Uncertainties pervade GHG emission reduction projects

James Wintergreen and **Elizabeth Delaney** outline the difficulties encountered in assessing the likely quantity and value of emission reductions from a potential CDM project

This article identifies challenges which companies may encounter as they incorporate greenhouse gas (GHG) emissions into their project evaluation process. It reports issues which First Environment's climate change team addressed in a feasibility study for a combined-cycle power plant that an international power generation company is constructing and will be operating in a developing country. The study evaluated the potential quantity and value of certified emission reductions that might be attributed to the project under the proposed structure of the Clean Development Mechanism (CDM) of the Kyoto Protocol.

In general, the challenges can be classified into four categories comprising issues related to:

- ☐ studying data sources;
- ☐ calculating the host country baseline;
- ☐ calculating the facility's emissions; and
- ☐ valuing the emission credits.

Studying data

Throughout the study, project data collected from multiple public and private sources required careful assessment and continual review. While the evaluation and management of project data is always important, GHG emissions data is particularly complex because it is reported in a variety of units and collected for different purposes, resulting in diverse underlying data assumptions. Although data regarding power plant emissions appeared to be comparable, special care had to be exercised to ensure that the data was, in fact, equivalent. In cases where the data was different, conversion and allocation methods needed to be explicitly defined.

The Emissions Marketing Association consists of more than 270 members from 190 companies worldwide. Its aim is to promote market-based trading solutions for environmental control

Calculating the host country baseline

The technical group of the team began with the formidable task of calculating the emissions baseline of the host country's electricity generation sector. As might be expected for a developing country, data sources were limited. The lack of useful efficiency data for the host country required that estimations be derived from a developed country database.

The first task in developing the baseline was to identify the fuel mix of the electrical generation sector. Actual production figures would have been desirable for this purpose, but they were not available for the entire sector so national generation capacity values were used instead. This data was then used to calculate a single base year of GHG emissions per unit of power.

The next challenge was how to develop this profile to account for future changes in the generation sector. Multiple variables needed to be incorporated in this projection. First was the country's total capacity, for which there were several growth projections, including estimates based on extended historical growth trend lines. We eventually incorporated projected estimates obtained from a contact in the host country government. Another factor contributing to the baseline's change over time was the mix of technology in the sector, as more growth was expected in certain fuel technologies than others.

Calculating facility emissions

Although the client company provided operating parameters to assist with calculating the facility emissions, the limited historical data for the combined-cycle plant posed an obstacle to calculating these GHG emissions. This was overcome by modifying existing datasets of comparable technologies for use in the calculations. A final consideration incorporated into the plant emissions model was the ageing of the plant and the associated decline in efficiency impacting its long-term emissions profile. Using this efficiency and emissions data, the technical team was able to propose a GHG emissions rate for the plant which allowed the calculation of total annual GHG emissions.

Finally, with the facility's emissions profile and a host country baseline calculated, the technical team was able to determine the emission reduction units that could be associated with the introduction of the combined-cycle project into the developing country's electrical power sector.

Financial valuation of emission credits

The financial group of the team applied the technical information to assess how the emissions reductions which had been identified would impact the project's overall financial return. Part of this analysis focused on emission reduction prices in the market. Because of the immature state of the market and uncertainty about evolving policy, research into recent documented trades and discussions with brokers suggested the range of prices that were considered.

The second part of the analysis addressed the costs associated with registering the credits under the CDM. This required an examination of the still-evolving CDM project cycle and the estimation of costs that would be associated with each management task in the process. The revenues and costs were then distributed over the project timeline and additional financial considerations, such as taxes, inflation, currency risk and the project discount rate, were also addressed. The resulting financial model identified the net present value (NPV) related to the GHG emission reductions of the project.

Conclusion

As might be expected, assumptions and uncertainty throughout the study resulted not in a single value but several different scenarios and associated project NPVs. The scenarios incorporated groups of assumptions that could impact the ultimate financial feasibility of the project, though all scenarios resulted in positive NPVs for the client's project investment.

This study demonstrates that the process of emission reduction and valuation is subject to multiple uncertainties. As it may be some time before agreement on a standard evaluation method is reached, parties undertaking such a process should be critically aware of the assumptions they are making and ensure that they document their decision process accordingly. EF

James Wintergreen is technical assistant to the president of First Environment, a US-based company that provides strategic environmental management and engineering services internationally. E-mail: jtw@firstenvironment.com. Elizabeth Delaney is vice-president of First Environment. E-mail: bah@firstenvironment.com. *The opinions expressed in the above article are not necessarily the opinions of the EMA, its members or member companies.*