PROJECT SPECIFIC APPROACHES

1. Investor Analysis

Task	Method	Data Requirements	Tool Requirements	Comments
1. Identify the Least Cost Reference Case	1. Identify the Objective of the CDM project.	• For example, a common objectives will be to increase national electricity production whilst lowing GHG emissions per MWh.	Word processing	The strengths of this approach are: • Accurate if emission reduction evaluation is done after project has been established. • Investor friendly The weaknesses of this approach are: • Uncertainty for the investor if emissions are evaluated after the project has been constructed • Can be difficult to get data on private investments.
	2. List all alternatives for achieving the same objectives using different methods. Alternatives need not exist in the country. Based on opinion.	• Identify type of Technology/project[1] • Identify the Efficiency • Note how will achieve the same objectives as CDM project.	Excel spreadsheet to calculate NPV (recommended)	
	3. Determine the financial viability of each alternative and select the best performing alternative.	• List the IRR for each technology or project. **The IRR is the discount rate that makes the present value of the investment's costs and payoffs add up to 0.**	INCA can calculate NPV for power plant investments (option).	
	4. Select the project with best Internal Rate of Return (IRR). [Other methods such as Net Present Value (NPV) can be used if preferred, however it is customary to identify the best alternative using IRR.]	• The best IRR is usually the investment where the discount factor that reduces the net present value to zero is the highest.		
2. Calculate GHG emissions from reference project/technology.	Calculate GHG emissions from the plant or project	• Note emissions from transportation of fuels, from import of fuels etc...Try to account for emissions that occur directly and indirectly (e.g. Leakage + Production) in terms of emissions of t CO2 equivalent per MWh If leakage can not be calculated explain why.	Excel spreadsheet (recommended)	Note that all GHG emissions can be converted to CO2 equivalent according to the impact on greenhouse warming. E.g. Since CH4 is approximately 20 times more damaging than CO2, CH4 can be converted into CO2 equivalent by multiplying the quantity of multiply CO2 by 20.
	Multiply the annual generation of CO_2 equivalent emissions (noting, where possible, leakage) with the specific emission of the most feasible technology/plant. (If not known, the specific emission can be calculated from the specific emission of the fuels (related to the calorific value)	• The annual generation of energy refers to the generation of electricity for the technology over a year. (i.e. Note that this will be affected by how often the plant will run, since few plants generate electricity 24 hours a day for all the days in a year). Annual emissions can be calculated by multiplying the no. of MWh expected to be generated per year by the quantity of CO_2 equivalent produced per MWh.		

[1] For Investor Analysis the data requirements are the same for rural electrification projects, renewable energy projects and energy efficiency projects.

	divided be the efficiency of the plant.		
3. Calculate GHG emissions from CDM project or technology	Give short description of project	• Identify fuel inputs, outputs • Give start date when operations begin.	RES (Recommended.)
	If project already constructed measure real CO2 emissions if not calculate emissions per MWh with reference to fuel emissions and technology efficiency.	• *For constructed project /technology* – Measure daily CO2 emissions per MWh • *For unconstructed project / technology*- Estimate emissions by using CO2e emissions factors for fuels used (e.g. coal, oil, gas etc) and multiply these by the efficiency of the specific technology used to give the GHG emissions per MWh.	
	Calculate how many CO2 e emissions per year.	• Give expected annual production of electricity in MWh • Calculate expected emissions per year by multiplying the no. of MWh per year by the amount of GHG emissions expected per MWh	
4. Calculate No. of Credits for CDM project	Identify whether the CDM project results in a reduction of emissions compared to the reference case.	• Subtract the number total annual CO_2 equivalent emissions from CDM project. Convert into credits using : 1 ton CO2 reduced = 1 credit.	

2. *Marginal Plant or Control Group Baseline*

Task	Method	Data Requirements	Tool Requirements	Comments
1. Identify feasible Control or groups marginal plant	First identify potential marginal plants or control groups (must exist or be in operation at the same time as the CDM project) by answering the question: what technology or power plant type would be used if the CDM project does not occur?	• *Rural electrification projects* an example of marginal technology might be lighting, communication such as radio/TV or cooling). It is recommended that a common technology used by rural communities for energy needs is used for these projects. • *Renewable energy projects* selection of a marginal technology depends if the CDM renewable energy project will be grid connected or not. If it is connected to the grid than a marginal plant could be a common grid connected power plant (average, worst / best existing plant, best available technology), but in the instance that the project is off grid, the marginal technology will be one that is used to supply energy to rural households diesel generator (see above) • *Energy Efficiency Projects T*he marginal plant must be off grid if the energy efficiency project is in an off grid application but must be grid connected if the CDM project is grid connected. Additionally, energy efficiency projects usually improve existing technologies and therefore the marginal plant or control group could be the same type of technology in the CDM project but without energy efficiency improvements.		Strengths • Considers existing technology Weaknesses • Sometimes difficult to find data (e.g. electricity grid system)
2 Justify control group or marginal plant selection	Provide evidence that the conditions the marginal or control group / plant / technology operates under are the same as the conditions that the CDM project operates under.	• Provide data that confirms the regulatory framework governing marginal plant and CDM project is the same. • Identify consumers of energy for marginal plant and CDM project. Provide data that confirms that the factors that affect consumption patterns are the same. • Economic situation (e.g. economic factors that might affect GHG emissions)		
3. Calculate CO2 equivalent emissions from marginal plant or control group.	Describe process and identify fuel inputs and outputs in the marginal group or control group. Estimate emissions and if possible any leakage that the project might generate.	• Fuel inputs • Fuel outputs • Identity of technology components and efficiencies • Note GHG emissions resulting from electricity generation (e.g. when fuel is combusted) in t CO2/MWh . Consider leakage i.e. emissions resulting from the import of fuels etc. If data for calculating leakage is not available indicate why.	Recommend an RES flow chart. MESAP can store all this data and calculate total CO2 emissions (optional). MESAP data	.

	Sum all emissions of CO2 equivalent gases to give a total per MWh. Calculate how much CO2 is emitted annually.	• Give total emissions of CO2 e per MWh in terms of tonnes of CO2e per MWh. • Identify the annual production of energy for the technology or project, noting that plants/technologies rarely run 24 hours per day for 365 days per year. Then calculate approximate no. for tonnes of CO2 equivalent emissions per year.	collection resembles a technology database. In the marginal plant approach MESAP can model the whole electricity generating sector. Allowing selection of the average, best or worst technology as benchmark (optional)
4. Calculate the CO2e for CDM project.	Give short description of project Measure real CO2 emissions MWh. Calculate how many CO2 e emissions per year.	• Fuel inputs • Fuel outputs • List all technology components • Emissions from process/fuels etc and if possible consideration of leagkage given in t CO_2 equivalent per MWh (e.g. transportation of fuels, from import of fuels etc). If leakage data is not available indicate why. • Give All GHG emissions (e.g. Leakage + Production) in terms of emissions of t CO2 e per MWh • Identify the annual generation of energy from the reference case. For grid connected reference cases, calculate the load factor (i.e. how often the plant will and if it will operate at peak, base or intermediary load) given in MWh/ Installed Capacity KW / per year • Calculate approximate no. for tonnes of CO2 equivalent emissions per year. • Give start date when operations begin.	• RES (flow chart)
4. Calculate No. of Credits for CDM project	Identify whether the CDM project results in a reduction of emissions compared to the reference case.	• Subtract the number total annual CO_2 equivalent emissions from CDM project. Convert into credits using : 1 ton CO2 reduced = 1 credit.	

3. Scenario Analysis

Task	Method	Data Requirements	Tool Requirements	Comments
1. Describe likely scenarios	Common scenarios used in scenario analysis answer the following questions: 1. What would happen if the CDM project was delayed? 2. What would happen if the CDM project did not occur at all and the economy of the country improved dramatically or remained constant (business as usual BAU) or deteriorated dramatically?	• List all factors that impact the CDM project and or effect the CO2e emissions and are necessary to set up an energy system model e.g. - Production capacity of plant/technology - Efficiency of technology/plant - political factors (regulations, subsidies, liberalisation etc). - technical standards, - energy demand, - energy supply, - population growth, - economic development.	Most energy models can be used to calculate different scenarios using historic data for the existing energy system under evaluation.	Weakness: • The development of scenarios can be expensive. • Dependence on expert opinion can reduce transparency Strengths: • The model can be altered to reflect real scenarios and therefore revising the baseline is relatively simple.
2. Select the scenario as baseline that describes the current situation most realistically.	Feed data into the energy planning model for each scenario and then vary the key factors, or CO2 e emissions, to generate results for each scenario. Select the emission level that is most likely under a range of key factor developments as the baseline and provide justification for this choice.	• The model will calculate the emissions of t CO2e for different scenarios for individual sectors or for the entire energy system • Identify which scenario is the most realistic by analysing the results and doing sensitivity analysis. Should several results be credible experts shall select the baseline.		
3. Calculate the CO2e for CDM project.	Give short description of project Measure real CO2 emissions MWh. Calculate amount of CO2e emissions / a.	• Identify fuel inputs, outputs (e.g. in flowchart) • Give start date when operations begin. • Measure CO2 emissions per MWh • Note efficiency of technology / project. • Give expected annual production of electricity in MWh and note load factor and calculate CO2e emissions / per year.		
4. Calculate No. of Credits for CDM project	Identify whether the CDM project results in a reduction of emissions compared to the reference case.	• Subtract the number total annual CO_2 equivalent emissions from CDM project. Convert into credits using : 1 ton CO2 reduced = 1 credit.		

4. Benchmarks

Task	Method	Data Requirements	Tool Requirements	Comments
1 Select benchmark type: a) Average emissions within sector e.g. electricity sector b) Project / technology types e.g. gas pipeline projects	***a) Sector Specific*** List all the plants within the sector. ***b) Project/Technology Specific*** List all the project/technologies within the country that fall into the category defined.	• Total No. of plants or project/technologies (if electricity sector then plants that generate electricity) • Identify type of plants • Note the technical lifetime of each plant (so that the average can be altered when plants no longer exist)	Set up simple excel spread sheet to create the lists. OR Create technology database containing data on the power plants, on fuel consumption and on sector energy consumption. The MESAP database can handle this kind of information and allows for standardised reporting and even internet access.	The strengths of Benchmarking are: • Flexibility • Transparency • Cost effective • Easy to apply • Well documented in literature • Incorporates annual increment of energy consumption when regularly reviewed The weaknesses are: • No reflection of real emissions reduction Leakage is often not calculated due to limited data. • Data may be difficult to collect for some sectors.
2. Calculate baseline.	Calculate the average (or better than average [see comments column]) annual CO2e emissions for the sector or project/technology type.	• Add up total amount of emissions per MWh and divide by total number of plants or projects/technologies in the list to give the average in t CO_2 eq /MWh.	These type of calculations can be done using the MESAP module "Calculator" (optional)	Better than average emission levels can be set to avoid over-crediting. Calculation methods are defined in the definitions under better than average emission level.
3. Calculate the CO2e for CDM project.	Give short description of project Measure real CO_2 equivalent emissions t per MWh. Calculate amount of CO2e/ a.	• Identify fuel inputs, outputs • Give start date when operations begin. • Measure CO_2 equivalent emissions per MWh • Note efficiency of technology / project. • Give expected annual production of electricity in MWh	Use RES (flow chart).	
4. Calculate No. of Credits for CDM project	Identify whether the CDM project results in a reduction of emissions compared to the reference case.	• Subtract the benchmark CO_2 equivalent emissions per MWh from the CDM projects calculated CO2 e.g. emissions per MWh. Then multiply this by total MWh expected from the project per year to calculate total emission reductions per year. Convert into credits using : 1 ton CO2 reduced = 1 credit.		

5. Technology Matrix

Task	Method	Data Requirements	Tool Requirements	Comments
1. Identify technologies	• Make list of all technologies that are used in the country and categorise them according to sectors. E.g. electricity sector	• Names of technologies • Efficiencies • Fuels used to run them	Same as above	The strengths of this approach are: • Easy to calculate • Data often available • Can be developed to reflect regional differences in technology use. The weaknesses of this approach are: • Baselines may not actually represent real emission reductions. • Could promote technology dumping, since the technology reference is likely to be the one that maximises credit rather than focus on new technologies. • Lots of technology data needed which might often not be available
2. Calculate average emission factors for each technology	• Use international emission factors for technologies or calculate according to CO2 emission factors of fuels and multiply be the efficiency of the technologies.	• Emission factors for each technology listed • Estimation of t/CO2 e.		
3 Calculate the baseline	• Identify which technology is most likely to be used if the CDM project did not go ahead.	• Provide justification for selecting a technology as the reference case. (Consider which technologies are likely to be used to generate the same levels of electricity as the CDM project for a similar price.)		
	• The emission factor for the selected technology is the baseline.	• The factors should be calculated as tCO2eq per MWh.		
4. Calculate No. of Credits for CDM project	Identify whether the CDM project results in a reduction of emissions compared to the reference case.	Subtract the benchmark CO_2 equivalent emissions per MWh from the CDM projects calculated CO2 eq emissions per MWh. Then multiply this by total MWh expected from the project per year to calculate total emission reductions per year. Convert into credits using : 1 ton CO2 reduced = 1 credit.		

6. Top Down Scenario

Task	Method	Data Requirements	Tool Requirements	Comments
1 Establish a model of the national energy system.	• Usually this is best done using an economic/energy planning model.	Dependent on which model is used. Usual data requirements are to list all fuel sources for energy, breakdown different processes and energy conversions, actual and future demand data for various energy types and some micro economic data and forecasts	Economic energy model. E.g. MESAP, MARKAL , LEAP etc.	The process is the same as the method used by the UNFCCC to establish emission caps for Annex B countries. Therefore, the method is most useful for Activities Implemented Jointly (AIJ), rather than CDM. The method is relatively expensive in terms of time and cost.
2. Establish a national goal for CO2 emissions	• This is established by political consensus.			Gaining political consensus on a national target is often time consuming.
3. Based on national goal establish CO2 eq. Emission reduction targets for different sectors.	• Set according to political consensus	Political factors such as the impact on the economy, costs for reduction, employment, and social issues will be considered and the impact of emissions targets on different sectors.		
4. Set the Baseline	• Within each sector establish an average emission level as the baseline.	Consider different emission levels from different technologies/plants/industry in each sector and establish an average target for all industry/plant/technologies in this sector. This average is the baseline.	Most energy economic planning models will calculate this.	
5. Calculate credits.	• Identify which sector the CDM project falls into and identify the appropriate baseline. • Calculate emission reductions and the total number of credits.	Emission reductions are the different between the Annual Emissions from the CDM project and the relevant annual CO2eq sector baseline. Convert this figure into credits using : 1 ton CO2 reduced = 1 credit		

7. *Hybrid Analysis*

Task	Method	Data Requirements	Tool Requirements	Comments
1. Identify preferred baseline methodology	Easiest to start by selecting a project specific approach (investment analysis, scenario analysis, control group method) and then standardising key parameters.	• Consider data availability • Credibility of different approaches • Tool needs	Tool requirements will be dependent on approach used. .	
2. Standardise certain parameters within the baseline method .	Parameters that can be standardised could include the following: • Project Lifetimes • Fuel • Energy efficiency measures • Costs • Emissions factors	• *Project lifetimes* – will be dependent on the definition for project lifetimes, set by the UNFCCC. It could be technical lifetime, economic lifetime, or a fixed period of time. • *Fuel* – Standardisation is only possible in countries with a predominant fuel used in a particular sector and with unlikely change in national fuel demand trends. Calculate emission factors for fuel t CO2/MWh. • *Energy Efficiency measures* – Arbitrary efficiency improvements could be factored into baselines, though different factors may need to be defined for different sectors. • *Costs* – standardisation is easy in principle, (e.g. use Usc/kWh values for displaced electricity) but difficult to determine at the start of a project due to the influences of changing fuel mixes. • *Emission factors*. Standardisation is easy for the energy sector but less appropriate for other sectors since emissions factors are often site specific (e.g. CH4 from mining, landfills or rice production).		
3. Calculate the baseline	Depends which method is being followed.	See relevant project specific section above.		
4. Calculate the emission reductions and credits.	Subtract the estimated emission value for the reference case from the estimated CO2 eq emissions from the CDM project.	• Give value in t CO2 equiv. per MWh. • Credits are calculated according to 1 ton CO2 reduced = 1 credit		