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The People's Republic of China

**Evaluation of UNDP/GEF Project: Demonstration for Fuel Cell Bus
Commercialization in China Part I
(CPR/01/G31)**

Report of the Evaluation Mission

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ABBREVIATIONS

BP	British Petroleum
CICETE	China International Center for Economic and Technical Exchanges
CTA	Chief Technical Advisor
DC	Daimler Chrysler Company Limited, Germany
EV	Electric Vehicles
FCB	Fuel Cell Buses
FCV	Fuel Cell Vehicle
GEF	Global Environment Facility
GHG	Greenhouse Gases
IPHE	International Partnership for the Hydrogen Economy
IPS	International Procurement Specialist
MoST	Ministry of Science and Technology
MoC	Ministry of Commerce
MoF	Ministry of Finance
NPC	National Project Coordinator
NPC	National Project Director
NPD	National Project Director
NDRC	National Development Reform Commission
PMO	Project Management Office
Pro-Doc	November 2002 UNDP Project Document for the "Demonstration for Fuel Cell Bus Demonstration in China"
SEPA	State Environmental Protection Agency
UNDP	United Nations Development Programme

EXECUTIVE SUMMARY

UNDP's November 2002 Project Document for the "Demonstration for Fuel Cell Bus Commercialization in China" (UNDP Project No CPR/01/G31) divides the project into two parts:

- Part I corresponds to Year 1 of the project primarily involving assistance to obtain six FCBs and hydrogen re-fueling stations for Beijing and Shanghai;
- Part II corresponds to Years 2 to 5 primarily involving operation of the FCBs and refueling stations and procurement of a second set of FCBs and refueling stations.

GEF approved funding for Part I in November 2002 and the project commenced operations in March 2003. An evaluation of Part I of this project was conducted between November 15 to 26, 2004 to:

- review the effectiveness of project activities and results to date; and
- summarize good practices from the realities of implementation and provide improvements to the design of Part II based on lessons learned in Part I.

Notable points that mark the Part I achievements up to November 2004 are as follows:

- agreements are in place to procure only 3 FCBs. As a result, only 3 FCBs are to be delivered to Beijing with FCB procurement for Shanghai being deferred to Part II pending funding availability. This shortfall is primarily due to an overly optimistic estimate of FCB price reduction during the project design that did not materialize between March 2003 and the period of the FCBs tender in early 2004;
- delivery of the three demonstration FCBs to Beijing in September 2005 is 10 months behind schedule. This delivery would mark the end of Part I;
- project activities to date have been well managed. It is unclear if different approaches would have improved project performance, and averted deferral or delays of certain outputs.

The evaluation concludes that:

- GEF and UNDP resources on this project have been effective most notably in the building of partnerships and the successful completion of the FCB procurement process;
- good management and careful preparations have maximized the effectiveness of capacity building efforts of the project;
- there could have been more careful and realistic planning of the FCB procurement during the project design and Inception stages of the project;
- Part II FCB demonstrations should use different FCBs considering anticipated FC advances over the next 18 to 24 months.

Lessons learned from Part I include:

- the necessity of strong stakeholder support from all levels for a successful project;
- continual efforts to foster and maintain working relationships between all project participants;
- the importance of strong technical and administrative personnel on a successfully implemented project; and
- the importance of proper and realistic planning of demonstration activities for new technologies that incorporates technological advances and new costs.

Regarding next steps for the project, a number of recommendations are provided including:

Recommendations to the Government of China:

- Complete remaining activities of Part I under a strengthened project management regime to ensure the timely deliveries of the FCBs and refueling station;
- Resolve communication problems between various Chinese agencies and foreign suppliers. More effective communications need to foster an improved understanding of Chinese laws and regulations, differing business interests and the complexities of the technology. The outcome would be trusting working relationships and a reduced risk of “surprises” that frequently plague technology promotions;
- Provide the assurance for sufficient funding to ensure the success and progression of the FCB demonstration knowing that GEF funding for Part II is fixed. Possible items for additional funding under Part II includes:
 - additional buses in Shanghai and Beijing;
 - extension of the Beijing FCB demonstration to overlap with the 2008 Olympics;
- In close collaboration with UNDP, provide inputs to the Part II project brief on potential FCB cost reductions over the next 10 to 15 years. This information would be critical to future GEF support.

Recommendations to UNDP:

- Support requirements for improved project management capacity for the remainder of Part I;
- In close collaboration with the Government of China, prepare the Part II project brief to include information on:
 - strengthened project management support to ensure the timely completion of all Part II activities;
 - measures to ensure continued project support from all stakeholders;
 - measures to maintain a high level of publicity activities;
 - mechanisms to maximize effectiveness of information sharing during workshops and closer collaboration between all project participants;

- efforts to thoroughly assess prevailing market conditions of FCBs and re-fueling technologies that ensure realistic activities and budgets for Part II;
- current trends in FCB developments and how these may affect cost reductions to FCBs over the next 10 to 15 years. The analysis could include:
 - an overview of increased global funding for FCB development;
 - promising avenues of reducing costs, improving durability and reliability (such as FCBs with fuel cell/hybrid power systems); and
 - forecasts of increased production and reduced prices.

Recommendations to the GEF:

- Approve funding for Part II on the basis that:
 - project activities to date are closely linked with GEF OP-11 objectives to reduce GHG emissions from the transport sector;
 - valuable information can be provided from the operation of a new generation of FCBs that are likely more durable and reliable and less costly;
 - optimism that the cost reduction curve for fuel cell technologies will be steeper in the coming years due to increasing costs to operate internal combustion engines that have resulted from the recent doubling of international oil prices;
 - Government of China strongly supports the project at all levels;
 - the overall impact of a successful FCB demonstration in China is enormous considering the size of its public transit sector, and the potential to showcase FCBs during the 2008 Olympics;
 - the China FCB project can take the global lead amongst other GEF FCB projects, and effectively share successes between developing countries.

1. INTRODUCTION

This report summarizes the findings of the Evaluation Mission conducted during November 2004 for the “Demonstration for Fuel Cell Bus Commercialization” or UNDP Project No. CPR/01/G31. The Project Document (Pro-Doc) refers to this project as Phase II of a four-phased GEF-supported demonstration project to provide assistance towards commercialization of fuel cell buses (FCBs) for public transportation in Chinese cities. Phase I was the preparation of the proposal for the FCB commercialization (UNDP TRAC funding under Project No. CPR/96/313). Phase II was divided into two parts in the Pro-Doc:

- Part I corresponding to Year 1 of the project primarily involving the preparation and procurement of the first set of FCBs (3 each for Beijing and Shanghai) and the hydrogen re-fueling station; and
- Part II corresponding to Years 2 to 5 principally involving:
 - demonstration activities of the FCBs and refueling station constructed during Part I;
 - a second procurement of FCBs (3 each for Beijing and Shanghai); and
 - preparations for the Phase III demonstration project.

Part I commenced on March 27, 2003. By June 2004, a significant milestone of Part I was marked by procurement agreements brokered by UNDP and the Government of China for the supply and technical support for Beijing FCBs and the hydrogen re-fuelling station. By November 2004, a significant number of activities of Part I had been completed prompting this evaluation.

1.1 Objectives and Scope of Evaluation

The Pro-Doc states that GEF project funding authorization was initially committed for Part I; approval for Part II funding was conditional upon satisfactory completion of Part I and availability of funds from GEF countries. This evaluation provides information on:

- the effectiveness of Part I activities; and
- improvements to the Part II design based on lessons learned in Part I.

The main objectives of this Evaluation were to “*to review the efforts made and results achieved in partnership building among the respective agencies and companies and to review the approaches to access to potential partners and the methodologies in selection of proper fuel cell bus technologies and relevant supporting infrastructure for commercializing the environmental friendly public transportation in the Chinese cities*”.

To achieve this objective, the evaluation was conducted with the following scope:

- Assess the relevance of the project against the national development priorities and objectives and assess how the project supports China in its efforts to address the public transport needs and environment protection objectives;

- Study the government policies in development of FCBs for the Chinese cities and review the project strategies in partnership building with business sector in relation to achieve the project objectives, more specifically as how to understand national needs and global FCB potentials;
- Evaluate criteria and procedures in selection of the suppliers for the respective technologies and the approaches for access to the potential suppliers of the FCBs and the refueling station;
- Find out key official approval procedures and certification requirements for commercializing the FCBs;
- Analyze current FCB projects in other countries, and the domestic and international market developments in supply and demand of the technology to advise on potential project expansion for Part II;
- Summarize good practices and lessons learned in partnership building of the project with companies and agencies in introducing FCBs and designing and building the refueling station;
- Recommend actions to improve Part II of the project in identifying the most practical and appropriate FCB technologies and partners for the needs of Shanghai and other cities.

The detailed ToRs as set by UNDP China are shown in Appendix A.

1.2 Evaluation Methodology

The Evaluation was conducted as follows:

- Review of key reports and UNDP files on project activities in Beijing. A list of documents reviewed is shown in Appendix B;
- Interviews with consultants and the Project Management Office (PMO) in Beijing. Interviews were conducted during the November 15-17/04 period;
- Interviews with project personnel with the various levels of governments in China including the central and municipal levels of government including officers from Ministry of Science & Technology (MoST), Ministry of Finance (MoF), Ministry of Commerce (MoC) and their UN implementing agency for procurement, China International Center for Economic and Technical Exchanges (CICETE), Beijing Municipal Commission for Science and Technology and the Science and Technology Commission of Shanghai Municipality. Persons interviewed during this evaluation are listed in Appendix B;
- Interviews with the UNDP staff involved with the project;
- Incorporating cross-referenced opinions, key views and information into the Evaluation Report.

A detailed itinerary of the Mission is shown in Appendix C. The Evaluation Mission comprised of one International Expert and one National Expert.

This evaluation report is presented as follows:

- An overview of project implementation to date from March 2003 and its context with the development of China;
- Review of project results based on project design and execution;
- Conclusions and lessons learned from the implementation of Part I; and
- Recommendations based on lessons learned in Part I that can increase the probabilities of a successful Part II.

This evaluation report follows the format specified by the UNDP Guideline for Evaluators (December 1998). Wherever possible, evaluation guidelines as set in the GEF's "Monitoring and Evaluation Policies and Procedures" January 2002 were also followed.

2. PROJECT IMPLEMENTATION

An Inception Mission for this project was fielded in February and March 2003. An Inception Report was issued in late March 2003 that provided project implementation plans.

2.1 Inception Schedule and Project Objectives

The March 2003 Inception Report proposed that Part I was to be completed on October 31, 2004 with a startup date for Part II being November 1, 2004. Completion of Part I was to be marked by the presence of operational FCBs and a hydrogen re-fueling station. Developmental objectives of Parts I and II as taken from the pro-doc are “to reduce GHG emissions and air pollution in the long-term through the widespread commercial introduction of fuel cell buses in urban areas of China”. The Logical Framework Planning Matrix (log-frame) for Part I is contained in Appendix D.

The immediate objectives for Parts I and II were to:

- *determine the technical and commercial viability of FCBs and the associated fuel cell systems;*
- *establish the necessary technical and operational, managerial and planning capacity to maximize the likelihood of long-term sustainable use of FCBs; and*
- *create a national-level awareness of FCBs and their long-term potential and develop a strategy for pursuing that potential.*

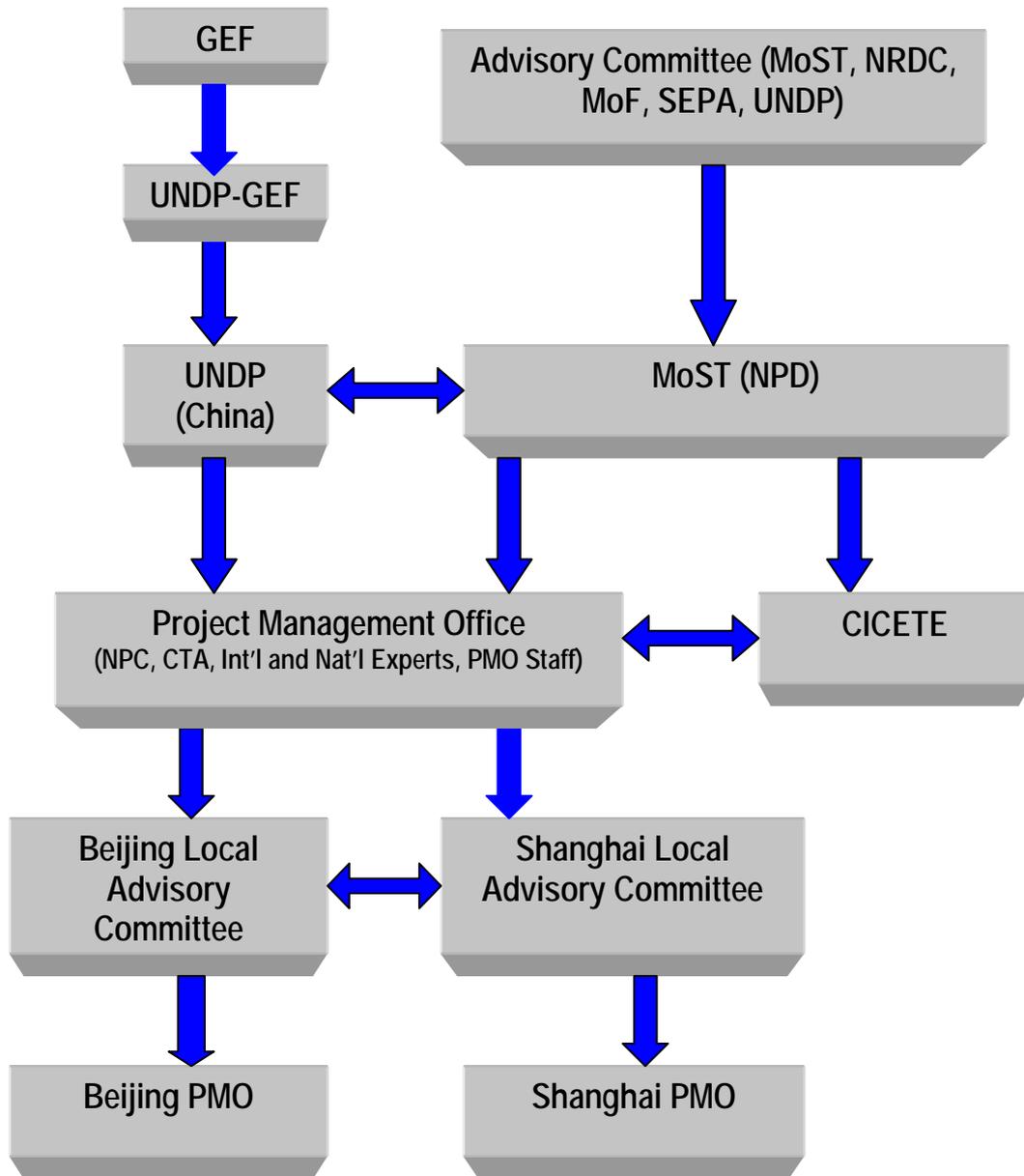
The intended beneficiaries of the project are:

- Government agencies and institutions involved with policy initiatives to support fuel cell commercialization;
- Municipal transportation companies;
- Fuel cell and bus manufacturers and suppliers;
- Local residents of Beijing and Shanghai (short-term) and all peoples and nations (particularly those threatened by climate change)

2.2 Implementation Modalities

The project organization chart is shown on Figure 1. UNDP assistance is being provided to the Project Management Office. UNDP-GEF funds for administration are channeled through CICETE, a service provider to the UNDP under the MoC. CICETE requires NPD approval prior to the disbursements for UNDP funds.

Figure 1: Project Organization Chart



2.3 Project Progress To Date

As of November 2004, a number of activities as proposed in the Inception Report have been completed including:

- Holding an Inception Workshop;
- Preparing and distributing semi-annual management reports in English;
- Undertaking vendor communications and study tours;
- Developing system specifications;
- Formulate guidelines for quarterly reports for in-service performance of each FCB system;
- Design data collection systems;
- Contract signed with DC to procure three units of its FCBs
- Agreement reached with BP to construct a hydrogen refueling station in Beijing
- Publish a project newsletter;
- Undertake a study tour for policy planners.

Slow progress has been noted between March and June 2003 in part to the SARS outbreak that delayed many of the project activities. A new CTA was recruited in July 2003. Project progress has been good since this date to the extent that the project has made up some of the lost time. GEF and UNDP resources have been instrumental to the project successes. Recruitment of the new CTA in July was crucial in linking the project with the global fuel cell partners. UNDP has provided the required internal monitoring and backstopping support for project workshops, major project decisions, recruitment, study tours, and procurement decisions. The Mission has also noted frequent visits and communications between the PMO and UNDP (UNDP China and UNDP-GEF). Without this support, the project would have likely experienced further delays. Further discussion is contained in Section 4.1.

Activities that have not followed the Inception plan and schedule include "place new FCBs in operation" and "installation of the hydrogen refueling station":

- Completion of negotiations with the FCB supplier was delayed 5 months to May 2004;
- Delivery date for 3 operational buses in Beijing will be delayed by 10 months to September 2005;
- Training of operating staff has been delayed until the arrival of the equipment;
- Procurement of Shanghai FCBs was deferred to Part II. Further complicating this scenario, the Shanghai FCB procurement is pending funding availability (commensurate with the prevailing FCBs prices at the time of tendering) and GEF approval of Part II FCB funding;
- Full operation of the Beijing hydrogen re-fueling station has been re-scheduled to July 2005, 10 months behind the Inception schedule; and
- Operation of the Shanghai refueling station has been deferred to Part II pending purchase of the Shanghai FCBs.

All concerned parties within the Government of China and UNDP have accepted these schedule changes. The primary causes of these changes were two faulty design assumptions at the project formulation and Inception stage:

- The rate of development of FCB technologies would facilitate cost reductions that would allow for the purchase of 6 FCBs. These cost reductions did not materialize between March 2003 and the time of tendering of the FCBs in early 2004; and
- Lead delivery time for the buses (from signing of contract to the delivery of buses) was assumed to be 7 months in the Inception Report. The actual lead delivery time of the Daimler Chrysler FCBs is 16 months.

3. PROJECT RESULTS

These results are also shown in summary form in Appendix D in the format of the logical framework project planning (log-frame) matrix.

3.1 Project Relevance to National Development Priorities and Objectives

The Government of China considers this project to be very important in that it responds to their priorities of developing sustainable energy sources and reducing air pollution problems in urban areas. As such, the relevance of this project to Chinese development priorities and objectives is very strong. Strengthening the relevance to sustainable energy sources is the recent doubling of imported oil prices increasing risks to China's energy security. As with other countries reliant on imported fuels, China is keenly aware of the urgency to develop sustainable domestic energy sources.

To support development of these sustainable fuels, China's mid to long-term development plan to 2020 contains statements that the development of hydrogen fuel and clean vehicles will be encouraged and supported. This plan envisions increasing support for hydrogen fuel vehicles from government, industry and the private sector. There would also be support for ongoing initiatives including the National Electric Vehicle (EV) program, the International Partnership for the Hydrogen Economy (IPHE), and international cooperative ventures (namely with the USA, Canada, Germany, France and the EU). The most recent plans had envisioned commercialization of hydrogen fuels between 2006 and 2010. Commensurately, funding for fuel cell and electric vehicle development by the Chinese Government had increased from Rmb 60 million (for the 1996-2000 period) to more than Rmb 800 million (for the 2001-2005 period). More recently, policy makers have now targeted hydrogen commercialization for the 2010-2020 period. The Mission understands that the next Five Year Plan (2006-2010) currently being formulated will contain specific plans to meet these commercialization goals.

3.2 Efficiency

Considering the achievements of Part I to date, project efficiency has been very good due to good management. The project team has demonstrated its diligence in executing project plans including meeting project reporting requirements, initiating vendor communication and study tours, developing system specifications, selecting system suppliers, formulating reporting guidelines, reaching agreements with FCB and refueling station suppliers and publishing a project newsletter.

Part I project personnel funded by UNDP were mainly from government and academic backgrounds. This appears to be adequate given one of the main objectives of Part I was the need to formulate partnerships and accumulate knowledge of FCBs. An exception to this was the background of the new CTA and the IPS, both of whom were from the private sector and with significant experience in clean vehicles, fuel cell technology and bus procurement. When the new CTA arrived in July 2003, the project was in need of a broader network of suppliers that would include foreign companies. The CTA linked his broad network of foreign suppliers with the project greatly expanding the project outreach. He also provided credibility to the project and facilitated meaningful dialogue between the

project and a number of leading fuel cell equipment vendors in Japan, Canada, the USA, and Europe.

Shortly after these project linkages were established, study tours were organized under the leadership of the NPC who used the CTA's industry network to carefully select vendors to visit. Each selected vendor was sent a profile of the project and personnel involved in advance of their arrival. As a result of these preparations, the study tours were well received by the vendors. The outcome of the study tour was the ability of the project team to better communicate its project needs with foreign suppliers that better prepared them for the FCBs procurement process.

The criteria and procedures used for FCB supplier selection and the refueling station were reviewed during this mission. Notwithstanding the outcome of no FCB procurement for Shanghai, the criteria and procedures for FCB supplier selection appear to be open and transparent. Procurement for the first set of FCBs was completed using the "Invitation to Bid (ITB)" approach. ITB documents were released in December 2003, and four bids were received in March 2004. Negotiations with the successful bidder, Daimler Chrysler were concluded in May 2004.

There may have been some opportunity costs related to the ITB approach for the FCB tender. Long discussions took place between the PMO and CICETE concerning the advantages between the ITB process and the "Request for Proposal (RFP)" approach. The main justification for the RFP process had revolved around the flexibility of project management. The Mission learned that CICETE would seriously consider the RFP approach on the next tender depending on the technical advances made on FCBs.

3.3 Outputs

Outputs (as defined in the Pro-Doc for Part) that have been already been produced in a timely manner and with good quality includes:

- an Inception Workshop;
- semi-annual management reports in English including an important "Annual Review Report";
- vendor communications and study tours;
- system specifications;
- a list of system suppliers;
- guidelines for quarterly reports for in-service performance of each FCB system;
- information exchanges with other FCB projects;
- contract with DC to procure three units of its FCBs;
- agreement with BP to construct a hydrogen refueling station in Beijing;
- a published project newsletter; and
- a study tour for policy planners.

Outputs that are delayed include:

- operational FCBs in Beijing. Delivery of Beijing FCBs will be delayed 10 months behind the Inception schedule of November 2004 to September 2005;

- full operation of the Beijing re-fueling station. Full operation re-scheduled for July 2005, 10 months behind the Inception schedule but in concert with the arrival of the FCBs in September 2005.

Outputs that cannot be delivered during Part I include:

- operational FCBs for Shanghai. Shanghai FCBs will be delivered during Part II pending available funding (commensurate with the prices of available FCBs at the time of tendering) and GEF approval of Part II FCB funding;
- full operation of the Shanghai's re-fueling station. Full operation for this refueling station will materialize only upon delivery of FCBs to Shanghai during Part II.

3.4 Immediate and Developmental Objectives

Immediate objectives of the project have been partially achieved through the accumulation of FCB knowledge from project study tours and workshops. This includes technical and commercial viability of FCBs and FCVs in other countries (mainly developed countries), and the requisite capacity required to sustain FCB use. In addition, efforts have been made by the PMO and concerned government agencies to create national-level awareness of FCBs. These efforts create awareness of government efforts to reduce GHGs, the development objective of the project. Upon the arrival of operational FCBs and the re-fueling station to the project, further progress of these objectives will be made. However, with no procurement of FCBs for Shanghai, less progress was made on the immediate objective of *"determining the technical and commercial viability of FCBs and the associated fuel cell systems"*. The inability of the project to purchase the FCBs for Shanghai was due to poor project design that assumed a steeper cost trajectory for FCBs from March 2003 to the time of the tender in early 2004.

Table 1 provides a tabular depiction of expected project outputs versus the current status of these outputs.

3.5 Effectiveness

The project activities have been effective in producing the outputs listed in Section 3.3. Examples of effective activities include DC contract negotiations where the CTA and IPS were very effective as "lead negotiators". It is unclear if different approaches would have improved project performance or averted delays or deferral of certain outputs; project delays and deferrals appear to be caused by poor project design.

For the remaining activities of Part I, different skill sets will be required to ensure timely delivery of the operational FCBs and the hydrogen refueling station. Current project personnel from government and academic backgrounds are somewhat untested in project implementation situations where timeliness of delivery is crucial to project success. Their effectiveness can be enhanced through greater participation of the CTA (who comes from a private sector background) and FCB and hydrogen refueling station suppliers.

In addition, greater efforts are required to maintain good working relationships between various consortia members. An example for improvement in this regard includes the relationship between the members of the hydrogen refueling station team, and the need for improved communications between BP, Beijing Sino Hytec and Tsinghua Tongfang.

Problems are emerging on this critical path activity involving completion of the land lease agreement and other permits that threaten to place the project further behind schedule. More effective communications are required based on considerations of Chinese laws and regulations, differing business interests and the complexities of the technology. The fostering of more trusting working relationships will reduce the risk of “surprises” that frequently plague technology promotions.

Table 1: Comparisons Between Expected Outputs and Current Project Status

Expected Outputs for Part I*	Status as of November 2004
<ul style="list-style-type: none"> Commercially relevant demonstration of the technical feasibility of FCBs and their refueling infrastructure for Beijing and Shanghai 	<ul style="list-style-type: none"> Agreements with the FCB and refueling station supplier have been reached for Beijing only. The roles of the CTA and the IPS were significant in concluding successful negotiations. However, there are insufficient funds for Shanghai FCB procurement during Part I. UNDP contributions were significant to assist the Chinese government and personnel in formulating equipment supplier selection criteria and procedures. Expected outputs not fully expected to be delivered until September 2005.
<ul style="list-style-type: none"> Accumulation of a substantial body of knowledge about reliability, failure modes, opportunities for improving design and reducing costs of FCBs in China and Chinese public responses to FCBs 	<ul style="list-style-type: none"> UNDP-sponsored study tours (to visit potential vendors in developed countries) and in-country workshops have facilitated a number of partnerships between Chinese groups and foreign suppliers. This has resulted in a substantial increase in information exchanges on FC technologies and opportunities to decrease costs towards commercialization of FCs; Public awareness of the FCB initiatives has been boosted by the presence of high profile government officials, newspapers and CCTV at the UNDP-sponsored Inception workshop, and ongoing publicity personnel from various central and government agencies. Accumulation of FCB knowledge will be ongoing with the assistance of UNDP-sponsored PMO personnel until the completion of Part I in August 2005. This includes PMO management of the DC FCB procurement contract.
<ul style="list-style-type: none"> Increased capacity among public transport policy makers and planners at the national and municipal levels and at bus companies in Beijing and Shanghai for policy and planning to optimize public transport management, technologies (including FCBs), infrastructure and operations. 	<ul style="list-style-type: none"> UNDP-sponsored study tours for policy planners during December 2003 and September 2004 have provided policy makers the opportunity to view examples from other countries where FCB technologies, clean vehicle policies, planning and support measures are more advanced. This included visits to Germany and France.

* as taken from the pro-doc

3.6 Capacity Building

The project has effectively built capacity within various Chinese academic and government agencies. This started soon after the arrival of the new CTA who introduced the project team to his extensive network of international industry contacts. This facilitated the undertaking of the study tours of potential equipment vendors for the FCBs and the refueling station, strengthening of system specifications, participating on the tendering process, and setting up information exchanges with other organizations and projects involved with FCB development. Direct beneficiaries of these capacity building activities included officers from the central and municipal government levels and their project partners from the participating universities.

3.7 Impacts

The main positive impact of the project thus far has been to create a wider awareness of FCBs and the use of hydrogen fuel. Upon award of the FCB procurement contract, DC showcased one of their FCBs in Beijing during May 2004. The press coverage of this event was extended to a very wide audience in China.

There has not been a “negative” impact resulting from the deferred Shanghai FCB procurement. Moreover, the outlook of the Shanghai team as well as all those involved on the project is that a deferred Shanghai procurement will likely result in the tendering and testing of a newer generation of FCBs, likely from a different vendor. While it would have been ideal to procure the same set of buses from DC for the Shanghai demonstration to provide comparisons with the Beijing FCBs, the use of DC FCBs for the Shanghai demonstration is not practical for the following reasons:

- DC cannot guarantee significant price reductions of these FCBs when they are ordered likely sometime in 2006;
- The time lag between the Beijing and Shanghai procurements is likely to be 2 years. Given the current active state of FC development in China and abroad, a new generation of FCBs will likely be available within 2 years with improved durability and reliability characteristics as well as lower costs;
- Using the DC FCBs for Shanghai would forego the opportunity to demonstrate a better generation FCBs at a lower cost.

Hence, there would be more benefits to the Shanghai FCB demonstration if a newer generation of buses were procured for Part II. Furthermore, this would better meet the project objectives of advancing FCBs towards commercialization.

It is worthwhile to note of the possibility of an opportunity to extend the DC FCB demonstration in Beijing by one year ending to early September 2008 to overlap with the 2008 Olympics. While the impact of showcasing the FCBs during the 2008 Olympics is potentially very positive, the project will need to carefully consider the details and impacts of this extension, potential risks, associated additional project costs and potential demonstration benefits.

3.8 Sustainability

Currently, there is a lot of momentum built by this project given the importance that the Chinese government places on fuel cell development. While it is possible that the positive results of this project could be sustained without UNDP or international assistance, UNDP involvement provides added credibility and more exposure to positive project results. This also improves the likelihood that FCB commercialization will occur at an earlier date.

3.9 Views of the Direct Beneficiaries

The Mission visited with a large number of direct beneficiaries of the project as listed in Appendix C. This included from government agencies and institutions involved with policy initiatives to support fuel cell commercialization, municipal transportation companies, fuel cell and bus manufacturers and suppliers. Their views included a very positive view of the project and that the project was necessary for the long-term health of China and those outside of China.

Despite no FCBs to be procured during Part I for Shanghai, the Mission found the Shanghai team remains highly motivated to the project and values the involvement of GEF and UNDP. Much of their preparatory work had been already been completed including the set up of the Project Office, recruitment of the Project Manager, establishment of a project guidance committee led by a deputy mayor and an expert consultant committee, finalization of the routes for FCB system operation, and allocation of relevant funds for training and demonstration operations of the FCB system. In addition, they have formed partnerships with foreign automotive firms located in Shanghai and local industry to well position their team to undertake the demonstration project. The prevailing attitude on the Shanghai team on the delays to the delivery of FCBs is “to learn from the Beijing FCB demonstration and to improve on it using the next generation of FCBs”.

4. CONCLUSIONS AND LESSONS LEARNED

The main concerns of the current progress of Part I involve the shortfall in the procurement of FCBs that only allow for a Beijing demonstration. Funds for Part II and more importantly for the startup of the Shanghai FCB demonstration are contingent upon approval of GEF funding, and possibly additional funding from the Chinese Government at the central and municipal levels.

4.1 Conclusions

The most important conclusions arising from this evaluation includes:

- GEF and UNDP assistance on this project has been effective and instrumental in the building of partnerships, accumulation of knowledge and the procurement of the FCBs. This is marked by a signed contract with DC to procure three FCBs at a reasonable price and an agreement from BP to contribute to construct a hydrogen refueling station in Beijing. It is doubtful if an FCB tender could have been done without the backing of GEF and UNDP; local institutions would not have had the capacity and financial backing to solicit bids from foreign suppliers;
- The FCB Project is very important to the Chinese government. The project responds to sustainable clean fuel and clean vehicle policies and has garnered support from the highest levels of central and municipal government in China. The presence of operational FCBs in China will likely stimulate and accelerate the development of improved designs for FCBs and other FC applications to transportation by the several academic institutes and private firms already involved in FCV development;
- The building of partnerships between diverse groups of stakeholders has been a significant achievement and instrumental to project achievements to date. This includes partnerships between relevant Chinese government agencies and ministries, central and municipal governments, academic institutes and private sector firms. These partnerships have assisted to provide better focus in the accumulation of FCB knowledge and procurement of FCBs. There has also been good inter-ministerial dialogue on this project that involves a diverse range of issues from environmental improvement to energy issues and road safety. There are continual efforts required, however, to maintain and improve the working relationships and trust between consortia members to meet critical delivery timelines. This is especially important with regards to the consortia members responsible for the refueling station installation where there are potential delays on critical path activities;
- Careful preparations and appraisals of potential vendors prior to the study tours were valuable. This maximized the effectiveness of the study tours and provided a sound basis for meaningful discussions during the study tour;
- International procurement of FCBs is complex requiring the skills of strong technical and administrative personnel. The project has personnel with strong knowledge of FCB technical requirements, FCB supplier capacities and issues related to intellectual property rights. Without the involvement of the CTA, IPS and NPC all of whom have

- fuel cell backgrounds, the FCB procurement process for Part I would have likely experienced more delays;
- Procurement of FCBs requires careful and realistic planning. Project managers need to carefully assess available technologies, market conditions of FCBs, prevailing price ranges and lead delivery times;
 - Part II FCB demonstrations should use different FCBs considering ongoing technological advances. FCBs procured for Part I still have issues related to their costs, durability and reliability. The next FCB procurement is likely to occur in 18 to 24 months, at which time there should be a new and improved generation of FCBs. The use of a new generation of FCBs would provide more demonstration benefits.
 - Awareness of sustainable transportation and clean vehicles for public transit has been increased. This is visible in interviews with the project staff, government officials, transport managers, technical experts and the city people.

4.2 Lessons Learned

Key lessons from this project include:

- Strong support from all project participants is required for this project. This includes the GEF, UNDP, the Government of China, and participating academic institutions and private sector firms. Lack of support from any one these groups would have resulted in further project delays and even failure. Resources from GEF and UNDP have been instrumental in “building bridges” between interested groups in China and FCB expertise outside of China;
- Continual efforts are required to maintain trusting and effective working relationships between all project participants. This would include efforts to maintain continual dialogue and transparency between project participants on critical path activities such as the installation of the re-fueling station;
- The presence of a strong technical and administrative team will increase the likelihood of a successfully implemented project. This was notably evident during:
 - the complex but successful FCB procurement process with the involvement of the CTA, IPS and NPC, all of whom had backgrounds with FCBs and fuel cells. As well, there were strong administrative personnel in the PMO to manage the complex international FCB transactions;
 - PMO-managed activities such as the foreign study tours that were carefully prepared, organized and managed. This maximized the effectiveness of promoting technology and policy exchanges, and increased the chances of follow-up actions required to strengthen cooperation between Chinese and foreign organizations;
- Provide realistic goals when planning demonstrations of new technologies. An accurate assessment of the FCB market and hydrogen refueling technologies will be required for future procurement. This would include assessment of different types of FCBs and refueling technologies, their costs and required lead times for delivery.

5. RECOMMENDATIONS

5.1 Recommendations to the Government of China

- Complete remaining activities of Part I under a strengthened project management regime. To ensure the timely deliveries of the FCBs and refueling station, the Government should provide project management leadership and close monitoring of progress of the Daimler Chrysler FCB contract and the Beijing BP refueling station;
- Resolve communication problems between various Chinese agencies and foreign suppliers. One important example is the lack of effective communication between Beijing personnel on the refueling station and the foreign suppliers that can only harm the progress of the project. More effective communications need to foster improved understanding of Chinese laws and regulations, differing business interests and the complexities of the technology. The outcome would be the existence of trusting working relationships and a reduced risk of “surprises” that frequently plague technology promotions;
- Provide the assurance for sufficient funding to ensure the success and progression of the FCB demonstration knowing that GEF funding for Part II is fixed. This assurance will demonstrate serious government commitment to sustainable energy development and clean transport alternatives and increase the likelihood of GEF funding for subsequent phases. Possible items for additional funding under Part II includes:
 - additional buses in Shanghai and Beijing;
 - extension of the Beijing FCB demonstration to overlap with the 2008 Olympics;
 - national or international project management specialist to provide peer guidance to the project person acting as the overall project manager where appropriate;
 - staff to administer and operate the FCBs;
 - strengthened publicity efforts during the operation of the FCBs.
- Provide inputs to the Part II project brief in close collaboration with UNDP on potential FCB cost reductions over the next 10 to 15 years. Since significant FCB cost reductions have not yet materialized during this project, an analysis of potential cost reductions in the Part II project brief would provide information critical to future GEF support.

5.2 Recommendations to UNDP

- Support requests by the Government of China to improve project management capacity of the PMO for the remainder of Part I. Remaining Part I funds can be utilized for a National Project Management Specialist to provide project management leadership and progress monitoring of the FCB contract with Daimler Chrysler and the refueling station with Beijing Sinohytec and BP;
- In close collaboration with the Government of China, prepare the Part II project brief to include the following information:

- Support for strengthened project management that would include a Project Management Specialist to provide peer guidance or managerial assistance where appropriate to project personnel acting as the overall project manager. The primary function of this specialist will be to ensure the timely completion of all Part II activities including the test operation of FCBs, training of design, operational and manufacturing staff for the production of FCBs, and procurement of additional buses;
- Measures to ensure continued project support from all stakeholders including auto industry, environmental activists, high level officials from central and municipal governments;
- Measures to maintain a high level of publicity activities;
- Mechanisms to maximize effectiveness of information sharing during workshops and closer collaboration between all project participants including selected institutes and private sector equipment suppliers;
- Efforts to thoroughly assess prevailing market conditions of FCBs and re-fueling technologies that ensure realistic activities and budgets for Part II. This would include Part II procurement activities that will meet budget expectations, accurately reflect realistic equipment delivery times and provision of sufficient technical support during the demonstration;
- Current trends in FCB developments and how these may affect cost reductions to FCBs over the next 10 to 15 years. The analysis could include:
 - an overview of increased global funding for FCB development;
 - promising avenues of reducing costs, improving durability and reliability (such as FCBs with fuel cell/hybrid power systems); and
 - forecasts of increased production and reduced prices.

5.3 Recommendations to the GEF

- Approve funding for Part II on the basis of the following:
 - Part I activities to date are closely linked with GEF OP-11 objectives to reduce GHG emissions from the transport sector by providing the bases for demonstrating clean technologies;
 - Part II investments will provide valuable information from a new generation of FCBs that are likely to be more durable and reliable and reduced in cost;
 - optimism that the cost reduction curve for fuel cell technologies will be steeper in the coming years due to increasing costs to operate internal combustion engines that have resulted from the recent doubling of international oil prices;
 - Government of China support for the project is very strong at all levels. The project is viewed as a key contribution to their objective of a “Green Olympics”;

- the overall impact of a successful FCB demonstration in China is enormous considering China has the world's largest public transit sector, and is rapidly becoming the one of the world's largest consumers of fossil fuels. Furthermore, there is a very good opportunity to showcase FCBs and the impact of GEF funding during the 2008 Olympics;
- the China FCB project can take the global lead amongst other UNDP/GEF FCB projects. In comparison to lessons learned from a project in a developed country, the successes and lessons from a project in a developing country such as China can be more relevant and effective.

Appendix A – Mission Terms of Reference

Terms of Reference for the Evaluation

UNDP/GEF Project CPR/01/G31 – Demonstration for Fuel-Cell Bus Commercialization in China

A. Introduction

In response to the global environment challenges linked to the air pollution problems and the public transportation needs in the developing countries, the UNDP programme on Fuel Cell Bus (FCB) Commercialization was developed under the financial support from the Global Environment Facility (GEF). Cities in four countries (Brazil, Mexico, India and China) were included in the programme. The FCB China Project covers Beijing and Shanghai, two mega-cities facing fast growing needs to upgrade the public transit and the critical challenge of vehicular air pollution.

The Project Document for China FCB Project was approved in November 2002. It was designed to be implemented in two phases, each phase introducing six Fuel Cell Buses to the cities. The funding for Phase II of the project is subject to the approval by GEF after the completion of the Phase I, which is to be marked by the procurement of the buses. The Project Management Office (PMO) signed the contract with DaimlerChrysler (DC) in May 2004 to procure three FCBs.

Partnership building between the private sector and the government is crucial for the success of the project by commercializing this new environmentally-friendly means of transportation. The PMO developed strategies to build and expand these partnerships. The procurement of the FCBs from DC and the construction of the hydrogen refueling station in partnership with BP are results from the partnering, which not only enables the business to enter this potential market but also lowers the cost to be covered by the government to improve the public services of transport and environment.

According to the decision of the Project Review meeting on 29 June 2004, the project evaluation is to be conducted to summarize the experiences and lessons learned during Phase I so as to provide guidance in determining the targets and strategies for Phase II. In this regard, the findings and recommendations of the evaluation will contribute to identify best possible ways to advance the modern public transportation technology by commercializing FCBs in the cities.

B. Objectives of the Evaluation

The objective of the evaluation is to review the efforts made and results achieved in partnership building among the respective agencies and companies and to review the approaches to access to potential partners and the methodologies in selection of proper fuel cell bus technologies and relevant supporting infrastructure for commercializing the environmental friendly public transportation in the Chinese cities.

C. Specific Tasks for the Evaluation

By review of the relevant documents/reports and meeting with agencies and companies of the project, the evaluation mission will carry out the following tasks:

1. Assess the relevance of the project against the national development priorities and objectives and assess how the project supports China in its efforts to address the public transport needs

and the environment protection objectives. Give recommendations for the phase II in this respect.

2. Study the government policies in development of FCBs for the Chinese cities and review the project strategies in partnership building with business sector in relation to achieve the project objectives, more specifically as how to understand the national needs and the global FCB potentials.
3. Evaluate criteria and procedures in selection of the suppliers for the respective technologies and the approaches for access to the potential suppliers of the FCBs and the refueling station.
4. Find out key official approval procedure and certification requirement for commercializing the FCBs.
5. Analyze the current FCB projects in other countries, and the domestic and international market developments in supply and demand of the technology to find out and advise potentials for possible project expansion for Phase II.
6. Summarize good practices and lessons learned in partnership building of the project with companies and agencies in introducing the FCBs and designing and building the refueling station.
7. Recommend actions to improve Phase II of the project in identifying the most practical and appropriate FCB technologies and partners for the needs of Shanghai and other cities.

D. Products Expected from the Evaluation

The evaluation mission should complete and submit hard and electrical copies of the Project Evaluation Report before departure from Beijing. The report should be in conformity with the format set forth in the UNDP Guidelines for Evaluators (December 1998).

E. Composition of the Evaluation Team

The mission will consist of: one international expert (to be identified by UNDP) and one national expert (to be identified by MoST) who will be working as a team. Both experts should have basic knowledge of fuel cell technology development globally and practical experience in public-private partnership building for advancing the new technologies from the research to the market.

The experts should hold an advanced degree in studies relevant to the subject, and have at least 10 years of working experience. The international expert will act as the team leader and the national expert will support for the mission by providing inputs on the national context in development of the technology, the public transport and the vehicle production.

F. Schedule of the Mission and Budget

The evaluation mission is scheduled to start in mid November 2004, lasting for 12 days (including arrival and departure). A preliminary schedule for the mission is proposed as follows and shall be finalized by the PMO in consultation with respective agencies. The mission cost will be charged to 74500 Miscellaneous under Key Activity B.

Schedule

Date	Activity	Lead Agency
1	Arrival in Beijing	UNDP
2	Briefing at UNDP office and review of the background materials	UNDP
3	Meeting the project management office, the Beijing Oversight Office and CICETE	The PMO
4-5	Meeting the current and candidate partners of Fuel Cell Bus and Hydrogen Refuelling Station, DC, BP, auto producers, etc.	The PMO
6-7	Visit to Shanghai to meet the Shanghai Oversight Office and candidate partners	The PMO
8-10	Drafting of the evaluation report	Expert
11	Debriefing to share recommendations and findings of the evaluation at UNDP office	UNDP
12	Departure from Beijing	UNDP

G. Roles and Responsibilities

The manager of the UNDP FCB programme at UNDP-GEF New York will assist the UNDP CO and the evaluation team in preparing for the final evaluation of the project. The evaluation mission reports to UNDP CO. The executing agency (EA) shall coordinate all relevant national and the international agencies and companies and provide in advance copies of the necessary documents needed by the evaluation expert/s. Likewise, the EA shall arrange and finalize the itinerary/schedule for the mission in consultation with all parties concerned. The Chief Technical Advisor (CTA) will provide insights of the global FCB market to the mission and discuss with them in detail the technology selection for Phase I and II and the process of the selection. The EA and UNDP-Beijing will coordinate the logistical arrangements for the evaluation.

H. Support to the Evaluation Team

UNDP will provide policy guidance to the mission, and the PMO will arrange necessary briefings, background materials, meetings, travel and other logistical support.

The following documents and reports shall be provided to the mission to assist the team to conduct the evaluation:

1. Project document (UNDP)
2. Evaluation Guideline (UNDP)
3. Project Implementation Report (the PMO)
4. Framework or draft Project Brief for Phase II of the Project (the PMO)
5. Documents on partnership building with companies and agencies, such as consultant reports, technical reports, study tour reports, newsletters, etc (the PMO)

I. Intended Project Immediate Objectives (for Phase I and II)

- (1) Determine the technical and commercial viability of fuel cell buses and the associated fuel supply systems.

- (2) Establish the necessary technical, operational, managerial and planning capacity with the bus companies, scientific and industrial communities, and national and municipal-level policy makers to maximize the likelihood of long-term sustainable use of FCBs.
- (3) Create a national-level awareness of FCBs and their long-term potential and develop a strategy for pursuing that potential.

Drafted: 11 October 2004

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Appendix B - List of Persons Interviewed and Documents Reviewed

This is a listing of persons contacted during the Evaluation Period. The Evaluation Team consisting of Mr. Roland Wong (Team Leader) and Dr. Yi Bao-lian (national Expert) regret any omissions to this list.

1. Ms. Maria Suokko, Assistant Resident Representative, Cluster Manager Energy and Environment, UNDP China, Beijing;
2. Mr. Miao Hongjun, Program Manager, UNDP China, Beijing;
3. Mr. Wang Bing, Director, International Financial Institution Division IV, Ministry of Finance, P.R. China, Beijing;
4. Mr. Xu Jing, National Project Director, Fuel Cell Bus Demonstration for China, Ministry of Science and Technology, P.R. China, Beijing;
5. Mr. Chen Jiachang, Deputy National Project Director, Fuel Cell Bus Demonstration for China, Ministry of Science and Technology, P.R. China, Beijing;
6. Ms. Zhu Duanni, Chief Division II, CICETE, Beijing;
7. Ms. Chen Fei Ran, Programme Officer, Division II, CICETE, Beijing
8. Mr. Jia Jinlong, Programme Officer, CICETE, Beijing;

Beijing Team:

9. Ms. Shen Xiang, Deputy Division Chief, Beijing Municipal Commission;
10. Mr. Zheng JiChun, Commissioner, Beijing Science and Technology Commission;
11. Mr. Feng Xingfu, Vice General Manager, Beijing Public Transportation Corporation;
12. Mr. Tang Miao, Deputy General Engineer, Beijing Public Transportation Corporation;
13. Mr. Zhou Fu Quan, Engineer, Beijing Municipal Commission for Science and Technology;
14. Dr. Fanhua Ma, Associate Professor, State Key Laboratory of Automotive Safety and Energy, Tsinghua University;
15. Dr. Wei Yintao, Associate Professor, Department of Automotive Engineering, Tsinghua University;
16. Dr. Zhuge Weilin, Department of Automotive Engineering, Tsinghua University;
17. Prof. XuDa Hong (Bertand Hsu), Senior Advisor, Tsinghua University;
18. Mr. George Wu, General Manager, Beijing Sinohytec Co. Ltd.;
19. Dr. Zhuo Yuqun, Manager, Hydrogen Making Dept., Tsinghua Tongfang Co. Ltd.;

20. Mr. Peter Leong, Project Manager, Hydrogen, BP Asia Pacific (Malaysia), Kuala Lumpur, Malaysia;
21. Ms. Sally Wu, Legal Advisor, BP Legal, BP (China) Holdings Ltd., Beijing;
22. Mr. Walter Rau, Manager Fuel Cell Bus Programme, Daimler Chrysler, Mannheim, Germany;
23. Dr. Michael Jones, British Petroleum, London, UK

Shanghai Team:

24. Mr. Ma Qiao, Manager, Project Office in Shanghai for Fuel Cell Bus Commercialization in China;
25. Mr. Shou Ziqi, Vice Chairman, Science and Technology Commission of Shanghai Municipality;
26. Mr. Ma Xing Fa, Director, Senior Engineer, Science and Technology Commission of Shanghai Municipality;
27. Mr. Huang Yi, Deputy Director, Shanghai Science & Technology Information Center;
28. Cai Xia Ying, Director SM, Senior Engineer, Shanghai Urban Transport Bureau;
29. Yan Shaowei, Vice-Director, Shanghai Urban Transport Bureau;
30. Dr. Jianxin Ma, Professor Chemical Engineering, Institute for Hydrogen Technologies, Tongji University;
31. Dr. Zhuoping Yu, Dean of School of Automotive Studies, Tongji University;
32. Dr Luo Feng, Associate Professor, Tongji University;
33. Dr. William Gao, Executive Vice President, PATAC Co. Ltd.;

Project Management Office:

34. Mr. John Wallace, Chief Technical Advisor;
35. Dr. Lun Jingguang, National Project Coordinator;
36. Ms. Wang Ju, Manager of PMO;
37. Dr. Wei, Project Management Specialist;

Documents reviewed for this evaluation includes:

1. UNDP Pro-Doc dated November 26, 2002 and Project Brief for “CPR/01/G31: Demonstration for Fuel Cell Bus Commercialization for China – Part I” dated February 6, 2002;
2. Inception Report for “Demonstration of Fuel Cell Bus Commercialization in China CPR/01/G31/1G/99”, April 2003;
3. Summary from the Project Management Office of Contacting Potential Supplies, Mexico and Brazil Team and Academics Conference in China, May 2003;
4. Newsletters for GEF/UNDP Demonstration of Fuel Cell Bus Commercialization in China, Issues 1 to 4 (2003), 1 to 3 (2003);
5. Semi-Annual Report for Demonstration of Fuel Cell Bus Commercialization in China, November 10, 2004.
6. Project Implementation Report

Appendix C – Mission Itinerary

Schedule for the Evaluation Mission

15-26 Nov. 2004
CPR/01/G31

Date	Activity	Lead Agency
Nov. 15 19:05pm	Arrival in Beijing and Staying in Xiyuan Hotel, meeting at the airport by the PMO	The PMO
Nov. 16 9:30-10:30	Joint briefing at the UNDP office and review of the TOR and the schedule	UNDP
10:30-12:00	Meeting CICETE staff	The PMO
14:00-18:00	Meeting the MoST and the project management office	The PMO
Nov. 17 9:00-12:00	Meeting the project management office and the CTA	The PMO
Nov. 17 afternoon	Flying to Shanghai and initial discussion with Shanghai project staff	The PMO
Nov. 18	Visit to Shanghai to meet the Shanghai Oversight Office and candidate partners and return to Beijing in the evening	The PMO
Nov. 19	Meeting the Beijing Oversight Office and the current and candidate partners of Fuel Cell Bus and Hydrogen Refuelling Station, DC, BP, auto producers, etc.	The PMO
Nov. 20-23	Drafting of the evaluation report	Expert
Nov. 22 14:00	Meeting with Ministry of Finance	The PMO
Nov. 24	Debriefing to share recommendations and findings of the evaluation at the UNDP office	UNDP
Nov. 25	Finalizing the evaluation report	UNDP
Nov. 26	Completion of evaluation report (changes accepted from stakeholders until Dec 6/04)	UNDP

Appendix D – Logical Framework (Log-Frame) Project Planning Matrix

Appendix D - Logical Framework Project Planning Matrix (status in *bold italics* as of November 2004)

	(1) Programme or project summary	(2) Indicators	(3) Means of verification	(4) External factors (assumptions and risks)
Development objective	Reduce air pollution and GHG emissions through widespread commercial introduction of fuel cell buses in urban areas of China.	<ul style="list-style-type: none"> - Air pollution and CO₂ emissions reduced in Beijing and Shanghai during project <i>Not yet achieved</i> - Larger reductions in China and elsewhere once FCB technology is commercially deployed. <i>Not yet achieved</i> 	For project: fuel consumption of FCBs and bus-km traveled.	
Immediate objective 1	Determine the technical and commercial viability of fuel cell buses and the associated fuel supply systems	<ul style="list-style-type: none"> - Six buses and 2 refueling stations are purchased and placed into operation <i>Not yet achieved</i> 	Second Semi-Annual project report	
Output 1.1 <u>Part I Activities</u>	Operational basis for project management established Hold Inception Workshop Prepare and distribute semi-annual reports in English	<ul style="list-style-type: none"> - Advisory Committee and Local Oversight Committees established <i>Achieved</i> - Attendance at Inception workshop <i>Achieved</i> 	Inception Report	
Output 1.2 <u>Part I Activities</u>	A commercially relevant demonstration of the technical feasibility of FCBs and their refueling infrastructure in Beijing and in Shanghai. Develop system specifications Undertake vendor communications and study tours	<ul style="list-style-type: none"> - Number of vendor visits completed during study tours <i>Achieved</i> - Persons consulted in formulating FCB system specifications <i>Achieved</i> - Number of qualified bids received <i>Achieved</i> 	First two Semiannual project reports	Assumptions: 1) The procurement process is adequate so that the buses can be commercially produced, and 2) the suppliers will accept the structuring of the contract into two Parts. <i>The high cost of FCBs precludes a two-part contract. The likelihood of using the same FCB supplier for Part II is low.</i>

	(1) Programme or project summary	(2) Indicators	(3) Means of verification	(4) External factors (assumptions and risks)
	Select system suppliers	- Successful negotiations of contracts for each city <i>Partially achieved for Beijing only</i>		FCBs can be procured from commercial vendors at satisfactory cost
	Install hydrogen fueling system	- Installation of the hydrogen fuel supply stations <i>Not yet achieved.</i>		Risk of vendor failure <i>The cost of FCBs has been more costly than anticipated resulting in only 3 FCBs procured for Beijing only.</i>
	Place initial set of buses in operation	- Delivery of the first 6 buses <i>Not yet achieved</i>		
Output 1.3	The accumulation of a substantial body of knowledge about reliability and failure modes, opportunities for improving the design and reducing the cost of FCBs	- Development of quarterly reporting guidelines <i>Achieved</i>		
<u>Part I Activities</u>	1.3.1 Formulate guidelines for quarterly reports on in-service performance of each FCB system.	- Persons consulted in formulating reporting guidelines <i>Achieved</i>	First two Semiannual project reports Newsletters	
	1.3.2 Design data collection systems	- Data collection system installed <i>Partially Achieved</i>	Draft system design	
	1.3.3 Collect ridership data	- Initial ridership survey completed <i>Deferred as a Part II activity</i>		
	1.3.4 Exchange experiences with other fuel cell bus projects	<i>Achieved</i>		
	1.3.5 Publish a project newsletter	- Publication of bi-monthly newsletter in English and Chinese		

	(1) Programme or project summary	(2) Indicators	(3) Means of verification	(4) External factors (assumptions and risks)
		<i>Achieved</i>		
Immediate objective 2	Establish the necessary technical, operational, managerial and planning capacity within the bus companies, scientific and industrial communities, and national and municipal-level policy makers	- Publication of documents demonstrating accumulated experience and knowledge <i>Achieved</i>		
Output 2.1 <u>Part I Activities</u>	A cadre of bus-company staffs in Beijing and Shanghai trained in the operation, maintenance and management of FCB systems None	<i>Deferred as a Part II activity</i>		
Output 2.2 <u>Part I Activities</u>	An examination and certification program for FCB operators and mechanics is developed. None	<i>Deferred as a Part II activity</i>		
Output 2.3 <u>Part I Activities</u>	Increased capacity among public-transport policy makers and planners at the national and municipal levels and at bus companies in Beijing and Shanghai Undertake a study tour to visit selected public transport planners, policy makers, and service providers worldwide	- Number and breadth of visits successfully completed during study tours <i>Achieved</i> <i>Achieved</i>	First two Semiannual project reports	
Output 2.4 <u>Part I Activities</u>	Enhanced scientific, technical, and industrial capacity in China relating to manufacturing and commercial utilization of FCBS and their associated fuel supply systems None	<i>Ongoing</i>		
Immediate Objective 3	Create a national-level awareness of FCBS and their long-term potential and develop a strategy for pursuing that potential	- Development of a strategy for commercialization of FCBS in China <i>Ongoing</i>	Phase III Strategy Document	