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CURRENT APPROACHES TO FINANCING FUEL CELL PROJECTS UNDER OPERATIONAL PROGRAMS 7 AND 11

INTRODUCTION

1. This paper reviews the GEF approach to support of fuel cell projects and describes the results of ongoing efforts to more clearly define the rationale and expected outcomes from one approved and several pending projects. Along with more detailed technical analysis currently or soon to be made available by the Implementing Agencies and STAP, this paper is intended to inform Council consideration of future proposals for additional GEF investment in fuel cell projects.

2. Fuel cell projects address the greenhouse gas mitigation objectives of the GEF in important ways. Analysis by STAP, the IPCC, and other authorities indicates that, if successfully commercialized and fueled by hydrogen from appropriate sources, widespread use of fuel cells as a source of energy for transportation and power could achieve dramatic reductions in greenhouse gas emissions. This potential has been recognized in two operational programs. OP 7, Reducing Long-Term Costs of Low GHG-emitting Energy Technologies, identifies stationary fuel cells for generating heat and electricity as a promising technology. OP 11, Promoting Environmentally Sustainable Transport, lists fuel cells for public transport among technologies eligible for support.

GEF Operations and Policy Work in Fuel Cells

3. The initial commitment of GEF support for fuel cell development was in the form of Planning Development grants (PDFs) for fuel cell bus projects to four countries, Brazil, Egypt, Mexico, and India. A fifth project is being developed for China by UNDP without PDF support. At its December 1999 meeting, the GEF Council approved the first fuel cell bus project, *Brazil: Hydrogen Fuel Cell Buses for Urban Transport*. In discussion of the work program, several Council members sought clarifications on the rationale for supporting the technology and requested circulation of the revised project document prior to endorsement. The IFC has also indicated interest in providing GEF support to stationary fuel cells although no specific project has been identified consistent with its financial requirements.

4. In response to the Council concerns and the need to better understand the evolving status of the technology, a medium size project was initiated under UNEP to produce an independent assessment of the technology and its implications for the GEF. UNDP has taken a lead role in preparing the assessment of fuel cell buses, while the IFC has the lead for the assessment of stationary fuel cell applications. This work was the basis for workshops in April and July on fuel cell bus commercialization that brought together technical experts, public officials, and private sector representatives from 14 countries. Fuel cell development was also addressed at a May 2000 workshop in Paris on the GEF Transport OP hosted by the Government of France and at the June meeting of STAP in Bangalore, India. Separate technical meetings are planned on stationary fuel cell issues.

Issues

5. On the basis of this analysis, numerous issues were identified and discussed relating to GEF support of fuel cell development. These included (i) technical and environmental questions concerning the source of hydrogen; (ii) economic questions concerning the costs of the technology, prospects for reaching a competitive price with a reasonable level of investment, and the timing of investments; and (iii) developmental issues related to the likely nature of technology transfer expected to occur from the projects. Additional operational questions were raised concerning cooperation with the private sector, particularly with respect to risk-sharing; criteria for evaluating projects for work program entry; and the risk of a disproportionate emphasis on this type of project to the exclusion of other transport initiatives, particularly modal shifts (e.g., bikeways and high-speed bus lanes that encourage alternatives to low occupancy vehicles). Documents responding to many technical and operational issues are being prepared by UNDP and will soon be available.

The GEF Approach

6. The evolving GEF approach to support of fuel cell projects is consistent with the increasing emphasis on long term projects and engaging the private sector. As previously noted in the work program presentation of solar thermal power plant projects, in order to support technology development a sustained commitment to several projects over a period of years is necessary to attract private investment and to allow for meaningful evaluation of technical progress.

7. Technical and environmental questions, the *first* issue, are inevitable in the early stages of almost every new energy technology. One response is a continuing process of technical monitoring and review consistent with the rapid pace of technological advance. STAP plays a central but not exclusive role in meeting this need. Consequently, consultation and collaboration with other key public and private players is also important and is so far being discussed with two of the most active groups in the field, the California Fuel Cell Partnership and the International Energy Agency. Another means of addressing technical issues (particularly with respect to the fuel cycle) as suggested by the STAP review may be targeted research.

8. The economics of fuel cell buses are a *second* concern. Currently, the incremental cost of fuel cell buses is high and the number of buses to be acquired in the initial set of projects is small. However, these projects will provide experience essential for evaluating the prospects for a subsequent investment phase with much lower expected incremental costs. Specific indicators of technical and economic performance have been developed and will serve as a basis for any future GEF support. Based on cost reductions typical for manufacture of similar technologies, commercialization prospects have been judged to be highly promising. As STAP notes in its evaluation, support of fuel cells will also contribute to electric vehicles and other technologies of environmental benefit.

9. A further economic consideration is the importance of *engaging the private sector*. Private firms typically own the technology and will be the primary source of investment, and thus should logically be partners in the design, financing, and

implementation of projects. Indeed, the extent of private sector response will often be an indicator of project success. As noted above, business participation was emphasized in the workshops and meetings held this year. To further engage industry, UNDP has suggested the possibility of forming a Private Industry Advisory Panel. Such a panel might also be one means to assure consideration of the linkage between mobile and stationary fuel cell development, as most of the key corporate developers of the technology are pursuing both applications.

10. The *timing* of GEF support is another element of the economic and technical analysis. Delaying GEF involvement could reduce costs and reduce performance risks. On the other hand, early experience is important as the basis for long-term urban transport planning. As a high percentage of all buses manufactured will be used in developing countries, some effort to promote the early introduction of the technology into such complex and change-resistant systems is considered appropriate. Conversely, delay risks further “technological lock-in,” the inertia that results from cumulative investment and experience in competing technologies.

11. A *third* key issue identified by some Council members and the STAP review is the pace and nature of technology transfer expected as a product of GEF support of fuel cells and other new technologies. Most GEF renewable energy projects have not led directly to local manufacture of technology as this would normally follow the creation of a market of sufficient size to justify a major capital investment. However, viewed as a process, technology acquisition evolves over time and frequently begins with the acquisition of familiarity through experience. Subsequently, technology is adapted to local needs and circumstances, and then as markets grow so too the opportunities for local manufacture. This view was strongly supported by representatives of the countries endorsing the proposed projects, notably including countries with advanced scientific programs. GEF plans to require increasing attention to this issue and to strategies for promoting local ownership of technology in project development.

12. A *fourth* element of the GEF approach addresses the need to assure integrated planning and integration of new technology with the urban transport system. This issue was emphasized by STAP and will be specifically identified for STAP Roster Review of specific project proposals. The Secretariat has also had preliminary discussions of several modal shift concepts in recent months and expects several projects of this type will reach at least the PDF stage by the next Council meeting. On the other hand, representatives of developing country transport systems emphasized that local experience with fuel cell buses in actual operating conditions is essential to allow early consideration of the technology and its planning implications.

Risks

13. As with all new technology projects and as noted in OPs 7 and 11, there are numerous unavoidable risks. The technology may not mature as expected or the costs of alternatives may be lower than projected. In addition, there are political and institutional risks associated with urban transport such that even technical success does not assure achievement of environmental goals. For example, consumer acceptance and bus

ridership will also be highly important determinants of the ability to reach GHG emission reduction goals. These risks will be reduced by involving several countries and technology providers in different approaches, by cost-sharing arrangements, and by a phased approach to technology development.

Conclusion

14. As recognized in the World Energy Assessment produced by UNDP for the CSD 9 meeting to take place in April next year, the development and rapid introduction of new clean energy technologies in developing countries is essential for meeting development objectives and avoiding high environmental costs. The GEF may be unique in its capacity for support of “technological leapfrogging.” The fuel cell projects illustrate the operational difficulties associated with meeting this challenge. Numerous questions remain and some can only be addressed with experience. The GEF will continue its search for creative solutions and to communicate lessons learned.