details	CFE-06-06 Post Combustion Capture Technologies
Task Force	Cleaner Fossil Energy
Project Location(s)	Australia, China
Project Manager	Dr Paul Feron, CSIRO

Project Overview

The aim of the Post Combustion Capture (***PCC***) program is to further the science and the practical application of removal of CO_2 from flue emission of coal-fired power stations. The program has a targeted laboratory research component as well as pilot plant demonstration component with real flue gas conditions that feed into each other with the aim of achieving realistic and cost effective emission control technology by retrofitting existing coal power stations. The Australian Government is contributing funding to the project.

Project Status

There has been rapid progress and learning associated with the program over the last 6 months with significant increases in the percentages of CO_2 that can be captured. The application of this technology, once proven, may be transferred to any coal-fired power station. Additionally, given the modular nature of the technology, the system can be added in stages. Currently pilot programs are running at the Munmorah power station, NSW and Huaneng power station, Beijing. A further pilot plant is in the design stage at Tarong power station, QLD, this project is approximately 8 months behind schedule due to issues with the tendering process.

Project Outcomes

Key outcomes sought are:

- Gaining a better understanding of ammonia and MEA in the flue chemistry with CO_2.
- Further increasing the CO_2 capture rate at pilot plants to 85% (currently at 65% at Munmorah).
- Identifying solutions to decrease the energy and water requirements of the technology, which currently result in an approximate 25% energy reduction of the power station output.
- Progressing the pilot plants to the demonstration phase.

Future Potential

- Through the pilot plants that are partially funded through the APP, it is hoped that demonstration scale plants will be facilitated at current pilot sites and elsewhere, with the site at Munmorah planning a small scale demonstration plant to be up and running by 2011 with a large scale demonstration plant anticipated by 2016.
- The future potential of this technology is significant as it can potentially be retrofitted to all existing coal-fired powers stations, as well as being designed in to new plants. Additionally, given the modular nature of the technology, the system can be added in stages.
- There is current research being undertaken by CSIRO into certain enzymes which act as a catalyst and thereby reduced the heat energy requirements by 50%. Research is also being undertaken into other potential solvents, including ionic liquids. The CSIRO is keen to see follow on projects to demonstration scale, publish key findings and commercialise technologies developed through licensing agreements.

Barriers to Success

- The PCC technology currently requires approximately 25% additional power output from the power station to drive the process.
- The cost of capture and storage of the CO_2 (currently ranges from AU$100 to AU$250/tonne) needs to be balanced with the CO_2 emissions costs for the PCC technology to become commercially viable.

Lessons Learnt

- The technology can deliver key benefits to the environment in terms of CO_2 emissions reduction. Reduction rates of CO_2 are expected to reach up to 85% by the end of 2009 (currently at approximately 65%)
- Without the involvement of the APP, the pilot programs may not have commenced or may have been commissioned on a much smaller scale.
- Changes in the chemistry in one component of the PCC system can have a significant knock-on effect.
- The energy and water requirements of the technology are significant and ongoing research into the reduction of these components is required before the PCC approach has the potential to become commercially viable. Research into enzymes which could reduce the energy requirements by half is being undertaken by CSIRO.

Project Details	CLM-06-01 Information Sharing on Coal Processing Technologies
Task Force	Coal Mining
Project Location(s)	India
Project Manager	Shri A. Ray Choudhury (CMDPI)

Project Overview

The aim of the Information Sharing on Coal Processing Technologies program is to improve coal preparation efficiency, reduce waste coal generation and reduce cost by streamlining suboptimal systems of coal preparation by sharing experience gained in other Partner Countries. Lack of information on the technologies available in other Partner Countries hinders some Partner Countries from optimising the performance of their coal preparation techniques. Information sharing on technologies available in respect to coal preparation would probably lead to increases in efficiency of operations and offer beneficiation process cost savings as well as improvements to environmental and social issues.

Project Status

Phase 1 of the project plan was completed in August 2007. Phase 2 has now been initiated.

Project Outcomes

The project has successfully held meetings in the US between the Indian Project Managers and the US Project Managers with the identification of one technology that may help in reduction of C02 emissions but this is yet to be demonstrated with the use of Indian coal.

Upon technical results of the tests, the objective for information sharing on this project becomes secondary to initiating a demonstration-scale deshaling unit to be installed at various mine sites in India, which will lead to an engineering design for a commercial-scale deshaling plant in India. The final results of this type of demonstration project are expected to aid in market transformation and provide a model for future replications in India.

Future Potential

Future potential identified in funding of a demonstration plant in India by a Partner Country to test the implementation of dry beneficiation technologies which if successful may be deployed throughout India. Additional potential identified in communication between India and Partner Countries at the technical level to identify other potential coal beneficiation technologies that could be used in India.

Barriers to Success

- No clear guidelines to the project or for the development of a communication plan.
- No on-line platform for communication/knowledge.
- No budget for testing or implementation of various technologies.
- A lack of a funding commitment for demonstration plant.

Lessons Learnt

- Project has assisted India in identifying a technology gap in beneficiation of coal and inexperience with operating coal beneficiation facilities.
- Project also highlighted an opportunity in India for further expertise and sharing of international experiences with Indian industry and Government in relation to dry beneficiation.
- Project identified a large need for information sharing among the Partner Countries with “clean” technologies that may be suitable for the Indian coal industry.
- The information sharing project has not been effective to engage with all Partner Countries to identify all of the existing clean coal technologies that may be effectively tested and potentially deployed in India. Further work under the APP to share information on a multilateral basis could be undertaken, particularly at a technical level.

Project Details	CLM-06-09 Coal Mine Health and Safety
Task Force	Coal Mining
Project Location(s)	Australia, China
Project Manager	Mr Michael Alder, Department of Resource, Energy and Tourism

Project Overview

This project involves undertaking a series of studies and workshops to gather and disseminate best practice mine safety procedures and practices, together with the deployment of improved safety equipment, throughout the AP6 participating member countries. The aim is to control the health and safety risks associated with mine operations by developing and implementing new site specific technologies, education, and training and through development and implementation of a sound legislative, regulatory and enforcement framework. The project also offers the opportunity to review options for more environmentally friendly disposal of methane extracted as part of mine ventilation than simply releasing it to the atmosphere. While Australia is the lead country (including providing the associated funding) for sub-projects 1 and 4, China and Australia have joint project management and funding responsibility for the China Mine Safety Demonstration project. Other APP countries are the lead agencies for the remaining sub-projects including sub-projects 2, 3 and 5. The Australian Government is contributing funding to the project.

Project Status

Stage 1 for sub-projects 1 and 4 was completed within the specified timelines. Stage 2 of sub-projects 1 and 4 have been completed and the draft reports issued. Stage 3 for sub-projects 1 and 4 have commenced and are expected to be delivered within the specified timeframes.

Outcomes 1 and 8 of the China Safety Demonstration Project at the Xuandong Mine in the Hebei Province have been completed.

Project Outcomes

Key outcomes include improvements in health and safety (***H&S***) and a reduction in fatalities and injuries across the participating APP economies, improvements in the economics of coal mining both through an improvement in productivity and a reduction in mining costs, commitment by participating Governments, industry and unions/workforce to improve H&S and an understanding and commitment to safety as a way of life through the dissemination of information and training in best safety work practices.

This project may also lead to reductions in methane and dust emissions vented to the atmosphere through examining alternative disposal of methane such as flaring or use to generate power.

Future Potential

The future benefit such a project can deliver to the coal mining industry globally is varied depending on the level of safety culture maturity of a country and/or organisation. Smaller coal mining companies which are less advanced in terms of safety culture maturity, would obtain greater benefit from the information that has been documented than larger organisations.

The program activities being trialled at the demonstration mine can be up-scaled and replicated at a number of mines across China resulting in a systematic and consistent approach to health and safety management.

Barriers to Success

- Obtaining information from other Partner Countries.
- Challenges with understanding government legislation and policies due to language difficulties.
- Industry adoption of new practices.

Lessons Learnt

- Greater benefit could have been gained by focusing on fewer sub-projects.
- Obtain greater industry support and involvement to help to drive the provision of additional resources.
- Improved communication across all partnership groups on the progress of each project and project outcomes.
- The most valuable information is sourced when you go to the country you are seeking information from.
- Face-to-face meetings help to facilitate information exchange.

Project Details	CLM-06-11 Increasing Recovery and Use of Coal Mine Methane
Task Force	Coal Mining
Project Location(s)	India, China
Project Manager	Dr Jayne Somers, US EPA

Project Overview

The aim of the project is to improve mine safety and increase coal mine methane/coalbed methane production and utilisation in the APP countries, primarily in China and India, by promoting use of more effective drilling and mine drainage technologies and techniques in advance of mining, and the recovery or use of low-grade CMM sources, such as VAM (ventilation air methane).

The efforts of this Task Force are intended to be complementary to efforts to promote coal mine methane project development under the Methane to Markets (***M2M***) Partnership. The activities of this Task Force may tap into the project-based activities of the M2M Coal Subcommittee where relevant and appropriate to ensure that there is no duplication of effort.

Project Status

Coal Mine Methane Feasibility Study at the Hebi No. 6 Coal Mine in China is close to completion. The assessment is intended to quantify the potential benefits of improved methane drainage practices on drainage efficiency, the mine development and production schedule, mining costs, coal production rates, and projects the anticipated increase in gas recovery, improvements in recovered gas quality and the increased power generation potential.

Other key milestones achieved include completion of meetings between mine management and CMM experts to initiate feasibility study and completion of methane pre-feasibility and resource assessment.

Project Outcomes

The feasibility assessment will provide much more substantive data on the GHG reduction outcomes that can be expected from implementation of the project. The project is predicted to have strong commercial viability and is attractive to potential funders and carbon funds who are particularly interested in the potential of the project to produce significant quantities of verifiable carbon credits.

There is also strong interest from private sector companies who see the commercial opportunities associated with the wider application of the technologies transferred through the project.

The opportunity also exists to deliver sustainable development outcomes with high priority in China for alternative fuel sources for electrical generation and the potential to supply local communities with energy from process.

Future Potential

The project may have future potential for wider commercial application. The use of methane as a clean energy source provides an additional revenue stream for a mine and can also promote local sustainable development objectives. Enhanced methane recovery also improves mine air quality and reduces safety concerns.

Barriers to Success

- The lack of international cooperation has resulted in lost value potentially derived from better communication and knowledge transfer within and across Task Forces. The current configuration of the Task Forces and supporting infrastructure do not promote the wider transfer of knowledge and expertise.
- A change in management at the feasibility study site has stalled the progress of the project. Commercial pressures may have reduced the new mine management's commitment to the project.
- Lack of a feedback mechanism in the private sector, i.e. once technology has been transferred and applied in commercial environment; the APP does not necessarily have visibility.

Lessons Learnt

- CMM project may have the level of ministerial commitment that other projects are lacking given that it is part of the strategic economic dialogue between China and the USA.
- Project fundamentally viable as its objectives are completely aligned with the APP's vision for GHG reductions generated through technology transfer.
- Continuity in the key project stakeholders is critical to ensure that hard won international networks do not have to be re-created from scratch at various stages of the project program.

Project Details	CMT-06-05 Centre of Excellence
Task Force	Cement
Project Location(s)	Japan, China, India
Project Manager	SUI Tongbo, China Building Materials Academy

Project Overview

The project is designed to provide a mechanism for the diffusion and adoption of best practice and best emerging technologies within APP member countries. Initially, the project has provided a series of technical workshops to disseminate best practice technologies and best emerging technologies in the areas that will have the greatest impact in reducing cement plant greenhouse gas emissions, their use of energy and maximisation of their clean development potential.

Project Status

Japanese companies were considered among the earliest investors in the Chinese cement industry and have since been recognised as global leaders in management methodologies and waste disposal. When it comes to technology adoption however, Japanese industry has been slow to adapt given the speed of overall national economic growth. In regard to project specifics, gains can be measured through a series of technical exchange activities to date. No schedule currently exists for future exchanges; however a proposal has been made to both the Australian and Japanese Governments. The global financial crisis (***GFC***) has affected project funding to date and is the subject of current review in addition to further developments of the project. The Cement Industry Federation (***CIF***) of Australia has undertaken a review of alternative fuels, energy efficiency, the use of supplementary cementitious material and the use of alternative raw material. Consequently, CIF and Cement Australia are undertaking a trial project of Ultra Sonic grinding in Brisbane. The Australian Government is contributing funding to the project.

Project Outcomes

- Cement Sustainability Initiative Protocol: 40 of China’s largest cement manufacturers participated in an introductory seminar regarding WBCSD CSI Protocol.
- Clean Development Technology Exchange: Seminars hosting other developing nations within Asia and also Africa held in China demonstrating advancements in cement manufacturing technology.

- Cement & Concrete Technology Development: Domestically orientated seminars emphasised linking Chinese manufacturers to university-based technology development institutes.

Future Potential

Current plans call for a continued and regular program of technology exchange, including seminars regarding advancements in production technology and global best practices.

Barriers to Success

- China’s smaller scale producers numbering approximately 5,000 will face greater economic hurdles with regard to investment in new technology. NSP is typically only viable on a larger scale.
- Commercial sensitivity, in particular quantification of technical benefits of advanced technology from Japan, which has limited the take-up of this technology by potential recipients in China or elsewhere.
- Combining the development in hardware with up-to-date software. This is largely dependent on transferring both technological and operational expertise to apply the technology in new manufacturing environments.

Lessons Learnt

This project appears to have delivered a well-balanced and highly cost-effective forum for the transfer of advanced technology to China and other developing countries. However, specific technology transfer examples and quantifiable benefits cannot be cited as these were not part of the structure of the project when first initiated and do not naturally result from COE activities. In order to quantify benefits, an investment would be needed in tracking, reporting and verifying technology implementation undertaken within a period of time after participation in COE projects.

Project Details	CMT-06-10 Cement Industry Performance Diagnosis
Task Force	Cement
Project Location(s)	Japan, China, India
Project Manager	Fumio Yamashita, Deputy Director, Manufacturing Industries Bureau, Ministry of Economy, Trade and Industry (***METI***) Japan

Project Overview

This project consists of specialists in energy saving, environmental management and cement production in the Japanese cement industry visiting cement factories in China and India for a specified period. There, such specialists carry out performance diagnosis primarily for energy saving and environmental management, then provide short-term and medium to long-term recommendations on how acceptable factories can introduce technologies and operational approaches that are optimal for the factories.

Project Status

Primary and Secondary Diagnosis studies have been completed in China and India, including explanatory meetings held in each country. The NEDO homepage (Japanese only) contains a summary of this process and survey outcomes from phases 1 and 2. A total of 8 companies within China and India are being assessed within the project, selected on the basis of being both ‘model’ and large scale cement manufacturers. With the majority of these companies already utilising existing 5 and 6 stage technology, the opportunities for the transfer of advanced technology are considered limited, although management expertise is expected to add value. Japanese industry experts plan to be dispatched to China and India for the third diagnosis by the end of 2009.

Project Outcomes

Chinese stakeholders specifically cited beneficial knowledge exchange regarding:

- energy efficiency;
- waste management; and
- environmental management practices.

These results have yet to be fully quantified, however a project report has been produced in draft in China, and is reportedly under review by China’s NDRC. Appropriate technologies and operational approaches for the energy savings and environment protection measures selected by Japanese industry experts as the result of on-site survey are expected to be deployed within APP Partner Countries.

Future Potential

Future expansion in Chinese or Indian regions is expected and will potentially include some of the smaller or medium-sized cement manufacturers. It is considered a significant challenge to effect meaningful efficiency improvements at such level due to common economic constraints within small and medium sized organisations.

Barriers to Success

- Need for field training for the 16 largest Chinese cement manufacturers.
- Commercial sensitivity, in particular quantification of technical benefits of advanced technology from Japan.
- Active support from China's NDRC will be important for these programs to be more widely-recognised.
- Environmental regulation: The use of hazardous waste in kilns is highly regulated in some areas, limiting its use even when environmental benefits are potentially achievable at low cost.
- Technology/economics: Fly ash utilisation is less economically-attractive in countries where it is cheaper to dispose than landfill. (In contrast, the Japanese government reportedly subsidises cement kilns to utilise fly ash as it is cheaper than funding more landfill space).

Lessons Learnt

Further needs analysis may be required to focus activity on technology transfer which delivers the greatest value to recipient Partner Countries. Gaining visibility to national industrial technology roadmaps may be an efficient way to obtain this insight as well as gain stronger government backing.

Project Details	CMT-07-07 (Sub Project 1) Best Practice for Co-Processing & Management of Cement Kilns
Task Force	Cement
Project Location(s)	Australia, USA, India
Project Manager	Dr. S.P Ghosh, Cement Manufacturers Association

Project Overview

This project is intended to promote the use of hazardous and other industrial wastes as a reliable alternate, renewable source of energy for clinker production in cement kilns. Umbrella Project 7 will demonstrate the technical and economic feasibility of co-firing various types of hazardous and other industrial wastes safely. The goal of the Umbrella Project is to provide cement kilns with a reliable, affordable supply of renewable energy, as well to serve as a clean, safe destruction technology for waste management in Asia-Pacific Partnership member countries. The Australian Government is contributing funding to the project.

The objectives of Sub-Project 1 are as follows:

- to facilitate introduction of international best practices on co-processing of hazardous waste (***HW***) in the Indian Cement Industry; and
- to create an enabling environment for development of cost effective and efficient technologies for utilisation of HW in cement manufacturing and identify, assess and address barriers to the promotion of the technology.

Project Status

It was identified in the project review meeting that is was unclear if the progress by ACC to achieve the above objectives was specifically attributable to the APP project or if it was business as usual since co-processing of HW is advancing in India rapidly anyway. It was, however, identified that there are 3 current pilot demonstration projects being undertaken at the following ACC cement plants: Kymore Cement Works, Madhya Pradesh, Jamul Cement Works, Chhattisgarh and Wadi Cement Works, Karnataka.

Project Outcomes

The following desired outcomes of the project were discussed in the project review meeting:

- Establishment of demonstration plants at the 3 ACC cement plants in Kymore, Jamul and Wadi.

- Establishment of financing by the APP for the feasibility and demonstration co-processing “mixing” plants at each of the 4 ACC sites.
- Promotion of the use of hazardous and other industrial wastes as a reliable alternative renewable source of energy for clinker production in cement kilns.
- Demonstration of the technical and economic feasibility of co-firing various types of hazardous and other industrial wastes safely and efficiently.

Future Potential

The APP could focus this Flagship Project to funding and developing the first demonstration “mixing plant” in cooperation with ACC and Holcim. There is the future potential for private and public financing particularly since the mixing plants are functioning to serve the public interest.

Barriers to Success

- Industries that are producers of HW need government policy direction with incentive programs to ensure a reliable supply to cement kilns and investment certainty for capital project development.
- No project financing or APP initiative for the development of a demonstration mixing plant at the ACC kiln sites.
- There is a need to define operational procedures concerning mixing plant developments and the sustainability benefits of contributing HW to the cement industry.

Lessons Learnt

In undertaking the project a key lesson is that there is still a large need for information sharing among the Partner Countries with “clean” technologies that may be suitable for the Indian cement industry. The project has assisted India to learn that it has knowledge and technology gaps for the inclusion of individual HW materials that may be used in co-processing combustion processes in the cement industry. It was identified that there is also inexperience and a lack of technical feasibility with operating facilities.

Project Details	CMT-07-07 (Sub Project 2) Solvent Based Fuels
Task Force	Cement
Project Location(s)	Australia, Japan
Project Manager	John Worsley, Operations Manager, Geocycle

Project Overview

The project will develop new techniques to process hazardous liquid, semi-liquid and solid by-products from other industrial processes into alternative fuels for co-processing in Australian (and international) cement kilns, by bringing together existing technologies from several other industries in a unique combination and coupling them with several new developments. Specifically the project involves a fully integrated: high viscosity fuel production and utilisation process; a waste dewatering/water purification system; a steel drum recovery/recycling system; and the production of high quality distillate fuel. The application of this technology, once proven, may be applied to any industrial process reliant on fossil fuels. The Australian Government is contributing funding to the project.

Project Status

Phase 1 of the project is completed with the commissioning of the drum recycling system. The system is at 50%b capacity (4, 000 tonnes/ year) and will ramp up to 8, 000 tonnes per year.

Phase II of the project (Solvent Dewatering Plant) is currently on hold due to the GFC. A concept process design and cost estimate has been prepared and the project is now awaiting board approval.

Project Outcomes

The main outcome was the commissioning of the Drum Recycling System which was opened by the Australian Government Minister for Resources, Energy and Tourism in early May 2009.

Since commissioning, the commercial viability of the drum emptying/recycling method developed has been established.

Future Potential

The future of this project is significant. Geocycle is owned by Cement Australia who in turn is owned by parent company, Holcim. They are one of the world's largest producers and

distributors of cement and also producers of ready-mix aggregates and asphalt. They operate across 70 countries and have a market presence in every continent.

Therefore the potential to scale up and replicate this project globally throughout the Holcim group of companies is significant. Geocycle have reported that there is a high level of interest on the progress of this project within Holcim.

Barriers to Success

- The primary barrier to success at present is the GFC. The company Board of Directors have put a hold on the second phase of the project (Solvent Dewatering Plant). The company wishes to focus on consolidation rather than research and expansion.
- Technically, the high water content and low calorific value of some fuels produced are a major issues (hence the planned development of the Solvent Dewatering Plant). Dehydration of some fuels will further increase efficiencies and market share, but this is on hold until economic conditions improve.

Lessons Learnt

- The project will deliver key benefits to the environment in terms of a reduction in landfill and a reduction in energy use of CO_2 emissions. Therefore there is significant interest in the success of this project.
- Without the involvement of the APP, the project may not have commenced or may have been commissioned on a much smaller scale.
- There is significant opportunity to up-scale the project internationally through the Holcim parent company.
- Technical issues with the Drum Recycling System have been relatively minor. The size of the shredder chamber has been increased and adjustments to the grinder have been made.
- The primary technical issue however is the high water content and low calorific value of some fuels produced (hence the planned development of the Solvent Dewatering Plant). Dehydration of some fuels will further increase efficiencies and market share, but this is on hold until economic conditions improve.
- The primary barrier to success at present is the GFC. The company Board of Directors have put a hold on the second phase of the project (Solvent Dewatering Plant). The company wishes to focus on consolidation rather than research and expansion.

Project Details	CMT-07-07 (Sub Project 3) Utilising Biosolids in Cement Kilns
Task Force	Cement
Project Location(s)	Australia, Japan, India
Project Manager	Jim Young, Blue Circle Southern Cement

Project Overview

The project involves the processing of biosolids from Melbourne Water's Western Treatment Plant located in Werribee, Victoria at the Blue Circle Southern Cement plant in Waurn Ponds, Victoria. Specifically the project will examine the feasibility of introducing biosolids from industrial wastewater, as an alternative renewable energy source into the Waurn Ponds Cement Plant and the viability of biosolids as a replacement fuel for traditional fossil fuels utilised in cement kilns. A secondary phase of the project will also develop control strategies to capture and contain mercury emissions from biosolids processed at the plant. The Australian Government is contributing funding to the project.

Project Status

Sufficient project funding under the Federal Government Asia-Pacific Partnership scheme has allowed steady progress to date. Currently the project is proceeding to what is being titled the Bio-Solids Mercury Management Technology Demonstration Stage. The primary objective within this stage will be to determine the configuration and estimated costs of a suitable system to achieve maximum efficiency in removal of mercury, when utilising bio-solids as a kiln fuel.

Secondary objectives of this project phase will be:

- to demonstrate the system development has a greater mercury removal efficiency than current leading commercially available technology offering; and
- to demonstrate the removal impact upon other pollutants in the flue gas stream such as NOx, SOx, metals, organics, PM10 and PM2.5 crystalline silica.

Project Outcomes

- Execution of agreement with Indigo Technologies (March 2009).
- Completion of mercury control technology pilot plant design and design of the demonstration and evaluation program (June 2009) including equipment design for pilot plant, experimental design for trial.

Future Potential

The future potential of this project is also largely dependent on the success of the mercury removal technology. If Indigo and Blue Circle Southern Cement can demonstrate the system development has greater mercury removal efficiency than current leading commercially available technology offering, the worldwide industry demand could potentially increase overnight. Future legislation may also become a significant driver in the deployment of this technology. Given the size of certain cement facilities throughout Asia and the USA this technology development could result in significant mercury reductions on a global scale.

Barriers to Success

Technologically, 2 significant barriers exist. Firstly, the ability of Indigo Technologies to demonstrate the system development has greater mercury removal efficiency than current leading commercially available technology offering is a significant barrier to the overall project success and future project expansion or replication.

Secondary to the successful demonstration of mercury removal is the successful drying and preparation of biosolid fuels on-site. Biosolid arrives on-site with an approximate 30% moisture content which needs to be efficiently dried in order to become a successful fuel supplement.

Financially, a long-term commercial commitment from biosolid suppliers such as Melbourne Water also will be important to achievement of long-term project success.

Lessons Learnt

- Without appropriate government funding through the APP, the project would not have commenced or proceeded to its current status.
- Key to securing further developments or international deployment of the project is the future investment of both government and private capital funding.
- To ensure further investment opportunities or improved project economics, it will be important for governments to provide more consistent long-term regulation or policy regarding clean energy or mercury emission levels.

Project Details	CMT-07-07 (Sub Project 4) Best Practice for Co-Processing & Management in Cement Kilns
Task Force	Cement
Project Location(s)	Australia, China, India, USA
Project Manager	Gary Stanley, US Department of Commerce

Project Overview

Project 7 is an Umbrella project that is intended to provide cement kilns with a reliable, affordable supply of renewable energy, while serving as a clean, safe destruction technology for waste management in the Asia-Pacific Partnership member countries. It will do this by promoting the use of hazardous and other industrial wastes as a reliable alternate, renewable source of energy for clinker production in cement kilns. This project is expected to increase awareness of options for using alternative fuels, promote installation of enabling technologies, and reduce emissions from fossil fuels. The Australian Government is contributing funding to the project.

Project Status

The project is complete.

Project Outcomes

A 2 day “APP Exposition of US technologies for Clean Cement” was held in conjunction with the Meeting of the Cement Task Force in Charleston, SC. The event helped to promote private sector discussion between the APP member countries.

2 reverse trade missions were also held, one from China and the second from India.

Future Potential

The event was judged a success by the US co-organisers. While tangible outcomes are difficult to measure the role that the APP can play in providing an open forum for private sector companies from different regions to explore commercial opportunities is considered valuable.

Barriers to Success

For the organisers it proved challenging to recruit companies from China and India to participate, although it is recognised that one of the positives from the event was initiating private sector dialogue between Partner Countries.

Lessons Learnt

- In setting up the project, it was assumed that it would be challenging to engage private sector companies/vendors directly involved in the US cement sector. In reality, the private sector has responded positively to the commercial opportunities and new markets that could open up as a result of stronger links with the cement industry in both China and India.
- It is considered by the Department of Commerce that the event would have had significantly greater participation if it had been dovetailed with a recognised cement industry conference, rather than a specific APP event.

Project Details	PGT–06-01 Best Practices for Power Generation Activity Plan.
Task Force	Power Generation and Transmission
Project Location(s)	Australia, Canada, China, India, Japan, Korea, USA
Project Manager	Jim Hendricks – Private Consultant representing the Edison Electric Institute

Project Overview

This project's aim was to assist participating countries' power generators to improve their overall coal-fired power plant thermal efficiency, resulting in significant mitigation of greenhouse gases and air pollutants by developing a best practices handbook.

This review will catalyse the implementation of best practices technologies and training of personnel to further stimulate their deployment in Partner Countries improving the national generating efficiency in each Partner Country. The Australian Government is contributing funding to parts of the project.

Project Status

8 peer reviews, workshops and site visits were held during 2006-2009 within Australia, Japan, India, Korea, and the USA with a peer review planned for 2010. Participating countries are currently evaluating what future steps should be taken.

One key milestone of APP involvement in India is a shift towards collaboration with State-run utilities that account for 2/3 of the total electricity generation in India and are inefficiently run.

Project Outcomes

One of the initial outcomes of the project was the development of the Green Handbook Peer Review Document. This Green Book provides a framework for participating countries to use when evaluating the thermal efficiency of coal-fired power plants.

Since then, various peer reviews held at participating country facilities have raised awareness of the Green Book, and provided specific hands-on technical guidance to plant managers and engineering staff resulting in improvements to the handbook and significant sharing of best practices. There is a strong confidence that efficiency gains achieved in various Partner Countries are permanent – e.g. after initial training, power plant operators are likely to continue implementation in the future because of the obvious cost savings and efficiency gains.

In addition, there have been 2 best practices events that focused on the hydroelectric and wind power sectors resulting in participants collaborating on ways to maintain and improve the efficiency of hydro and wind power generation facilities.

Future Potential

The future potential of this project is significant through the provision of in-depth training in Partner Countries and expansion of utilisation of the Green Book. There is also the potential to take similar peer review events to other non-Partner Countries.

Although there has been no aggregate quantification of emissions reductions, the feeling is that widespread adoption of the techniques outlined in the Green Book will result in significant emissions reductions and efficiency improvements.

Going forward, the Peer Review analysis will result in future workshops, development of technology transfer opportunities and pathways for implementation such as financing and identification of service providers. This Peer Review framework is also being utilised in the distribution and demand side management efforts.

Barriers to Success

- It takes a while to develop a framework with the high level commitment and engagement from governments.
- Regulatory and financing challenges in the Indian power sector.
- Identification of commercially viable projects and funding mechanisms.

Lessons Learnt

- Participation from the investment community could significantly increase the rate of technology transfer and efficiency gains. Power plant owners/operators are entirely focused on the capital costs of projects with little attention to energy and/or fuel savings.
- Workshops, site visits and peer reviews have resulted in a large network of power plant engineers and efficiency specialists.
- Development of the Green Book has identified a number of best practices efforts that can be used at coal plants worldwide.

Project Details	RDG 06-01 High Efficiency Solar Power Stations for Affordable Energy
Task Force	Renewable Energy and Distributed Generation Task Force
Project Location(s)	Australia
Project Manager	Mr Barry Hendy, Solar Systems Pty Ltd

Project Overview

This project aims to deploy 1GW of power station-related technology across Australia, China and the USA, all utilising breakthrough photovoltaic concentrators producing ultra-high efficiencies. This project constitutes the Demonstration Stage and Stage One of the larger project “construction of a 154MW Heliostat Concentrator Photovoltaic (HCPV) Solar Power Station in Victoria Australia and international deployment of the power station". The Australian Government is contributing funding to the project.

Project Status

The development facility at Bridgewater, Victoria has achieved the milestone of 140kW of solar power generation. The most significant achievement was on 11/12/2008 when the system went "on sun" at full strength for the first time with 30 heliostats and was generating 144.6kW DC which is equivalent to 141.3kW DC SOC, exceeding the design objective of 140kW. A significant investment has been made in the ability to measure, record and optimise electricity generation for the facility. There is ongoing performance testing and technical evaluation being conducted at the facility.

The next major goal is to deliver a Prototype HCPV unit. The site has been selected, there has been detailed community consultation and final negotiations are underway.

Solar Systems received funding of AU$4.5 million from APP funding for the Demonstration Phase of the larger 154MW solar power station which is complete. Solar Systems have received private investment from TRUenergy which is also a financial partner in the Project.

Project Outcomes

The APP funding is primarily apportioned to funding the construction, testing and evaluation of the 140kW Demonstration Facility. The construction and operation of the Demonstration Facility at Bridgewater, Victoria and the achievement of the 140kW in measurable output from the facility has been a key step in achieving the aims of the project. It is expected that with the success of this “proof of concept” stage subsequent stages of the project will deliver a 0.5MW development facility, a 2MW repeatable power station, a commitment to power

purchase agreement for 102MW output and agreements between Solar Systems and APP partners on deployment of HCPV technology in Australia, the USA, China and Korea.

Future Potential

Solar Systems HCPV technology aims to be the most cost effective and efficient solar power generation ever developed. At a final capacity of 154MW the Stage 2 and 3 HCPV project is expected to be the largest photovoltaic power station in the world.

The stages of the project including the progressive scaling of the technology from demonstration to large scale development will help to establish concentrated solar PV technology as a commercially viable renewable energy technology in Partner Countries.

Upon completion of the 140kW demonstration facility a modular based system will be constructed. These repeatable units will be able to be manufactured and configured to the relevant site deployment and connected to the national electricity grid. These modules will form the "building block" upon which large scale "roll out" of the technology both domestically and internationally will be based.

Barriers to Success

- There is lack information on research and development for the technology, engineering, construction, monitoring and verification, and operations and maintenance for projects of this type.
- The APP funding has made it somewhat easier to get appointments however, the status as an APP Flagship is largely not recognised by people outside of government entities involved with APP.

Lessons Learnt

- Need to have processes and methodologies developed that will enable learning to facilitate large scale roll out of the technology.
- The APP targets should be focused around successful deployment.
- The HCPV technology developed will be deployed at large scale where there is the best commercial market, which may not necessarily be Australia. APP has a role in creating a more “level playing field” between Partner Countries by providing input into government-to-government connections and policy developments.

Project Details	RDG-06-16 Feasibility Study and Development of Smart Energy Solution Using Various Renewable Energies
Task Force	Renewable and Distributed Generation
Project Location(s)	Japan, Korea, India
Project Manager	New Energy Foundation (***NEF***) (Japan) Hyosung Corporation (Korea)

Project Overview

This project comprises sub-project parts:

- The NEF project was a "Feasibility Study and Development of Smart Energy Solution Using Various Renewable Energies": A desktop feasibility review for renewable energy based rural electrification was conducted in a group of villages in north Maharashtra State, India.
- The Hyosung is the development of 2 software tools. The first tool is designed to model optimal energy generation sources, including PV, CHP and solar, in a microgrid for the purposes of designing the most cost-effective power solution to satisfy a user-defined demand curve. The second software tool is to optimise the operational phase of a microgrid.

Project Status

The NEF project, "Feasibility Study and Development of Smart Energy Solution Using Various Renewable Energies", has been dormant since the study was completed in 2007. The project would require additional funding to check assumptions made in the desktop study, and/or investigate other case study locations.

The optimal energy generation source software tool has been completed and has a hybrid Korean-English language interface. Screenshots were provided for review. The remaining software tool designed to optimise the operational phase of a microgrid on the basis of the first tool, has been continued by Hyosung after the University of Wollongong in Australia chose to cease participation. A testable version of the software tool is due in May/June 2010.

Project Outcomes

The NEF project was completed in 2007. The project demonstrated a potentially feasible alternative to diesel generation in the context of rural electrification efforts. Considering that 400 million rural Indians lack regular electricity, the potential impact of adopting a non-fossil fuel based approach to rural electrification is vast, but has not been calculated.

For the Hyosung project, the remaining budget is expected to be sufficient to reach the next and final milestone, completion of a beta-tested operational optimisation tool for microgrid arrays that include renewable energy. Such grids, when properly operated, are projected by Hyosung to reduce demand for fossil fuel-based generation by one third vs. traditional coal-fire thermal generation-based grids.

Future Potential

To realise the potential of the NEF project, a new and more detailed study that includes more detailed cost estimation and incorporates data from a site visit is required.

For the Hyosung project, the Korean Government has focused on a Korean demonstration project which combines power solutions with IT/software development and has short-listed 2 sites for modelling - a small island off the south coast of South Korea and a university campus.

Barriers to Success

The NEF project has not been well engaged with by Indian sponsors and it is unclear whether the project has sustainable momentum at this stage.

For the Hyosung project, barriers include:

- understanding/analysis of scalability opportunities in developing countries; and
- lack of active support from the Korean Government and Australian development partner.

Lessons Learnt

- Without adequate funding, general applicability of feasibility studies is not possible.
- Developing incentives for development partners to remain in projects could be a worthwhile approach if projects are to be successful.

Project Details	STF-06-02 Status Review of Steel Industry Related Indicators for Energy Saving
Task Force	Steel
Project Location(s)	India, China
Project Manager	Mr. Toshiyuki Naito, The Japan Iron and Steel Federation

Project Overview

The goal of this project is identifying effective technologies and equipment for energy saving, emissions reduction, environmental protection and recycling in steel plants, and reviewing the diffusion rates of these technologies across the industry.

Project Status

An initial survey of technologies & equipment was completed in September 2006 in Tokyo, with the project survey methodology subsequently discussed at sessions in April 2006 (Berkeley), Sept 2006 (Tokyo), March 2007 (Kolkata), October 2007 (Wollongong), April 2008 (Busan) and November 2008 (Beijing). An Expert Group focusing on data analysis and a Data Hub focusing on data collecting systems have been established. The project is now complete.

Project Outcomes

This project is part of a reorganised portfolio of projects managed through the Steel Task Force. STF-06-02 as a stand-alone project consisted of consensus building within APP member countries regarding acceptable performance indicators that could be used as the basis of setting mid-term goals and objectives for the industry at a sectoral level.

Collaboration with the International Energy Agency (***IEA***) and the International Iron and Steel Institute (***IISI***) was achieved as part of this project.

Future Potential

There remains a large and unrealised dissemination opportunity for the findings from the Steel Task Force projects to date.

Barriers to Success

The key barriers for this sector were identified as follows:

- Setting and following through on APP-wide mid-term performance targets for the steel industry.
- Facilitating actual technology transfer, not just doing studies—in this regard the Steel TF mentioned that Japan's Bank for International Cooperation as well as NEDO offered financing mechanisms designed to support tech transfer projects.
- Representation on the Steel Task Force is "too complicated" and too heavily weighted to management experts rather than technical experts who truly know how to deliver effective engineered results.

Lessons Learnt

The project delivered a key consensus among APP member countries which can serve as the basis for future projects. However, dissemination of this outcome within member countries and industries appears to have been limited.

Project Details	STF-06-03 Performance Indicator Settings (Steel Industry)
Task Force	Steel
Project Location(s)	China, India
Project Manager	Mr. Young-Joo Kim, Korea Iron & Steel Association (***KOSA***)

Project Overview

The project consists of identifying quantitative indicators related to energy efficiency and environmental improvement. Each Partner Country involved is to set milestones of performance indices by taking into account each country's situation and background etc., after demonstrating potentials of CO_2 emission reduction, etc., based on the results of the status review (STF-06-02).

Project Status

The following milestones were identified for the project:

- identification of project : April 2006 (Berkeley);
- discussion on project survey methodology : Sept 2006 (Tokyo);
- discussion on project scope, barriers survey and third party involvement: April 2008(Busan); and
- draft of barriers survey result reported : November 2008 (Beijing)

Project Outcomes

Stakeholders in China noted that the project would have greater longer-term benefit with greater direct technology transfer. Japanese and Korean stakeholders indicate the project has played a role in enabling propagation of their expertise in efficient steel plant operations management.

A 100-page report on the 3 site visits in China associated with this project has been published in both Chinese and English.

Future Potential

Korea has less original technology to transfer by comparison with the USA, Japan and Australia, though POSCO's Finex technology does have transfer potential.

For the performance indicator settings to have an impact on the industry, they would need to be reflected in government or international standards or regulations applicable to the industry.

Alternatively, the settings could be reflected in market-based incentive programs for improvements in industry indicators, including investor-led disclosure initiatives (such as CDP) or supply chain initiatives directed at the steel industry.

Barriers to Success

The following key barriers were identified for this project:

- Lack of focus and lack of tangible results to date with which to keep stakeholders engaged.
- Lack of funding.
- Continuing sensitivity over sharing commercially proprietary process information.
- Lack of Korean Government focus on the project.
- Representation in the project meetings was considered “too complicated” and too heavily weighted to management experts rather than technical experts who truly know how to deliver effective engineered results.

Lessons Learnt

It is felt that enterprises have spent extensive time on the performance indicator project providing detailed information and explaining systems, including information which could be considered commercially sensitive, and the return on this investment has not been sufficient to gain support for continuing this activity. Stakeholders fell that the APP needs to take more responsibility for follow-up of technical transfer and create funding opportunities. To achieve this, technology transfer needs to be more narrowly-focused on activities that lead to commercial results, perhaps focusing in the process on agreed “leadership” technologies that shift the entire paradigm of some aspect of steel production.

Project Details	STF 06-04 Performance Diagnosis
Task Force	Steel Task Force
Project Location(s)	India, China, Japan
Project Manager	Mr. ACR Das – Ministry of Steel (India)

Project Overview

The project involves identifying and exploring areas of collaboration in research and development of energy efficiency and environmental protection technology between participating countries. This will primarily be achieved by offering voluntary advice on appropriate improvement plans to steel companies in participating countries, based of energy savings and environmental protection diagnosis.

The focus is on the removal of CO_2 from flue emissions from steel plants through the development of cost effective emission control technology. Following these diagnoses of energy consumption and environmental protection opportunities, appropriate improvement strategies will be advised and improvement measures implemented.

Project Status

Japanese experts within the disciplines of energy saving and environmental protection conducted site visits of 3 Indian and 3 Chinese steel plants between December 2007and February 2009, to offer advice on best practices and clean technologies.

Japan's NEDO developed the performance diagnosis methodology applied although they are not officially involved in this project. As a result of diagnosis, improvement potential in energy reduction and CO_2 reduction was found. The quantitative diagnosis across the 5 sites where data was collected found that the energy reduction potential was 55,614 TeraJoules/yr and the CO_2 reduction potential was 6,149 Kilotonnes/yr. The improvement ratio to total energy consumption is 2-17% of each plant.

Project Outcomes

The visits by the Japanese industry experts to the Chinese and Indian Steel Plants focused on a diagnosis of factors that included examining energy conservation (through energy balance survey and diffusion assessments) and environmental protection (through emission data and environmental regulatory reviews).

On-site discussions and reports were produced for each of the sites visited which included the results of reduction potential for energy conservation, the status of the introduction of technology, and the comparison of energy consumption providing a baseline understanding of

potential technology improvements. Recommendations were included, on a range of environmental protection measures such as desulphurisation, reduction of dust emissions and recommendations on energy conservation measures such as waste heat recovery, furnace improvement etc.

Future Potential

Indian and Chinese companies are continually looking for ways to make improvements in their steel production processes. The Project provided a potential benchmark for the improvement of environmental protection and energy conservation and created a model where information can be exchanged by industry experts with significant CO_2 savings and environmental improvements in the large integrated sites visited.

The potential to reduce CO_2 emissions in large integrated steel plants has been defined through this diagnosis. There are, however, hundreds of smaller plants that could also potentially implement some of the measures proposed if they were customised and were commercially viable.

Barriers to Success

- The project identified the potential for improvement but not the specific technology solutions for each plant thereby acting as a pre-feasibility for future potential investment in plant expenditure but not solutions.
- There is no planned ongoing interaction between the parties that have been part of the performance diagnosis. There is a potential that the reports produced are not utilised in any further way to make improvements at the plant.
- There were gaps/discrepancies in the data gathering process therefore it was difficult to draw consistent conclusions across sites and to make specific recommendations for each facility for example, the calorific value of coal used in the performance diagnosis report varies between countries, which has the potential to distort the results.

Lessons Learnt

- The performance diagnosis is only the first step. For actual implementation of energy and environmental improvements, the plants need to be able to prioritise recommendations, identify customised technology solutions which are then costed and appropriate financing mechanisms for those technology solutions proposed.
- It is not clear to the steel plants in India how the proposed measures can be financed.
- The performance diagnosis is a useful first step in knowledge exchange, however, assessment of technical feasibility of potential technologies and the ways those technologies can be financed needs to be performed.

Project Details	STF-06-05 State of the Art Clean Technology Handbook (***SOACT***)
Task Force	Steel
Project Location(s)	N/A
Project Manager	Larry Kavanagh – American Iron & Steel Institute

Project Overview

The SOACT Handbook project is a logical extension to the work undertaken to compile baseline performance data in STF-06-02. The goal of the project is to develop a comprehensive information document containing best available energy saving technologies, practices and environment protection in the iron and steel industry. The document will include an upfront list along with an abstract of all presented technologies. In its final version, the document will be web-based and regularly updated by each participating country.

Project Status

- SOACT Version 1.0 published in December 2007.
- SOACT Version 2.0 scheduled for publication in early 2010.

Project Outcomes

Besides the Handbook itself, the anticipated outcomes of the project are:

- to share knowledge across participating countries by compiling a comprehensive information document containing best available technologies and practice for energy saving and environment protection;
- to provide (steel industry) decision-makers with access to an accurate description of technology options to support capital improvement projects;
- to create a "live" clearinghouse matching technology suppliers and end users; and
- to create a "living" record of implementing "best available technology" over time.

Future Potential

Significant GHG emissions reductions potentially are achievable through STF projects, in particular the STF-06-02 project evaluating energy efficiency in steel production.

The project benefits from its objective to transfer technologies with proven commercial application.

The Task Force has observed that there remains a large and unrealised opportunity to more widely disseminate the findings of the Steel Task Force to date.

Barriers to Success

The following key barriers were identified for this project:

- Information flows and willingness of all parties to openly share knowledge.
- Bureaucratic inertia.
- Setting and implementing industry wide performance targets.
- Facilitating the transfer of investment grade projects, the next step beyond the current focus on pilot scale projects.

Lessons Learnt

The project timeline was extremely optimistic given the challenges experienced in overcoming bureaucratic inertia and establishing multilateral networks.

The private sector participants are enthusiastic about sharing knowledge and best practice, but more resistant if it is felt that specific technology transfer may help a developing participant to gain competitive advantage.

Appendix 3

List of Contributors

- ACC Ltd, India
- American Iron & Steel Institute
- Australian Coal Association
- Australian Lighting Council
- Blue Circle Southern, Australia
- Carbon Storage Solutions, Australia
- Cement Industry of Australia
- Central Mine Planning & Design Institute, India
- Centre for Policy & Sustainable Research, India
- China Association of Lighting Industry
- China Building Materials Academy
- China Cement Association
- China Huang
- China Iron & Steel Association
- China Nonferrous Metals Industry Association
- CS Energy, Australia
- CSIRO, Australia
- Delta Energy, Australia
- Department of the Environment, Water, Heritage and the Arts, Australia
- Department of Resources, Energy and Tourism, Australia
- Edifice Consultants, Australia
- Edison Electric Institute, USA
- EDS, India
- Electric Power Development Co., Ltd., Japan
- The Federation of Electric Power Companies, Japan
- GE, India

- Geocycle, Australia
- Guo Ao Development, China
- Hyosung Corporation, Korea
- IBM, India
- Indian Cement Manufacturers Association
- IHI Corporation, Japan
- Japan Coal Energy Centre (JCOAL)
- The Japan Iron and Steel Federation
- JFE Steel Corporation, Japan
- JNARDDC, India
- Korea Iron & Steel Association
- Leighton India
- Lawrence Berkeley National Lab, USA
- Melbourne Water, Australia
- Ministry of Economy, Trade and Industry, Japan
- Ministry of New Renewable Energy, India
- Ministry of Steel, India
- Mitsubishi Materials Corporation, Japan
- Mitsui & Co., Ltd., Japan
- National Development & Reform Commission, China
- Natural Resources Defense Council, China
- New Energy Foundation, Japan
- Office of Environmental Policy & Compliance, USA
- Office of Surface Mining, USA
- OSRAM, Asia Pacific
- Otis, India
- Paharpur Business Centre, India
- Phillips Lighting, China
- POSCO, Korea

- Selecto Systems, India
- Simtars, Australia
- Solar Systems, Australia
- Spectral, India
- Steel Authority of India
- Sumitomo Metal Industries, Ltd., Japan
- Sumitomo Osaka Co, Japan
- Sustainability Victoria, Australia
- Taiheiyo Cement Corporation, Japan
- Tarong Energy, Australia
- The Institute of Energy Economics, Japan
- Tokyo Electric Power Company, Japan
- Thermal Power Research Institute (TPRI), China
- US Aluminium Association
- US Department of Energy
- Environmental Protection Agency, USA
- Environmental Protection Agency Climate Change Division, USA
- USAID, USA
- Environment Protection Authority Victoria, Australia
- Virginia Tech, USA
- Xstrata Coal, Australia