Innovative Financial scheme for sustainable development of Renewable Energy project in Rural Areas in Vietnam, Philippines and Indonesia (IFRERA) – Project 69

Supported by the ACE through the EC – ASEAN Energy Facility

Newsletter 5
Economic assessment of SHP and energy projects

Editorial

Welcome to the fifth newsletter of the IFRERA project. IFRERA is a collaborative effort between IED (France), ETC (Netherlands), ADEME (France), IoE (Vietnam), MBA (Philippines), and the local authorities and investors in the concerned countries. This newsletter will focus on economic profitability assessment, and the related training workshops on "Economic Analysis of Sustainable Energy projects and Programmes" in Vietnam (Hanoi, December 19-20, 2005) and in Jakarta (March 21st, 2006).

Why do an economic assessment?

Successful sustainable energy projects require a comprehensive assessment and definition of all conditions to be fulfilled during their live "from preliminary studies to final assessment" and regarding the three "pillars" that found them:

- Technical engineering
- Economic and financial engineering
- Management of the project within its local and general context.

As seen in figure 1, economic analysis must be the "basis" of this second pillar and followed by the financial analysis.

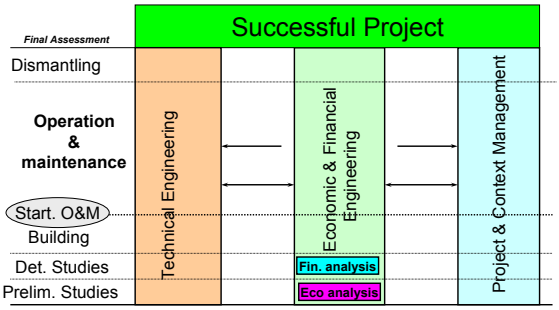

Figure1: The "Three pillars" for successful projects

The economic assessment of sustainable energy projects and programmes has two main goals:

- A "conventional one" which is to define the reference economic profitability of specific projects and assess their values within changing conditions ("sensitivity studies") resulting from the local, national and international framework of such projects

- An "advanced one", which is to define and make an optimal use of potential incentives in favor of such projects, including renewable energy ones:
    - Specific power purchase agreements ("tariffs")
    - Subsidies or soft loans
    - Carbon credits valuation on derivative markets, such as carbon funds…

Beside conventional criteria to assess the economic and the financial profitability of the IFRERA projects, such as their Net Present Value (NPV) or their Internal Rate of Return (IRR), an innovative method already tested in Europe was used and presented during the two training workshops.

The Profitability Index Method

The Profitability Index (PI) of a project is simply the ratio between its Net Present Value (the sum of discounted cash-flows during operation less the initial investment) and its initial investment cost. The discount rate to use in this method is the averaged weighted cost of capital before tax on profit and resulting from equity and debt costs,.

The main advantages of the Profitability Index method are:

- Access to an "universal profitability scale" for projects:
    - Projects with PI < 0 are not profitable
    - Projects with 0 < PI < 0.3 are not enough profitable to attract investors who want to finance their growth from operating their projects.
    - Projects with PI > 0.3 are sufficiently profitable to attract private investors and to allow them to re-invest in new projects and activities leading to a long term sustainable growth. This is the hypothesis taken for the IFRERA projects.
- Any investment project can be described by a simple linear relationship between the selling price of electricity (the "tariff") and its Profitability Index (PI), as shown in figure 2:

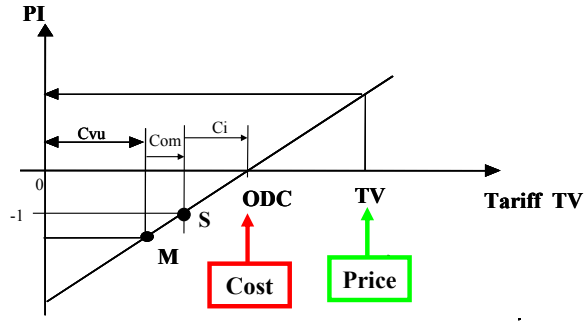

Figure2: The "PI versus Tariff" graph

From this model and from this graph, one can have access to the following parameters:

- The profitability index level from the tariff, and from this value other conventional profitability parameters values: Internal rate of return, net present Value, simple and discounted pay-back time, as there is a simple

and direct link between the profitability index of a project and those parameters.

- Cost and cost-structure of the kWh: the "fixed cost part **Ci**" due to the investment cost ; the "O&M part **Cem**" due to operating and maintenance costs other than fuel costs; and the "variable cost part **Cvu**" due to fuel cost, which of course is zero for hydropower, solar and wind projects.

As it will be seen later, this cost structure is a strategic information to know in order to assess the performance of projects under scenarios including potential carbon credits valuation and sharp increases of fuel cost in the case of comparisons with fossil-fuel based alternatives.

All participants to the training workshops were able to get acquainted with the method and to apply it to the case studies from IFRERA projects in Vietnam and in Indonesia and performed with the associated specific and simple to use spreadsheets.

Sensitivity studies

From the above model and associated spreadsheets, sensitivity studies were very performed during the project and during the two training workshops. Within a specific financing scheme, parameters with main influence on profitability were the average annual capacity factor and the investment cost and then the O&M expenses.

To asses the impact of "soft financing", a direct formula was used and included in the software used in the training session. It gives both the impact on project profitability Index (and then on its IRR, simple and discounted pay-back time) and the equivalent subsidy on initial investment it can replace. Case study on the IFRERA Krong pa 2 project in Vietnam was very interesting: benefiting from a debt covering 70 % of the project cost at a 8 % nominal interest rate instead of the 11 % reference one boosts the PI value from 0.3 to around 0.6 (so, doubling the Net Present Value of the project), and is equivalent to the effect of a subsidy of 18 % on the investment cost.

A focus on inflation effect

As small hydro projects are to be operated within a long term power purchase contract, a specific evaluation of the potential effect of future inflation rate on the profitability of the same project than above was made during the Hanoi training workshop. This reference project discounted at 9 % real on 30 years presents a fair and sufficient 0.3 PI value with "reference" tariff with the hypothesis that this tariff is corrected each year from the inflation effect in order to get a constant power purchase on 30 years.

Simple formula from the Profitability Index method gave useful information on project performance in the case of no perfect protection from inflation effect:

* If not protected at all against inflation, initial tariff to ensure the same profitability level PI = 0.3 should be increased by 25 %, if not the profitability decrease would be

dPI' > -0.3, leading to a non profitable project (PI final < 0).

* If only a 20 % part of the tariff is not corrected each year from inflation, the corresponding increase of tariff should be only 5 % and if not, the final Profitability Index should be 0.25, a lower than 0.3 but still acceptable value.

A focus on carbon finance

As IFRERA projects can lower CO2 emissions, an assessment of potential valuation of potential "Carbon Credits" was made. Using the profitability Index Method, this assessment was particularly simple: the PI value increase of a project is the ratio between:

* The "Bonus" (in $/kWh) gained on each kWh by selling carbon credits at a specific price of avoided ton of CO2.

* And Ci (in $/kWh), the part of the kWh cost due to the investment cost (see figure 2: this result shows how strategic it is to know the cost structure of the delivered kWh).

Applied to reference projects discussed during the training workshops, this simple but reliable analysis shows that to get a sufficient increase of profitability index of SHP projects, the net selling price of avoided CO2 should be in the very upper range of potential carbon market prices envisioned in 2005. So, profitability of IFRERA reference projects must result from selling electricity and not from selling potential carbon credits.

A focus on energy crisis

IFRERA SHP projects are of course not directly dependent from oil prices. But decisions to implement them can benefit from a comprehensive analysis comparing such an SHP project and its fossil fuel based alternatives, such as a local diesel gen-set. This comparison was detailed during the Jakarta training workshop, putting in evidence that the PI decrease for such an alternative is proportional to the relative increase of fuel cost and to the ratio between the variable part of the kWh cost **Cvu** and the fixed part of this cost **Ci** (see figure 2), reinforcing here also the strategic interest to know those cost structures.

Conclusions

The economic analysis performed on the IFRERA SHP projects allowed to assess the best options to invest in and to perform sensitivity studies to evaluate the robustness of those reference projects. The two training workshops based on those reference case studies were successful in enforcing capacities of IFRERA projects stakeholders, partners and invited project managers and decision makers on economic assessment of sustainable energy projects, including by mastering the innovative Profitability index Method and its associated software.

Contacts

For more information about the IFRERA project:

IED France at ied@ied-sa.fr,

ADEME France at stephane.pouffary@ademe.fr

ETC Energy at energy@etcnl.nl

Institute of Energy, Vietnam at lienttvnl@hn.vnn.vn,

or visit the http://www.ied-asean.com webpage

This document has been produced with the financial assistance of the European Community through ACE-EAEF. The views expressed herein are those of IFRERA team and its partners, and can therefore in no way be taken to reflect the official opinion of the European Community