RETScreen® International

Clean Energy Decision Support Centre

e-Learning

Training Module

SPEAKER'S NOTES

FINANCIAL AND RISK ANALYSIS WITH RETSCREEN SOFTWARE

CLEAN ENERGY PROJECT ANALYSIS COURSE

This document provides a transcription of the oral presentation (Voice & Slides) for this training module and it can be used as speaker's notes. The training material is available free-of-charge at the RETScreen® International Clean Energy Decision Support Centre Website: www.retscreen.net.

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Cette publication est aussi disponible en Français.

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UNEP

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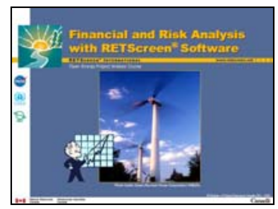
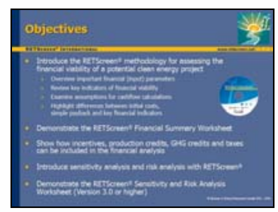
SLIDE 1: Financial and Risk Analysis with RETScreen® Software



Slide 1

This presentation discusses the use of RETScreen to assess the financial viability of a potential clean energy project. Then it shows how RETScreen can estimate the risk that the financial viability of the project will fall outside a certain range of values.

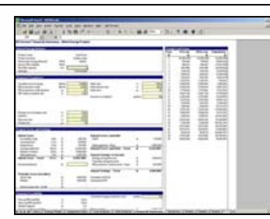
SLIDE 2: Objectives



Slide 2

This presentation has five objectives: first, to introduce the RETScreen methodology for assessing the financial viability of a potential clean energy project; second, to demonstrate the RETScreen Financial Summary Worksheet; third, to show how incentives, production credits, GHG credits and taxes can be included in the financial analysis; fourth, to introduce sensitivity analysis and risk analysis with RETScreen; and, fifth, to demonstrate the RETScreen Sensitivity and Risk Analysis Worksheet.

SLIDE 3: Financial Summary Worksheet



Slide 3

Here is an example screen shot from the RETScreen financial summary worksheet. This is for a hypothetical wind energy project. The top section summarizes the key results of the energy model sheet. The user enters parameters for the financial analysis in the second section. Year by year cash flows are tabulated on the right hand side. The costs and savings are summarized in the third section, and the fourth section, at the bottom, provides a range of measures of the financial viability of the project.

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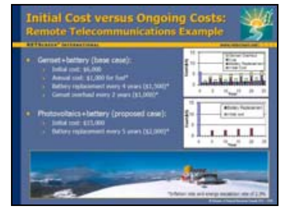
SLIDE 4: Financial Summary Worksheet

Slide 4

The RETScreen financial summary worksheet is accompanied by a cumulative cash flow graph, which is very useful for interpreting cash flows over the life of the project.

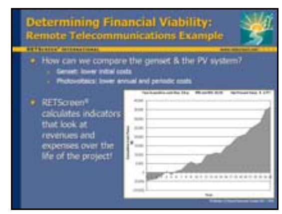
SLIDE 5: Initial Costs versus Ongoing Costs: Remote Telecommunications Example



Slide 5

To illustrate the difference between initial cost and ongoing costs, consider the following example, to be revisited later in this presentation. Electricity is needed for a remote telecommunications system. The base case is a diesel-fired electricity generator that charges batteries which in turn supply the load. While it is initially relatively inexpensive, it has many ongoing costs related to fuel, battery replacement, and genset overhaul. Our proposed case is a photovoltaic system with batteries. It initially costs 150% more than the base case system, but fuel and genset overhaul costs are eliminated.

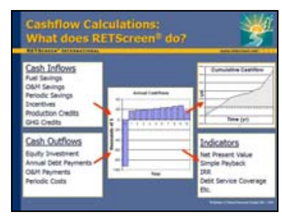
SLIDE 6: Determining Financial Viability: Remote Telecommunications Example



Slide 6

How do we compare the financial attractiveness of these two systems? The genset system has lower initial costs, but the PV system has lower ongoing costs. To address this difficulty, RETScreen calculates the values of several key financial indicators based on the costs and benefits over the whole life of the project.

SLIDE 7: Cashflow Calculations: What does RETScreen® do?

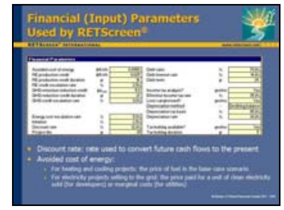


Slide 7

RETScreen calculates the cashflow in every year of a project. It finds the difference between cash inflows - such as fuel savings, operation and maintenance (O&M) savings, and incentives - and cash outflows - such as equity investment, annual debt payments, and O&M payments. For instance, the bar chart at the center of this slide shows the cashflows for a hypothetical ten year clean energy project, compared to some conventional technology. At the time of construction, or year 0, equity investment dominates any incentives that may be received, and a strong negative cashflow is recorded. In the following nine years of operation, however, fuel savings, credits, and other inflows together exceed outflows such as annual debt payments, so cashflows are positive. In the final year of the project, the cashflow declines slightly, due to end-of-project decommissioning costs.

This sequence of annual cashflows can be viewed visually, in the cashflow graph, or summarized in financial indicators such as the Net Present Value (NPV), Internal Rate of Return (IRR), and Simple Payback.

SLIDE 8: **Financial (Input) Parameters Used by RETScreen®**



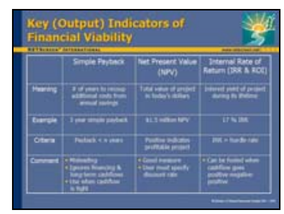
Slide 8

RETScreen permits the user to investigate the influence of a host of financial input parameters, relating to the cost of conventional energy, the value of production credits, the value of greenhouse gas emission reduction credits, inflation, debt financing, and taxation.

One significant financial input parameter is the discount rate, which is the rate used to convert future cash flows to the their value in the present. Because clean energy projects often involve paying for an initial investment out of future savings or benefits, the discount rate plays a key role in the viability of many projects.

Another significant financial input parameter is the avoided cost of energy. In the context of RETScreen, it is the per unit price or value of the conventional energy stream that the clean energy project supplants. For example, in heating or cooling projects, it is the price of conventional heating or cooling energy—that is, the cost of fuel in the base-case scenario. In electricity projects selling to the grid, it is the price paid to a developer for a unit of electricity generation from the clean energy project, or, to a utility, the marginal costs of generation.

SLIDE 9: **Key (Output) Indicators of Financial Viability**



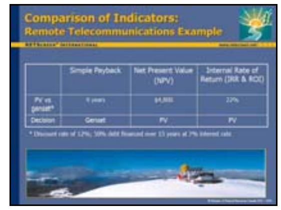
Slide 9

RETScreen calculates a number of key indicators of financial viability. Three of the best known are the Simple Payback, the Net Present Value (NPV), and the Internal Rate of Return (IRR). The simple payback is the number of years required for the initial cost of the project to be paid for out of annual savings. While it is often used, the simple payback is misleading and ignores financing and long-term cash flows, such that project benefits beyond the payback period are accorded no value. Very profitable projects may be missed if only the simple payback period is considered. A quick payback may be essential, however, when cash flow is tight.

The NPV is the golden measure of discounted cash flow mechanics. It is the sum of all costs and benefits, adjusted according to when they occur in the project. If the NPV is positive, then the project is financially attractive at the discount rate specified by the user. If it is negative, then money would be more profitably invested elsewhere. Unfortunately, picking an appropriate value for the discount rate can be tricky.

The IRR, also known as the return on investment (ROI), does not require the user to assume a discount rate; it is the true interest yield of the project over its lifetime. The IRR for a project can be compared to the return associated with investing the same amount of money in competing investments with a similar level of risk. An investor will typically have a “hurdle rate,” or target IRR that they require an investment to exceed. The IRR generally yields the same results as the NPV, although it can give confusing values in certain cases, such as when cashflows are always positive.

SLIDE 10: Comparison of Indicators: Remote Telecommunications Example



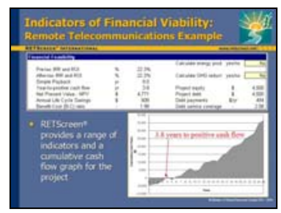
Slide 10

The Remote Telecommunications project example introduced earlier in this presentation demonstrates how the simple payback period can be misleading and cause worthwhile investment opportunities to be missed. The table on this slide shows the calculated simple payback, net present value, and internal rate of return for this project. The simple payback period is 9 years; since most organizations that use this measure seek a 3 to 5 year simple payback, the base-case genset option would be chosen over the PV system if only the simple payback were considered.

The NPV and IRR give a different, and more accurate, picture of the profitability of the PV system. The NPV of using the photovoltaic system in place of the genset is positive $4,800 at the discount rate of 12%, indicating that this is a very attractive project. This is echoed by the IRR, which at 22% compares very favourably with most investment opportunities.

The difference between the simple payback on the one hand and the NPV and the IRR on the other arises in two ways. First, the simple payback ignores all the fuel savings that occur following the payback period. Second, it also ignores that while the proponent has only had to put forward 50% of the project's initial costs—the remainder being debt financed—all benefits in excess of the debt payments accrue to the proponent.

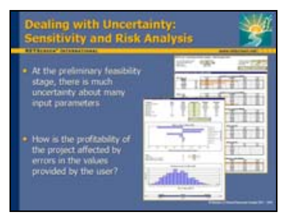
SLIDE 11: Indicators of Financial Viability: Remote Telecommunications Example



Slide 11

RETScreen provides a range of indicators and a cumulative cash flow graph for the project. Here RETScreen shows various measures of the profitability of using a photovoltaic system in the place of diesel generator for the remote telecommunications example.

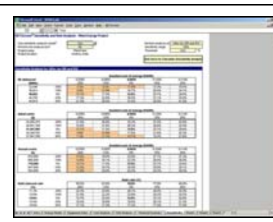
SLIDE 12: Dealing with Uncertainty: Sensitivity and Risk Analysis



Slide 12

At the preliminary feasibility stage, there is much uncertainty about many input parameters. Sensitivity Analysis and Risk Analysis provide tools for determining how the profitability of the project is affected by errors in the values provided by the user.

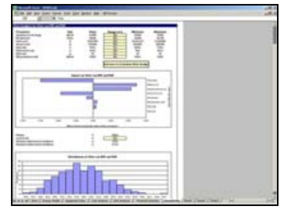
SLIDE 13: Sensitivity Analysis Worksheet



Slide 13

The screenshot shows the RETScreen Sensitivity Analysis tool. At the top right corner the user has selected that the sensitivity of the after-tax IRR to changes in various parameters be calculated. Tables of results are given for simultaneous variations in pairs of key variables such as the initial costs, the avoided cost of energy, and the debt interest rate.

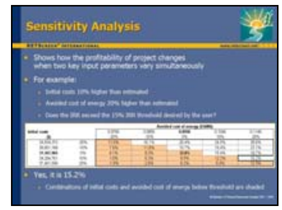
SLIDE 14: **Risk Analysis Worksheet**



Slide 14

This screenshot shows the RETScreen Risk Analysis tool. At the top, the user has indicated the percentage error that may be present for the estimated values of a list of key parameters. For example, a ±20% range of values is associated with the initial costs estimate. Below this are results showing how the uncertainty in these key parameters may affect the financial viability of the project, as estimated in this case by the after-tax IRR.

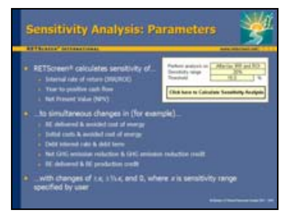
SLIDE 15: **Sensitivity Analysis**



Slide 15

The sensitivity analysis reveals how the financial viability of a project is affected by simultaneous variation in pairs of key parameters. For example, the table shows how increasing or decreasing the initial costs and the avoided cost of energy by up to 20% affects the project IRR. The user specifies that the IRR should be 15% or higher; shaded cells do not satisfy this criterion. Thus, a user who is concerned that the estimates of initial costs and avoided cost of energy are respectively 10% and 20% too low can verify that this combination of errors still results in a project meeting the 15% IRR threshold.

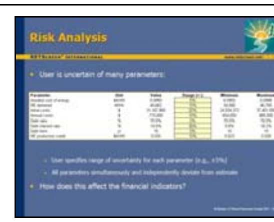
SLIDE 16: **Sensitivity Analysis: Parameters**



Slide 16

RETScreen calculates the sensitivity of the internal rate of return, year-to-positive cash flow, or Net Present Value (NPV) to simultaneous changes in, for example, the RE delivered & avoided cost of energy, the initial costs & avoided cost of energy, the debt interest rate & debt term, the net GHG emission reduction & GHG emission reduction credit, and the RE delivered & RE production credit. The changes are in increments of ±x and ±½x, where x is sensitivity range specified by the user.

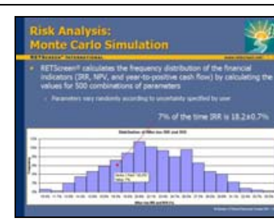
SLIDE 17: **Risk Analysis**



Slide 17

At the prefeasibility stage, the user is uncertain of many input parameters. The user often has a sense for how much the input parameters may deviate from the given levels. In the risk analysis, the user specifies, for each parameter in a list of key inputs, the range of variation that is likely. If all these inputs vary simultaneously and independently within the given range, how are the financial indicators affected?

SLIDE 18: **Risk Analysis:**
Monte Carlo Simulation



Slide 18

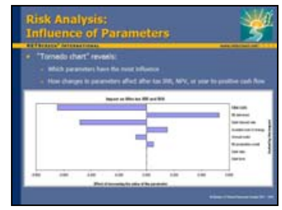
To answer this question, RETScreen performs a Monte Carlo simulation: it reruns its analysis 500 times, letting each key input simultaneously vary within the limits specified by the user. From these 500 runs, it calculates the probability that a financial parameter of interest, for example, the IRR, falls within a range of values. For the example on this slide, the IRR falls in the range of 18.2%+/-0.7% in about 7% of these 500 trials. By dividing the range of outcomes for the IRR into 20 sub-ranges of equal width, RETScreen determines an approximation of the frequency distribution of the IRR, as seen here.

SLIDE 19: **Risk Analysis: Level of Risk**

Slide 19

The user can then specify a desired level of risk, and RETScreen will indicate the range of outcomes for the specified financial indicator that are likely to occur within this level of risk. That is, the value of risk specified indicates the chance that the financial indicator will fall outside the specified range. In this example, there is a 10% risk that the IRR will fall outside the range of 14.6% to 29.8%.

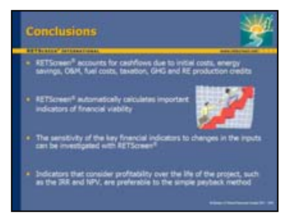
SLIDE 20: **Risk Analysis: Influence of Parameters**



Slide 20

RETScreen also displays a “Tornado Chart”, identifying which parameters have the most influence on the variability of a selected financial parameter, such as the after-tax IRR, NPV, or year-to-positive cash flow. As shown in the previous slides, the Monte Carlo analysis generates a probability distribution for the financial parameter of interest, based on the assumption that the input parameters to which the user has ascribed a range of possible values vary according to a normal distribution within that range. The impact graph shows how much of the variation in the financial parameter can be explained by variation in each input parameter in the risk analysis. This is expressed in relative terms: the impact graph indicates the effect of a one standard deviation increase in the input parameter. In the example shown here, the initial cost is the most critical parameter; an increase of one standard deviation in the initial cost leads to a decrease in the IRR of nearly 0.7 standard deviations.

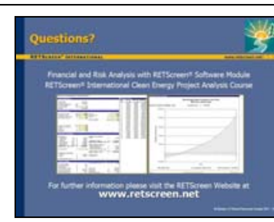
SLIDE 21: **Conclusions**



Slide 21

The RETScreen financial analysis accounts for all the key factors affecting the financial viability of a project, including initial costs, energy savings, operation and maintenance (O&M), fuel costs, taxation, greenhouse gas (GHG) and renewable energy (RE) production credits. It automatically calculates important indicators of financial viability, permitting users to evaluate projects based on their own criteria. Then RETScreen can investigate the sensitivity of the key financial indicators to changes in the inputs. During this analysis, the user should keep in mind that indicators that consider profitability over the life of the project, such as the IRR and the NPV, are preferable to the simple payback.

SLIDE 22: **Questions?**



Slide 22

This concludes the presentation of Financial and Risk Analysis with RETScreen Software. This introductory course continues in a further module. Please proceed to the presentation “Summary of Introductory Module”.