Title
PROFORM 4.0 USER MANUAL

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ProForm 4.0 User Manual

Photo: Courtesy of NREL

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Disclaimer

Table of Contents

Brief Introductory Description

ProForm is a spreadsheet tool designed to facilitate the pre-feasibility assessment of the environmental and financial aspects of renewable energy and energy efficiency projects. ProForm can assess renewable energy projects that generate electricity and/or produce non-electric energy, as well as fuel switching projects, methane gas capture projects, cogeneration projects, and energy efficiency projects that save electricity and/or fuels. These projects may involve a single installation of technology (such as a power plant) or they may include many units of equipment over one year or several.

Environmental Assessment – ProForm calculates the emissions of carbon dioxide (CO_2) and several other local air pollutants created by the combustion of fossil fuels that would be avoided through implementation of the assessed project.

Financial Assessment – ProForm calculates the Net Present Value (NPV), the Internal Rate of Return (IRR), the Debt Service Coverage Ratio (DSCR), the Annual Cash Flow, and the Simple Payback Period of a project from the perspective of the investor(s), both before and after taxes.

Funding

The initial seed money for the development of ProForm was provided by the United States Department of Energy. Funds for continued development, technical support, capacity building, and training workshops have been provided by the United States Agency for International Development.

Files

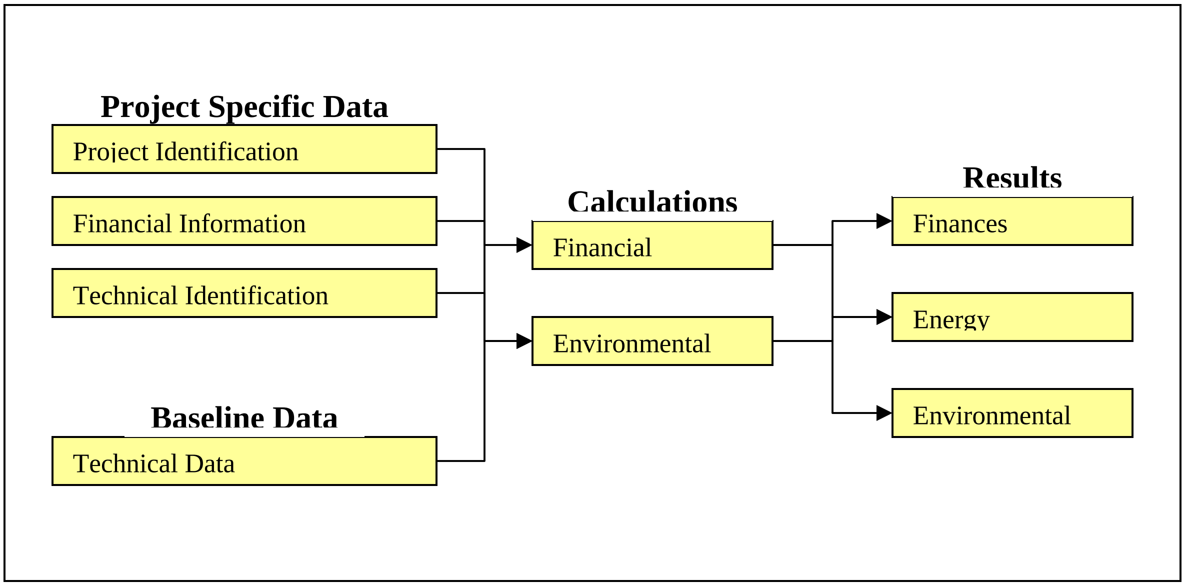
Included on the ProForm CD or in the ProForm zip file (available at http://poet.lbl.gov/Proform) are the following files: Introduction to ProForm, Warranty Disclaimer, ProForm Excel Workbook, ProForm Case Studies and the ProForm User Manual.

ProForm Technical Specifics

ProForm is an Excel template that makes use of Visual Basic macros to lead the user through the data input required to analyze projects. ProForm was developed using Microsoft Excel 1997 for Windows. It will function with any version of Excel released in 1997 or later. However, the macros may not fully function in foreign language versions of Excel.

ProForm Structure

ProForm requires that the user input information regarding the specific details of the project as well as the baseline scenario in the absence of the project. Using this information, ProForm performs financial and environmental calculations and presents the results in terms of finances, energy production and savings, and environmental emissions.



The workbook consists of 32 worksheets containing forms for inputting data on the project baseline, project finances, project technical engineering specifications, and calculations for each year of the project life. Additionally, the workbook contains an appendix that contains values for unit conversion, typical carbon intensities, and fuel energy contents.

The worksheets have been named to facilitate the user's comprehension. All of the worksheets that are to be used for the input of project data have names ending in the letter "I." For example, these include "IdI: Inputs – Project Identification" and "BaseI: Inputs – Baseline Energy Profile." Additionally, there are input sheets for each project type—renewable electric, renewable non-electric, energy efficiency, cogeneration, fuel switching, and landfill methane capture—as well as worksheets for entering the data required for single investor (basic) and multiple investor (advanced) financial analysis.

Associated with each of these worksheets is a calculation sheet, the name of which contains the same beginning letters as the input data sheet, but instead ends in "_Calcs." For example "Base_Calcs" is the worksheet that contains calculations regarding the baseline. Two additional calculations sheets, "FinAnal" and "AdvFinAnal" perform more financial analysis calculations. Furthermore, for each project type, there is a greenhouse gas emissions sheet, "GHG***." Finally, there are two results pages, "Results Basic" and "Results Advanced."

The cells on the worksheets have been color coded to facilitate use. Yellow cells are to be used for the input of project data. Gray cells have been designated for the workbook to perform pre-programmed calculations.   Purple cells contain analysis results. Although at times all of these cells may be visible to the user, some of them may be "write-protected" depending on the mode of use. ProForm users should only enter data in yellow cells unless functioning in Expert User Mode.

Macros

ProForm uses macros to carry out many of the calculations and graphing functions and to make the program more user-friendly. During the process of opening a file, some versions of Excel automatically disable macros when the macro security level is set at high. In order to use ProForm, the macro security level must be set to medium or low. To do so, before opening ProForm, select from the Excel Task Bar Menu:

- for Excel 1997: Tools → Options → General tab and uncheck Macro Virus Protection, or
- for Excel 2000 and later versions: Tools → Macro → Security and click on medium or low.

If medium security is chosen, every time ProForm is opened, a dialog box will appear asking the user if macros should be enabled or disabled. The user should choose the option to enable macros.

Getting Started

When the "Begin" button is clicked, a dialog box appears on the screen asking the user to choose a file name and location under which to save the document. This feature ensures that each time ProForm is used a blank template is maintained and protected from unintended modification. The workbook is thus saved under a different, user specified name. This enables users to more easily identify their different ProForm projects. ProForm will not allow the user to save over an existing file.

After saving the file with a new name, another dialog box will appear on the screen asking the user to select the type of project being analyzed. Following the user's selection, menus will appear asking the user for more information about the project. These options are described in detail below. The information from these initial dialog boxes allows ProForm to automatically select and locate the worksheets where data must be entered. Non-relevant worksheets and non-relevant rows on worksheets will then be hidden from the user. It is possible to view all of the worksheets and rows at once by choosing, from the top menu bar, Tools → Macros → Macro → unprotect_unhide_all. Users are cautioned against analyzing projects with all worksheets showing, as inadvertently entering numbers for other project types may alter the calculation results.

Project Types

Renewable Electricity Generation

Renewable electricity generation projects are ones that generate electricity to be sold off-site. Projects that generate electricity to be used on-site should be treated as energy efficiency projects, as it is assumed that in the absence of the project the same quantity of electricity would have had to be purchased from the grid.

Zero Emissions versus Other Renewable Projects

Not all renewable electric projects are emissions-free projects. Carbon emission reductions offsets may be obtained for projects that lower the carbon intensity below the business-as-usual scenario. ProForm allows the user to analyze renewable electricity projects that reduce emissions from the business-as-usual scenario even if they are not zero emission projects. Such projects might include hydroelectric projects that create methane emissions during the first few years as submerged biomass decomposes, or projects that use unsustainably harvested biomass. When the user selects the option for Renewable Electricity Generation, a menu will appear asking whether or not the project is zero emissions.

Biomass

Following the zero emissions dialog box, a menu will appear asking if the project uses biomass. For renewable electricity generation and renewable non-electric energy generation projects, biomass can be used as a project fuel. If biomass is used, only one biomass technology can be analyzed per project and the biomass technology must be entered as “technology 1."

For renewable electricity generation projects, ProForm allows for the analysis of projects that use either sustainably harvested biomass, or biomass that is not sustainably harvested. Sustainably harvested biomass is harvested and combusted for project fuel at the same rate as it is being replaced by planting or natural re-growth. This results in net carbon emissions of zero. Projects that use sustainably harvested biomass should be entered as zero emissions projects. Non-sustainably harvested biomass projects result in net carbon emissions and will require the input of the emissions factors associated with the project.

Renewable Non-electric

Renewable non-electric projects are projects that produce energy that is not used for electricity generation. Examples of renewable non-electric projects include solar water heating or the combustion of biomass for production steam. The energy from renewable non-electric projects may displace either electric or fuel baseline technologies.

Efficiency

Efficiency projects reduce the amount of electricity and/or the amount of fuel consumed. Projects that generate electricity to be used on site should be treated as energy efficiency projects, as it is assumed that the amount of electricity generated displaces electricity which otherwise would have been purchased. Furthermore, on-site electricity use, similar to conservation by efficiency measures, reduces transmission and distribution losses, thus decreasing emissions.

Cogeneration

ProForm is currently designed to analyze only single-cycle gas turbine cogeneration projects. The steam that is being displaced by a cogeneration project could be steam that was previously generated on site or steam that was purchased from an off-site supplier.

Fuel Switching

Fuel switching projects are projects that substitute the use of a less emissions-intensive fuel for a more emissions-intensive fuel. One example would be replacing coal with natural gas in a power plant. Fuel switching projects can either generate electricity or produce and utilize heat.

Landfill

Landfill projects are projects that dispose and/or make use of methane generated by solid waste decomposition. These include both capped landfills that currently generate and capture methane, and open-air dumps which, if covered, will produce methane. The captured methane is used either to generate electricity or to provide process heat. If Landfill Methane Capture is selected as the project type, a dialog box will appear asking if the energy produced will be used to generate electricity and thus displace an electric baseline, or if it will be used to generate heat and thus displace a fuel baseline.

Financial Analysis Types

After selecting the project type and associated baseline information, a dialog box will appear asking the user to select the type of financial analysis to perform. ProForm can conduct either a Basic or an Advanced Financial Analysis. A Basic Financial Analysis calculates returns to the project sponsor(s) collectively. All revenues, including those received from the sale of carbon offsets, are treated as flowing into one pool.

An Advanced Financial Analysis calculates specific returns to two different sponsors, Sponsor 1 and Sponsor 2, under alternative financial structures. In other words, both sponsors invest equity and/or borrowed funds in the project and receive a portion of the project benefits. If, after conducting a Basic Financial Analysis, the user wishes to conduct an Advanced Financial Analysis, he or she can do so by clicking on the "Advanced Financial Analysis" button on the Results Basic worksheet. The user must then enter data on the AdvFinI worksheet. Results for the advanced analysis will be located on the Results Advanced page.

Basic Vs. Expert User Mode

The last dialog box that will appear while getting started asks the user to choose the mode in which to operate ProForm. ProForm can be operated in Basic or Expert User Mode. Basic User Mode only permits the user access to yellow data input cells, whereas Expert User Mode allows access to most cells and formulas. Thus in Expert User Mode, the user can adapt any of the calculation sheets to the specifics of a project. For example, ProForm assumes much of the data entered for year 0, such as capacity factors or fuel Sulfur Oxides (SOx) intensity factors, remain constant over the entire project lifetime. ProForm fills in these values automatically on the calculation sheets. Should the user expect these values to vary over time, in the Expert User Mode data may be entered manually on the calculation sheets, allowing for a more detailed analysis. (See Example 2: Expert User Renewable Electricity Generation for further clarification.)

Data Entry

After the initial dialog box choices are made, a macro selects the appropriate sheets and shows on the screen the page for entry of project identification information. ProForm then guides the user through the data entry worksheets via a “Continue” button, which is located at the bottom of each page. After the user has entered data on all of the sheets, ProForm automatically saves the workbook when the final continue button is pressed. This feature has been included to help prevent the inadvertent loss of data. A user may also move back and forth between worksheets by using the worksheet tabs located at the bottom of the page. However, it is recommended that the user enter data in the order that the continue buttons direct, as the questions asked on later sheets may be affected by the user's choices on earlier sheets.

Required Data

In order to successfully analyze the emission reductions and financial return of a project, a certain amount of technical and financial information is required. An asterisk (*) is located to the right of cells for the entry of data essential to the analysis. If the user attempts to move to the next sheet via the "Continue" button without entering all of the data requirements, a warning message will appear advising the user to check for missing information. *Be sure to enter the value zero instead of leaving a required cell blank if the value for that input is zero*.

ProForm allows for the entry of more detailed information than the minimum data required for a simple analysis. This additional information will help to make the analysis more precise and should be entered wherever possible.

The measurement unit for each input is listed to the left of the yellow cell. For accuracy it is essential to enter data in the noted units. Unit conversion factors for mass, volume, and energy have been included in the Appendix. Weight measurements in ProForm are in metric tons.

Year of Project Technology Installation

ProForm assumes initial project investments are made in year 0 and the project will begin operation in year 1. For renewable electric, renewable non-electric, efficiency, and fuel switching projects, ProForm allows for the installation of technologies in multiple years. If technologies are installed over a multi-year period, data should be entered under the appropriate year (beginning in year 0). All installations must occur within the first five years. ProForm keeps track of each cohort (the technologies installed in a given year). ProForm analyzes projects that have a maximum operating life of twenty-five years. Thus if a technology is installed in year 4, the operating life of that technology can be at most 21 years (i.e., 25 years less 4).

Worksheet Specifics

IdI: INPUTS – PROJECT IDENTIFICATION

This page allows for the input of general identification information about the project, such as the project name and location. ProForm allows for the simultaneous analysis of projects that include multiple technologies when analyzing Renewable Electric and Efficiency projects. To add another technology to the analysis, click the button that reads "Add 2nd Technology." If the project is a renewable electric project and contains a technology that uses biomass or has non-zero emissions, that technology should be entered as technology 1.

RENEI: INPUTS – RENEWABLE ELECTRIC

ProForm allows for the analysis of renewable electricity generation projects that include up to two electricity generation technologies at a time. To add a second technology, click the "Add 2nd Technology" button on the IdI page. These technologies may be two similar technologies of different capacities or two completely different generating technologies. Units of each technology type can be installed over a five-year time period. For each year in which units are installed, the capacity per unit must be entered in the corresponding cell.

A capacity factor is required for each type of technology. The capacity factor is applied to all units of the same technology. For example, if three wind turbines were installed in year 0 and five in year 2 with a capacity factor of 50%, then every wind turbine, both the initial three and the following five, function at a capacity of 50%. Additionally, the technology service life applies to each unit of the same technology. If the operating life of the abovementioned wind turbines is 5 years, then the first three windmills discontinue operation after year 5, whereas the second set of windmills discontinues operation two years later, in year 7, as they were installed two years later. If greater flexibility is desired with respect to these assumptions, the user should select Expert User Mode and alter the calculations on the RenE_Calcs page.

If the project uses biomass for fuel, the conversion efficiency of the biomass to electricity must be entered on the RenEI page. Furthermore, if the project produces any emissions, emissions intensity factors for the project (in units of tons CO_2 per Megawatt-hour (CO_2/Mwh)) should be entered on the RenEI page.

RENNI: INPUTS – RENEWABLE NON-ELECTRIC

Only one renewable non-electric technology may be analyzed at a time in ProForm. However, similar to renewable electric projects, units of this technology can be installed over a five-year time period. ProForm considers each unit to be identical with respect to the energy output per unit and the unit operating life. If the project uses biomass for fuel, the conversion efficiency of the biomass to useful energy must be entered on the RenNI page.

EFFI: INPUTS – ENERGY EFFICIENCY

ProForm can analyze up to three different energy efficiency technologies at a time. For example, a project might include the installation of compact fluorescent lights, water heater insulation, and a more efficient mill. These technologies can conserve electricity, fuel, or both concurrently. If a given technology reduces both fuel and electricity consumption, it should be divided into two parts and analyzed as two separate technologies: one that conserves electricity and one that conserves fuel. Units of each of the three technologies can be installed over a five-year time period.

Also on the EffI page are cells to input information regarding the energy consumption per unit of technology, either in terms of MWh electricity or in terms of 1000 Gigajoules (GJ000) of fuel. Depending on the fuel type chosen in the selection box for each technology, the cells with the appropriate input units will be visible. Care should be taken to ensure that energy consumption values are correctly entered in accordance with the technology type assigned.

COGENI: INPUTS – COGENERATION

ProForm enables users to analyze a gas turbine (single cycle) cogeneration project. The cogeneration analysis lets users account for both electricity and heat (steam) production as environmental and economic benefits. In this type of cogeneration project, fuel (usually natural gas) is burned in a gas turbine to produce electricity and the resulting hot air is either used directly or used as a boiler input. The boiler may then use supplemental fuel to provide further heat or produce steam. Supplemental fuel is not always required.

A cogeneration project can displace purchased electricity or electricity sold to the grid. Waste heat from the turbine offsets fuel that would have been used for process heat. The user must input the turbine capacity and capacity factor as well as the yearly steam production. The user must also input the efficiency of energy conversion to electricity and process steam so that ProForm can calculate primary and supplementary fuel use.

In calculating fuel requirements for cogeneration projects, ProForm first calculates the fuel necessary to generate the electricity specified by the capacity and capacity factors on the CoGenI page. The waste heat from electricity generation is then used to heat steam. Supplementary fuel inputs are included if the waste heat from electricity generation is insufficient to meet the steam demands.

FUEL SWITCHI: INPUTS – FUEL SWITCHING

Fuel switching projects involve substituting a less carbon-intensive fuel in the place of a more carbon-intensive fuel. Although some fuel switching projects might involve the adaptation of existing technologies so that the cleaner fuel can be used, others may require the installation of completely new technologies. The technologies might use the fuel for production of heat, mechanical work, or electricity generation. To allow for all of these possibilities, the user must enter the number of units upgraded and the annual energy consumption of each unit. Fuel energy conversion factors are required for both the new project technology/fuel as well as for the baseline fuel. Emissions reductions are calculated based on the amount of baseline and project fuels required to produce equal amounts of useful energy.

LANDFILLI: INPUTS – LANDFILL GAS CAPTURE

Emissions reductions from landfill methane capture projects include both reductions in methane emissions from solid waste decomposition due to the capture of landfill gases, as well as reductions due to the displacement of electricity or heat generation by the use of landfill gas for energy generation.

The user must input information regarding the total biogas production, the portion of the biogas that is captured and used for energy recovery, and the methane content of the biogas. Any biogas that is captured and not used for energy recovery is assumed to be flared.

In ProForm, biogas production remains constant throughout the operating life of the project. If the amount of biogas produced by the landfill, or the proportion of this gas that is methane changes over time, these values should be changed in Expert User Mode on the Landfill_Calcs page.

ProForm calculates the amount of electricity or heat energy that is displaced based on the amount of energy available and captured from the biogas produced in the landfill and the efficiency of energy conversion from biogas to useful heat or electricity. Electricity produced by a landfill project may be used on site or sold to the grid.

BASEI: INPUTS – BASELINE ENERGY PROFILE

ProForm estimates emissions reductions based on the amount of energy that would have been generated or consumed in the absence of the project. In other words, the same amount of energy generated by a project would have been generated by the baseline if the project had not been implemented. Additionally, the energy conserved by an energy efficiency project would have been consumed were it not for the implementation of the project. Displaced energy is calculated based on the installed capacity of the project technologies and the associated capacity factors for each technology unit. Because it is assumed that all energy produced or saved by a project displaces equivalent amounts of energy from the baseline situation, an accurate estimate of how much of which baseline technology is being displaced is essential to an accurate estimate of reduced emissions.

Fuel Heat Values for Conversion Efficiencies

To calculate the amount of fuel displaced, the efficiency of combustion and, in the case of electricity generation, the efficiency in conversion to electricity is essential. The Gross Calorific Value (Higher Heating Value) of a fuel measures the amount of heat produced when that fuel is combusted. However, part of the combustion heat is used to evaporate any water content of the fuel; thus this heat is not available for end use. The Net Calorific Value (Lower Heating Value) represents the amount of heat available for end use after evaporation. In very general terms, the difference between Higher and Lower Heating Value is 3 to 7 percent for coal, 7 to 9 percent for liquid fuels, and 10 percent for natural and other gases. In ProForm, users should use the Lower Heating Value for fuel heat content when calculating fuel conversion efficiencies.

Baseline for Projects that Generate or Conserve Electricity

The baseline for electricity generation must be defined for renewable electric projects, renewable non-electric projects that displace electricity, efficiency projects that conserve electricity, cogeneration projects, and landfill projects that generate electricity.

Often a project will displace electricity from a regional grid. Depending on the complexity of the electricity system, this grid may include more than one source of electricity, i.e., more than one electricity generating plant. For example, a grid might include a coal-fired power plant, two natural gas power plants, and a hydro plant. The emissions reductions by a project depend on the portion of electricity displaced from each of these plants. Determination of this value can be quite complicated, as it depends on the dispatch of these plants.

ProForm allows a project to displace up to eight different generating technologies. If the project displaces more than one technology, the user will need to estimate the portion of each of these technologies that will be displaced. To enter multiple generating baseline technologies, simply enter the information for the first technology and click the "Add 2nd Technology" button on the BaseI page. Then enter the information for the second technology. The examples below are provided to aid in understanding how to determine the proportion of each baseline technology that might be displaced by a project. The examples assume an electricity generating system with the following characteristics that remain roughly constant over the lifetime of the project:

The system uses coal-fired power plants to serve low load (midnight to 6:00), natural gas-fired combined cycle power plants to meet intermediate load (6:00 to 18:00, and 22:00 to midnight), and diesel-fired gas turbines to meet the peak load in the evening (18:00 to 22:00).

Example 1: A renewable electricity-generating project: The output of a wind power plant is roughly constant over an average 24-hour period. Thus the plant will displace the coal-fired power plants for six hours (25%), the natural gas-fired combined cycle power plants for 14 hours (58%) and the diesel-fired gas turbines for four hours (17%).

Example 2: An electricity end-use efficiency project: This project will improve lighting efficiency at a large office building; specifically, it will reduce electricity demand primarily during daytime and early evening hours. It is assumed that the project will reduce electricity demand evenly from 8:00 to 20:00. Since peak load begins at roughly 18:00, on an average basis the project will displace diesel-fired gas turbines for two of the 12 hours of building operation (18:00 to 20:00), and natural gas-fired combined cycle power plants for the other 10 hours (8:00 to 18:00). Thus the electricity generation displaced would be allocated 17% to diesel-fired gas turbines and 83% to natural gas-fired combined cycle power plants.

Example 3: An electricity end-use efficiency project: This project will promote compact fluorescent lights (CFLs) in homes that will reduce electricity demand primarily during evening hours. The average CFL will operate daily from 19:00 to 23:00. Since most of this period corresponds with the system's peak load, it is assumed that each CFL will displace diesel-fired gas turbines for three of the four hours of its operation and natural gas-fired combined cycle power plants for the remaining hour. Thus, the electricity generation displaced would be allocated 75% to diesel-fired gas turbines and 25% to natural gas-fired combined cycle power plants.

User-Defined Baseline

Instead of allocating percentages of generation displaced to the various technologies that exist, a user-defined baseline or benchmark value can be used. User-defined baselines are generally carbon intensity factors that have been calculated based on actual plant data for the regional grid network in which the project is being implemented. Such baselines, frequently referred to as multi-project baselines, might be obtained from a regional energy agency that has already performed those complex calculations. If a user-defined baseline is used, the efficiency in energy conversion should be entered as 100%.

For a project in which a non-electric energy source replaces an electric baseline, it is necessary to enter a "Baseline Technology Energy Conversion Efficiency Factor." This factor represents the efficiency with which the electric baseline technology converts electricity to its desired form. For example, for a project in which a solar water heater is replacing an electric water heater, the electric water heater may be converting electricity to heat at only 90% efficiency. It is necessary to quantify the efficiency of electricity conversion to heat in the electric water heater in order to adequately compare service levels provided by the two energy sources.

For projects that displace electric baselines either by efficiency measures or by generation and consumption on site, transmission and distribution (T&D) losses must be accounted for. T&D losses should be input as a percentage.

Baseline for Projects that Generate or Conserve Non-Electric Energy

Enter information regarding baseline fuel type, the baseline fuel energy conversion efficiency, and the baseline fuel emission intensities.

Defining the Baseline for Efficiency Projects

Determining the baseline for an efficiency project can be a complex process. This is because the baseline is not necessarily the equipment that is currently in place, but may be the equipment that would have been in place in the absence of the project in order to provide an equivalent level of service as would be provided by the project. For example, if the existing equipment is nearly worn out, it does not represent a reasonable baseline for an efficiency project because, even in the absence of the project, the equipment would have been replaced. In this case, the baseline would be the least-cost option to replace the old equipment, at the *same service level* of the proposed project.

The service level question is another complicating factor in the calculation of the baseline. If a given manufacturing facility produces 100 units of output each day before an energy efficiency upgrade, and it is expanded to produce 150 units of output after the upgrade, the baseline again cannot be only the existing equipment. In this case, the baseline must be adjusted up to represent the equipment that would have been purchased in order to bring the service level up to 150 units per day (See Example 3: Basic User Energy Efficiency for more details).

Notice that, in either of these situations, the baseline scenario would involve additional capital investment. For this reason, ProForm requires the user to check a button indicating whether or not the existing equipment requires additional capital investment in order to provide the same service as the project. Whenever the button requiring additional investment is checked, an additional input row is exposed on the Financial Inputs (FinI) page allowing the user to input this value. As this expense would have to be incurred even without the project, it will be subtracted off the capital costs of the project in order to isolate the portion of the capital investment that is actually purchasing the efficiency gains. This expense is termed the “avoided investment.” For more information about the avoided investment, see the Avoided Investment section of the FinI page description below.

Inputting the Baseline for Efficiency Projects

When entering baseline data for efficiency projects, the user must first select what type of fuel is being displaced. Use the drop down box to select “electricity baseline” or “fuel baseline.” Then enter either the annual electricity consumption of the baseline scenario per unit or facility, or the annual fuel consumption per unit or facility. The user should use care to ensure consistency in inputs. If energy consumption is entered per unit, costs should be entered per unit on the financial sheet; if consumption is entered per facility, the financial costs should be entered as the sum for the facility. Additionally, it is important to be sure that the technologies in the baseline and the technologies installed in the project provide the same level of service. If they do not, the baseline inputs should be adjusted accordingly. To do this, when entering the “Number Of Baseline Units Avoided” make sure to enter the total number of baseline units that *would have been required to reach a service level equivalent to that of the project* (See Example 3: Basic User Energy Efficiency for more details).

Baseline for Cogeneration Projects

Cogeneration projects displace both the generation of electricity and the generation of process steam. The profile of electricity used in the baseline should be input in the same manner as for renewable electricity generation project baselines. Process steam for the baseline could either have been generated on site or purchased from an off-site provider. If steam is purchased off site, it is important to enter steam distribution system losses.

Baseline for Fuel Switching Projects

Enter information regarding the baseline fuel that was being used.

Baseline for Landfill Projects

Baselines for landfill projects can be open air, covered landfills with no methane capture mechanisms, and covered landfills with methane capture and flaring. For any of these scenarios, to calculate the emissions and the emissions reductions, the portion of biogas that is methane and the percentage of methane that is captured and flared need to be input. Total biogas production volume is input on the LandfillI page. Additionally, the baseline for heat or electricity displaced by the productive use of the captured methane is required.

FINI: INPUTS – BASIC FINANCIAL

ProForm analyzes projects from the sponsor's perspective. The costs input should thus be the costs faced by the sponsor. Similarly, the revenue input should be those revenues received by the sponsor, not those that might be received by a customer of the project.

ProForm allows the user to enter monetary data in local currency units (LCU) except for the carbon offset sales price, which must be in US$. The name of the currency should be input as the local currency unit, and the exchange rate relative to US$ should be entered. Data may also be input as US$ with the exchange rate equal to 1.

ProForm allows users to establish three different electricity price tiers for both electricity purchased and electricity sold. Each price tier may also increase at a set escalation rate over time. For example, a utility may be willing to buy 1000 kilowatt-hours (kWh) of project-generated electricity at one price and everything over 1000 kWh at another price, and each of these prices might be increasing by 2% annually. Or if an efficiency project reduces electricity consumption to a certain level, the end-user electricity price paid may change. The electricity offset by renewable non-electric, cogeneration, or landfill methane capture projects may also be subject to price tiers. Users must input the amount of electricity generated or purchased at each price tier on a percentage basis.

Fuel costs must also be entered. These include baseline fuel costs, biomass fuel costs, primary and supplementary fuel costs for cogeneration projects, and project fuel costs for fuel switching projects. Space is provided to enter the cost escalation rate for all fuel costs, allowing those costs to increase over time.

As many projects receive revenue from sources other than energy savings and sales and have expenses other than investment and operation costs, ProForm allows the user to input information about other annual revenue and expense streams including capacity payments. Costs that are incurred on a one-time basis at the time of installation, such as material transportation costs or engineering design costs, should be included in the project installation costs.

ProForm calculates the total investment costs for each year in which a technology is installed. Grants/subsidies and tax credits may be received for the implementation of the project. Grants or subsidies are assumed to lower the overall total capital costs before a loan is received, thus any grant or subsidy received by the sponsor is then subtracted from the installation costs before calculating the amount of equity and debt financing that is necessary. Grants or subsidies can only be entered in years in which capital investments are made.

ProForm assumes that debt is incurred corresponding to the schedule for technology installation. In other words, each year a technology is installed, the investment costs can be covered with both equity capital and debt capital. The equity fraction of investment costs can vary for each year in which new units are installed.

Additionally, for each year in which debt is incurred, the sponsor may take out either one loan or two separate loans. The user must specify how much of each year’s debt is covered by each loan. Each loan is subject to potentially different loan terms and interest rates.

ProForm calculates debt payments for loans that are repaid in uniform annual installments. For other loan repayment scenarios, interest and principal repayment scenarios need to be input in Expert User Mode on the financial analysis pages.

ProForm calculates the taxes on income from project revenues at a separate rate than income from the sale of carbon emissions reductions offsets. If, for a given year, the net income is negative, taxes will be calculated as a net rebate rather than an expense. This is because it is assumed the project is part of the sponsor's greater portfolio and, as such, losses will be written off against gains in other parts of the business. Tax credits may also be granted to the sponsor by the sponsoring country's government. Tax credits are accounted for in the year following the investment, as it is during that time period that the project begins to create a revenue stream. Tax credits are added into the net income and cash flow calculations.

ProForm calculates depreciation on a technology-specific basis. The investment costs of each technology are depreciated based on a user-selected depreciation period (which must be less than or equal to the equipment lifetime). Only the net capital investment required for each technology, after accounting for subsidies and displaced investments, is depreciated. Projects with multiple sponsors can depreciate technologies based on a sponsor's share of ownership at different rates, if desired. Depreciation is calculated on a straight-line basis. Under straight-line depreciation, the value of the technology/asset lost each year is constant. It is calculated by dividing net investment costs by the estimated useful life of the technology. If a different depreciation method is desired, the user may enter Expert User Mode and change the depreciation formulas on the FinAnal or AdvFinAnal pages.

To calculate the net present value (NPV) of the project, ProForm requires the input of a discount rate. The discount rate is the opportunity cost of capital—the return foregone by investing in the project rather than in another investment of comparable risk.

ProForm calculates the revenues from sales of carbon emission reduction offsets concurrently for up to three scenarios of different carbon offset sales prices. Scenarios for carbon offset sales price may have different initial values and/or assumed escalation rates. A user may choose not to analyze all of these possible scenarios simply by leaving the input cells blank. Carbon offset revenues are calculated based on reductions in CO_2 equivalents. Thus, if a project reduces methane emissions, those emissions are converted to CO_2 equivalents.

Space is provided to allow the user to note the share of carbon offsets that is retained by Host Country Government.

Monitoring and verification costs and fees are only applied to the cash flow stream for scenarios in which carbon offsets are being received. These costs are not incurred for situations in which the carbon offsets price is zero or for projects that do not create a net reduction in emissions.

Investment costs are input as cost per kW for renewable electric projects, as cost per unit for renewable non-electric, efficiency, and fuel switching projects, as total costs for landfill projects, and as cost per electricity generation technology and heat recovery technology for cogeneration projects. An expert user may instead input total capital costs on the "FinAnal" and "AdvFinAnal" worksheets simply by typing the cost in the appropriate cells (and thereby replacing the calculation formulas on those sheets.) The same is true for operation and maintenance (O&M) costs. For efficiency and fuel switching projects, it is assumed that there will be a net savings in project O&M costs relative to the baseline scenario. If, instead, there is an increase in O&M costs, these costs should be entered as a negative net savings.

Avoided Investment

For efficiency, cogeneration, and fuel switching projects, information on the investments avoided by the project may be input. These are the costs of investments that would have occurred in the absence of the project. Avoided investments only occur in the first five years during which new technology units can be installed. For efficiency projects, the avoided investment is calculated only when the user has checked the button on the BaseI page indicating that additional capital investment would be required to bring the existing equipment up to the service level of the project. In this case it is assumed that, in the absence of the project, an alternative investment in a presumably less-efficient technology would have been made in order to replace/expand the existing equipment. In this case, the baseline is not the existing equipment (either because its continued operation is not an option, or it does not represent a reasonable comparison to the project because it provides a different level of service). In such a case, the baseline is the less-efficient equipment that would have been installed in place of the project. The avoided investment effectively subtracts the cost of the baseline equipment from the cost of the project in order to isolate the portion of the investment that is going toward efficiency over-and-above what would have otherwise happened.

Below are three examples that should help clarify how to calculate the avoided investment in baseline technology.

<u>Example 1:</u> Investment in new infrastructure: The project being analyzed would build a new high-efficiency cement plant. The avoided investment would be the cost of a typical not-as-efficient cement plant of equivalent size that would be built if it were not for the proposed project.

<u>Example 2:</u> Replacement/upgrading of existing infrastructure: The project being analyzed would replace or upgrade an existing boiler that is still operational and could remain in operation for the foreseeable future. The same output is provided before and after the project. In this case, the baseline is the existing equipment, which requires no additional investment. The avoided investment is zero.

<u>Example 3:</u> Replacement of existing infrastructure: Identical to example 2, except that in the process of improving the energy efficiency of the existing equipment, the output or *service level* is expanded. In this case, the avoided investment is the investment that would have been required to expand the output of the existing equipment to provide the new, higher, output level in a presumably less expensive and less efficient way.

ADVFINI: INPUTS – ADVANCED FINANCIAL ANALYSIS

The Advanced Financial Analysis worksheets are quite similar to the Basic Financial Analysis worksheets. The difference is that the advanced financial analysis allows for more than one project sponsor. If this option is desired, the user needs to allocate project revenues and expenses between the two sponsors. Thus a percentage of investments, costs, cost savings, and carbon offset revenues must be allocated to each sponsor. Each sponsor may finance the project with both equity and debt capital. Furthermore, each sponsor may be subject to different financial conditions (loan terms, interest and inflation rates, taxes, depreciation, etc.)

GHG: CALCULATIONS – AVOIDED EMISSIONS

For each project type there is a greenhouse gas emissions calculation worksheet, visible only in Expert User Mode. These sheets are labeled “GHG***.” These sheets calculate the amount of emissions that would occur in the baseline scenario, the emissions produced by the project (if any), and the net emissions reductions by the project.

For the baseline emissions calculations, this involves calculation of the fuel consumption (both direct fuel consumption and fuel used for the generation of electricity) displaced by the project. Energy conversion efficiency factors are used in these calculations.

Methane emissions are converted to carbon dioxide equivalents to determine the value of carbon emissions reduction offsets. This conversion is calculated using a global warming potential for methane of 21, the value used by the United Nations Environmental Program.

FINANAL: CALCULATIONS – FINANCIAL ANALYSIS

The Financial Analysis worksheets contain the bulk of the financial calculations. The first section on the page summarizes the energy production and savings by the project. The energy results are used to calculate energy cost savings and energy sales revenues.

The next section calculates the investment costs of a project. For each technology and each year in which units are installed, the investment costs for that technology are calculated. Funds received in the form of grants or subsidies to the project are then deducted from these investment costs. Next, the investment avoided by the project technology is deducted from the initial investment costs (See *Avoided Investment* above). The remainder is the net investment cost for each technology. The total net investment necessary is determined by summing the net investment costs for each technology. Investment costs are calculated in US$000.

Using the equity fraction of the total capital investment, as entered by the user on the FinI sheet, ProForm then calculates the total equity capital and the total debt capital required by the project. The debt is then proportioned to the two loans, each with its own term and interest rate. For each year of the loan, for each year in which a technology is installed and for each of the two loans, the principal repayment is calculated. Loan principal repayments are calculated both with and without accounting for inflation. The annual principal repaid and interest due from each loan is calculated, assuming that loans will be repaid in uniform annual installments.

Next, ProForm calculates project revenues. Revenues include funds received for the sale of energy produced by the project, as well as energy savings for the reduction of energy consumption. Other sources of revenue, including capacity payments, may also be included. Revenues are initially calculated in LCU000 and then converted to US$000.

Funds received from the sale of carbon emission reductions are added to the revenue stream. Sales of carbon emissions offsets, for each of up to three carbon offset price scenarios, are calculated in US$000. These values are also discounted both prior to and after taxes, in order to calculate the net present value of carbon offset.

Lastly, if the project receives a tax credit, this is added to the project revenues. Tax credits can only be received during the five-year period over which new units can be installed.

Following the calculation of project revenues, ProForm calculates project expenses. Project expenses include fuel costs and operation and maintenance costs. These costs are calculated in LCU000 and then converted to US$000. Furthermore, if carbon emission reductions offsets are received, monitoring and verification costs are incurred. If the project requires payment of administration or adaptation fees, these fees are charged. Costs related to carbon emission reductions are calculated in US$000.

Other expenses include interest charged for loans and depreciation of project technologies. Loan interest and asset depreciation are calculated for each technology depending upon the year in which units of that technology are installed.

Once the above-listed calculations have been performed, ProForm can calculate the net income, the taxes, and the cash flow for the project. These are calculated for each carbon offset price scenario.

The net income is the sum of project revenues minus the sum of project expenses. For this calculation, inflation is accounted for in asset depreciation and loan interest payments. Income taxes are calculated based on each year’s net income. If the net income for a year is negative, a tax “rebate” is assigned to the project, calculated at the same rate of taxation. The cash flow for a given year is the sum of project revenues minus the sum of project expenses. Unlike the calculation for net income, the calculation for cash flow includes equity capital invested and debt payments. Cash flow calculations do not include asset depreciation. Nor do cash flow calculations account for inflation. Discounted cash flow calculations are used on the “Results” pages to calculate the net present value of the project for each carbon offset price scenario.

RESULTS

The results pages are divided into four sections: general project information, energy production and savings, financial information, and avoided emissions. The general project information section lists the project name, the project sponsor, the project location, the type of project and the type of baseline displaced by the project, the project technologies, and the project operating life.

The energy production and savings section gives the total amount of electricity generated for electricity producing projects, as well as the electricity or fuel conserved for all other project types.

For each of the five years during which new technologies may be installed, ProForm calculates the required capital per technology type and for the entire project, as well as the net annual required capital after accounting for grants and subsidies to the project.

For each of up to three carbon offset price scenarios, ProForm calculates the simple payback period, NPV, and internal rate of return (IRR) of the project. The simple payback period is the expected number of years required to recover the original investment.

The NPV is the sum of the future cash flows from the project discounted back to the present, minus the initial investment. A positive NPV indicates a viable investment. Additionally, for each carbon offset price, the NPV of the carbon offsets (pre and post taxation) is calculated.

The IRR is the discount rate that results in a net present value of zero. If ProForm is unable to calculate the IRR, “Negative Return” or “Cannot Calculate” will appear on the results page. “Negative Return” signifies that the cash outflows for the project exceed the cash inflows; or rather, the project loses money. The IRR cannot be calculated for projects that earn money on money, i.e., those projects for which the value of the avoided investment and subsidies is greater than the project investment.

For each year that the project is operating, ProForm calculates the net cash flow and the debt service coverage ratio (DSCR). The DSCR measures the ability of the project sponsor to make debt payments each year. It is the ratio of the cash flow available for a given year (revenues minus expenses) divided by the total amount of debt payments (interest and principal) that must be repaid that year. A DSCR greater than one indicates that, for that year, there may be sufficient inflow of cash to make debt payments, although most financial institutions require DSCRs of 1.3 or higher in order to lend to a project.

The fourth and final section of the results page is the avoided emissions section. This section presents the annual average, as well as the total emissions avoided by implementation of the project. The reductions are illustrated on a graph that shows both the annual and the cumulative reductions achieved by the project.

APPENDIX

The last page included in the workbook is the Appendix. This worksheet includes information on carbon coefficients (i.e., fuel carbon intensities) in units of Ton CO_2/GJ000; decimal prefixes; fuel net calorific values; energy, mass, and volume conversion factors; and a few other pertinent constants. These values have been included as reference material for the user and to aid the user in transforming inputs into the measurement units required by ProForm. The yellow colored cells contain global average or suggested values obtained from the Intergovernmental Panel on Climate Change (IPCC). If country-specific data are available, those values may be typed in place of the existing default values.

EXAMPLES

The remainder of this user manual contains example projects that have been analyzed in ProForm. These projects cover a range of project types that ProForm is capable of analyzing, and illustrate a variety of ProForm features. The goal of these examples is not only to instruct the user in how to analyze ProForm, but also to indicate the flexibility inherent in the structure of ProForm that allows for analysis of a large variety of project types and project financial structures. The first example project description is an analysis tutorial of a hydroelectric project. This example is the most detailed and should be read closely. The other projects serve to demonstrate the different operating modes and analysis types.

EXAMPLE PROJECTS

1) Renewable Hydroelectric Project – Basic User Mode, Basic Financial Analysis
2) Renewable Hydroelectric Project – Expert User Mode, Basic Financial Analysis
3) Cement Efficiency Project – Basic User Mode, Basic Financial Analysis
4) Cogeneration Project – Basic User Mode, Advanced Financial Analysis

EXAMPLE 1: Renewable Electric – Basic User Mode Example

Project Description:

Clean Energy Enterprises is a company that specializes in the promotion and development of small-scale renewable energy projects. Clean Energy Enterprises is considering the development of a run-of-the-river hydroelectric project in the small country of “ProFormland.” The project will provide 4.3 megawatts (MW) at maximum capacity.

The electricity currently provided to the national grid is generated by natural gas, coal, and hydropower. The proposed project will displace a portion of this existing generation. After careful analysis of power plant dispatch data, Clean Energy Enterprises has determined that 31% of the energy generated by this project will displace power from coal plants, 39% will displace power from natural gas plants, and the remaining 30% will displace power from other hydroelectric plants. The project will displace other hydroelectric generation due to its location relative to the geography and physics of the grid, and due to the large role hydropower already plays within ProFormland.

The expected service life of the installed equipment is twenty-five years. Accounting for seasonal fluctuations in water resources, required maintenance, and demand, it is expected that the project will produce 27,121 MWh annually.

The estimated average price that will be received for the sale of electricity generated is US$0.06/kWh during the four peak hours and US$0.048/kWh during the remainder of the day. Furthermore, the power purchase agreement signed includes an annual capacity payment of US$6/kW.

The total investment required to construct the facility is US$6.3million. Of this, the sponsor will contribute US$700,000 as equity and the remainder via a loan repaid over a ten-year period with 9% interest. Annual operating and maintenance costs are estimated to be US$0.02/kWh.

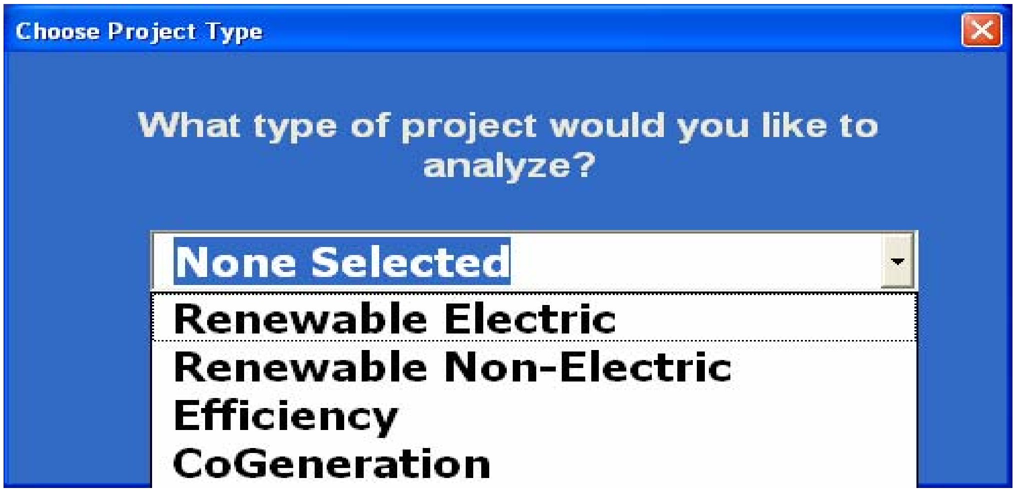
Clean Energy Enterprises pays 30% taxes on its annual income. However, as the government of ProFormland wishes to promote renewable energy services, funds received from the sale of carbon emissions reduction offsets will remain untaxed.

Other possible investments for Clean Energy Enterprises tend to have internal rates of return of approximately 12%. Thus the project finances will be analyzed with a 12% discount rate.

Clean Energy Enterprises estimates that it will receive between US$3 and US$5/ton CO_2 equivalents in the first year, escalating at 1% per year. Monitoring and verification costs will be approximately $7000 per year.

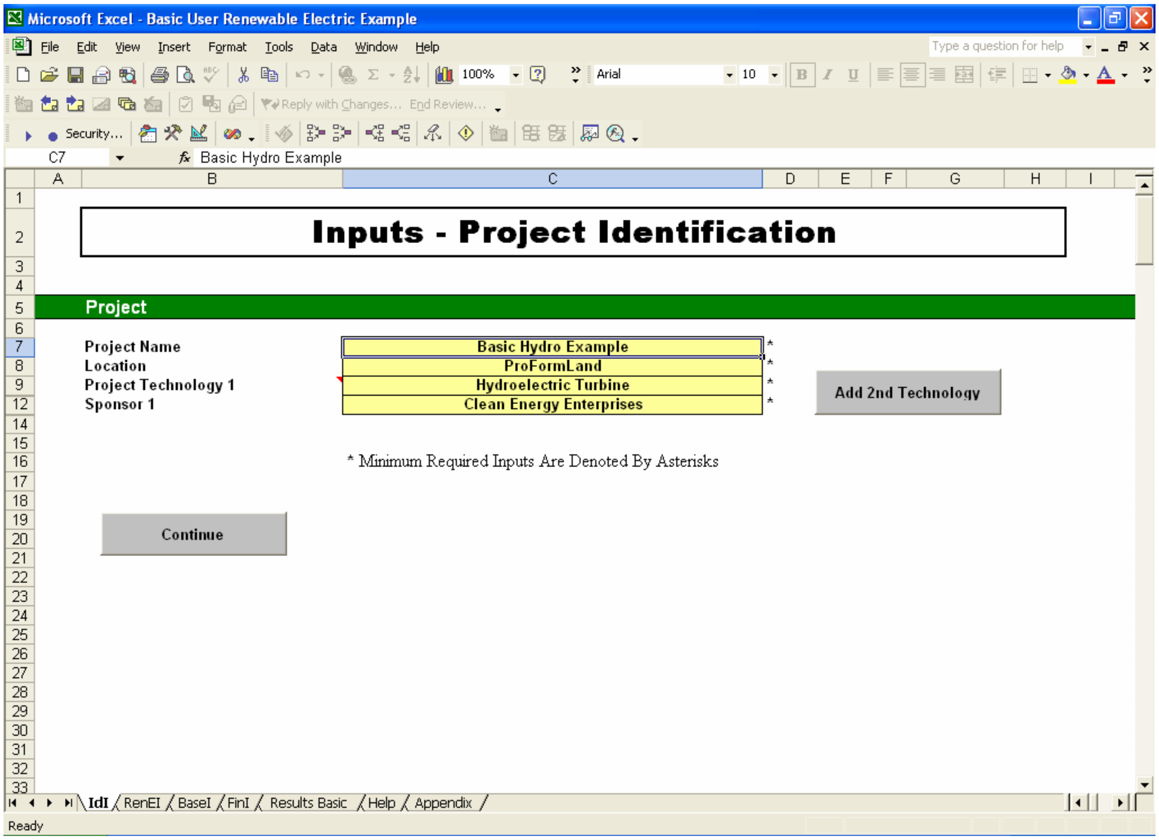
To Input and Analyze this Project:

After clicking the begin button on the splash page, a window will appear asking the user to choose a name and location in which to save the workbook. Save the project as “Basic User Renewable Electric Example.” Following this, a series of dialog boxes will appear on the screen. The first asks the type of project which is to be analyzed. As this project generates electricity to be sold to the grid, choose the option “Renewable Electric” and click the continue button. The project is a run-of-the-river hydroelectric project. Thus it will be assumed that any emissions created by the project will be negligible. Choose the option that, yes, the project is zero emissions. Next select no, the project does not use biomass fuel. For this project, there is only one sponsor who will finance the project via the sponsor’s own equity contribution and via a locally obtained loan. An advanced financial analysis is used when there is more than one project sponsor. Click the option for Basic Financial Analysis and then click the continue button. The ultimate dialog box that will appear concerns the user mode in which ProForm will be operated. This first example will be analyzed in Basic User Mode. Following this example, the same project will be analyzed in Expert User mode to demonstrate the capabilities and more complex analyses that ProForm is capable of performing. Choose the option for Basic User Mode and the continue button. Based on the answers to the questions in these dialog boxes, ProForm will then select the appropriate worksheets and rows necessary to analyze this type of project. The non-relevant worksheets will be hidden from view.



IdI: Inputs – Project Identification

After making choices from the initial dialog boxes, the “IdI” worksheet will appear on the screen. At the bottom of the screen are the worksheet tabs for BaseI, RenEI, FinI, and Results Basic. Clicking on those tabs will scroll through the various worksheets. However, clicking instead on the continue button at the bottom of the sheet will check for missing data before continuing and select the worksheets in the best order.



Inputs - Project Identification

Project

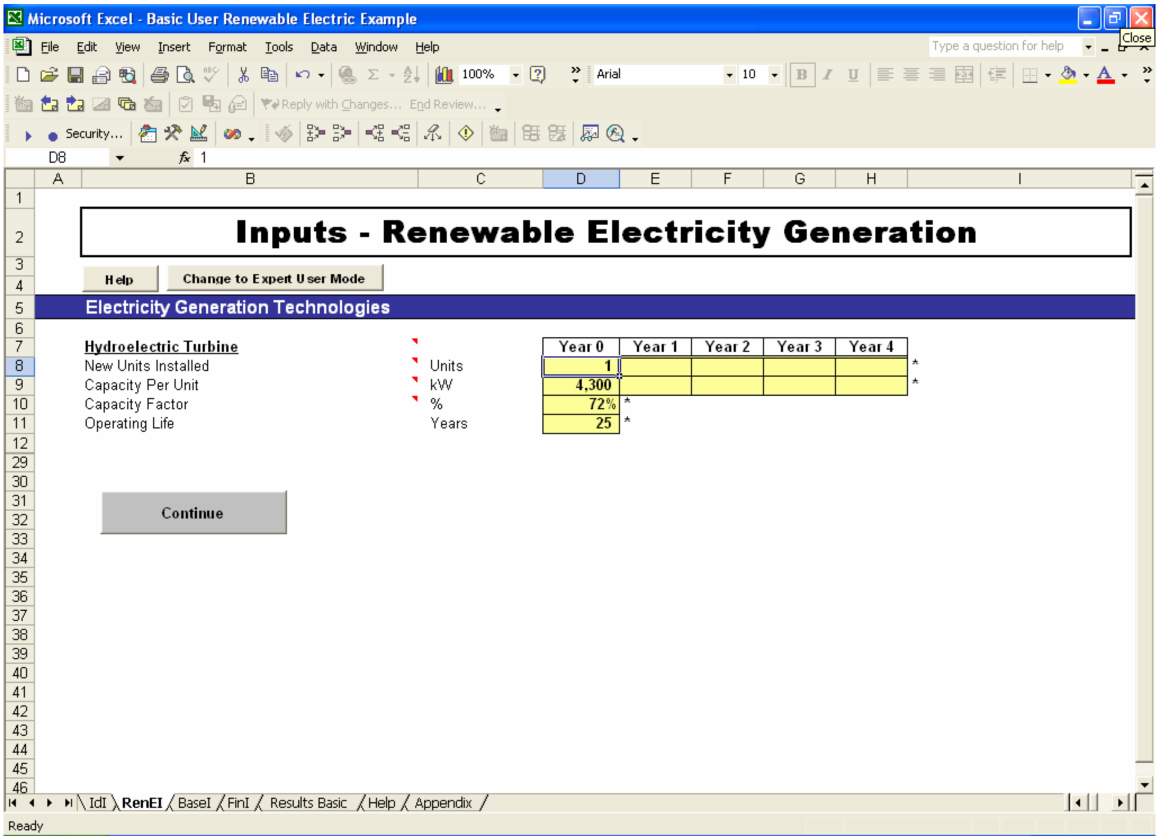
Project Name	Basic Hydro Example *
Location	ProFormLand *
Project Technology 1	Hydroelectric Turbine *
Sponsor 1	Clean Energy Enterprises *

* Minimum Required Inputs Are Denoted By Asterisks

The name for this example project is “Basic Hydro Example.” The project will be located in “ProFormland.” Project technology 1 is a hydro-turbine for electricity generation. The project sponsor is “Clean Energy Enterprises.” After entering this information in the cells on the IdI page, click the continue button. ProForm will check to ensure that all yellow input cells marked to the right with asterisks contain information. It will then select the RenEI page.

RenEI: Inputs – Renewable Electricity Generation

ProForm is capable of analyzing up to two different renewable electricity generating technologies per project. These technologies can be installed during a five-year time period. For each year in which a technology is installed, it is important to enter the capacity for the units of that technology installed in that year under the appropriate year heading. This project will install only one unit of one technology: a turbine installed in year 0, with a capacity of 4.3 MW. The cell to the left of the input for capacity indicates that the value for capacity should be entered in terms of kW rather than MW. Enter 4300 kW in the cell for year 0 hydroelectric turbine capacity. Note that this cell is sometimes titled ‘Technology 1,’ as the cell below it is titled ‘Technology 2.’ ProForm fills in technology names in row headers based on the names entered on the IdI worksheet.



Inputs - Renewable Electricity Generation

Electricity Generation Technologies

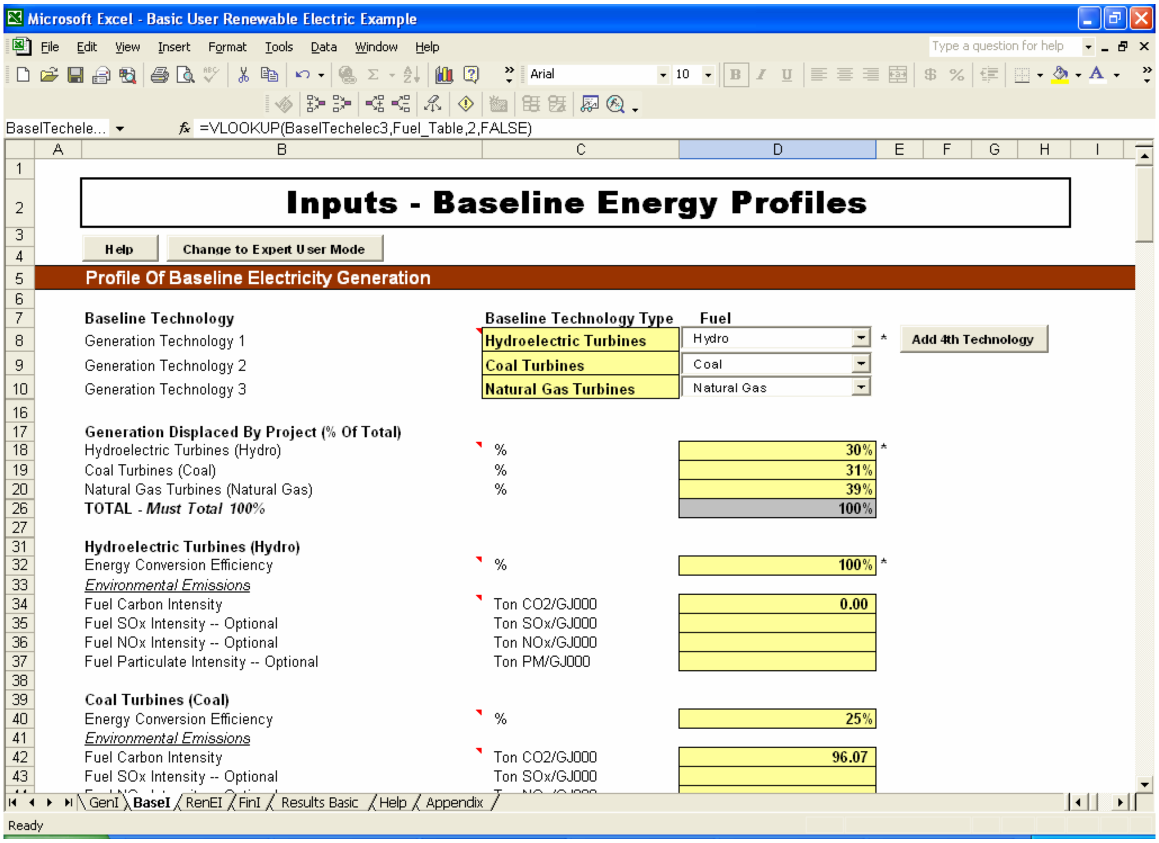
Hydroelectric Turbine		Year 0	Year 1	Year 2	Year 3	Year 4	
New Units Installed	Units	1					*
Capacity Per Unit	kW	4,300					*
Capacity Factor	%	72% *					
Operating Life	Years	25 *					

The next input cell asks for the capacity factor for each technology. ProForm assigns the same capacity factor to all installed units of the same technology. The capacity factor is the percent of the total possible output that is produced. The maximum total output for this turbine, if it were operating twenty-four hours a day, every day of the year, would be a total of 37,668 MWh annually (4.3 MW * 365 days/year * 24 hours/day). However, the actual expected output is 27,212 MWh. Thus the capacity factor is 72% (27,212 / 37,668). The turbine has an expected service life of 25 years.

After entering information on the RenEI page, click on the “Continue” button. ProForm will check to ensure that all yellow input cells marked to the right with asterisks contain information, and will select the next data entry sheet.

BaseI: Inputs – Baseline Energy Profile

The next sheet that will appear on the screen is “Inputs – Baseline Energy Profiles.” This sheet is used to input information regarding the existing energy infrastructure; or rather, business as usual in the absence of the project. The baseline energy profile is used as a comparison to the project energy profile both to calculate emissions reductions and to calculate revenues created by the sale of energy generated by or energy cost savings from the proposed project.



BaselTechele... =VLOOKUP(BaselTechelec3,Fuel_Table,2,FALSE)

Inputs - Baseline Energy Profiles

Profile Of Baseline Electricity Generation

Baseline Technology	Baseline Technology Type	Fuel
Generation Technology 1	Hydroelectric Turbines	Hydro
Generation Technology 2	Coal Turbines	Coal
Generation Technology 3	Natural Gas Turbines	Natural Gas

Generation Displaced By Project (% Of Total)		
Hydroelectric Turbines (Hydro)	%	30%
Coal Turbines (Coal)	%	31%
Natural Gas Turbines (Natural Gas)	%	39%
TOTAL - ***Must Total 100%***		100%
Hydroelectric Turbines (Hydro)		
Energy Conversion Efficiency	%	100%
Environmental Emissions		
Fuel Carbon Intensity	Ton CO2/GJ000	0.00
Fuel SOx Intensity -- Optional	Ton SOx/GJ000	
Fuel NOx Intensity -- Optional	Ton NOx/GJ000	
Fuel Particulate Intensity -- Optional	Ton PM/GJ000	
Coal Turbines (Coal)		
Energy Conversion Efficiency	%	25%
Environmental Emissions		
Fuel Carbon Intensity	Ton CO2/GJ000	96.07
Fuel SOx Intensity -- Optional	Ton SOx/GJ000	

This example project will generate electricity to sell to the grid, displacing electricity that would otherwise have been generated by other plants. Determination of which electricity generation technologies will be displaced by the project is a complex task and depends on many factors, including plant location, whether or not the plant provides base-load or load following capabilities, power purchase agreements that have been signed, generation costs, and more.

On the BaseI worksheet, the first header reads "Baseline Technology." To the right of this header is a yellow input cell and a pull-down menu. In the yellow cell, type in the name of one of the plants or technologies that currently exists and provides electricity to the grid. To the right of that name, in the associated pull-down menu, choose the type of fuel used by that technology or plant. Because three different baseline technologies are included in this example, coal combustion powered generators, natural gas powered turbines, and hydroelectric turbines, the user must next click the button labeled "Add 2nd Technology." A new row for "Generation Technology 2" will appear. Type the name of the second technology in the yellow box, and select the associated fuel. Repeat this process one more time to enter the third technology.

As noted in the project description, enter the percentage of the electricity generated by the project that will displace each generating technology: 31% for coal plants, 39% for natural gas plants, and 30% for hydroelectric plants. Other baseline scenarios, including user-defined baselines, may be also used in ProForm. See Example 3: Energy Efficiency for how to use user-defined baselines.

Below this section, for each baseline generation technology, is space to enter information with respect to the energy conversion efficiency and the emissions intensity of each existing technology. For hydroelectric generation, the energy conversion efficiency should always be entered as 100%. For this example, it is assumed that the energy conversion efficiency for the coal combustion technology is 25% and 30% for the natural gas plants.

The drop-down menu used to select the fuel used by each generating technology has already filled in the default fuel carbon intensity factors. These values, in units of tons CO_2/GJ000 are automatically referenced from the Appendix based on global averages for each fuel type. They can be changed by typing directly in the cells on the BaseI page, or by changing the values in the table located in the Appendix. Values for Sulfur Oxides (SOx), Nitrogen Oxides (NOx), and particulates emissions by the baseline technologies may also be entered if the user is interested in determining reductions in these air pollutants.

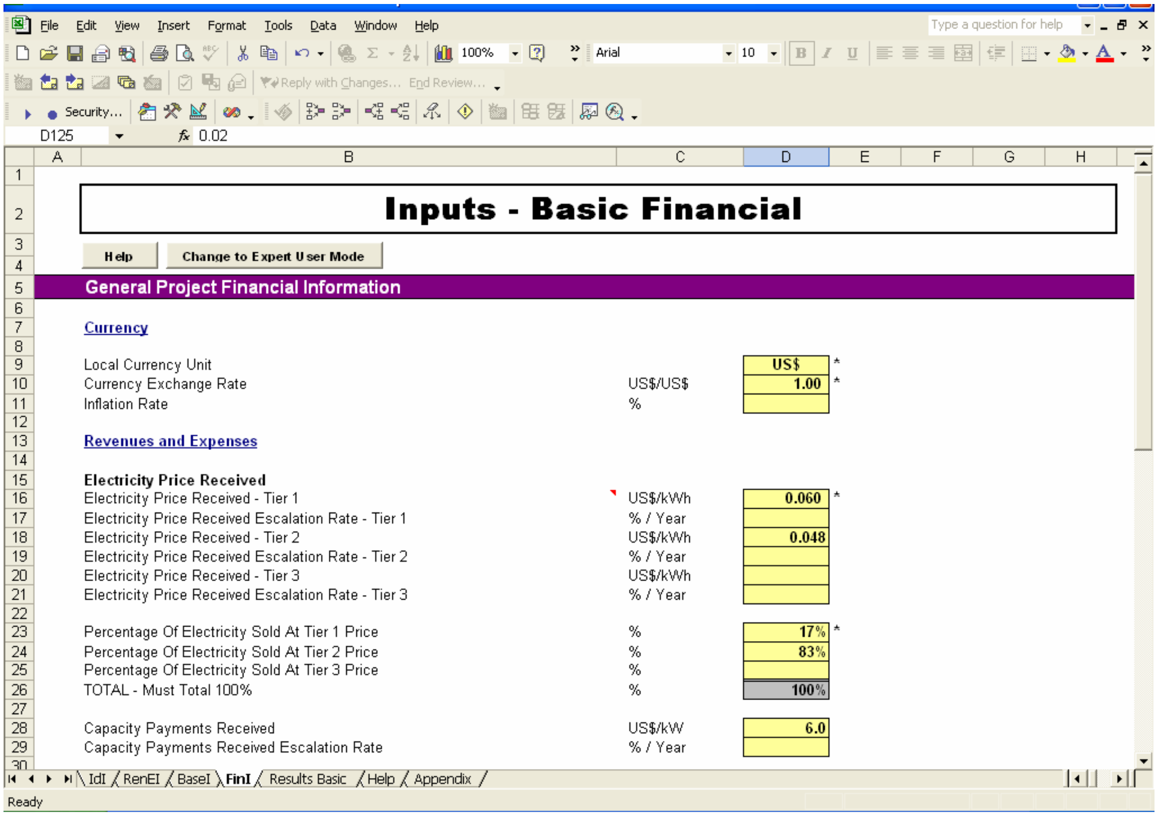
After entering information on the BaseI page, click on the “Continue” button. ProForm will check to ensure that all yellow input cells marked to the right with asterisks contain information, and will select the next data entry sheet.

FinI: Inputs – Basic Financial

ProForm performs a financial analysis using either US$ or local currency units. The majority of the financial terms may be entered in either unit. However, carbon offset prices and monitoring and evaluation costs must be input in US$. The name of the local currency and the exchange rate to dollars are the first two inputs on the FinI page. If no exchange rate is entered, ProForm cannot perform the analysis because ProForm converts all financial values and presents results in US$. If the project data are being input in terms of US dollars, the exchange rate should be input as 1. For this example project, the financial information available is in dollars. We will ignore inflation for the sake of this example – do not enter a value.

The next input cells in ProForm are for the price received for the sale of electricity. The estimated average price that will be received for the sale of electricity generated is US$0.06/kWh during the four peak hours and US$0.048/kWh during the remainder of the day. Thus for electricity price tier 1, the price received is $0.06. No increase in price is expected, so the escalation rate is entered as zero. This price will be received for all electricity sold during peak hours. For this project, electricity generation is relatively constant throughout the day, as this is a run-of-the-river plant. The percentage of electricity sold at peak rates will be 17% (4 out of 24 hours). The remaining 83% of the electricity will be sold at the tier 2 electricity price is $0.048/kWh, also with an escalation rate of zero.

Capacity payments will be received at a rate of $6/kW annually and are not scheduled to increase. No other sources of revenue or expenses were noted in the project description.



Inputs - Basic Financial

General Project Financial Information

Currency

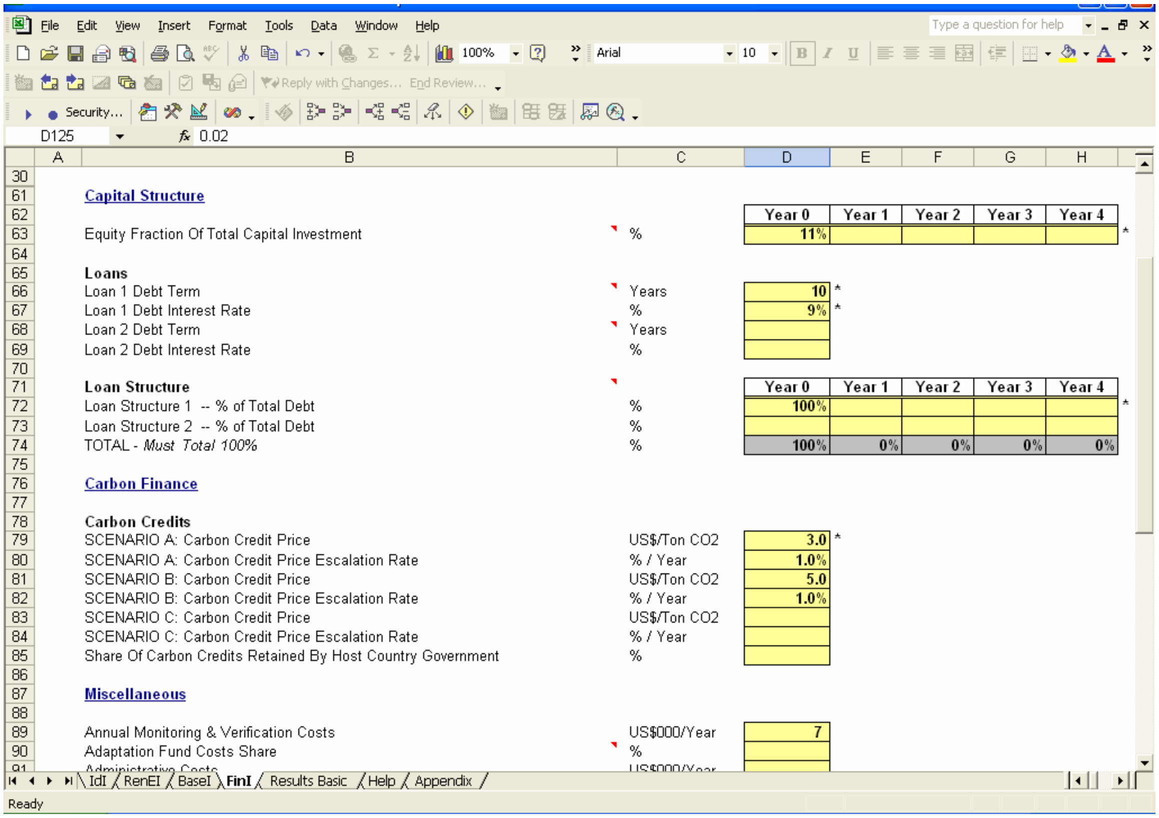
Local Currency Unit		US$	*
Currency Exchange Rate	US$/US$	1.00	*
Inflation Rate	%		

Revenues and Expenses

Electricity Price Received			
Electricity Price Received - Tier 1	US$/kWh	0.060	*
Electricity Price Received Escalation Rate - Tier 1	% / Year		
Electricity Price Received - Tier 2	US$/kWh	0.048	
Electricity Price Received Escalation Rate - Tier 2	% / Year		
Electricity Price Received - Tier 3	US$/kWh		
Electricity Price Received Escalation Rate - Tier 3	% / Year		
Percentage Of Electricity Sold At Tier 1 Price	%	17%	*
Percentage Of Electricity Sold At Tier 2 Price	%	83%	
Percentage Of Electricity Sold At Tier 3 Price	%		
TOTAL - Must Total 100%	%	100%	
Capacity Payments Received	US$/kW	6.0	
Capacity Payments Received Escalation Rate	% / Year		

The total investment required to construct the facility is estimated to be US$6.3 million. Of this, the Clean Energy Enterprises will contribute US$700,000 as equity. Thus eleven percent ($700,000/$6,300,000) is the equity fraction of the investment. Entering "=700,000/6,300,000" directly into the cell will yield more precise results than simply entering "11". Although the analysis will use the more precise value if entered, the cell will display "11%" either way. The remaining $5.6 million dollars required for the investment will be provided via a 10-year, 9% interest loan. Only one loan will be used to finance the project. Thus the cells for loan two should be left blank, and 100% input as the percentage of the debt covered by loan 1.

The project will be analyzed with two different carbon offset value scenarios. The first scenario is the low price scenario of $3/ ton CO_2 and the other is the high expected price scenario of $5/ton. These prices are expected to grow at 1% pear year. Monitoring and verification costs are $7000/year. Be aware that the units for monitoring and verification costs are US$000/year. Therefore the user should enter "7" as opposed to "7000."



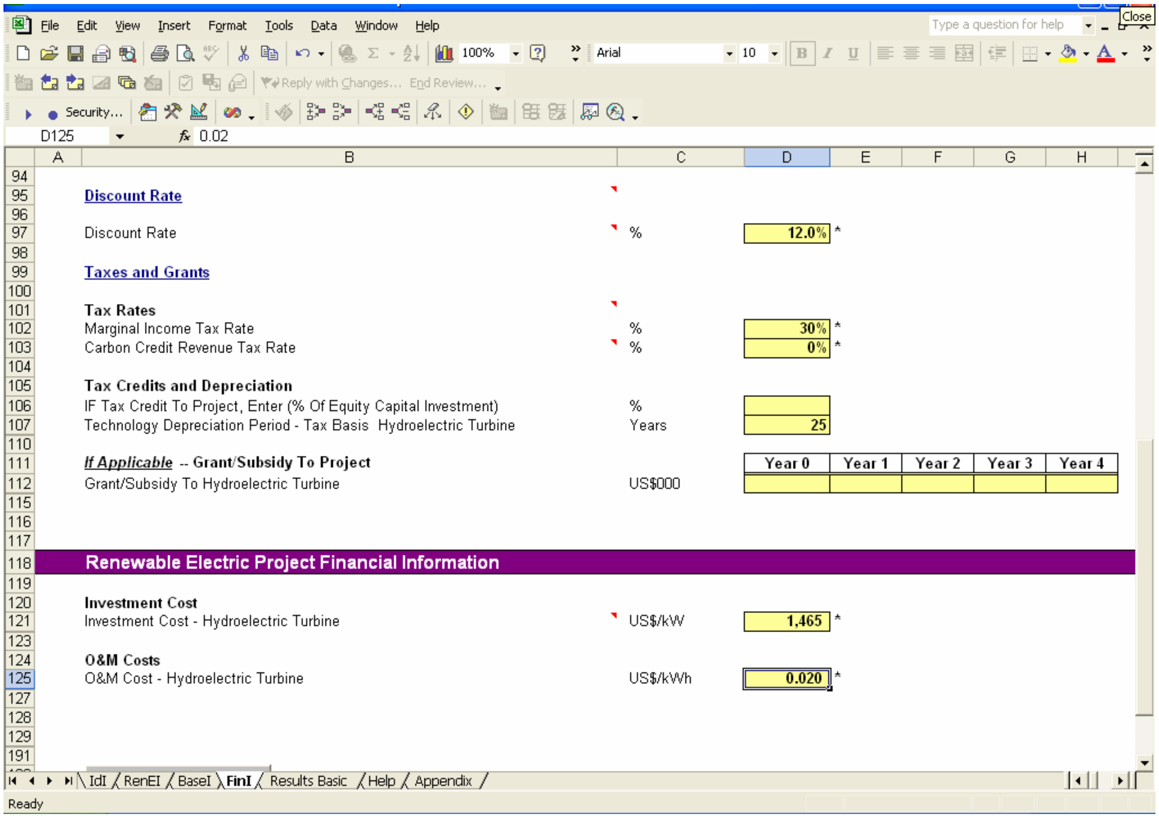
	A	B	C	D	E	F	G	H	
30									
61		**Capital Structure**							
62				**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	
63		Equity Fraction Of Total Capital Investment	%	**11%**					*
64									
65		**Loans**							
66		Loan 1 Debt Term	Years	**10**	*				
67		Loan 1 Debt Interest Rate	%	**9%**	*				
68		Loan 2 Debt Term	Years						
69		Loan 2 Debt Interest Rate	%						
70									
71		**Loan Structure**		**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	
72		Loan Structure 1 -- % of Total Debt	%	**100%**					*
73		Loan Structure 2 -- % of Total Debt	%						
74		TOTAL - *Must Total 100%*	%	**100%**	**0%**	**0%**	**0%**	**0%**	
75									
76		**Carbon Finance**							
77									
78		**Carbon Credits**							
79		SCENARIO A: Carbon Credit Price	US$/Ton CO2	**3.0**	*				
80		SCENARIO A: Carbon Credit Price Escalation Rate	% / Year	**1.0%**					
81		SCENARIO B: Carbon Credit Price	US$/Ton CO2	**5.0**					
82		SCENARIO B: Carbon Credit Price Escalation Rate	% / Year	**1.0%**					
83		SCENARIO C: Carbon Credit Price	US$/Ton CO2						
84		SCENARIO C: Carbon Credit Price Escalation Rate	% / Year						
85		Share Of Carbon Credits Retained By Host Country Government	%						
86									
87		**Miscellaneous**							
88									
89		Annual Monitoring & Verification Costs	US$000/Year	7					
90		Adaptation Fund Costs Share	%						

The project will be analyzed at a discount rate of 12%.

Clean Energy Enterprises is subject to a 30% tax on income. However, carbon offsets received for the project will not be taxed. Input zero in the cell for Carbon Credit Revenue Tax Rate (note that this cell is required, so you must enter zero and not simply leave it blank).

The expected service life of the turbine is 25 years. For this example, it is assumed that the technology is depreciated in equal amounts, using straight-line depreciation, over the entire 25 years during which the project is operational.

The investment costs include all one-time costs incurred at the start of the project. These should be entered as cost per kW installed capacity. For this project, investment costs are $1465/kW ($6.3 million / 4300 kW). The annual operating and maintenance costs are estimated to be US$0.02/kWh.



Discount Rate

Discount Rate	%	12.0%	*

Taxes and Grants

Tax Rates

Marginal Income Tax Rate	%	30%	*
Carbon Credit Revenue Tax Rate	%	0%	*

Tax Credits and Depreciation

IF Tax Credit To Project, Enter (% Of Equity Capital Investment)	%	
Technology Depreciation Period - Tax Basis Hydroelectric Turbine	Years	25

If Applicable -- Grant/Subsidy To Project		Year 0	Year 1	Year 2	Year 3	Year 4
Grant/Subsidy To Hydroelectric Turbine	US$000					

Renewable Electric Project Financial Information

Investment Cost

Investment Cost - Hydroelectric Turbine	US$/kW	1,465	*

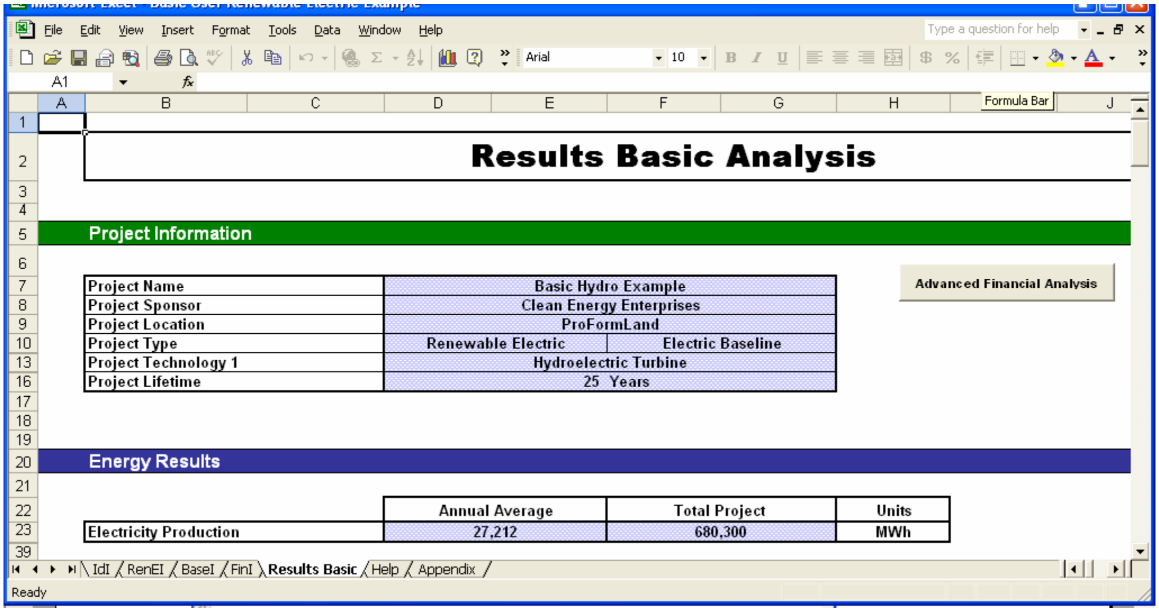
O&M Costs

O&M Cost - Hydroelectric Turbine	US$/kWh	0.020	*

After entering information on the FinI page, click on the continue button. ProForm will check to ensure that all yellow input cells marked to the right with asterisks contain information. It will then save the workbook to the computer and show the results of the analysis.

Results Basic

The results page summarizes the outcome of the ProForm analysis in terms of energy, finances, and emissions. The first section presents the project identification information. Immediately below is a table containing the results of the energy analysis. For renewable electric projects, ProForm calculates the total amount of electricity that will be generated by the project as well as the annual average. This project will generate a total of 680,300 MWh throughout its 25-year operating life.



Results Basic Analysis

Project Information

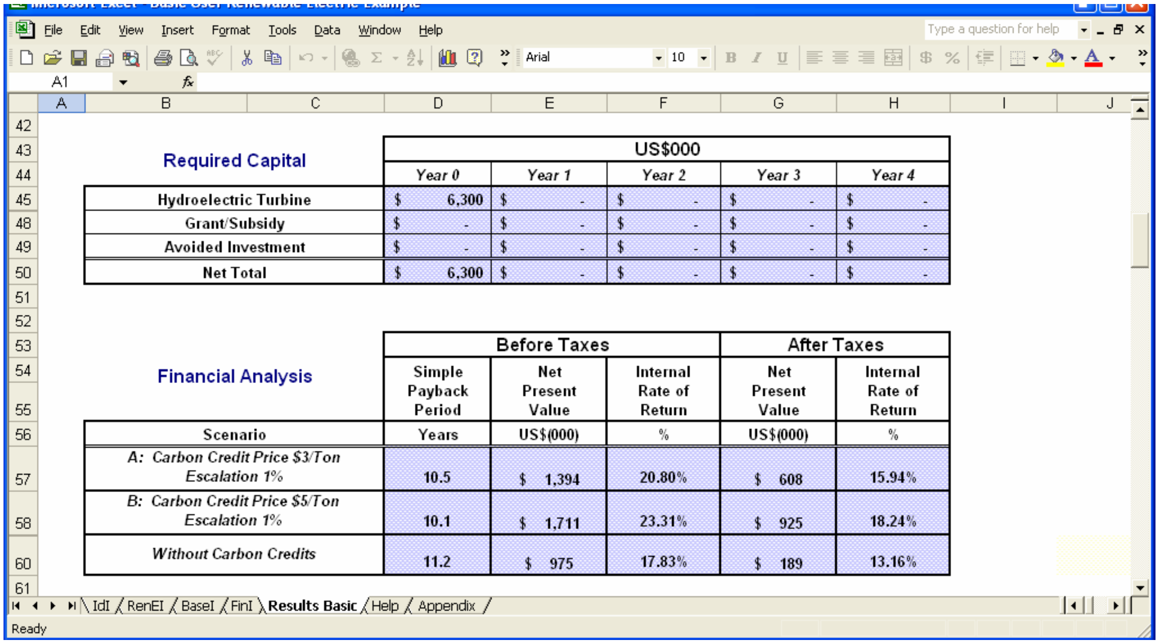
Project Name	Basic Hydro Example	
Project Sponsor	Clean Energy Enterprises	
Project Location	ProFormLand	
Project Type	Renewable Electric	Electric Baseline
Project Technology 1	Hydroelectric Turbine	
Project Lifetime	25 Years	

Energy Results

	Annual Average	Total Project	Units
Electricity Production	27,212	680,300	MWh

Below the energy analysis is a section on project finances. ProForm calculates the required capital needed for each year in which new technologies are installed. The total investment costs for this example project are $6.3 million. The simple payback period for this project, i.e., the amount of time needed to break even on the investment, not accounting for the time value of money, is 10.1 years if carbon offsets are sold at $5/ton CO_2 and 11.2 years without considering carbon offsets.

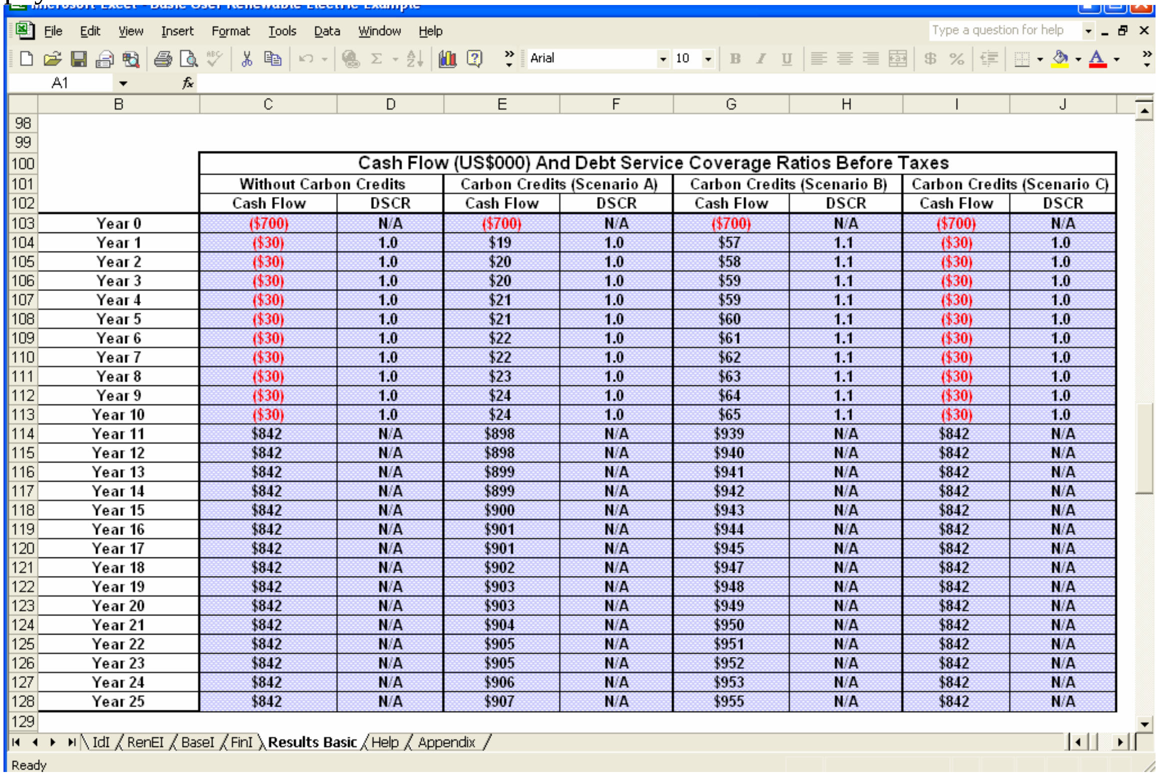
The net present value of the project, at a discount rate of 12%, ranges between $975,000 and $1,711,000 before taxes and $189,000 and $925,000 after taxes. These values represent the project value without sale of carbon emissions offsets and with an offset value price of $5/ton CO_2 respectively. Pretax internal rates of return also range between 17.8% and 23.3%. The added value of carbon offsets at a value of $5/ ton CO_2 (accounting for monitoring and verification costs) is $736,000.



Required Capital	US$000				
	Year 0	Year 1	Year 2	Year 3	Year 4
Hydroelectric Turbine	$ 6,300	$ -	$ -	$ -	$ -
Grant/Subsidy	$ -	$ -	$ -	$ -	$ -
Avoided Investment	$ -	$ -	$ -	$ -	$ -
Net Total	$ 6,300	$ -	$ -	$ -	$ -

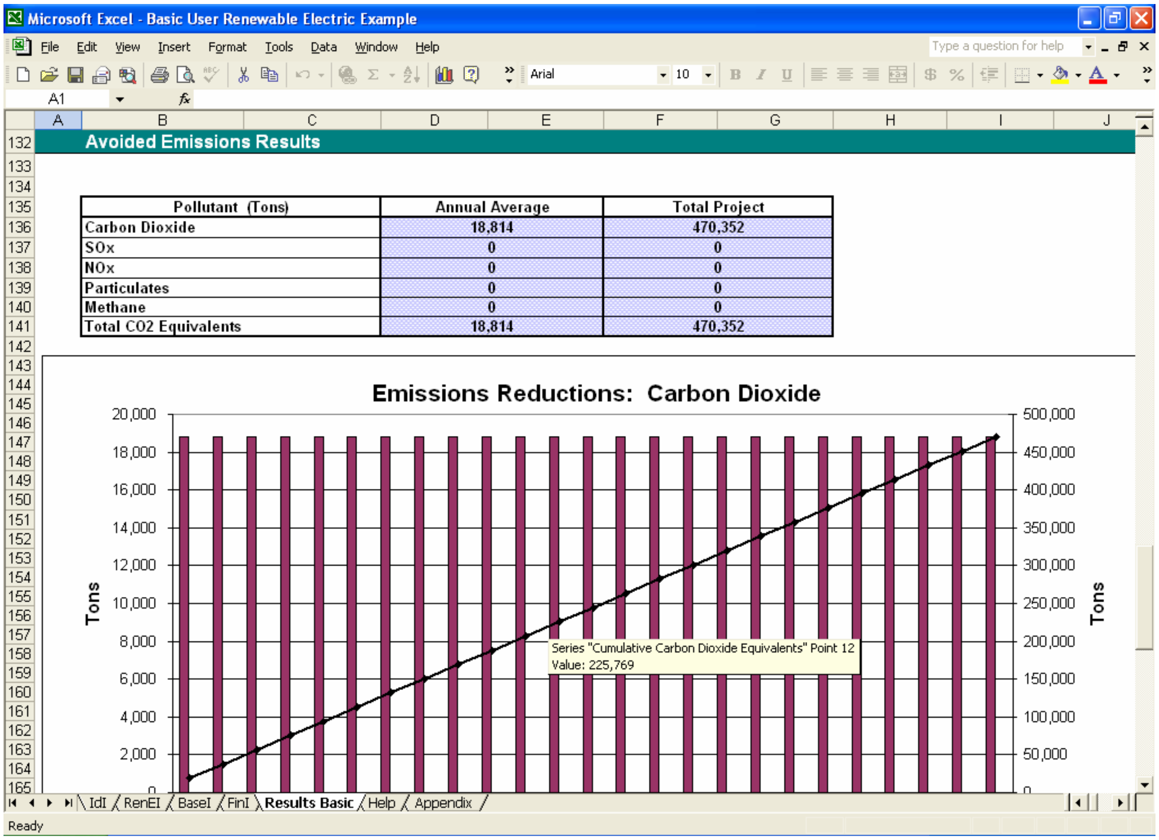
Financial Analysis	Before Taxes			After Taxes	
	Simple Payback Period	Net Present Value	Internal Rate of Return	Net Present Value	Internal Rate of Return
Scenario	Years	US$(000)	%	US$(000)	%
A: Carbon Credit Price $3/Ton Escalation 1%	10.5	$ 1,394	20.80%	$ 608	15.94%
B: Carbon Credit Price $5/Ton Escalation 1%	10.1	$ 1,711	23.31%	$ 925	18.24%
Without Carbon Credits	11.2	$ 975	17.83%	$ 189	13.16%

The cash flow is negative the first year in all scenarios. However, it is positive for all other years in the carbon offset scenarios, but negative for the term of the loan in the scenario without carbon offsets. The debt service coverage ratio is above 1 for both carbon offset scenarios, indicating the availability of sufficient cash to make loan payments.



	Cash Flow (US$000) And Debt Service Coverage Ratios Before Taxes							
	Without Carbon Credits		Carbon Credits (Scenario A)		Carbon Credits (Scenario B)		Carbon Credits (Scenario C)	
	Cash Flow	DSCR	Cash Flow	DSCR	Cash Flow	DSCR	Cash Flow	DSCR
Year 0	($700)	N/A	($700)	N/A	($700)	N/A	($700)	N/A
Year 1	($30)	1.0	$19	1.0	$57	1.1	($30)	1.0
Year 2	($30)	1.0	$20	1.0	$58	1.1	($30)	1.0
Year 3	($30)	1.0	$20	1.0	$59	1.1	($30)	1.0
Year 4	($30)	1.0	$21	1.0	$59	1.1	($30)	1.0
Year 5	($30)	1.0	$21	1.0	$60	1.1	($30)	1.0
Year 6	($30)	1.0	$22	1.0	$61	1.1	($30)	1.0
Year 7	($30)	1.0	$22	1.0	$62	1.1	($30)	1.0
Year 8	($30)	1.0	$23	1.0	$63	1.1	($30)	1.0
Year 9	($30)	1.0	$24	1.0	$64	1.1	($30)	1.0
Year 10	($30)	1.0	$24	1.0	$65	1.1	($30)	1.0
Year 11	$842	N/A	$898	N/A	$939	N/A	$842	N/A
Year 12	$842	N/A	$898	N/A	$940	N/A	$842	N/A
Year 13	$842	N/A	$899	N/A	$941	N/A	$842	N/A
Year 14	$842	N/A	$899	N/A	$942	N/A	$842	N/A
Year 15	$842	N/A	$900	N/A	$943	N/A	$842	N/A
Year 16	$842	N/A	$901	N/A	$944	N/A	$842	N/A
Year 17	$842	N/A	$901	N/A	$945	N/A	$842	N/A
Year 18	$842	N/A	$902	N/A	$947	N/A	$842	N/A
Year 19	$842	N/A	$903	N/A	$948	N/A	$842	N/A
Year 20	$842	N/A	$903	N/A	$949	N/A	$842	N/A
Year 21	$842	N/A	$904	N/A	$950	N/A	$842	N/A
Year 22	$842	N/A	$905	N/A	$951	N/A	$842	N/A
Year 23	$842	N/A	$905	N/A	$952	N/A	$842	N/A
Year 24	$842	N/A	$906	N/A	$953	N/A	$842	N/A
Year 25	$842	N/A	$907	N/A	$955	N/A	$842	N/A

The total expected emissions reductions from this project are 470,352 tons of CO_2. To find the cumulative emissions reductions up to a given year, move the mouse pointer over the desired point on the black “Cumulative Carbon Dioxide Equivalents” line. A text box will appear displaying the desired value.



Avoided Emissions Results

Pollutant (Tons)	Annual Average	Total Project
Carbon Dioxide	18,814	470,352
SOx	0	0
NOx	0	0
Particulates	0	0
Methane	0	0
Total CO2 Equivalents	18,814	470,352

Series "Cumulative Carbon Dioxide Equivalents" Point 12
Value: 225,769

EXAMPLE 2: Renewable Electric – Expert User Mode Example

Project Description:

The proposed project is the same project as the Basic User Renewable Electric Project Example; however, a few of the financial details have been changed.

The Department of Energy of ProFormland has recently announced that it expects national electricity demand to increase dramatically over the next 20 years. This will affect the expected revenues from the project. Clean Energy Enterprises will enter into a power purchase agreement that will provide $6/kW or $25,800 annually for years 1 to 10, but, for years 11 to 25, it will receive increased capacity payments of $7/kW or $30,100 annually.

Furthermore, the price received for electricity is expected to rise. After year 10, the price received for peak hours is predicted to be $0.064/kWh and the price received for off-peak hours is predicted to be $0.052/kWh. It is not expected that the quantity of electricity produced or the peak hours will change during the lifetime of the project.

Clean Energy Enterprises has also changed its accounting practices. Part of the investment costs can no longer be depreciated. Thus only $6 million of the total $6.3 million investment will be depreciated. It will be depreciated using the double declining balance method instead of straight-line depreciation. The depreciation schedule will be the following:

Year	Depreciation US$000
1	480
2	442
3	406
4	374
5	344
6	316
7	291
8	268
9	246
10	240
11	240
12	240
13	240
14	240
15	240
16	240
17	240
18	240
19	240
20	240
21	193
22	0
23	0
24	0
25	0

To Input and Analyze this Project:

Analysis using Expert User Mode in ProForm is quite similar to analysis in Basic User Mode. The main difference between the two modes is that, in Expert User Mode, the user has access to all of the calculations and input variables used by ProForm. The gray colored cells in ProForm contain these preprogrammed calculations and are write-protected when not in Expert User Mode.

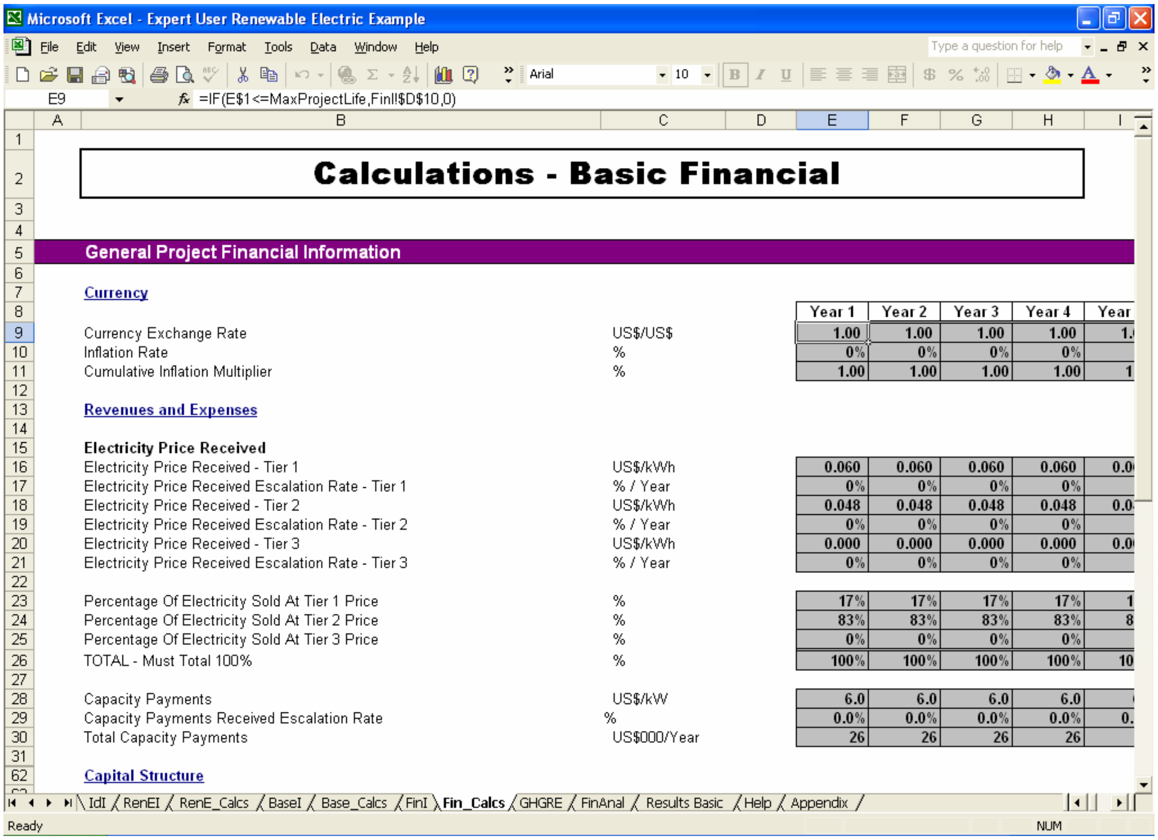
Expert User Mode can be selected in one of two ways. The first occurs when getting started. As such, in the initial dialog boxes that appear after selecting the “Begin” button, the user should choose expert instead of basic when asked to select the user mode. Expert User Mode can also be selected while performing a basic user analysis. At the top of each of the input pages (except for IdI) is a gray colored button that reads: “Change to Expert User Mode.” Clicking on this button will uncover the calculations worksheets.

Because many of the details for this example project are the same as in the previous example, the fastest way to perform an expert user analysis of this project is to open the “Basic User Renewable Electric Example” workbook created in the previous example. Once opened, go to File → Save As and save the workbook with the new name of “Expert User Renewable Electric Example.” Then select the tab for any one of the input worksheets, for example the “BaseI” worksheet. At the top of the page, next to the help button and underneath the page title “Inputs – Baseline Energy Profiles” is a button with the title “Change to Expert User Mode.” Click on this button and the calculation worksheets will be uncovered.

Upon entering Expert User Mode for renewable electricity generation projects, the following calculation sheets will become visible: “RenE_Calcs,” “Base_Calcs,” “Fin_Calcs,” “GHGRE,” and “FinAnal.” Each of these worksheets contains columns representing the years of operation of the project technology (years 0 to 25) and the values for every input and every calculation associated with each year. Most input data is held constant over the years. However, as an expert user, the value for any input in any year can be changed by clicking on the cell for that year and typing in a new value. For most inputs, if a value is changed in one year, it will be changed in all subsequent years.

For this example project, Expert User Mode is necessary to adapt some of the financial calculations to the specifications of the project description. Financial calculations appear on the “FinI,” “Fin_Calcs,” and “FinAnal” worksheets.

The first change that will be made for this project is with respect to the increase in capacity payments Clean Energy Enterprises expects to receive after year 10. Click on the tab at the bottom of the screen labeled “FinI.” Six dollars per kilowatt has been filled in for capacity payments on row 28. Click on the tab at the bottom of the screen labeled “Fin_Calcs.” For years 1 to 25 on row 28, “Capacity Payments,” the value 6 is filled across the row for all years. Select the cell in this row under the column heading for year 11. Type in 7, replacing the 6. All subsequent years (12–25) are automatically updated to contain the value 7. ProForm will now calculate the finances for the project using this change in the value of the capacity payments.



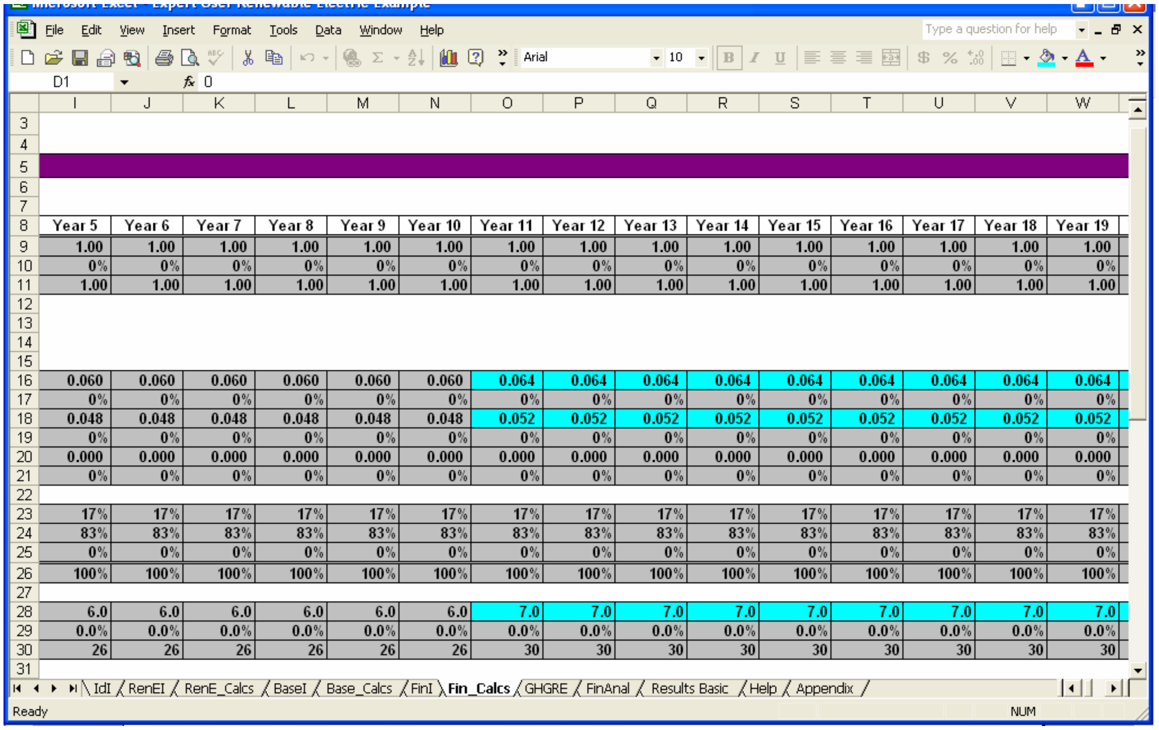
E9 =IF(E$1<=MaxProjectLife,FinI!$D$10,0)

Calculations - Basic Financial

General Project Financial Information

7	Currency						
8			Year 1	Year 2	Year 3	Year 4	Year
9	Currency Exchange Rate	US$/US$	1.00	1.00	1.00	1.00	1.
10	Inflation Rate	%	0%	0%	0%	0%	
11	Cumulative Inflation Multiplier	%	1.00	1.00	1.00	1.00	1
12							
13	Revenues and Expenses						
14							
15	**Electricity Price Received**						
16	Electricity Price Received - Tier 1	US$/kWh	0.060	0.060	0.060	0.060	0.0
17	Electricity Price Received Escalation Rate - Tier 1	% / Year	0%	0%	0%	0%	
18	Electricity Price Received - Tier 2	US$/kWh	0.048	0.048	0.048	0.048	0.0
19	Electricity Price Received Escalation Rate - Tier 2	% / Year	0%	0%	0%	0%	
20	Electricity Price Received - Tier 3	US$/kWh	0.000	0.000	0.000	0.000	0.0
21	Electricity Price Received Escalation Rate - Tier 3	% / Year	0%	0%	0%	0%	
22							
23	Percentage Of Electricity Sold At Tier 1 Price	%	17%	17%	17%	17%	1
24	Percentage Of Electricity Sold At Tier 2 Price	%	83%	83%	83%	83%	8
25	Percentage Of Electricity Sold At Tier 3 Price	%	0%	0%	0%	0%	
26	TOTAL - Must Total 100%	%	100%	100%	100%	100%	10
27							
28	Capacity Payments	US$/kW	6.0	6.0	6.0	6.0	
29	Capacity Payments Received Escalation Rate	%	0.0%	0.0%	0.0%	0.0%	0.
30	Total Capacity Payments	US$000/Year	26	26	26	26	
31							
62	Capital Structure						

Clean Energy Enterprises also expects an increase in the prices received for the sale of electricity. Click on the tab at the bottom of the screen labeled “FinI.” The electricity price received for tier 1 is $0.06/kWh. The electricity price received for tier 2 is $0.048/kWh. Click on the tab at the bottom of the screen labeled “Fin_Calcs.” For years 1 to 25 on row 16, “Electricity Price Received - Tier 1,” $0.06 is filled across. Select the cell in this row under the column-heading year 11. Type in 0.064, replacing the 0.06 that is currently there. All subsequent years (12–25) are automatically updated to contain this value. For years 1 to 25 under row 18, “Electricity Price Received – Tier 2,” $0.048 is filled across. Select the cell in this row under the column-heading year 11. Type in 0.052, replacing the 0.048 that is currently there. All subsequent years (12–25) are automatically updated to contain this value. ProForm will now calculate the finances for the project using these changes in electricity prices.



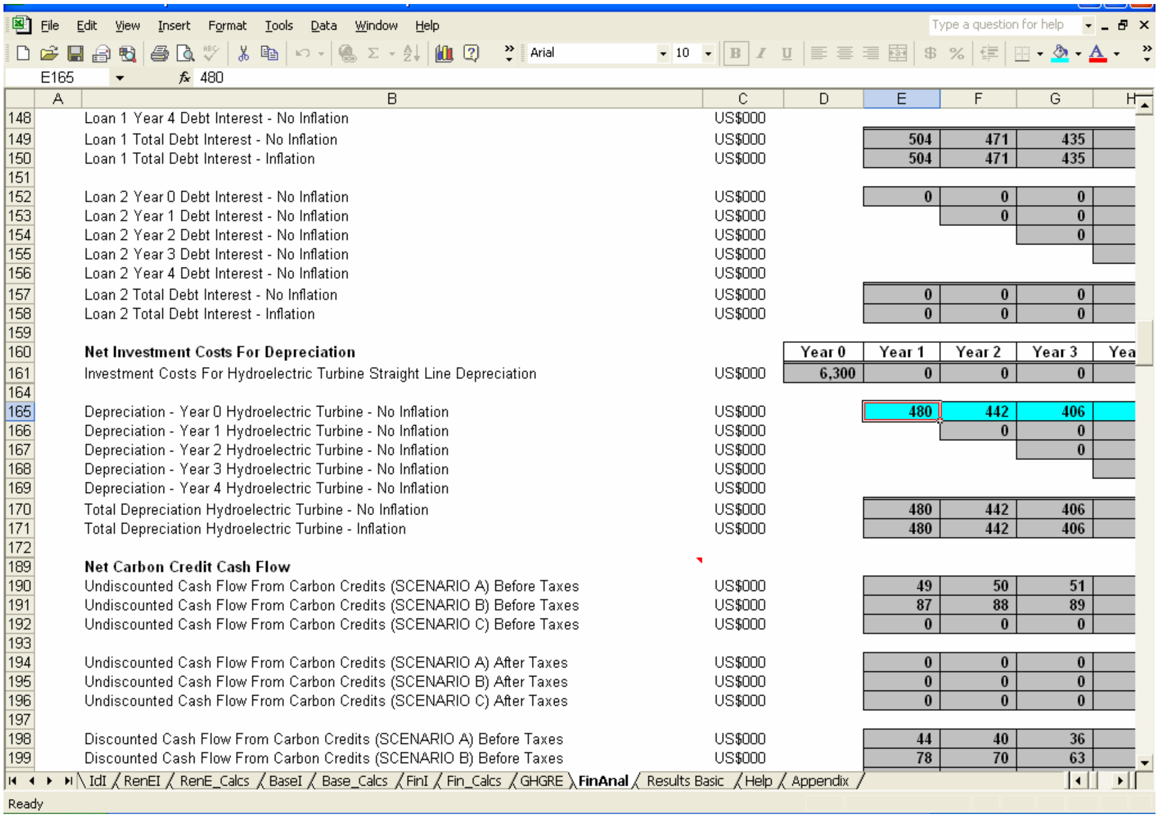
	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
3															
4															
5															
6															
7															
8	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19
9	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
10	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
11	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
12															
13															
14															
15															
16	0.060	0.060	0.060	0.060	0.060	0.060	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064
17	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
18	0.048	0.048	0.048	0.048	0.048	0.048	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052
19	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
21	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
22															
23	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%
24	83%	83%	83%	83%	83%	83%	83%	83%	83%	83%	83%	83%	83%	83%	83%
25	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
26	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
27															
28	6.0	6.0	6.0	6.0	6.0	6.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
29	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
30	26	26	26	26	26	26	30	30	30	30	30	30	30	30	30
31															

Note: The cells are highlighted in this figure to better indicate where changes were made as an expert user. The cells will not be highlighted in the actual program.

Additionally, Clean Energy Enterprises has switched its accounting procedures. On the “FinI” worksheet, line 107, “Technology Depreciation – Tax Basis Hydroelectric Turbine,” 25 years was entered. ProForm thus depreciated this asset in equal amounts over the entire 25 years of the project. The depreciation schedule that Clean Energy Enterprises will use, for a double declining balance of $6 million, was calculated outside of ProForm and is listed above in the project description. To change the depreciation schedule, select the “FinAnal” tab.

The FinAnal worksheet shows the steps for most of the project financial calculations. First is a section listing the energy generated or saved by the project. Then there are rows that calculate the investment costs, subsidies, and equity required. Further below are rows that list the revenues, below which the expenses are located. Under the heading “Expenses” is a section entitled “Net Investment Costs For Straight-Line Depreciation.” There are a total of eight input lines under this heading. The first, entitled “Investment Costs For Hydroelectric Turbine,” displays the $6,300,000 total cost of the investment in the turbine. If what was desired was simply to change the amount of straight-line depreciation from $6.3 million to $6 million, we could simply change the 6,300 in this cell to 6,000. However, the required changes are more complex and require cell-by-cell changes in the lines below. The next five rows below the investment cost calculate the depreciation for each year in which new technology units were installed. This project only installed one unit, in year 0. The rows for units installed in years 1-4 are filled with zeros, as no units were installed during that time period. Row 165, “Depreciation – Year

0 Hydroelectric Turbine – No Inflation,” contains the straight-line depreciation schedule for the project as mentioned above. These values will be replaced with the numbers for the double declining balance depreciation schedule in the project description. Click on the cells in this row, and, for each year, type in the correct double declining balance schedule.



	A	B	C	D	E	F	G	H
148		Loan 1 Year 4 Debt Interest - No Inflation	US$000					
149		Loan 1 Total Debt Interest - No Inflation	US$000		504	471	435	
150		Loan 1 Total Debt Interest - Inflation	US$000		504	471	435	
151								
152		Loan 2 Year 0 Debt Interest - No Inflation	US$000		0	0	0	
153		Loan 2 Year 1 Debt Interest - No Inflation	US$000			0	0	
154		Loan 2 Year 2 Debt Interest - No Inflation	US$000				0	
155		Loan 2 Year 3 Debt Interest - No Inflation	US$000					
156		Loan 2 Year 4 Debt Interest - No Inflation	US$000					
157		Loan 2 Total Debt Interest - No Inflation	US$000		0	0	0	
158		Loan 2 Total Debt Interest - Inflation	US$000		0	0	0	
159								
160		**Net Investment Costs For Depreciation**		Year 0	Year 1	Year 2	Year 3	Yea
161		Investment Costs For Hydroelectric Turbine Straight Line Depreciation	US$000	6,300	0	0	0	
164								
165		Depreciation - Year 0 Hydroelectric Turbine - No Inflation	US$000		480	442	406	
166		Depreciation - Year 1 Hydroelectric Turbine - No Inflation	US$000			0	0	
167		Depreciation - Year 2 Hydroelectric Turbine - No Inflation	US$000				0	
168		Depreciation - Year 3 Hydroelectric Turbine - No Inflation	US$000					
169		Depreciation - Year 4 Hydroelectric Turbine - No Inflation	US$000					
170		Total Depreciation Hydroelectric Turbine - No Inflation	US$000		480	442	406	
171		Total Depreciation Hydroelectric Turbine - Inflation	US$000		480	442	406	
172								
189		**Net Carbon Credit Cash Flow**						
190		Undiscounted Cash Flow From Carbon Credits (SCENARIO A) Before Taxes	US$000		49	50	51	
191		Undiscounted Cash Flow From Carbon Credits (SCENARIO B) Before Taxes	US$000		87	88	89	
192		Undiscounted Cash Flow From Carbon Credits (SCENARIO C) Before Taxes	US$000		0	0	0	
193								
194		Undiscounted Cash Flow From Carbon Credits (SCENARIO A) After Taxes	US$000		0	0	0	
195		Undiscounted Cash Flow From Carbon Credits (SCENARIO B) After Taxes	US$000		0	0	0	
196		Undiscounted Cash Flow From Carbon Credits (SCENARIO C) After Taxes	US$000		0	0	0	
197								
198		Discounted Cash Flow From Carbon Credits (SCENARIO A) Before Taxes	US$000		44	40	36	
199		Discounted Cash Flow From Carbon Credits (SCENARIO B) Before Taxes	US$000		78	70	63	

Note: The cells are highlighted in this figure to better indicate where changes were made as an expert user. The cells will not be highlighted in the actual program.

This is one example of how, as an expert user, ProForm can be adapted to the specifics of a wide variety of projects.

Results

The results from the analysis of this example are located on the same Results Basic page as the results from the previous example. For this particular case, the results for an expert user are quite similar to those of a basic user. The energy output, emissions reductions, required capital, and value of the carbon emissions reductions offsets remain unchanged. However, project finances improve, as Clean Energy Enterprises will receive more revenues from capacity payments and electricity sales. The project IRR is now 18.86% or 24.16%, and the pretax NPV is now $1223 or $1959, for the scenarios without sale of carbon emissions reductions and with the sale of carbon emissions reductions at $5/ton CO_2, respectively.

EXAMPLE 3: Energy Efficiency – Basic User Mode Example

Project Description:

Fabulous Cement Fabricators LTD, a cement manufacturing company whose factory is located in ProFormland, is investigating the possibility of improving its cement production facility. Currently the plant has the capacity to produce 950 tonnes of clinker per day. The facility consumes 3.4 GJ of fuel oil and 133 kWh per tonne of clinker produced. The plant operates at approximately 80% of capacity.

The proposed project will improve production by replacing all of the existing kilns and mills within the facility. The new equipment being considered is more efficient than the existing equipment and will allow Fabulous Cement Fabricators LTD to increase its production capacity to 2200 tonnes of clinker per day. The improved facility will use only 2.8 GJ of fuel oil and 95.76 kWh per tonne of clinker produced. The plant will still function at 80% capacity, producing 642 kilo tonnes clinker/year. The new equipment has an expected operating life of 25 years.

Currently Fabulous Cement Fabricators LTD purchases its electricity at a rate of \$0.17/kWh. The cost of electricity has been escalating at a rate of 2% for the past ten years. Fuel oil costs are \$3.50 /GJ and predicted to remain constant.

The Department of Energy of ProFormland recently completed a full analysis of all plants supplying electricity to the grid. From this study, it was determined that the benchmark value to be used for determining carbon emissions reductions from base-load electricity consumption should be 0.643 tons CO_2/Megawatt hour. Transmission and distribution losses across the grid are 15%.

Replacing the existing kilns is expected to cost \$63 million, whereas replacing the existing mills is expected to cost \$42 million. Operation and maintenance costs will decrease with the new equipment by \$385,440 for the kilns and \$256,960 for the mills. These numbers have been adjusted to account for differences in the level of service between the existing and the proposed equipment. Furthermore, if Fabulous Cement Fabricators LTD does not invest in this improved equipment, it will have to spend \$33 and \$22 million, respectively, to increase the capacity and service life of its existing kilns and mills.

Fabulous Cement Fabricators LTD plans to finance this project with 75% equity. To cover the remainder of the investment costs, Fabulous Cement Fabricators LTD will take out a loan to be repaid in equal installments over 10 years with an interest rate of 8%. The inflation rate in ProFormland has been steady at 5% per year and marginal income taxes are low in ProFormland, at a rate of 15%.

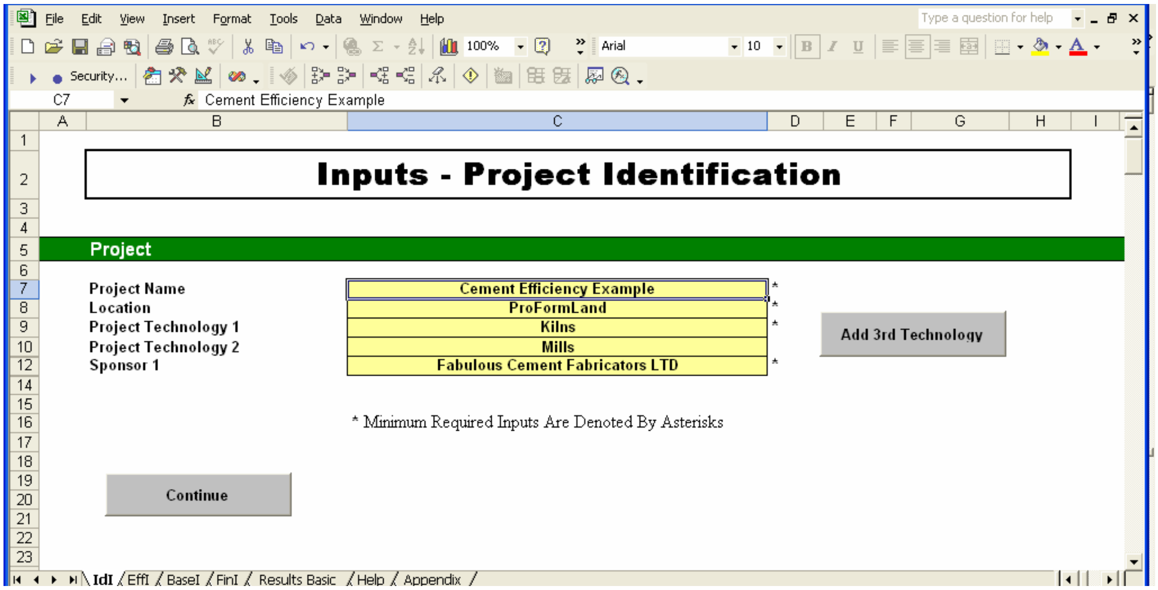
The current market price for the sale of carbon emissions reductions is \$5/ton CO_2 equivalents and expected to vary anywhere between remaining constant and escalating 10%/year over the next 25 years. Monitoring and verification costs are \$10,000 per year.

To Input and Analyze this Project:

From the “Begin” menu, save the project as “Basic User Energy Efficiency Example – Cement.” Then, from the initial dialog boxes choose the following options: For project type, select Efficiency project. There is only one project sponsor, so select the option for Basic Financial Analysis. This example will be analyzed in Basic User Mode. Based on the options chosen in these dialog boxes, ProForm will then select the appropriate worksheets and rows necessary to analyze this type of project. The non-relevant worksheets will be hidden from view.

IdI: Inputs – Project Identification

After selecting options from the initial dialog boxes, the IdI worksheet will appear on the screen. At the bottom of the screen are the worksheet tabs for EffI, BaseI, FinI, and Results Basic. Fill in the yellow input cells on the IdI worksheet. The name for this example project is “Cement Efficiency Example.” The project will be located in “ProFormLand.” The project involves the installation of two technologies. The first will be the more-efficient kilns; the second will be the more-efficient mills. Enter “Kilns” for Project Technology 1, then click the button labeled “Add 2nd Technology” to reveal the row to input Project Technology 2. Enter “Mills” in this cell. The project sponsor is “Fabulous Cement Fabricators LTD.” After entering this information, click the continue button. ProForm will check to ensure that all cells marked with asterisks contain information, and will select the EffI page.



Inputs - Project Identification

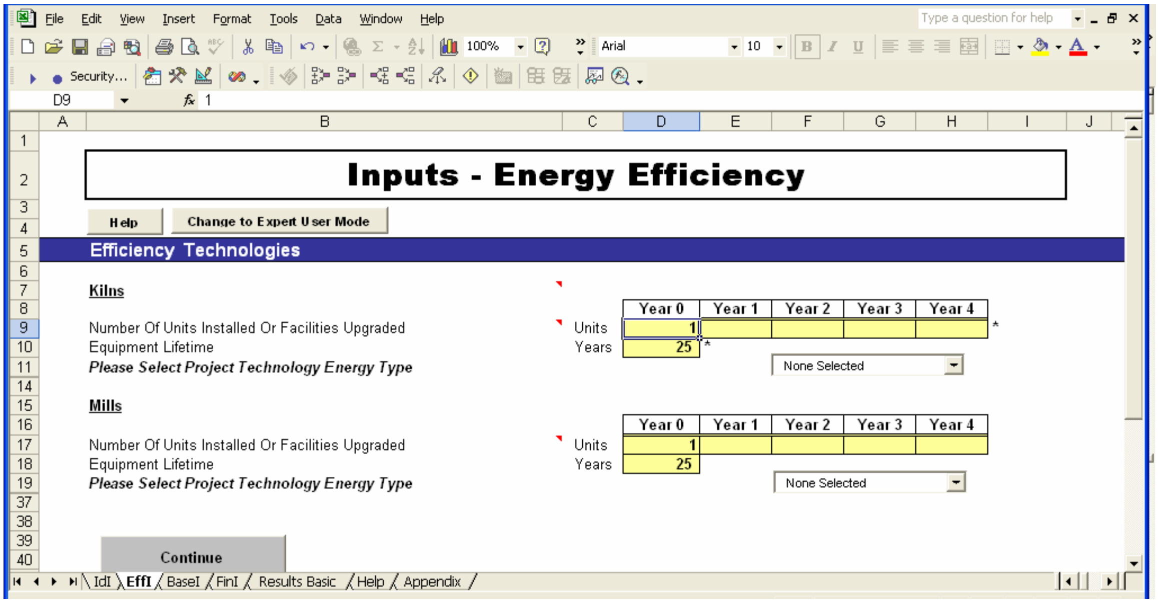
Project

Project Name	Cement Efficiency Example *
Location	ProFormLand *
Project Technology 1	Kilns *
Project Technology 2	Mills
Sponsor 1	Fabulous Cement Fabricators LTD *

* Minimum Required Inputs Are Denoted By Asterisks

EffI: Inputs – Energy Efficiency

ProForm is capable of analyzing up to three different energy efficiency technologies per project. These technologies can be installed during a five-year time period. This project will install two different technologies: more-efficient kilns and more-efficient mills. ProForm asks for the annual electricity and/or fuel consumption per unit or facility. The project description for this example project does not mention how many kilns or how many mills are being replaced; instead, production values and costs are aggregated for the entire facility. Thus energy consumption data should be entered for the entire facility. Each of these technologies has a service life of 25 years.



Inputs - Energy Efficiency

Efficiency Technologies

Kilns

		Year 0	Year 1	Year 2	Year 3	Year 4
Number Of Units Installed Or Facilities Upgraded	Units	1				
Equipment Lifetime	Years	25				

Please Select Project Technology Energy Type — None Selected

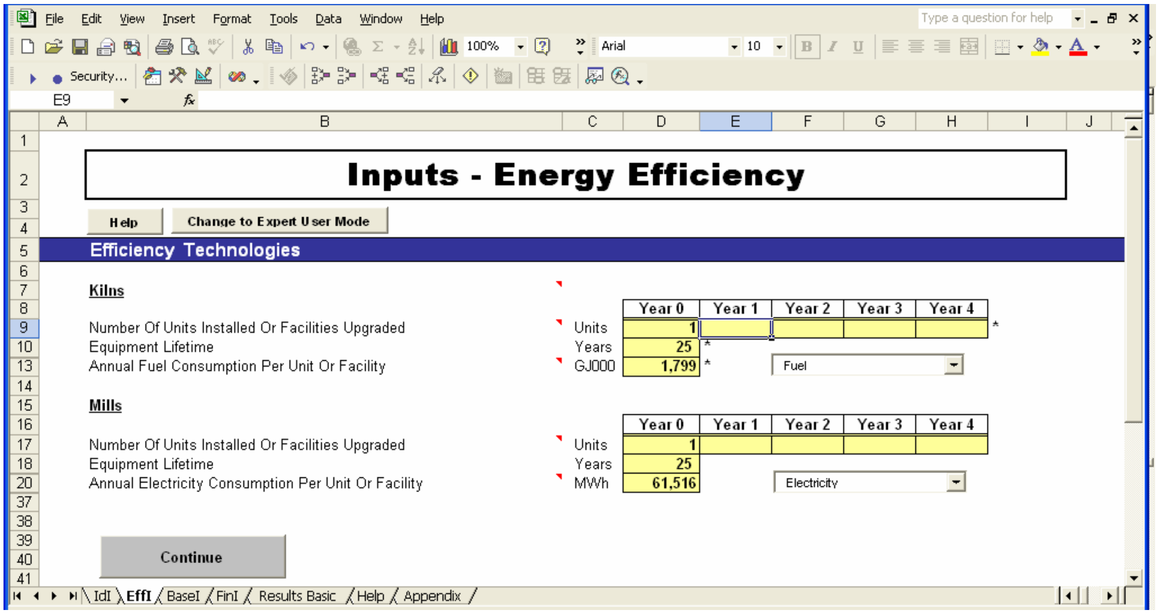
Mills

		Year 0	Year 1	Year 2	Year 3	Year 4
Number Of Units Installed Or Facilities Upgraded	Units	1				
Equipment Lifetime	Years	25				

Please Select Project Technology Energy Type — None Selected

Next select the fuel type for the two technologies. Kilns consume fuel, while mills consume electricity. Select the appropriate energy type from the drop-down menus by each technology.

Fuel oil consumption by the new project infrastructure will be 2.8 GJ/tonne clinker * 2200 tonnes clinker/day * 365 day/ year * 80% capacity, or 1,798,720 GJ/year. Electricity consumption will be 95.76 kWh/ tonne clinker * 2200 tonnes clinker/day * 365 day/year * 80% capacity, or 61,516,224 kWh/year. Enter “1799” and “61,516.”



Inputs - Energy Efficiency

Efficiency Technologies

Kilns

		Year 0	Year 1	Year 2	Year 3	Year 4
Number Of Units Installed Or Facilities Upgraded	Units	1				
Equipment Lifetime	Years	25				
Annual Fuel Consumption Per Unit Or Facility	GJ000	1,799		Fuel		

Mills

		Year 0	Year 1	Year 2	Year 3	Year 4
Number Of Units Installed Or Facilities Upgraded	Units	1				
Equipment Lifetime	Years	25				
Annual Electricity Consumption Per Unit Or Facility	MWh	61,516		Electricity		

After entering the required information in the cells on the EffI page, click the continue button. ProForm will check to ensure that all cells marked to the right with asterisks contain information, and then will select the BaseI page.

BaseI: Inputs – Baseline Energy Profile

The next sheet that will appear on the screen is BaseI. This sheet is used to input information regarding the business as usual in the absence of the project. It is important to understand that the baseline may or may not be the existing equipment. In this case, even in the absence of the project, an investment would have to be made in order to raise the output level. It is important that this cost be included within the baseline. For this reason, ProForm requires that the user select whether or not the existing equipment requires additional capital investment in order to provide the same service as the project. Both technologies require additional investment, so click the appropriate button for both technologies.

To allow for projects in which fuel displaces electricity or vice versa, ProForm requires that the user select the energy type of the baseline as well. Select “Fuel Baseline” for the kilns and “Electricity Baseline” for the mills. You will notice that, as you make your selections, ProForm displays additional input cells.

The worksheet is now split up into three separate sections. The first section is for entering information about the consumption and capacity of the baseline units. The next two sections are for entering information about the electricity and fuel that power these baselines.

Begin with the first section. The annual fuel consumption by the existing infrastructure is 3.4 GJ/ tonne clinker * 365 days/year* 950 tonnes clinker/day * 80% capacity factor. This gives 943,160 GJ of fuel oil /year. The annual electricity consumption by the existing infrastructure is 133 kWh/ tonne clinker * 365 days/year* 950 tonnes clinker/day * 80% capacity factor, resulting in 36,894,200 kWh /year. Enter “943” and “36,894.”

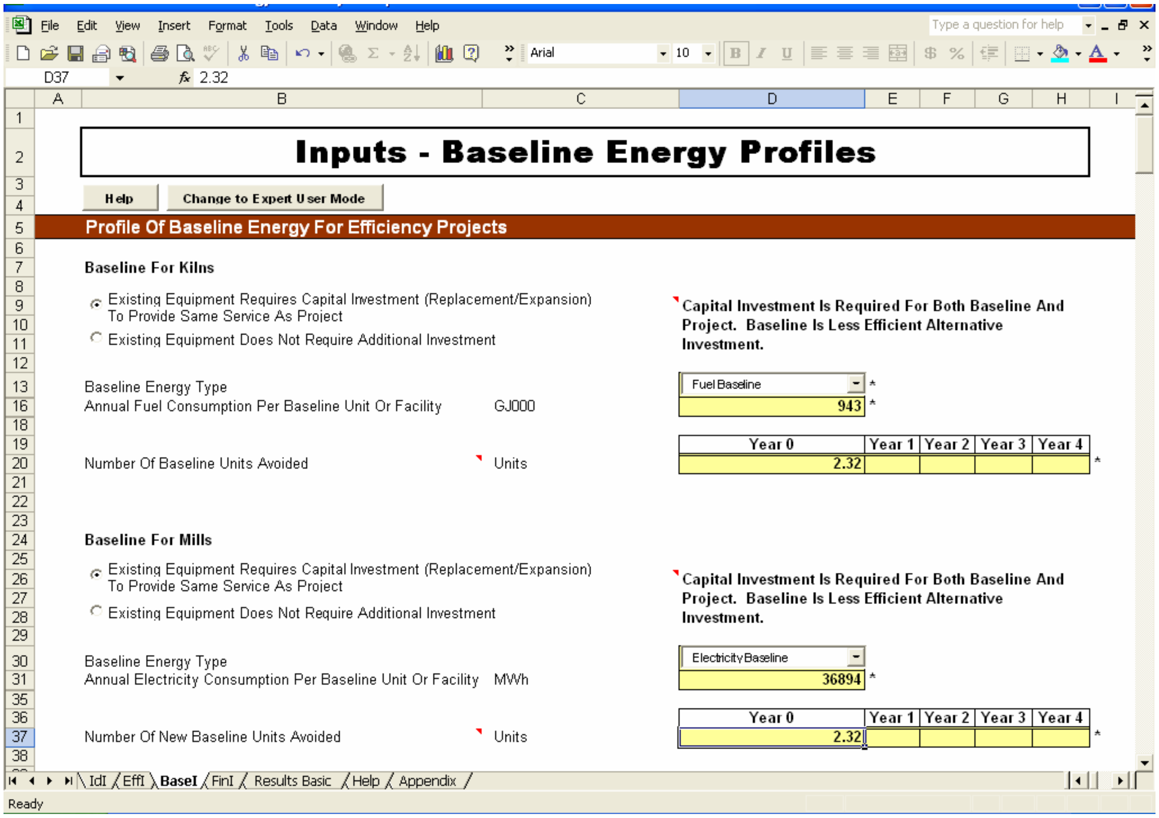
Notice that the estimated energy consumption by the project infrastructure, as entered on the EffI page, is actually higher than these values! If these estimates for energy consumption by the proposed project are compared to energy consumption from the existing infrastructure, it appears the project would actually increase energy consumption!

The proposed project energy consumption is higher than energy consumption by the existing infrastructure because the proposed project has a larger capacity. It produces 2200 tonnes clinker per day, whereas the existing infrastructure only produces 950 tonnes clinker per day. On a per ton output basis, to produce the same quantity of cement, the new project technology is more efficient.

For an accurate estimation of reduced emissions, a comparison between project emissions and baseline emissions must be made using the same level of service. This is why the

“Number Of Baseline Units Avoided” is required. A baseline unit produces 950 tonnes of clinker per day, while the new unit produces 2200 tonnes of clinker per day. Therefore the project avoids 2200/950= 2.32 baseline units.

As ProForm is an Excel based program, any of the above calculations can be performed in the software itself. For example, instead of typing 943 GJ000/year in the annual fuel consumption cell, “=3.4*950*365*0.8/1000” can be entered instead.



Inputs - Baseline Energy Profiles

Profile Of Baseline Energy For Efficiency Projects

Baseline For Kilns

● Existing Equipment Requires Capital Investment (Replacement/Expansion) To Provide Same Service As Project

○ Existing Equipment Does Not Require Additional Investment

Capital Investment Is Required For Both Baseline And Project. Baseline Is Less Efficient Alternative Investment.

Baseline Energy Type: Fuel Baseline *

Annual Fuel Consumption Per Baseline Unit Or Facility GJ000: 943 *

		Year 0	Year 1	Year 2	Year 3	Year 4
Number Of Baseline Units Avoided	Units	2.32				

Baseline For Mills

● Existing Equipment Requires Capital Investment (Replacement/Expansion) To Provide Same Service As Project

○ Existing Equipment Does Not Require Additional Investment

Capital Investment Is Required For Both Baseline And Project. Baseline Is Less Efficient Alternative Investment.

Baseline Energy Type: Electricity Baseline

Annual Electricity Consumption Per Baseline Unit Or Facility MWh: 36894 *

		Year 0	Year 1	Year 2	Year 3	Year 4
Number Of New Baseline Units Avoided	Units	2.32				

The profile for electricity generation is the next section that appears on the screen. For a more detailed explanation of this section, please refer to “Example 1: Basic User Renewable Electricity Project.” For this project, emissions reductions will be calculated by comparison with a user-defined baseline. The Department of Energy of ProFormland determined that the baseline value for the existing grid electricity generation to be used is 0.643 Tons CO_2/MWh. Determination of this value is complex, and depends on the emissions intensity of electricity currently produced for the grid, the types of plants supplying electricity to the grid, expected emissions from future generation of electricity, and many other factors. ProForm is not a tool for determining such baseline values. However, it does allow for those values to be used if they are provided via another source.

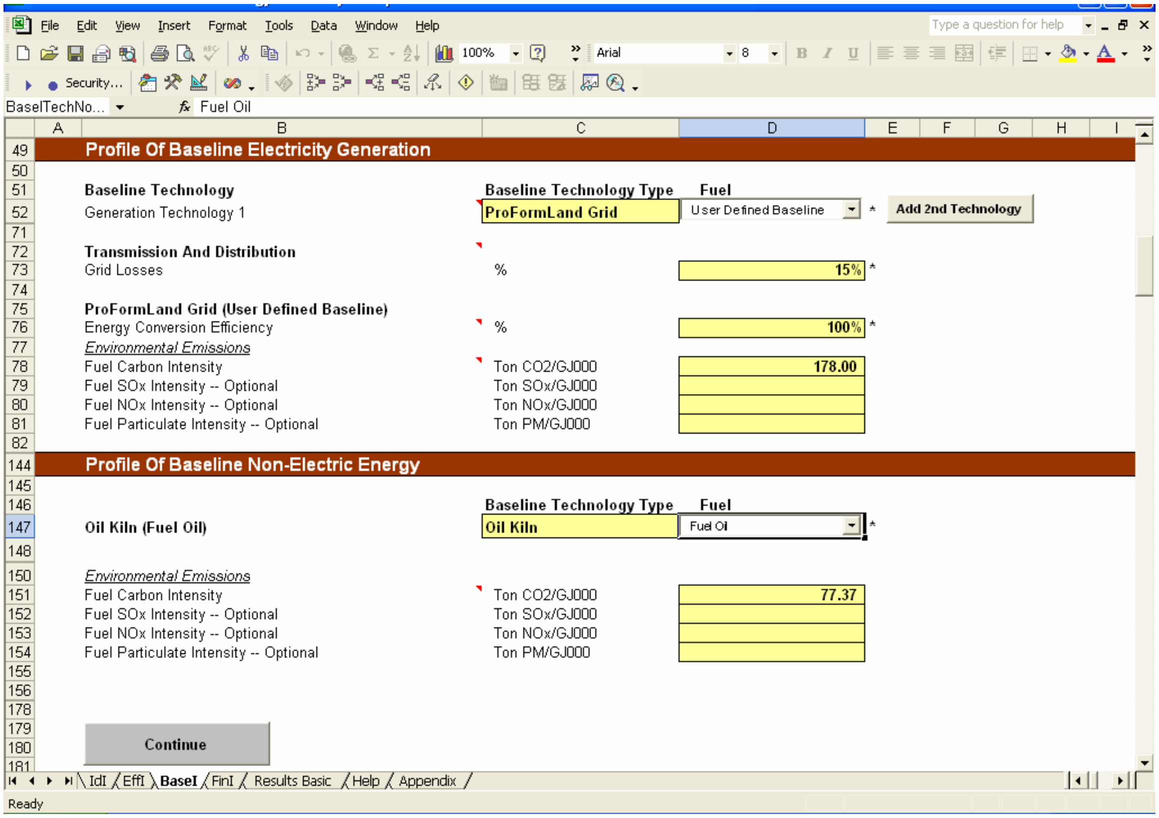
If a user-defined baseline is used in ProForm, it functions as the emissions factor by which project emissions rates are compared to calculate total emissions reductions. For energy efficiency projects, it is assumed that the electricity conserved due to implementation of the project is electricity that would have been generated at the user-defined baseline emissions rate. Thus, by multiplying the electricity saved by that benchmark value and then adjusting to account for transmission and distribution losses, the emissions reductions from the project are calculated.

To enter a user-defined baseline value in ProForm, select “User Defined Baseline” from the fuel pull-down menu. A dialog box will appear asking for the user-defined baseline carbon intensity in units of tons CO_2/GJ000.   The user-defined baseline suggested by the ProFormland Department of Energy is 0.643 tons CO_2/ MWh. This value needs to be converted to tons CO2/GJ000. There are 277 MWh in one GJ000. Thus 0.643 tons CO_2/MWh is equivalent to 178 tons CO_2/GJ000. Type 178 in the dialog box and click on “Ok.” This automatically fills the user-defined baseline value in the corresponding “Fuel Carbon Intensity” cell below.

Energy efficiency projects that conserve electricity reduce the amount of electricity that needs to be generated and transmitted across the grid. As such, the actual energy savings by an efficiency project include not only the amount of electricity saved on-site, but also the amount of electricity that is lost during transmission and distribution of the electricity from the site of generation to the project location. Enter 15% for transmission and distribution losses.

The energy conversion efficiency is the effectiveness with which electricity providers convert the heat energy of their fuel to electricity. This efficiency is used by ProForm to calculate the amount of fuel displaced by the electricity generated or offset by the project. The energy conversion efficiency of the various technologies was included in the user-defined baseline, calculated by the ProFormLand Department of Energy. Thus 100% should be input for the energy conversion efficiency. If user-defined emissions factors are available for other local pollutants, such as SOx, NOx, and particulates, those values can be entered in cells for fuel emissions intensity.   No information regarding these pollutants was given in the example project description.

Below the section for inputting information about the electricity baseline is a section for describing the fuel that will be conserved. Type in oil kiln for the Baseline Technology Type, and choose fuel oil from the pull down fuel menu.



fx Fuel Oil

Profile Of Baseline Electricity Generation

Baseline Technology	**Baseline Technology Type**	**Fuel**	
Generation Technology 1	ProFormLand Grid	User Defined Baseline	*
Transmission And Distribution			
Grid Losses	%	15%	*
ProFormLand Grid (User Defined Baseline)			
Energy Conversion Efficiency	%	100%	*
Environmental Emissions			
Fuel Carbon Intensity	Ton CO2/GJ000	178.00	
Fuel SOx Intensity -- Optional	Ton SOx/GJ000		
Fuel NOx Intensity -- Optional	Ton NOx/GJ000		
Fuel Particulate Intensity -- Optional	Ton PM/GJ000		

Profile Of Baseline Non-Electric Energy

	Baseline Technology Type	**Fuel**	
Oil Kiln (Fuel Oil)	Oil Kiln	Fuel Oil	*
Environmental Emissions			
Fuel Carbon Intensity	Ton CO2/GJ000	77.37	
Fuel SOx Intensity -- Optional	Ton SOx/GJ000		
Fuel NOx Intensity -- Optional	Ton NOx/GJ000		
Fuel Particulate Intensity -- Optional	Ton PM/GJ000		

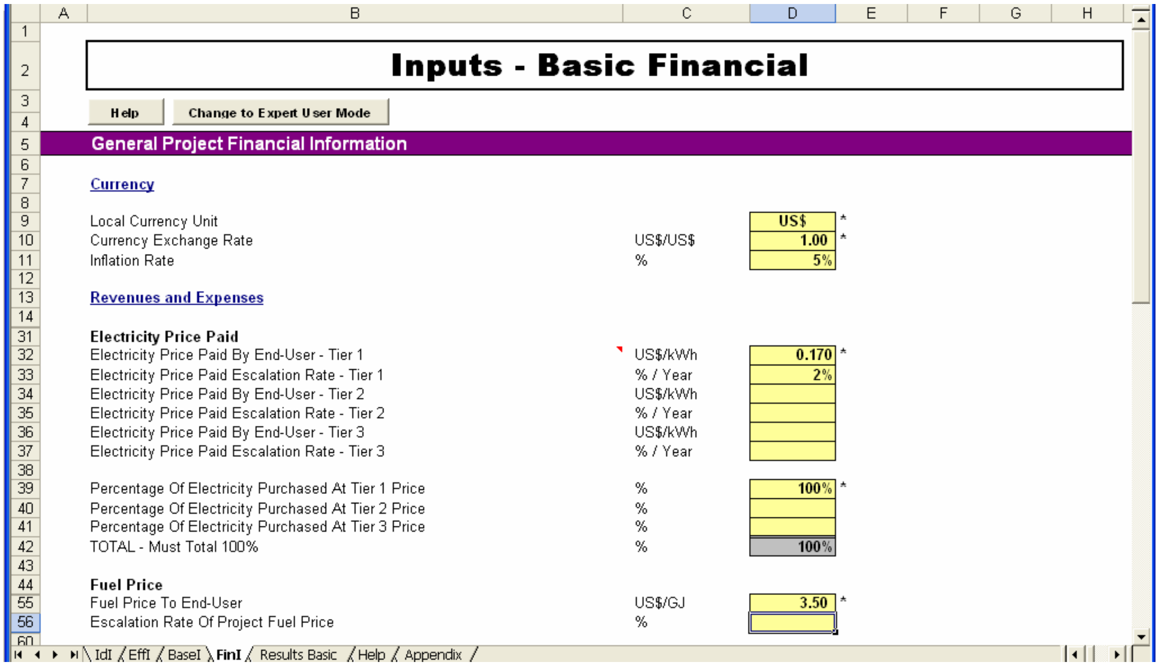
After filling this information into the cells on the BaseI page, click the continue button. ProForm will check to ensure that all cells marked to the right with asterisks contain information. It will then select the FinI page.

FinI: Inputs – Basic Financial

The financial information available for this example project is in US dollars, thus the value 1 should be entered for the exchange rate. Enter 5% for the inflation rate.

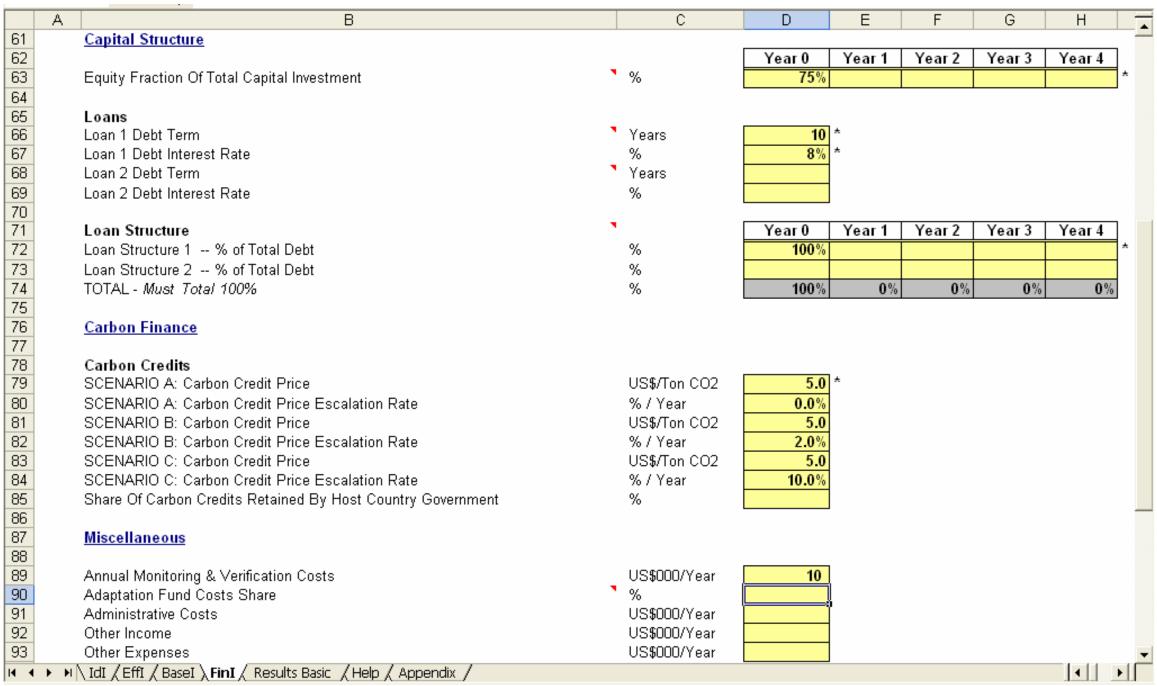
Fabulous Cement Fabricators LTD currently purchases 100% of its electricity at the rate of $0.17/kWh. This price is escalating at a rate of 2% per year. Enter this information for electricity price paid tier 1. Fuel costs are $3.50 per GJ and not expected to change.

The equity fraction of the total capital investment is 75%. The remaining costs will be covered via a single loan, which should be assigned 100% of the debt. The loan will be repaid over at 10-year period at an interest rate of 8%. The cells for loan two will be left blank.



	A	B	C	D	E	F	G	H
1								
2		**Inputs - Basic Financial**						
3								
4								
5		**General Project Financial Information**						
6								
7		Currency						
8								
9		Local Currency Unit		US$	*			
10		Currency Exchange Rate	US$/US$	1.00	*			
11		Inflation Rate	%	5%				
12								
13		Revenues and Expenses						
14								
31		**Electricity Price Paid**						
32		Electricity Price Paid By End-User - Tier 1	US$/kWh	0.170	*			
33		Electricity Price Paid Escalation Rate - Tier 1	% / Year	2%				
34		Electricity Price Paid By End-User - Tier 2	US$/kWh					
35		Electricity Price Paid Escalation Rate - Tier 2	% / Year					
36		Electricity Price Paid By End-User - Tier 3	US$/kWh					
37		Electricity Price Paid Escalation Rate - Tier 3	% / Year					
38								
39		Percentage Of Electricity Purchased At Tier 1 Price	%	100%	*			
40		Percentage Of Electricity Purchased At Tier 2 Price	%					
41		Percentage Of Electricity Purchased At Tier 3 Price	%					
42		TOTAL - Must Total 100%	%	100%				
43								
44		**Fuel Price**						
55		Fuel Price To End-User	US$/GJ	3.50	*			
56		Escalation Rate Of Project Fuel Price	%					
60								

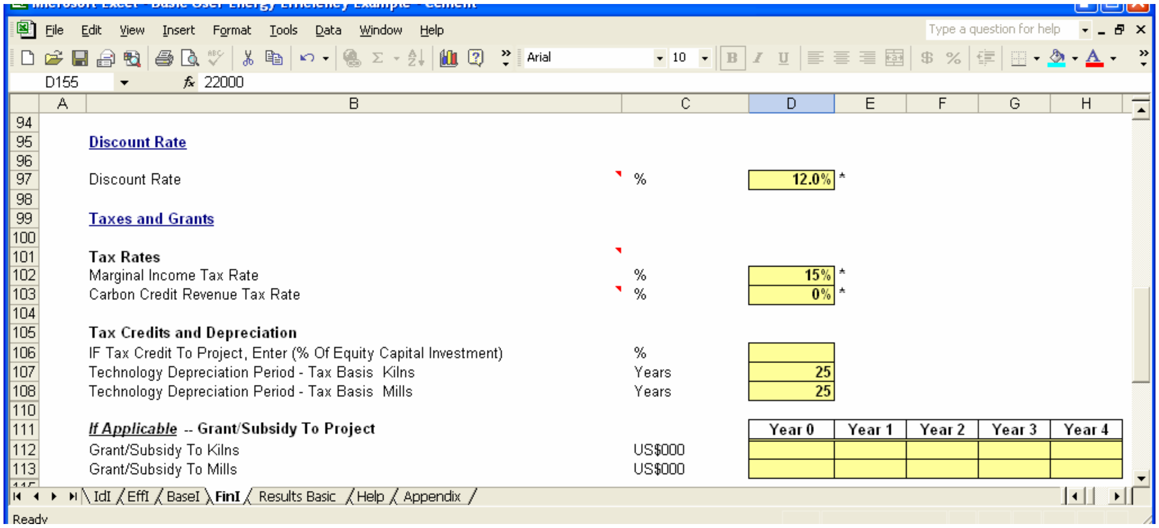
The current market price for the sale of carbon offsets is $5/ton CO_2 equivalent. The project will be analyzed for three different carbon offset price scenarios. For the first scenario, the price received will remain constant. For the second scenario, the price received will increase at a rate of 2% per year. The last case is the most optimistic, with the price received increasing 10% per year. Monitoring and verification costs for carbon emissions reductions are $10,000 per year, but should be entered as 10, as the unit for input is US$000.



	A	B	C	D	E	F	G	H
61		Capital Structure						
62				Year 0	Year 1	Year 2	Year 3	Year 4
63		Equity Fraction Of Total Capital Investment	%	75%				*
64								
65		**Loans**						
66		Loan 1 Debt Term	Years	10	*			
67		Loan 1 Debt Interest Rate	%	8%	*			
68		Loan 2 Debt Term	Years					
69		Loan 2 Debt Interest Rate	%					
70								
71		**Loan Structure**		Year 0	Year 1	Year 2	Year 3	Year 4
72		Loan Structure 1 -- % of Total Debt	%	100%				*
73		Loan Structure 2 -- % of Total Debt	%					
74		TOTAL - *Must Total 100%*	%	100%	0%	0%	0%	0%
75								
76		Carbon Finance						
77								
78		**Carbon Credits**						
79		SCENARIO A: Carbon Credit Price	US$/Ton CO2	5.0	*			
80		SCENARIO A: Carbon Credit Price Escalation Rate	% / Year	0.0%				
81		SCENARIO B: Carbon Credit Price	US$/Ton CO2	5.0				
82		SCENARIO B: Carbon Credit Price Escalation Rate	% / Year	2.0%				
83		SCENARIO C: Carbon Credit Price	US$/Ton CO2	5.0				
84		SCENARIO C: Carbon Credit Price Escalation Rate	% / Year	10.0%				
85		Share Of Carbon Credits Retained By Host Country Government	%					
86								
87		Miscellaneous						
88								
89		Annual Monitoring & Verification Costs	US$000/Year	10				
90		Adaptation Fund Costs Share	%					
91		Administrative Costs	US$000/Year					
92		Other Income	US$000/Year					
93		Other Expenses	US$000/Year					

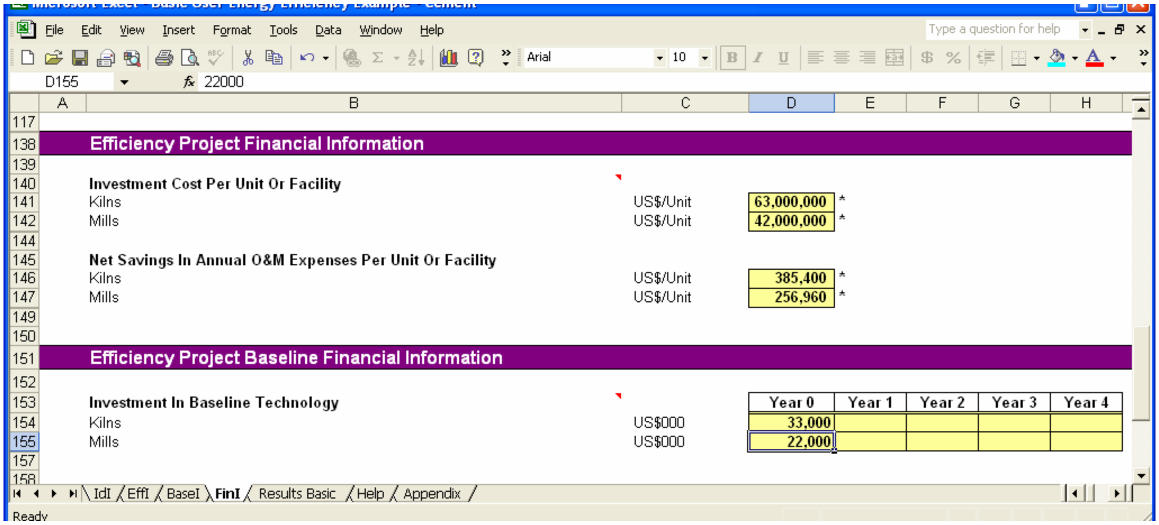
No information was provided regarding other possible investments or the expected return. As such, we will select 12% for the discount rate. The marginal income tax rate is 15%. Because revenues received from the sales of carbon emissions reductions will not be taxed, enter zero in the cell for Carbon Credit Revenue Tax Rate. Both the kilns and the mills will be depreciated over 25 years.

Installation costs are $63,000,000 total for all of the new kilns and $42,000,000 total for all of the new mills. Annual operation and maintenance costs will decrease by $385,440 for the kilns and $256,960 for the mills.



	A	B	C	D	E	F	G	H
94								
95		**Discount Rate**						
96								
97		Discount Rate	%	12.0%	*			
98								
99		**Taxes and Grants**						
100								
101		**Tax Rates**						
102		Marginal Income Tax Rate	%	15%	*			
103		Carbon Credit Revenue Tax Rate	%	0%	*			
104								
105		**Tax Credits and Depreciation**						
106		IF Tax Credit To Project, Enter (% Of Equity Capital Investment)	%					
107		Technology Depreciation Period - Tax Basis Kilns	Years	25				
108		Technology Depreciation Period - Tax Basis Mills	Years	25				
110								
111		***If Applicable*** **-- Grant/Subsidy To Project**		**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**
112		Grant/Subsidy To Kilns	US$000					
113		Grant/Subsidy To Mills	US$000					

When calculating costs, the investment costs avoided by the implementation of the project must also be considered. Avoided investment costs are the costs of replacing, rehabilitating or expanding equipment so that it will have the same service life and level as the project technology. For this example, the avoided investment is the cost of increasing production of the existing equipment to the same output as the new installation. The improved facility will have a production capacity of 2200 tonnes clinker per day. The existing facility can only produce 950 tonnes clinker per day. Thus the displaced investment is the cost of additional equipment that will increase production capacity by 1250 tonnes clinker per day, at the existing level of efficiency. The costs, as given in the project description, would be $33 million for increasing the kiln capacity, and $22 million for increasing the mill capacity.



Efficiency Project Financial Information

Investment Cost Per Unit Or Facility		
Kilns	US$/Unit	63,000,000 *
Mills	US$/Unit	42,000,000 *
Net Savings In Annual O&M Expenses Per Unit Or Facility		
Kilns	US$/Unit	385,400 *
Mills	US$/Unit	256,960 *

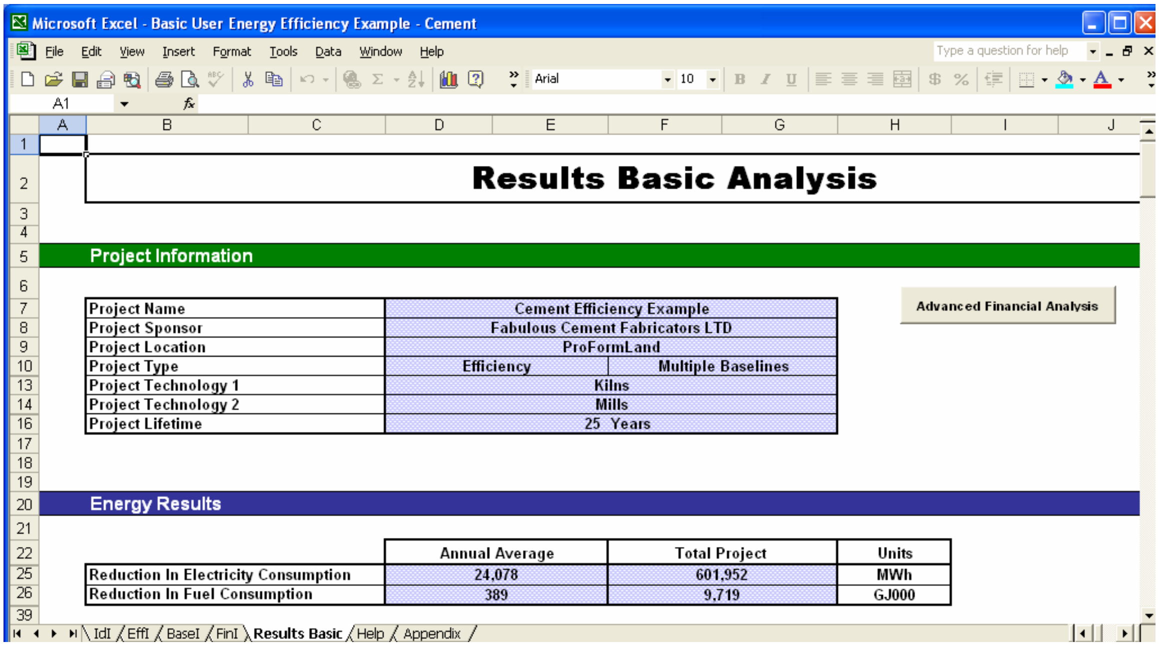
Efficiency Project Baseline Financial Information

Investment In Baseline Technology		Year 0	Year 1	Year 2	Year 3	Year 4
Kilns	US$000	33,000				
Mills	US$000	22,000				

After entering the required information in the cells on the FinI page, click the continue button. ProForm will check to ensure that all cells marked to the right with asterisks contain information. It will then save the workbook to the computer and show the results of the analysis.

Results Basic

The results page summarizes the outcome of the ProForm analysis in terms of energy, finances, and emissions. The first section presents the project identification information. Immediately below is a table containing the results of the energy analysis. For energy efficiency projects, ProForm calculates the total amount of energy that will be saved by the project as well as the annual average. This project will conserve a total of 601,952 MWh of electricity and 9,719 GJ000 of fuel oil during its 25-year operating life.



Results Basic Analysis

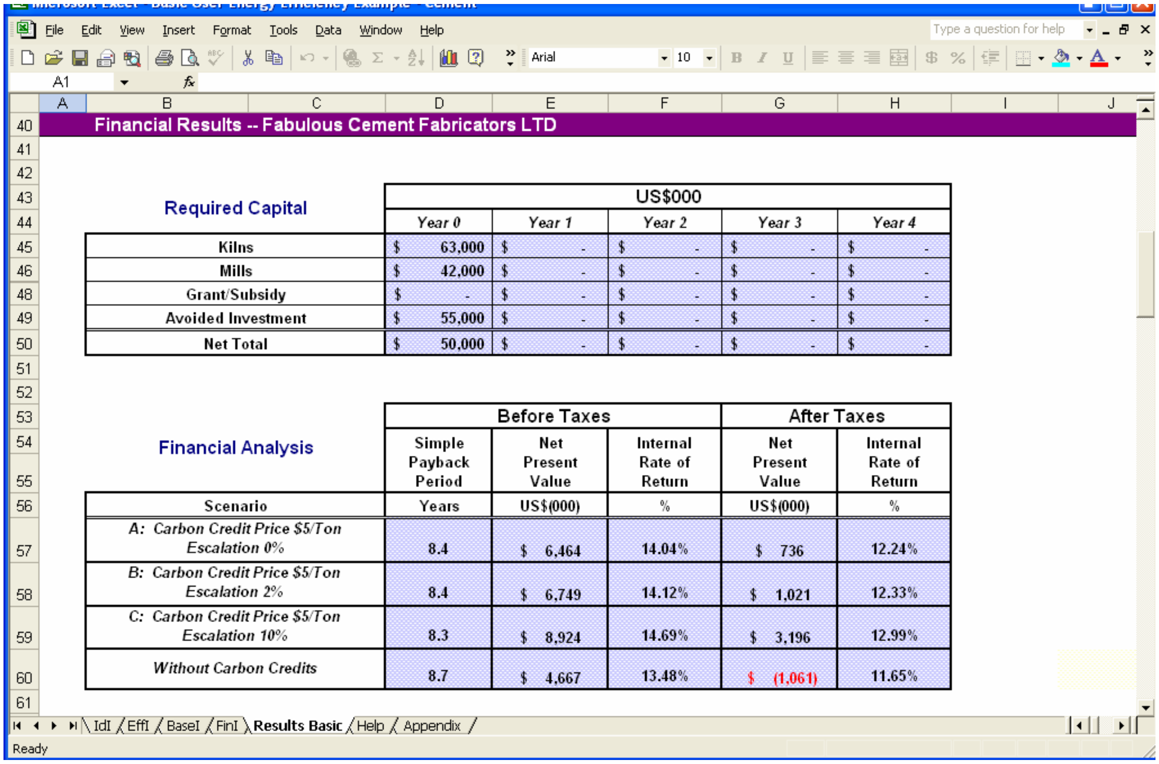
Project Information

Project Name	Cement Efficiency Example	
Project Sponsor	Fabulous Cement Fabricators LTD	
Project Location	ProFormLand	
Project Type	Efficiency	Multiple Baselines
Project Technology 1	Kilns	
Project Technology 2	Mills	
Project Lifetime	25 Years	

Energy Results

	Annual Average	Total Project	Units
Reduction In Electricity Consumption	24,078	601,952	MWh
Reduction In Fuel Consumption	389	9,719	GJ000

Below the energy analysis is a section on project finances. ProForm calculates the required capital needed for each year in which new technologies are installed. The investment costs are calculated so as to include the displaced investment. Therefore, even though the entire cost of the upgrade will be $105 million, the cost of the more-efficient equipment over and above the cost of bringing the old equipment up to the new level of service is only $50 million. The simple payback period for this project, i.e., the amount of time needed to break even on the investment, not accounting for the time value of money, is between 8.3 and 8.7 years, depending on the price received for the sale of carbon offsets.

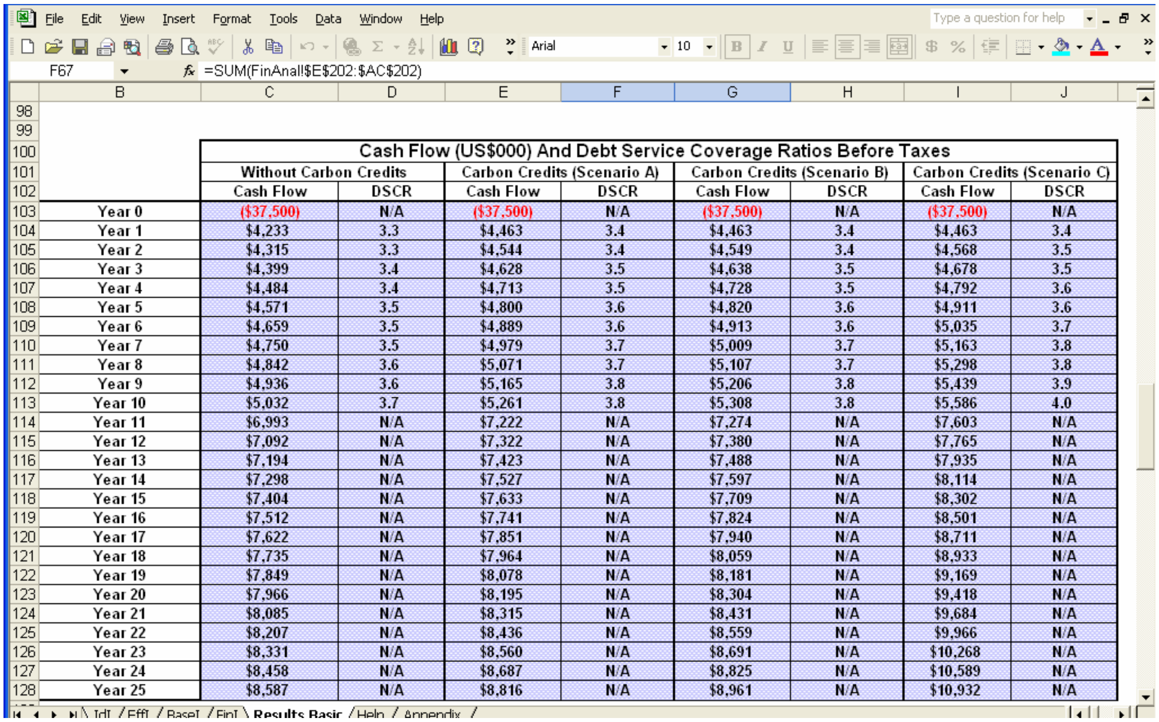


Financial Results -- Fabulous Cement Fabricators LTD

Required Capital	US$000				
	Year 0	Year 1	Year 2	Year 3	Year 4
Kilns	$ 63,000	$ -	$ -	$ -	$ -
Mills	$ 42,000	$ -	$ -	$ -	$ -
Grant/Subsidy	$ -	$ -	$ -	$ -	$ -
Avoided Investment	$ 55,000	$ -	$ -	$ -	$ -
Net Total	$ 50,000	$ -	$ -	$ -	$ -

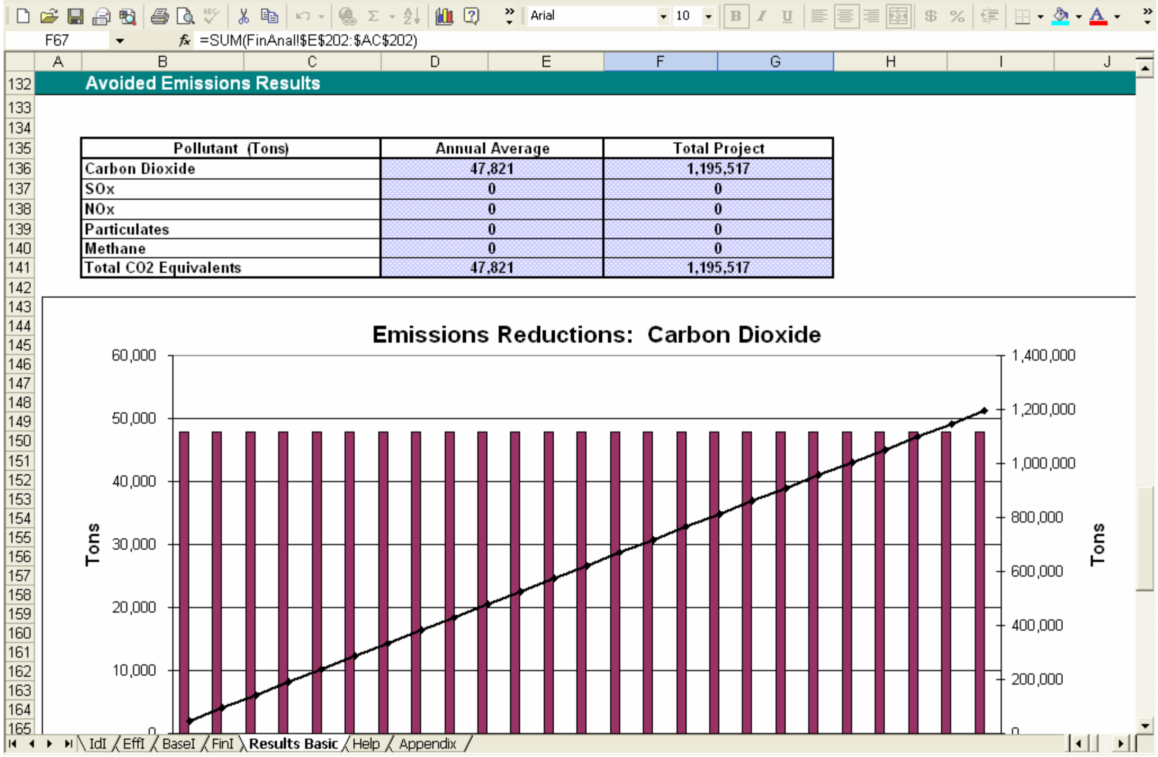
Financial Analysis	Before Taxes			After Taxes	
	Simple Payback Period	Net Present Value	Internal Rate of Return	Net Present Value	Internal Rate of Return
Scenario	Years	US$(000)	%	US$(000)	%
A: Carbon Credit Price $5/Ton Escalation 0%	8.4	$ 6,464	14.04%	$ 736	12.24%
B: Carbon Credit Price $5/Ton Escalation 2%	8.4	$ 6,749	14.12%	$ 1,021	12.33%
C: Carbon Credit Price $5/Ton Escalation 10%	8.3	$ 8,924	14.69%	$ 3,196	12.99%
Without Carbon Credits	8.7	$ 4,667	13.48%	$ (1,061)	11.65%

The net present value of the project, at a discount rate of 12%, ranges between $4,667,000 and $8,924,000 before taxes, and a net loss of $1,061,000 and a net gain of $3,196,000 after taxes. These values represent the project value without the sale of carbon emissions offsets and with the sale of carbon offsets at a price of $5/ton CO_2 escalating at a rate of 10% per year, respectively. The added net present value of carbon offsets at a price of $5/ ton CO_2 is between $1,797,000 and $4,257,000, depending on the annual increase in the amount received for the offsets.



Cash Flow (US$000) And Debt Service Coverage Ratios Before Taxes								
	Without Carbon Credits		Carbon Credits (Scenario A)		Carbon Credits (Scenario B)		Carbon Credits (Scenario C)	
	Cash Flow	DSCR	Cash Flow	DSCR	Cash Flow	DSCR	Cash Flow	DSCR
Year 0	($37,500)	N/A	($37,500)	N/A	($37,500)	N/A	($37,500)	N/A
Year 1	$4,233	3.3	$4,463	3.4	$4,463	3.4	$4,463	3.4
Year 2	$4,315	3.3	$4,544	3.4	$4,549	3.4	$4,568	3.5
Year 3	$4,399	3.4	$4,628	3.5	$4,638	3.5	$4,678	3.5
Year 4	$4,484	3.4	$4,713	3.5	$4,728	3.5	$4,792	3.6
Year 5	$4,571	3.5	$4,800	3.6	$4,820	3.6	$4,911	3.6
Year 6	$4,659	3.5	$4,889	3.6	$4,913	3.6	$5,035	3.7
Year 7	$4,750	3.5	$4,979	3.7	$5,009	3.7	$5,163	3.8
Year 8	$4,842	3.6	$5,071	3.7	$5,107	3.7	$5,298	3.8
Year 9	$4,936	3.6	$5,165	3.8	$5,206	3.8	$5,439	3.9
Year 10	$5,032	3.7	$5,261	3.8	$5,308	3.8	$5,586	4.0
Year 11	$6,993	N/A	$7,222	N/A	$7,274	N/A	$7,603	N/A
Year 12	$7,092	N/A	$7,322	N/A	$7,380	N/A	$7,765	N/A
Year 13	$7,194	N/A	$7,423	N/A	$7,488	N/A	$7,935	N/A
Year 14	$7,298	N/A	$7,527	N/A	$7,597	N/A	$8,114	N/A
Year 15	$7,404	N/A	$7,633	N/A	$7,709	N/A	$8,302	N/A
Year 16	$7,512	N/A	$7,741	N/A	$7,824	N/A	$8,501	N/A
Year 17	$7,622	N/A	$7,851	N/A	$7,940	N/A	$8,711	N/A
Year 18	$7,735	N/A	$7,964	N/A	$8,059	N/A	$8,933	N/A
Year 19	$7,849	N/A	$8,078	N/A	$8,181	N/A	$9,169	N/A
Year 20	$7,966	N/A	$8,195	N/A	$8,304	N/A	$9,418	N/A
Year 21	$8,085	N/A	$8,315	N/A	$8,431	N/A	$9,684	N/A
Year 22	$8,207	N/A	$8,436	N/A	$8,559	N/A	$9,966	N/A
Year 23	$8,331	N/A	$8,560	N/A	$8,691	N/A	$10,268	N/A
Year 24	$8,458	N/A	$8,687	N/A	$8,825	N/A	$10,589	N/A
Year 25	$8,587	N/A	$8,816	N/A	$8,961	N/A	$10,932	N/A

The cash flow is positive for all carbon offset price scenarios and all years except for the initial year of investment. The debt service credit ratio is above 1 for all carbon offset scenarios, indicating the availability of sufficient cash to make loan payments.



Avoided Emissions Results

Pollutant (Tons)	Annual Average	Total Project
Carbon Dioxide	47,821	1,195,517
SOx	0	0
NOx	0	0
Particulates	0	0
Methane	0	0
Total CO2 Equivalents	47,821	1,195,517

The total expected emissions reductions from this project are 1,195,517 tons of CO_2.

EXAMPLE 4: Cogeneration – Advanced Financial Analysis Example

Project Description:

Xmills, a sawmill located in ProFormland, plans to install a power plant at its site. The plant would take advantage of waste wood residues, using that biomass to cogenerate electricity and process steam. Currently wood residues are either burned or trucked to a nearby landfill. Xmills plans to purchase additional wood residues from other nearby mills, increasing the plant's generating capacity.

On average, Xmills operates 75% of the time and uses a total of 450 GJ000 of steam per year to process and dry wood. In the past this steam has been purchased, at a price of $2.0/GJ. Purchased steam is produced from wood residues at an energy conversion efficiency of 85%. Losses due to the transport and distribution of steam through pipes from the location of production to Xmills are 10%. Furthermore, Xmills consumes 6,570 MWh of electricity per year at a cost of $25/MWh. The utility that sells the electricity to Xmills reports 15% transmission and distribution losses for electricity. The electricity distributed by the local utility is produced using diesel generators that are 25% efficient.

The power plant to be installed has a capacity of 5 MW. It is expected that the plant will generate electricity at 60% of capacity. The steam turbine has an efficiency of 15.8% and the production of process steam has an efficiency of 90%.

The total cost of the power plant installation is $8.25 million. The mill will use 25% percent of the electricity generated by the plant on-site and the remainder will be sold to the local utility. Xmills will receive $15/MWh from the utility for the electricity and an additional $65/MWh from the government of ProFormland as a clean energy subsidy. Xmills estimates that it will need to purchase roughly one half of the wood residues needed to run this plant, at a cost of $2/GJ. Operation and maintenance costs will be $100,000 annually. The plant has an expected service life of 20 years.

Xmills will finance the project half with its own equity capital and half via a loan from the National Bank of ProFormland. The loan will be repaid in equal installments over a ten-year period at an interest rate of 10%. Xmills is subject to a 20% marginal income tax. The current market price for carbon emissions reductions offsets in ProFormland is $5/ton CO_2. The value of the reductions will most likely increase during the course of the project. Monitoring and verification costs for these reductions are $15,000 per year.

Yenergy, a nearby company, would like to partner with Xmills in this project. Yenergy is willing to provide 25% of the total installation costs, in the form of equity capital. In return, Yenergy will to receive a share of the annual profits. Yenergy has asked to receive 25% of the annual net income and 50% of the carbon emission reductions offsets.

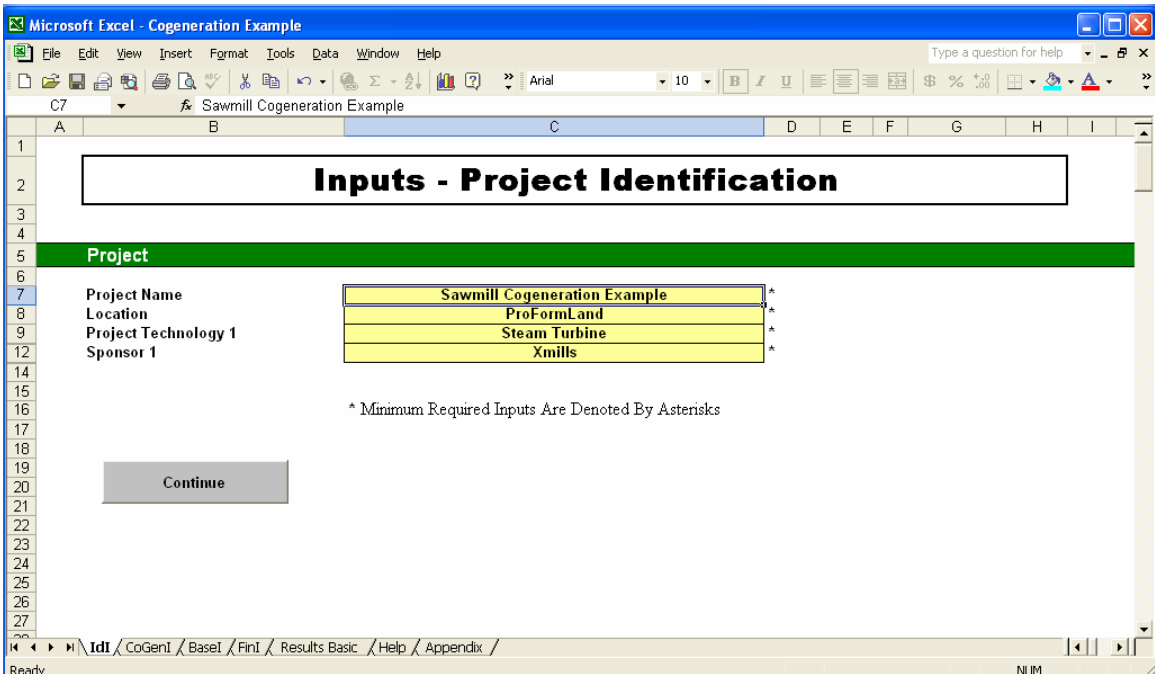
To Input and Analyze this Project:

From the Begin menu, save the project as "Cogeneration Example." Then, from the initial dialog boxes choose the following options: For project type, select "Cogeneration." Then choose the option "baseline steam is produced off-site." The project will be analyzed under two financing schemes. The project will first be analyzed from the perspective of Xmills as the sole investor. Select the option for "Basic" financial analysis. After the project has been analyzed as such, it will then be analyzed using an "Advanced" financial analysis to determine the financial returns if Xmills and Yenergy implement the project as a joint venture. This example will be analyzed in Basic User Mode.

Based on the options chosen in these dialog boxes, ProForm will then select the appropriate worksheets and rows necessary to analyze this type of project. The non-relevant worksheets will be hidden from view.

IdI: Inputs – Project Identification

After making choices from the initial dialog boxes, the "IdI" worksheet will appear on the screen. The name for this example project is "Sawmill Cogeneration Example." The project will be located in "ProFormland" and the project technology is "Steam Turbine." The project sponsor is "Xmills." After entering this information in the yellow input cells, click the "Continue" button. ProForm will check to ensure that all cells marked to the right with asterisks contain information and then will select the CogenI page.



Inputs - Project Identification

Project

Project Name: Sawmill Cogeneration Example *
Location: ProFormLand *
Project Technology 1: Steam Turbine *
Sponsor 1: Xmills *

* Minimum Required Inputs Are Denoted By Asterisks

CoGenI: Inputs – Cogeneration

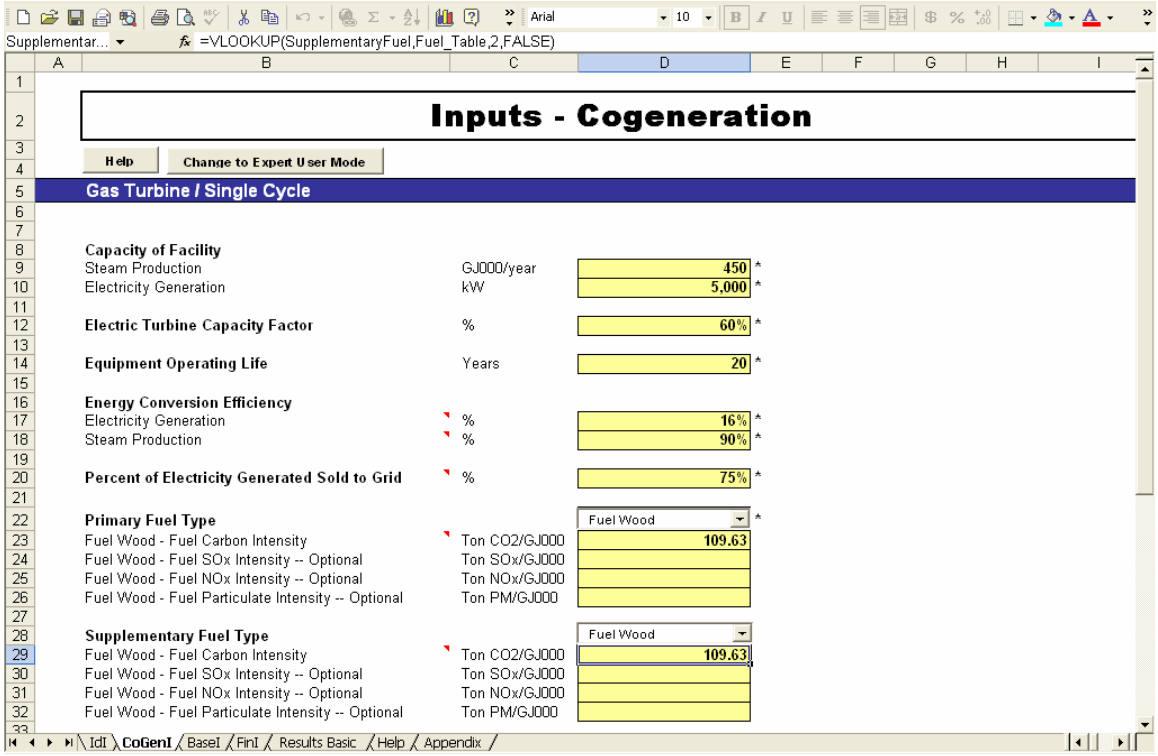
Details about the cogeneration technology to be installed are entered into ProForm on the cogeneration input sheet. The first information required concerns the capacity of the system. Steam capacity should be entered in terms of the total annual energy contained in the steam produced, in units of GJ000. This format may require the user to perform some calculations outside of ProForm, as often the energy contained in steam must be determined based on the pressure, temperature and weight of the steam vapor. Steam tables are available from a variety of sources to aid in this calculation. For this example project Xmills consumes, and thus requires, the production of 450 GJ000 of steam annually.

The electricity generating capacity of the steam turbine must also be input. ProForm calculates the amount of electricity produced based on the turbine capacity and a capacity factor input by the user. The power plant proposed is 5 MW and should be entered as 5000 kW. The capacity factor is 60%. The equipment operating life is 20 years.

The next inputs are the energy conversion efficiencies of both the electricity generation and the steam production. These efficiencies are used to calculate the amount of primary and secondary fuels necessary to produce the steam and electricity required by the project.

Primary fuel is the fuel needed to meet the project electricity requirements. ProForm takes the total amount of electricity that would be produced based on the plant capacity and the capacity factor and divides it by the electricity generation conversion efficiency to calculate the amount of primary fuel necessary. Supplementary fuel is the additional fuel needed to meet the steam requirements if the energy remaining in the steam after electricity generation is insufficient.

For this project, the electricity generation conversion efficiency is 15.8%. The steam production conversion efficiency is 90%. 75% of the electricity generated will be sold to the grid. Both primary and supplementary fuels are the mill's waste wood residues. The carbon intensity factors will be automatically filled in by ProForm if fuel wood is chosen from the fuel menus. Note that, although ProForm rounds 15.8% to 16% on the screen, 15.8% is the number that is used for the calculations.



Supplementar... =VLOOKUP(SupplementaryFuel,Fuel_Table,2,FALSE)

Inputs - Cogeneration

Gas Turbine / Single Cycle

Capacity of Facility			
Steam Production	GJ000/year	450	*
Electricity Generation	kW	5,000	*
Electric Turbine Capacity Factor	%	60%	*
Equipment Operating Life	Years	20	*
Energy Conversion Efficiency			
Electricity Generation	%	16%	*
Steam Production	%	90%	*
Percent of Electricity Generated Sold to Grid	%	75%	*
Primary Fuel Type		Fuel Wood	*
Fuel Wood - Fuel Carbon Intensity	Ton CO2/GJ000	109.63	
Fuel Wood - Fuel SOx Intensity -- Optional	Ton SOx/GJ000		
Fuel Wood - Fuel NOx Intensity -- Optional	Ton NOx/GJ000		
Fuel Wood - Fuel Particulate Intensity -- Optional	Ton PM/GJ000		
Supplementary Fuel Type		Fuel Wood	
Fuel Wood - Fuel Carbon Intensity	Ton CO2/GJ000	109.63	
Fuel Wood - Fuel SOx Intensity -- Optional	Ton SOx/GJ000		
Fuel Wood - Fuel NOx Intensity -- Optional	Ton NOx/GJ000		
Fuel Wood - Fuel Particulate Intensity -- Optional	Ton PM/GJ000		

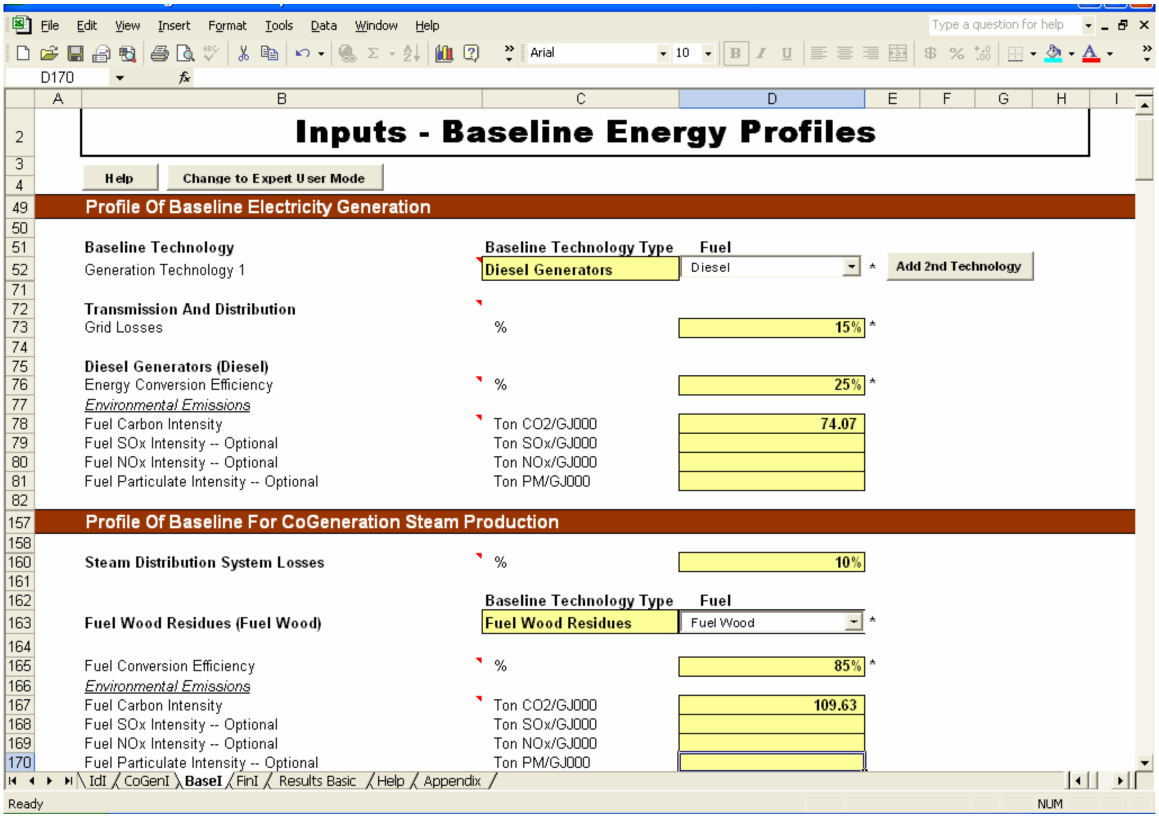
After entering information on the CoGenI page, click on the “Continue” button. ProForm will check to ensure that all yellow input cells marked to the right with asterisks contain information, and select the next data entry sheet.

BaseI: Inputs – Baseline Energy Profiles

The next sheet that will appear on the screen is “Inputs – Baseline Energy Profiles.” This sheet is used to input information regarding the existing energy infrastructure; or rather, business as usual in the absence of the project. The baseline energy profile is compared to the project energy profile both to calculate emissions reductions and to calculate revenues created by the sale of energy generated or by the energy cost savings from the proposed project. For cogeneration projects, two sections need to be filled in on the BaseI page. The first section profiles the baseline scenario for electricity generation. The second section profiles the baseline scenario for the production of process steam.

For this example project, baseline electricity is produced entirely with diesel generators. Enter “Diesel Generators” for baseline Generation Technology 1 and choose diesel from the fuel menu. Transmission and distribution losses are 15%. The diesel generators have an energy conversion efficiency of 25%. ProForm will automatically fill in the fuel carbon intensity factor of 74.07 tons CO_2/GJ000 when diesel is chosen from the fuel menu.

Currently Xmills purchases the process steam it uses rather than produce the steam internally. Thus for the baseline profile, the steam distribution losses must be input, as 10%. This steam is produced from fuel wood residues with an energy conversion efficiency of 85%.



Inputs - Baseline Energy Profiles

Profile Of Baseline Electricity Generation

Baseline Technology	**Baseline Technology Type**	**Fuel**
Generation Technology 1	Diesel Generators	Diesel *
Transmission And Distribution		
Grid Losses	%	15% *
Diesel Generators (Diesel)		
Energy Conversion Efficiency	%	25% *
Environmental Emissions		
Fuel Carbon Intensity	Ton CO2/GJ000	74.07
Fuel SOx Intensity -- Optional	Ton SOx/GJ000	
Fuel NOx Intensity -- Optional	Ton NOx/GJ000	
Fuel Particulate Intensity -- Optional	Ton PM/GJ000	

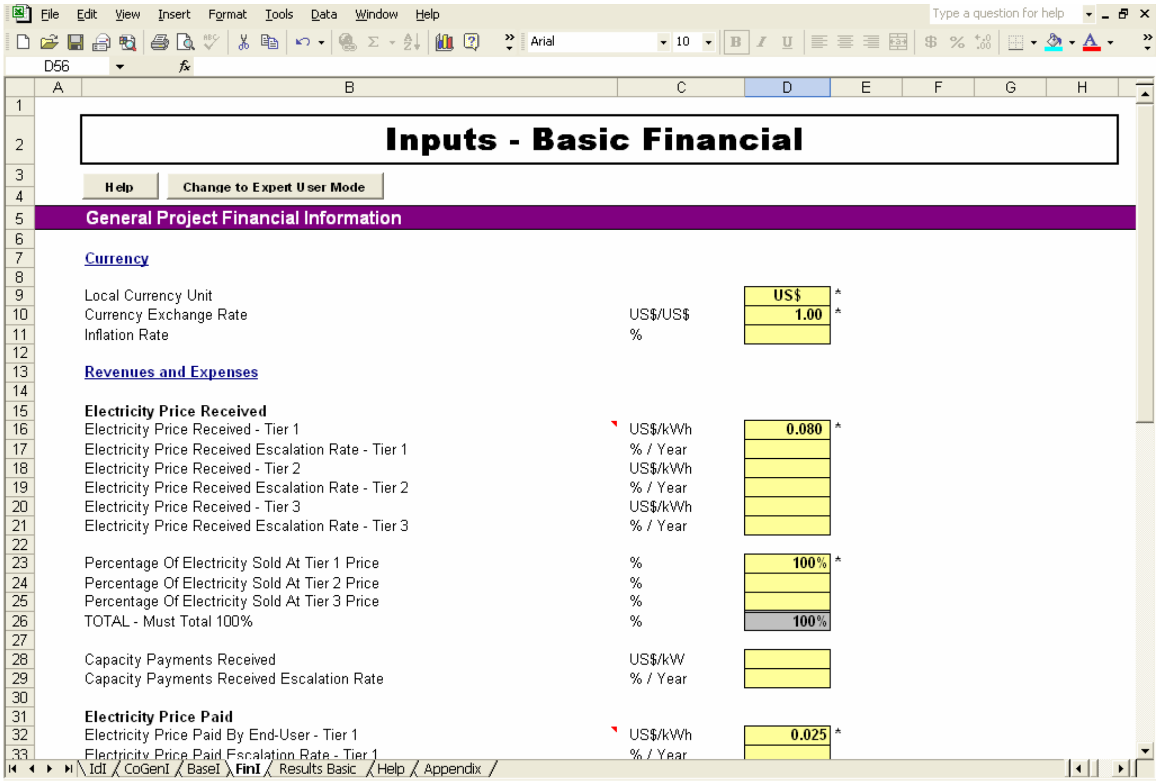
Profile Of Baseline For CoGeneration Steam Production

Steam Distribution System Losses	%	10%
	Baseline Technology Type	**Fuel**
Fuel Wood Residues (Fuel Wood)	Fuel Wood Residues	Fuel Wood *
Fuel Conversion Efficiency	%	85% *
Environmental Emissions		
Fuel Carbon Intensity	Ton CO2/GJ000	109.63
Fuel SOx Intensity -- Optional	Ton SOx/GJ000	
Fuel NOx Intensity -- Optional	Ton NOx/GJ000	
Fuel Particulate Intensity -- Optional	Ton PM/GJ000	

After entering information on the BaseI page, click on the “Continue” button. ProForm will check to ensure that all yellow input cells marked to the right with asterisks contain information, and will select the next data entry sheet.

FinI: Inputs – Basic Financial
The financial information available for this example project is in US dollars, thus the value 1 should be entered for the exchange rate.

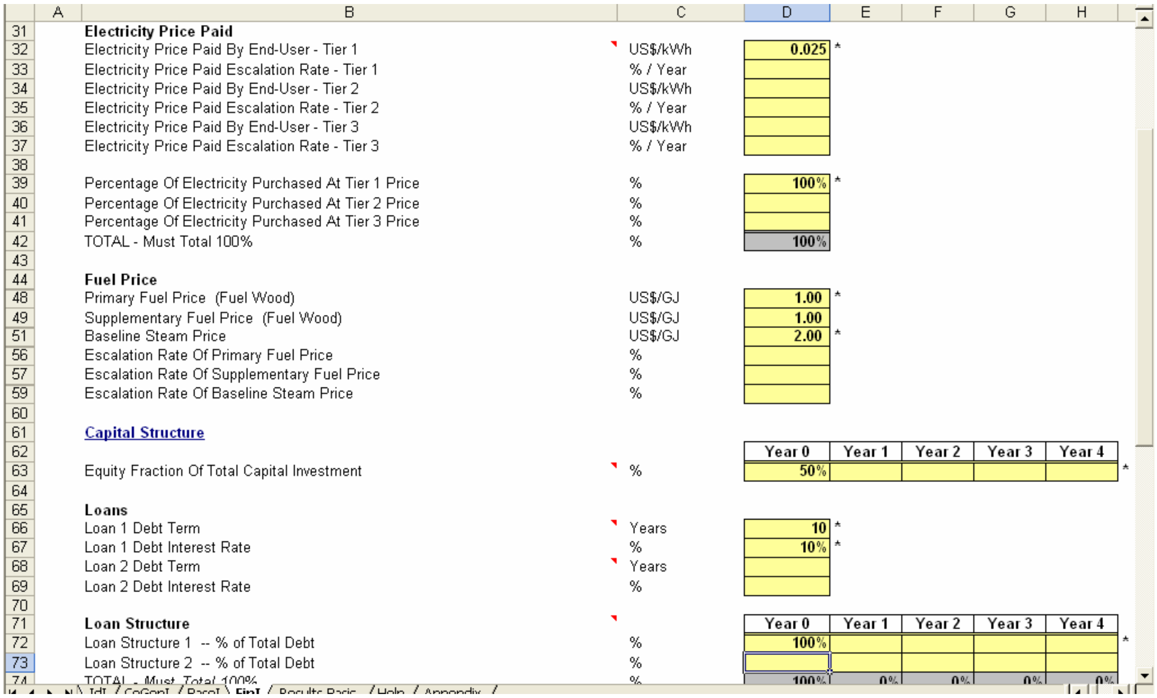
For the price received by Xmills for the sale of electricity, enter $0.08/kWh for electricity generated by the project (the combined price of $15/MWh from the utility and $65/MWh from the government subsidy converted to kWh). As it is a single price that will be received for all electricity sold, only the tier 1 electricity price will be entered and it will be allocated 100% in row 23. No capacity payments were mentioned in the project description, so that cell will be left blank. The price paid by Xmills previously to purchase electricity which, due to this project, will now be generated on-site, is necessary to calculate the electricity cost savings. Enter $0.025/kWh as the tier 1 price paid and allocate 100% to this tier in row 39.



Inputs - Basic Financial

	B	C	D
5	**General Project Financial Information**		
7	**Currency**		
9	Local Currency Unit		US$ *
10	Currency Exchange Rate	US$/US$	1.00 *
11	Inflation Rate	%	
13	**Revenues and Expenses**		
15	**Electricity Price Received**		
16	Electricity Price Received - Tier 1	US$/kWh	0.080 *
17	Electricity Price Received Escalation Rate - Tier 1	% / Year	
18	Electricity Price Received - Tier 2	US$/kWh	
19	Electricity Price Received Escalation Rate - Tier 2	% / Year	
20	Electricity Price Received - Tier 3	US$/kWh	
21	Electricity Price Received Escalation Rate - Tier 3	% / Year	
23	Percentage Of Electricity Sold At Tier 1 Price	%	100% *
24	Percentage Of Electricity Sold At Tier 2 Price	%	
25	Percentage Of Electricity Sold At Tier 3 Price	%	
26	TOTAL - Must Total 100%	%	100%
28	Capacity Payments Received	US$/kW	
29	Capacity Payments Received Escalation Rate	% / Year	
31	**Electricity Price Paid**		
32	Electricity Price Paid By End-User - Tier 1	US$/kWh	0.025 *
33	Electricity Price Paid Escalation Rate - Tier 1	% / Year	

Xmills will purchase some of the primary fuel required from other sawmills at a rate of $2/GJ. However, because half of the fuel will be provided free of charge via Xmill's own residuals, the cost of primary fuel should be entered as $1/GJ. All of the energy used in the project will be supplied from the waste wood residuals, thus the supplementary fuel costs are the same as the primary fuel costs.



	B	C	D	E	F	G	H
31	**Electricity Price Paid**						
32	Electricity Price Paid By End-User - Tier 1	US$/kWh	0.025 *				
33	Electricity Price Paid Escalation Rate - Tier 1	% / Year					
34	Electricity Price Paid By End-User - Tier 2	US$/kWh					
35	Electricity Price Paid Escalation Rate - Tier 2	% / Year					
36	Electricity Price Paid By End-User - Tier 3	US$/kWh					
37	Electricity Price Paid Escalation Rate - Tier 3	% / Year					
39	Percentage Of Electricity Purchased At Tier 1 Price	%	100% *				
40	Percentage Of Electricity Purchased At Tier 2 Price	%					
41	Percentage Of Electricity Purchased At Tier 3 Price	%					
42	TOTAL - Must Total 100%	%	100%				
44	**Fuel Price**						
48	Primary Fuel Price (Fuel Wood)	US$/GJ	1.00 *				
49	Supplementary Fuel Price (Fuel Wood)	US$/GJ	1.00				
51	Baseline Steam Price	US$/GJ	2.00 *				
56	Escalation Rate Of Primary Fuel Price	%					
57	Escalation Rate Of Supplementary Fuel Price	%					
59	Escalation Rate Of Baseline Steam Price	%					
61	**Capital Structure**						
62			Year 0	Year 1	Year 2	Year 3	Year 4
63	Equity Fraction Of Total Capital Investment	%	50%				*
65	**Loans**						
66	Loan 1 Debt Term	Years	10 *				
67	Loan 1 Debt Interest Rate	%	10% *				
68	Loan 2 Debt Term	Years					
69	Loan 2 Debt Interest Rate	%					
71	**Loan Structure**		Year 0	Year 1	Year 2	Year 3	Year 4
72	Loan Structure 1 -- % of Total Debt	%	100%				*
73	Loan Structure 2 -- % of Total Debt	%					
74	TOTAL - Must Total 100%	%	100%	0%	0%	0%	0%

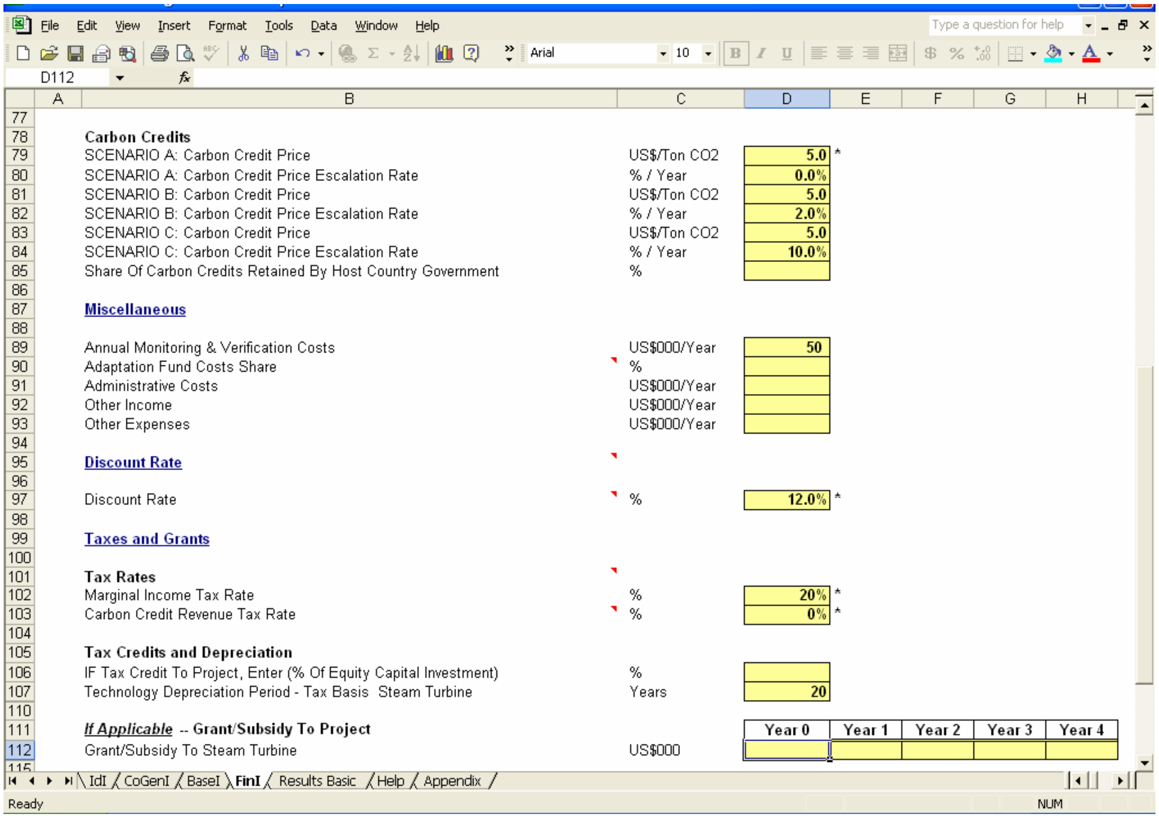
As Xmills will be producing its own process steam after implementation of this project, it will save on the cost of purchased steam. Baseline steam currently costs $2.0/GJ.

Under the Capital Structure heading, enter 50% for the portion of equity capital to be used. This loan is a 10-year loan with a 10% interest rate. As there is only one loan, allocate 100% to the portion of the debt that will be financed by loan 1.

For carbon emission reduction offset price, enter $5. To determine how different rates of increase in the value of these offsets will affect project finances, analyze the project with carbon offset price escalation rates of 0%, 2%, and 10%. The annual monitoring and verification costs are $50,000. The units are US$000, so enter 50.

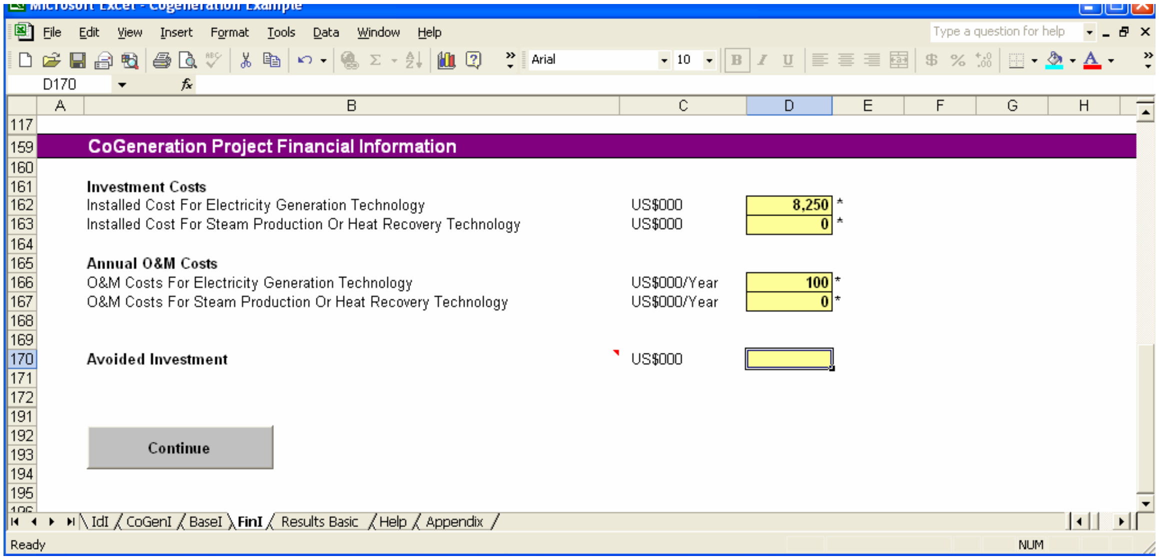
No information has been provided with respect to other comparable investments that Xmills could make instead of this project. Thus, the project will be analyzed using a discount rate of 12%. This rate may be adjusted later if more information becomes available.

Enter 20% for the marginal tax rate and 0% for the carbon offset revenue tax rate, as carbon offsets will not be taxed. Xmills will depreciate the power plant over the entire 20 years of its useful operating life.



	A	B	C	D	E	F	G	H
77								
78		**Carbon Credits**						
79		SCENARIO A: Carbon Credit Price	US$/Ton CO2	**5.0**	*			
80		SCENARIO A: Carbon Credit Price Escalation Rate	% / Year	**0.0%**				
81		SCENARIO B: Carbon Credit Price	US$/Ton CO2	**5.0**				
82		SCENARIO B: Carbon Credit Price Escalation Rate	% / Year	**2.0%**				
83		SCENARIO C: Carbon Credit Price	US$/Ton CO2	**5.0**				
84		SCENARIO C: Carbon Credit Price Escalation Rate	% / Year	**10.0%**				
85		Share Of Carbon Credits Retained By Host Country Government	%					
86								
87		**Miscellaneous**						
88								
89		Annual Monitoring & Verification Costs	US$000/Year	**50**				
90		Adaptation Fund Costs Share	%					
91		Administrative Costs	US$000/Year					
92		Other Income	US$000/Year					
93		Other Expenses	US$000/Year					
94								
95		**Discount Rate**						
96								
97		Discount Rate	%	**12.0%**	*			
98								
99		**Taxes and Grants**						
100								
101		**Tax Rates**						
102		Marginal Income Tax Rate	%	**20%**	*			
103		Carbon Credit Revenue Tax Rate	%	**0%**	*			
104								
105		**Tax Credits and Depreciation**						
106		IF Tax Credit To Project, Enter (% Of Equity Capital Investment)	%					
107		Technology Depreciation Period - Tax Basis Steam Turbine	Years	**20**				
110								
111		***If Applicable*** -- **Grant/Subsidy To Project**		**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**
112		Grant/Subsidy To Steam Turbine	US$000					

The total project investment costs are $8.25 million. This can be divided into two parts: the costs for installation of electricity generation and the costs for installation of heat recovery equipment. Since information is not provided as to what portion of the total investment costs comes from which part of the cogeneration system, the total costs can be entered for the electricity generation technology costs and zero can be entered for the heat recovery technology costs. The same is true of operation and maintenance costs, which are $100,000 annually. As the units are US$000, these should be entered as 8,250 and 100 respectively. Also note that, because the steam cost input cells are required, zeros must be entered instead of leaving them blank.



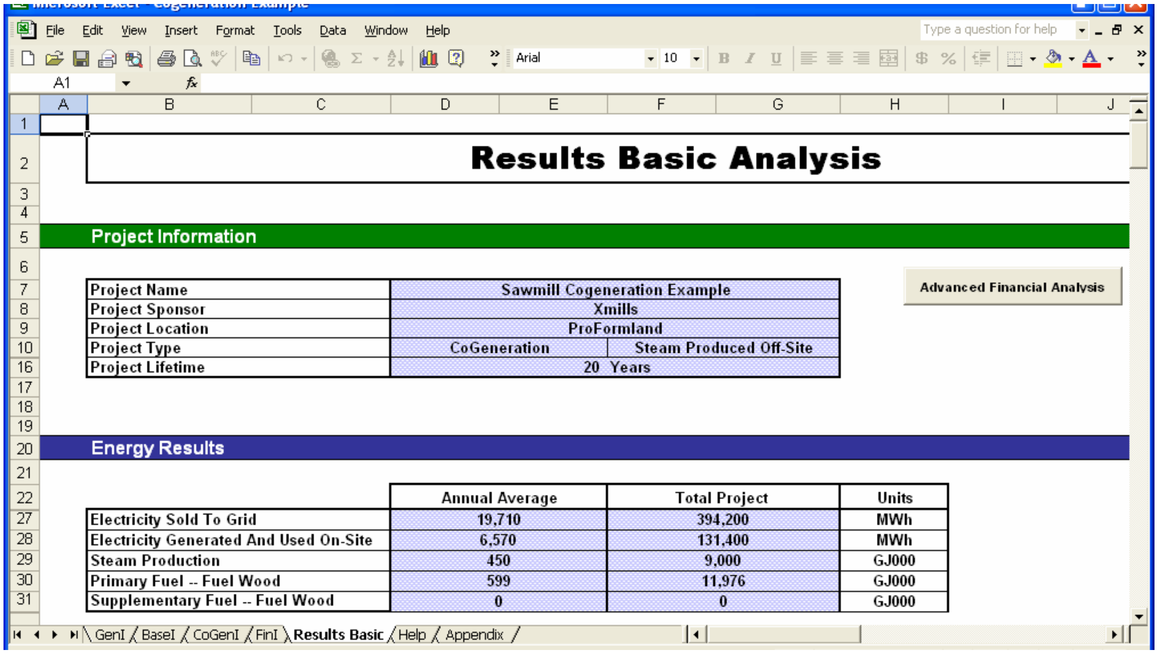
CoGeneration Project Financial Information

Investment Costs			
Installed Cost For Electricity Generation Technology	US$000	8,250	*
Installed Cost For Steam Production Or Heat Recovery Technology	US$000	0	*
Annual O&M Costs			
O&M Costs For Electricity Generation Technology	US$000/Year	100	*
O&M Costs For Steam Production Or Heat Recovery Technology	US$000/Year	0	*
Avoided Investment	US$000		

After entering information on the FinI page, click on the “Continue” button. ProForm will check to ensure that all yellow input cells marked to the right with asterisks contain information. It will then save the workbook to the computer and show the results of the analysis.

Results Basic

The results page summarizes the outcome of the ProForm analysis in terms of energy, finances, and emissions. The first section presents the project identification information. Immediately below is a table containing the results of the energy analysis. Xmills will be able to sell 394 GWh of electricity during its operating life and will save on the purchase of an additional 131 GWh. To do so it will use 11,976 GJ000 of waste wood residues.



Results Basic Analysis

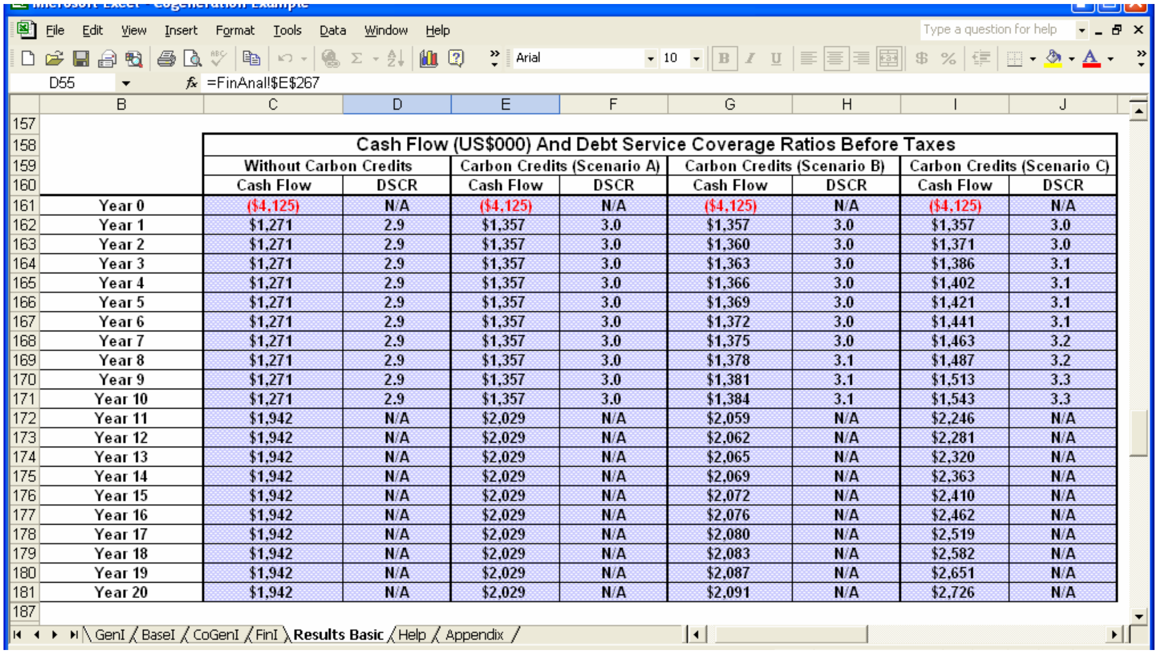
Project Information

Project Name	Sawmill Cogeneration Example	
Project Sponsor	Xmills	
Project Location	ProFormland	
Project Type	CoGeneration	Steam Produced Off-Site
Project Lifetime	20 Years	

Energy Results

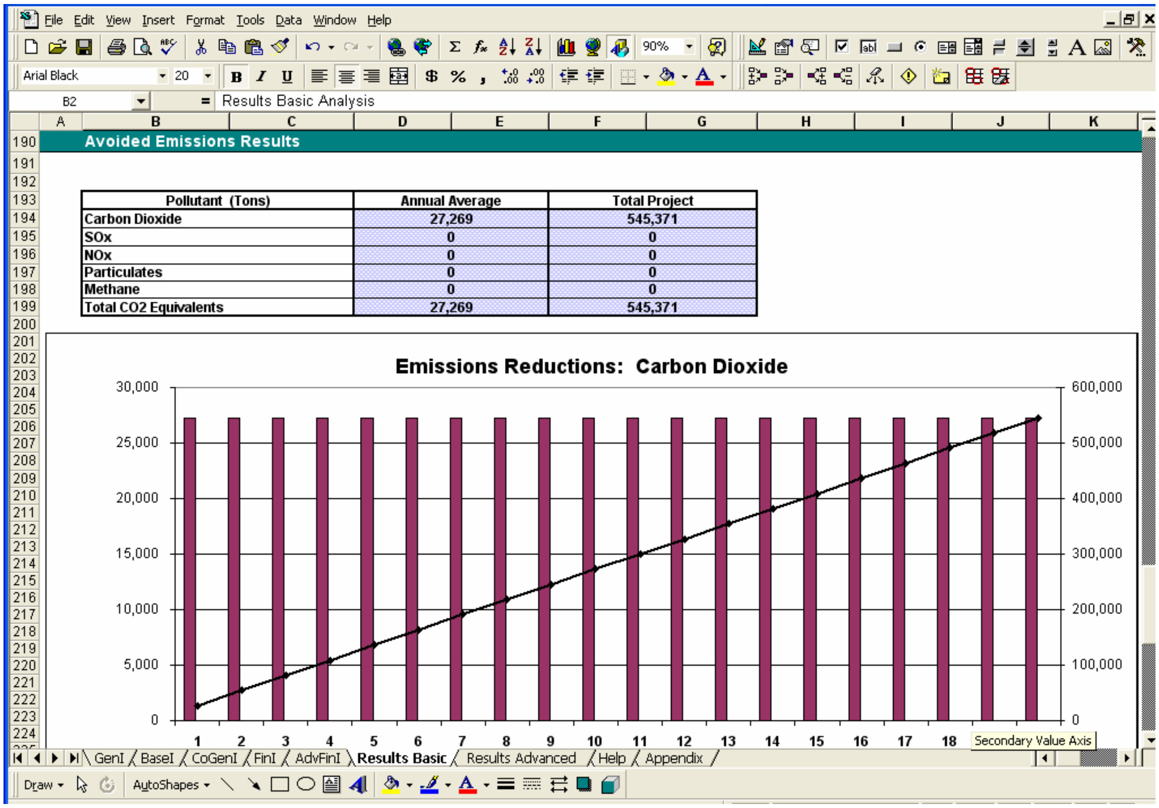
	Annual Average	Total Project	Units
Electricity Sold To Grid	19,710	394,200	MWh
Electricity Generated And Used On-Site	6,570	131,400	MWh
Steam Production	450	9,000	GJ000
Primary Fuel -- Fuel Wood	599	11,976	GJ000
Supplementary Fuel -- Fuel Wood	0	0	GJ000

The project will cost Xmills a total of $8.25 million with a simple payback period of 5.2 years if carbon emission reduction offsets are not sold, and a payback period of 4.9 years if carbon emission reduction offsets are sold at $5/ton CO_2 for all three increase rates. The NPV of the project is increased significantly by the value of carbon offsets. At the discount rate of 12%, the NPV is approximately $6.6 million without carbon offsets, and $8.3 million for the sale of carbon offsets at their highest evaluated value.



	Cash Flow (US$000) And Debt Service Coverage Ratios Before Taxes							
	Without Carbon Credits		Carbon Credits (Scenario A)		Carbon Credits (Scenario B)		Carbon Credits (Scenario C)	
	Cash Flow	DSCR	Cash Flow	DSCR	Cash Flow	DSCR	Cash Flow	DSCR
Year 0	($4,125)	N/A	($4,125)	N/A	($4,125)	N/A	($4,125)	N/A
Year 1	$1,271	2.9	$1,357	3.0	$1,357	3.0	$1,357	3.0
Year 2	$1,271	2.9	$1,357	3.0	$1,360	3.0	$1,371	3.0
Year 3	$1,271	2.9	$1,357	3.0	$1,363	3.0	$1,386	3.1
Year 4	$1,271	2.9	$1,357	3.0	$1,366	3.0	$1,402	3.1
Year 5	$1,271	2.9	$1,357	3.0	$1,369	3.0	$1,421	3.1
Year 6	$1,271	2.9	$1,357	3.0	$1,372	3.0	$1,441	3.1
Year 7	$1,271	2.9	$1,357	3.0	$1,375	3.0	$1,463	3.2
Year 8	$1,271	2.9	$1,357	3.0	$1,378	3.1	$1,487	3.2
Year 9	$1,271	2.9	$1,357	3.0	$1,381	3.1	$1,513	3.3
Year 10	$1,271	2.9	$1,357	3.0	$1,384	3.1	$1,543	3.3
Year 11	$1,942	N/A	$2,029	N/A	$2,059	N/A	$2,246	N/A
Year 12	$1,942	N/A	$2,029	N/A	$2,062	N/A	$2,281	N/A
Year 13	$1,942	N/A	$2,029	N/A	$2,065	N/A	$2,320	N/A
Year 14	$1,942	N/A	$2,029	N/A	$2,069	N/A	$2,363	N/A
Year 15	$1,942	N/A	$2,029	N/A	$2,072	N/A	$2,410	N/A
Year 16	$1,942	N/A	$2,029	N/A	$2,076	N/A	$2,462	N/A
Year 17	$1,942	N/A	$2,029	N/A	$2,080	N/A	$2,519	N/A
Year 18	$1,942	N/A	$2,029	N/A	$2,083	N/A	$2,582	N/A
Year 19	$1,942	N/A	$2,029	N/A	$2,087	N/A	$2,651	N/A
Year 20	$1,942	N/A	$2,029	N/A	$2,091	N/A	$2,726	N/A

The cash flow from the project is positive for all years except year 0, when the initial investment is incurred. Furthermore, the DSCR is greater than one, indicating there is sufficient cash flow to make debt payments each year. The project is expected to reduce carbon dioxide emissions by a total of 545 thousand metric tons.



Avoided Emissions Results

Pollutant (Tons)	Annual Average	Total Project
Carbon Dioxide	27,269	545,371
SOx	0	0
NOx	0	0
Particulates	0	0
Methane	0	0
Total CO2 Equivalents	27,269	545,371

Two-Sponsor Analysis

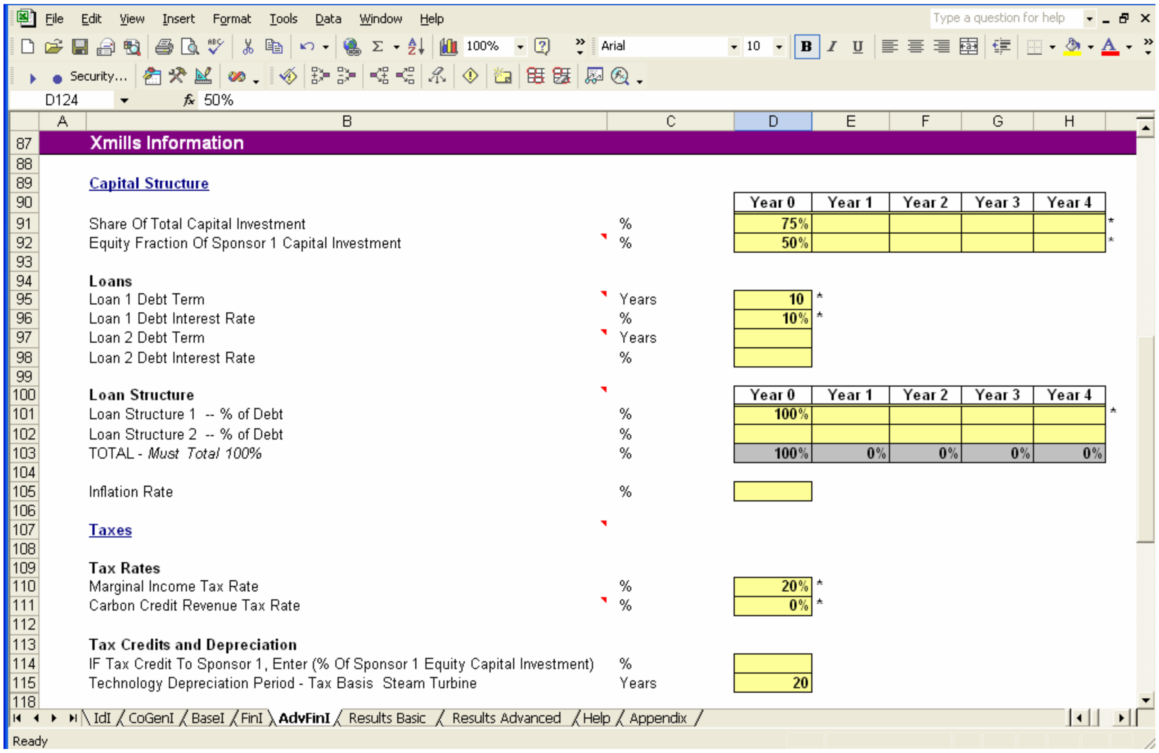
The results displayed on the Results Basic page are the financial returns of the project were Xmills to be the sole project sponsor. However, Xmills is also considering the possibility of implementing the project as a joint venture with Yenergy. To determine the project returns if such a partnership were to be formed, an Advanced Financial Analysis should be performed. On the Results Basic page, at the top right hand side of the screen is a gray button entitled “Advanced Financial Analysis.” After clicking on this button, a dialog box will appear inquiring the name of the second project sponsor. Enter “Yenergy” in this box. ProForm then automatically enters the sponsor’s name on the IdI page and displays the AdvFinI worksheet on the screen.

AdvFinI: Inputs – Advanced Financial

The Advanced Financial input page contains all of the same input cells as the basic financial analysis. However, in addition, the page allows for the concurrent analysis of finances for two project sponsors. This option is best for use when both project developers have an equity stake in the investment and will be splitting the net income and carbon offset revenues. The user must allocate the share of the total capital investment, the share of the net income before taxes, the share of the carbon emissions reductions offsets, and the share of the avoided investment (when appropriate) between the two project sponsors. ProForm will analyze project returns to both sponsors, allowing each to have potentially different tax and inflation rates. Furthermore, the project will be analyzed for each sponsor using the appropriate discount rates and loan conditions for that sponsor.

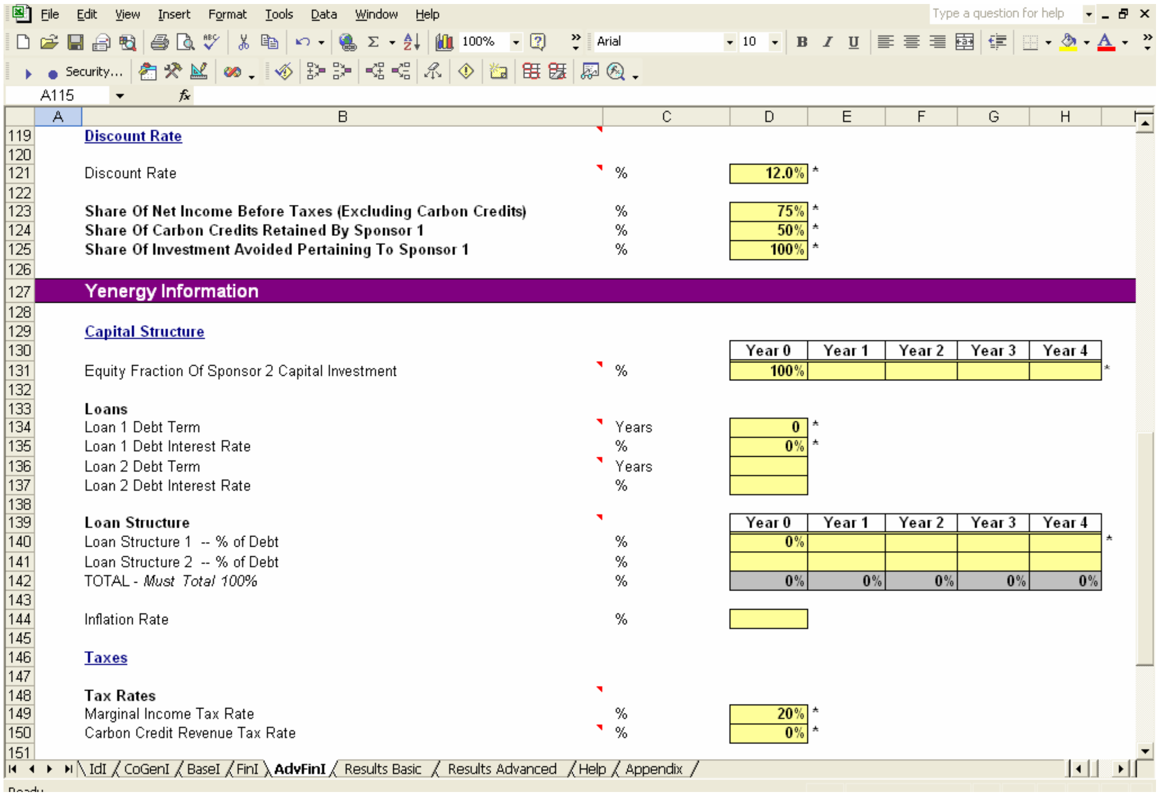
For this analysis, ProForm has automatically entered the information concerning the currency, energy sales prices, energy savings prices, carbon emissions offsets, and investment costs from their values on the FinI page. Scroll down through the first section to the section labeled “Xmills Information.” As Yenergy has offered to provide 25% of the investment costs, enter 75% for the share of the total investment costs pertaining to Xmills. We will assume that the equity portion of Xmills investment will remain 50%, with one loan providing 100% of the debt. That loan will be repaid over 10 years with a 10% interest rate. The taxes, depreciation, and discount rates will be the same as used to analyze the project with Xmills as the sole sponsor.

The agreement between Xmills and Yenergy is that Xmills will retain 75% of the net income and only 50% of the carbon offsets. The investment avoided by this project will pertain 100% to Xmills. However, as no avoided investment costs were indicated in the project description, this calculation will not affect the project finances.



	A	B	C	D	E	F	G	H	
87		**Xmills Information**							
88									
89		**Capital Structure**							
90				**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	
91		Share Of Total Capital Investment	%	75%					*
92		Equity Fraction Of Sponsor 1 Capital Investment	%	50%					*
93									
94		**Loans**							
95		Loan 1 Debt Term	Years	10	*				
96		Loan 1 Debt Interest Rate	%	10%	*				
97		Loan 2 Debt Term	Years						
98		Loan 2 Debt Interest Rate	%						
99									
100		**Loan Structure**		**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	
101		Loan Structure 1 -- % of Debt	%	100%					*
102		Loan Structure 2 -- % of Debt	%						
103		TOTAL - *Must Total 100%*	%	100%	0%	0%	0%	0%	
104									
105		Inflation Rate	%						
106									
107		**Taxes**							
108									
109		**Tax Rates**							
110		Marginal Income Tax Rate	%	20%	*				
111		Carbon Credit Revenue Tax Rate	%	0%	*				
112									
113		**Tax Credits and Depreciation**							
114		IF Tax Credit To Sponsor 1, Enter (% Of Sponsor 1 Equity Capital Investment)	%						
115		Technology Depreciation Period - Tax Basis Steam Turbine	Years	20					
118									

Yenergy will finance its portion of the project with 100% equity. Enter zeros for % of Debt in Loan 1, Debt Term and Debt Interest Rate (these cells are required and cannot simply be left blank). Yenergy is subject to the same tax rate and will depreciate its portion of the power plant on the same schedule as Xmills. Enter 20% for the marginal income tax rate, 0% for the carbon offset revenue tax rate, and 20 years for the depreciation period. Analyze the project using a discount rate of 12% for Yenergy.



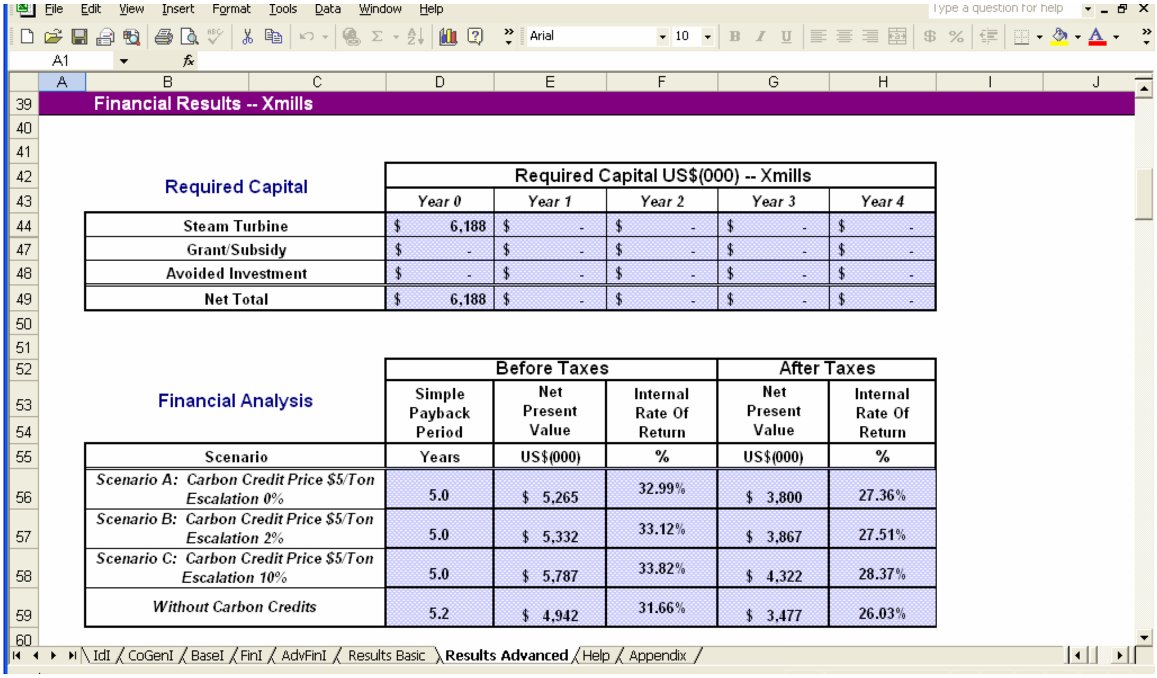
	A	B	C	D	E	F	G	H
119		**Discount Rate**						
120								
121		Discount Rate	%	12.0% *				
122								
123		**Share Of Net Income Before Taxes (Excluding Carbon Credits)**	%	75% *				
124		**Share Of Carbon Credits Retained By Sponsor 1**	%	50% *				
125		**Share Of Investment Avoided Pertaining To Sponsor 1**	%	100% *				
126								
127		**Yenergy Information**						
128								
129		**Capital Structure**						
130				Year 0	Year 1	Year 2	Year 3	Year 4
131		Equity Fraction Of Sponsor 2 Capital Investment	%	100%				*
132								
133		**Loans**						
134		Loan 1 Debt Term	Years	0 *				
135		Loan 1 Debt Interest Rate	%	0% *				
136		Loan 2 Debt Term	Years					
137		Loan 2 Debt Interest Rate	%					
138								
139		**Loan Structure**		Year 0	Year 1	Year 2	Year 3	Year 4
140		Loan Structure 1 -- % of Debt	%	0%				*
141		Loan Structure 2 -- % of Debt	%					
142		TOTAL - *Must Total 100%*	%	0%	0%	0%	0%	0%
143								
144		Inflation Rate	%					
145								
146		**Taxes**						
147								
148		**Tax Rates**						
149		Marginal Income Tax Rate	%	20% *				
150		Carbon Credit Revenue Tax Rate	%	0% *				
151								

After entering information on the AdvFinI page, click on the "Continue" button. ProForm will check to ensure that all yellow input cells marked to the right with asterisks contain information. It will then save the workbook to the computer and show the results of the analysis on the Results Advanced worksheet.

Results Advanced

The Results Advanced page is structured in the same format as the Results Basic Page. The first two sections list the general project information and the total project energy output and savings. Next, for each sponsor, the required capital, simple payback period, net present values, internal rates of return, cash flows and debt service coverage ratios are calculated. The results for sponsor #1 are listed first and then, below them, are the results for sponsor #2. The final section presents the total project avoided emissions.

By entering into this project as a joint venture, Xmills reduces the amount of capital it needs to invest in the project by \$2.06 million—from \$8.25 million to \$6.19 million. However, under the terms defined, Xmills also receives only a portion of the project net income. Thus the project profitability is also reduced from the point of view of Xmills. The NPV is reduced to \$4.9 million without the sale of carbon emissions reduction offsets, and \$5.8 million with the sale of carbon offsets at a price of \$5/ton CO_2 increasing at a rate of 10%/year. The IRR remains the same for the scenario without the sale of carbon offsets, but decreases slightly for the carbon offsets scenarios because a percentage of the profits received from the offsets is instead distributed to Yenergy.



Financial Results -- Xmills

Required Capital

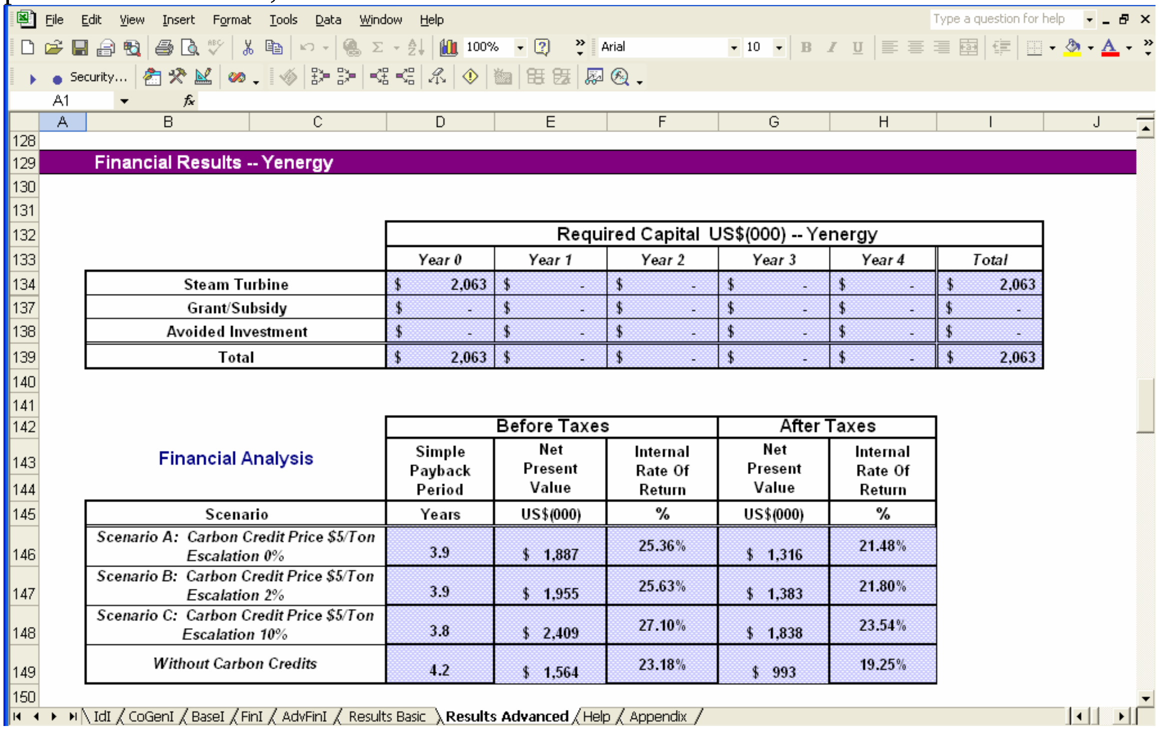
	Required Capital US\$(000) -- Xmills				
	Year 0	*Year 1*	*Year 2*	*Year 3*	*Year 4*
Steam Turbine	\$ 6,188	\$ -	\$ -	\$ -	\$ -
Grant/Subsidy	\$ -	\$ -	\$ -	\$ -	\$ -
Avoided Investment	\$ -	\$ -	\$ -	\$ -	\$ -
Net Total	\$ 6,188	\$ -	\$ -	\$ -	\$ -

Financial Analysis

	Before Taxes			After Taxes	
	Simple Payback Period	Net Present Value	Internal Rate Of Return	Net Present Value	Internal Rate Of Return
Scenario	Years	US\$(000)	%	US\$(000)	%
Scenario A: Carbon Credit Price \$5/Ton Escalation 0%	5.0	\$ 5,265	32.99%	\$ 3,800	27.36%
Scenario B: Carbon Credit Price \$5/Ton Escalation 2%	5.0	\$ 5,332	33.12%	\$ 3,867	27.51%
Scenario C: Carbon Credit Price \$5/Ton Escalation 10%	5.0	\$ 5,787	33.82%	\$ 4,322	28.37%
Without Carbon Credits	5.2	\$ 4,942	31.66%	\$ 3,477	26.03%

Yenergy would invest $2.06 million dollars in this project and expect to break even on that investment in 3.8–4.2 years, depending on the price of carbon emission reduction offsets. The before-tax IRR is 23.2% without the sale of carbon offsets, and 27.1% with the sale of carbon offsets at a price of $5/ton increasing at a rate of 10% per year. From the perspective of Yenergy, the project's return depends more on the price received for carbon offsets than for Xmills, because although Yenergy receives 25% of the net income generated by the sale of electricity and steam production savings, it receives 50% of the carbon emissions offsets.

In general, under the conditions listed above, the project is more profitable to Xmills as a single sponsor. However, other factors, such as the availability of capital and other possible investments, must also be considered.



Financial Results -- Yenergy

	Required Capital US$(000) -- Yenergy					
	Year 0	Year 1	Year 2	Year 3	Year 4	Total
Steam Turbine	$ 2,063	$ -	$ -	$ -	$ -	$ 2,063
Grant/Subsidy	$ -	$ -	$ -	$ -	$ -	$ -
Avoided Investment	$ -	$ -	$ -	$ -	$ -	$ -
Total	$ 2,063	$ -	$ -	$ -	$ -	$ 2,063

Financial Analysis

	Before Taxes			After Taxes	
	Simple Payback Period	Net Present Value	Internal Rate Of Return	Net Present Value	Internal Rate Of Return
Scenario	Years	US$(000)	%	US$(000)	%
Scenario A: Carbon Credit Price $5/Ton Escalation 0%	3.9	$ 1,887	25.36%	$ 1,316	21.48%
Scenario B: Carbon Credit Price $5/Ton Escalation 2%	3.9	$ 1,955	25.63%	$ 1,383	21.80%
Scenario C: Carbon Credit Price $5/Ton Escalation 10%	3.8	$ 2,409	27.10%	$ 1,838	23.54%
Without Carbon Credits	4.2	$ 1,564	23.18%	$ 993	19.25%

For Further Assistance

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