CDM Workshop

(Calculation Excercise of CDM Project Feasibility)

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1.Objective of the Workshop

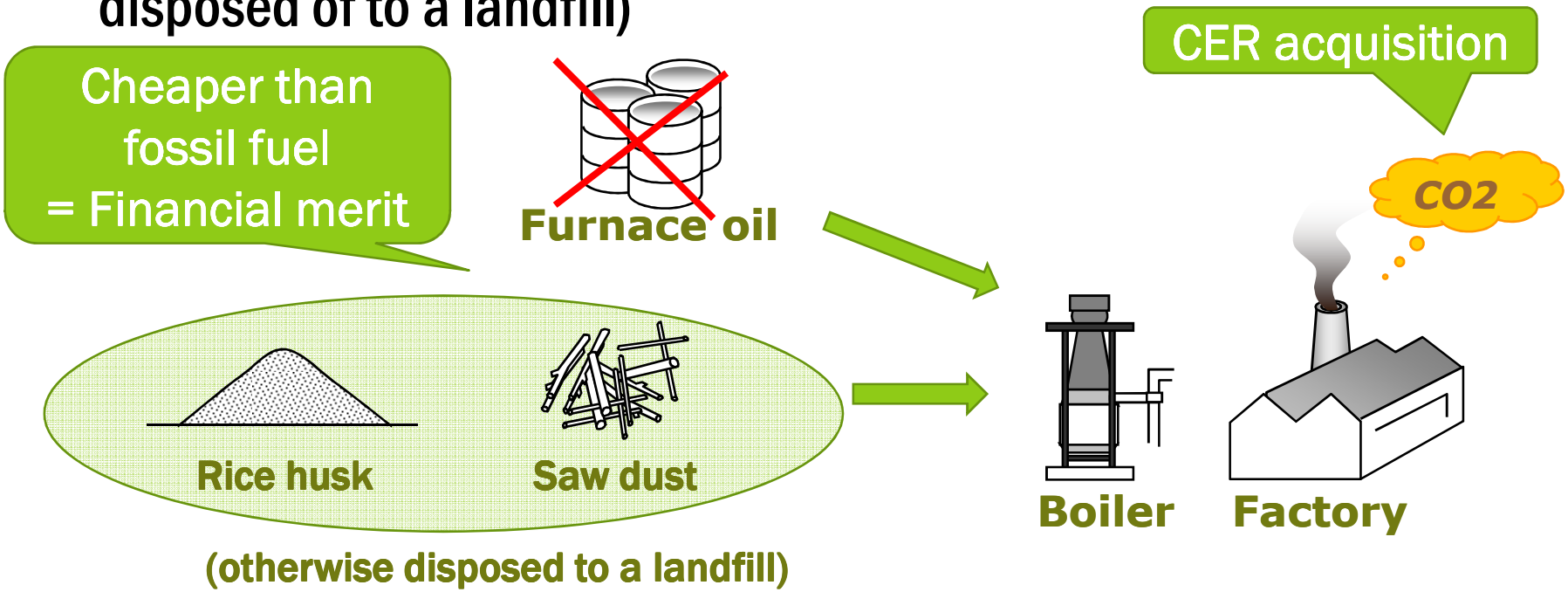
- To understand important factors to assess CDM project viability using simple examples.

- To understand basic concept of:
  - GHG emission reduction calculation
  - Simple project income and expenditure calculation

2. Description of the Example Case

Project Description

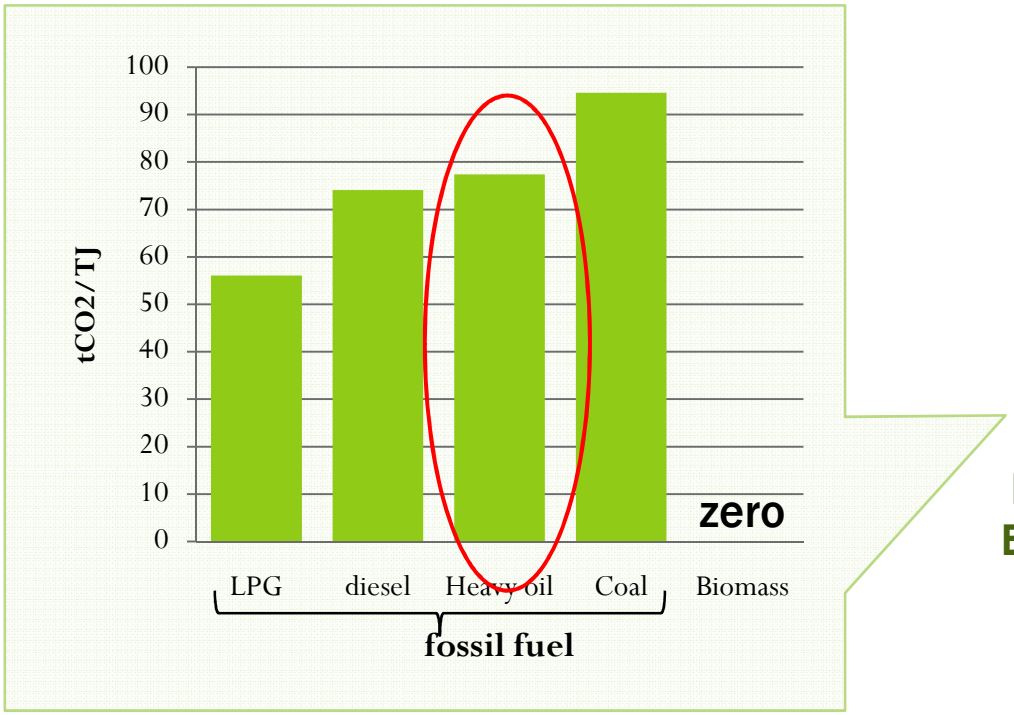
- Fuel switch from fossil fuel to biomass resources
- Biomass boiler will replace the furnace oil boiler
- Steam generated from the boiler will be used in-house
- Biomass will be collected from saw mill or rice mill (otherwise disposed of to a landfill)

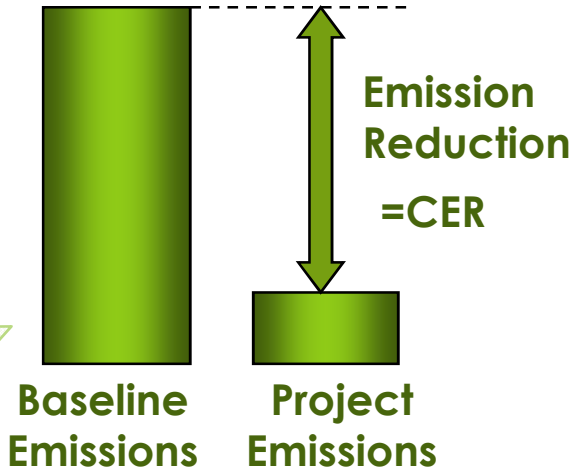


Small Scale Methodology Type III.C. Thermal energy production with or without electricity

3. Key Factors for Assessing Project Feasibility (1)

- GHG emission reduction amount (= Amount of CER)





Emission Reduction =CER

Baseline Emissions (tCO2) = Amount of energy to be replaced (t/y) × Emission Factor (tCO2/t)

Project Emissions (tCO2) = 0 (zero)

For simplification

3. Key Factors for Assessing Project Feasibility (2)

- Financial benefit of the project

Financial benefit (project income)	=	Cost saving by fuel switch	+	CER sales

- Other factors to be considered(not considered in this exercise):
  - Suitable technology
  - The availability of biomass resources (Seasonal change of biomass resources)
  - Purchasing price of biomass resources including future prospect (Supply and demand balances)

4. Preconditions and Assumptions Used for Calculation

- Preconditions

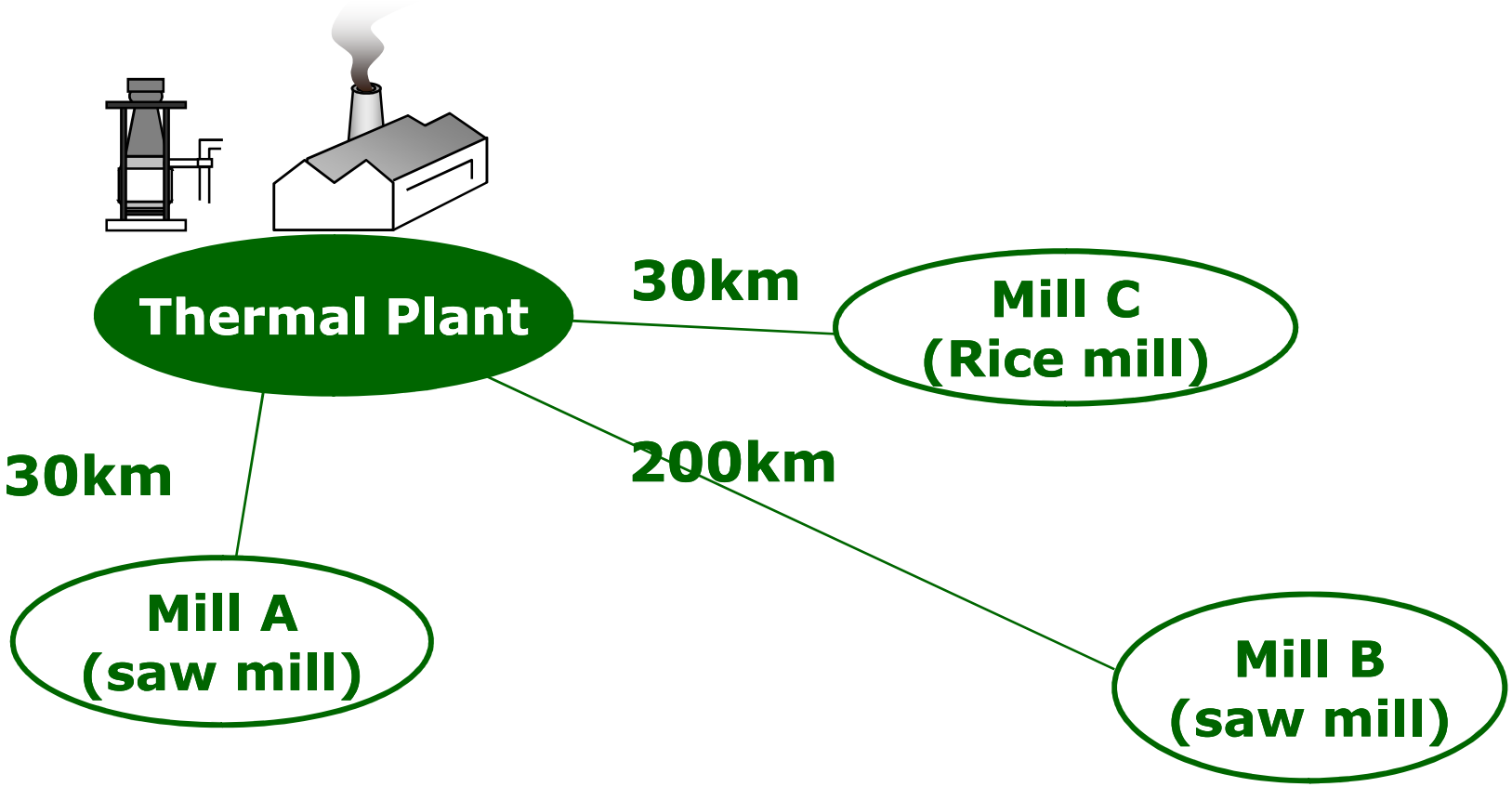
Item	Figure
Energy sources	Biomass (saw dust, rice husk)
Energy to be replaced	Furnace oil
Oil consumption	2 t_oil/day
Operating days	300 days/yr
Emission factor of furnace oil	3.19 kgCO2/kg_oil
Furnace oil price	33 Rupees/t_oil
Amount of biomass to replace 1 ton of oil	Rice husk: 3.3kg_biomass/kg_oil Saw dust: 2.5 kg_biomass/kg_oil
Biomass purchasing price	Rice husk: 3.0 rupees/kg Saw dust: 2.2 rupees/kg
Biomass transport cost	10 rupees/t/km
CER selling price	1500 rupees/tCER

Figures are assumptions, not necessarily reflect the actual situations

4. Preconditions and Assumptions Used for Calculation

- Assumptions (for the purpose of simplification)
  - Project initial cost is not considered.
  - CDM related cost (development cost, monitoring cost etc) is not included
  - Enough biomass is available at each mill throughout the year
  - Methane emissions from biomass decay process is not included in the calculation
  - Emissions related to biomass procurement is not considered
  - Additionality issue is not considered

5. Example Cases



- Case1: Mill A (saw dust)
- Case2: Mill B (saw dust)
- Case3: Mill C (rice)

6. Steps of Group Work

- Steps of Calculation Exercise of CDM Project Feasibility

Step1 **Amount of biomass required**

Step2 **Biomass procurement cost**

Step3 **Amount CER**

Step4 **CER sales**

Step5 **Financial benefit (cost saving) by fuel switch**

STEP1: Amount of Biomass Required

- What is the quantity of biomass resources to supply for the thermal energy demand?

Amount of Biomass Required (t/y)	=	Amount of oil to be replaced (ton/year)	×	Amount of biomass to replace 1 ton of oil (kg_bio/kg_oil)		
(Case A)	=	600 (ton/year)	×	2.5 (kg_bio/kg_oil)	=	1,500 ton/year
(Case B)	=	600 (ton/year)	×	2.5 (kg_bio/kg_oil)	=	1,500 ton/year
(Case C)	=	600 (ton/year)	×	3.3 (kg_bio/kg_oil)	=	1,980 ton/year

2ton/day × 300 day/year

STEP2: Biomass Purchasing Cost

- Biomass purchasing cost is a very important factor to plan a biomass project.

Biomass Procurement Cost (Rupees/year)	=	Amount of Biomass (ton/year)	×	(Purchasing cost (Rps/t)	+	Transport cost (Rps/t))
(Case 1)	=	1,500 (ton/year)	×	2,200 (Rps/t)	+	300 (Rps/t)
	=	3,750 ('000 Rps/yr)				
(Case 2)	=	1,500 (ton/year)	×	2,200 (Rps/t)	+	2,000 (Rps/t)
	=	6,300 ('000 Rps/yr)				
(Case 3)	=	1,980 (ton/year)	×	3,000 (Rps/t)	+	300 (Rps/t)
	=	6,534 ('000 Rps/yr)				

10 Rps/t/km × 30km

STEP3: Amount of CER

- Simple calculation of amount of CER to be obtained

Amount of CER (tCO2/y)	=	Amount of oil to be replaced (ton/year)	×	Emission factor of oil to be replaced (tCO2/t_oil)

(Case 1)	=	600 (ton/year)	×	3.12 (tCO2/t_oil)	=	1,872 tCO2/year
(Case 2)	=	600 (ton/year)	×	3.12 (tCO2/t_oil)	=	1,872 tCO2/year
(Case 3)	=	600 (ton/year)	×	3.12 (tCO2/t_oil)	=	1,872 tCO2/year

STEP4: Annual CER Sales

- Annual CER sales will be determined by CER amount and CER price

Annual CER sales (Rupees/tCO2)	=	Amount of CER (tCO2/y)	×	Unit CER price (Rupees/tCO2)

(Case 1)	=	1,914 (tCO2/year)	×	1,500 (Rps/tCO2)	=	2,871 '000 Rps/yr
(Case 2)	=	1,914 (tCO2/year)	×	1,500 (Rps/tCO2)	=	2,871 '000 Rps/yr
(Case 3)	=	1,914 (tCO2/year)	×	1,500 (Rps/tCO2)	=	2,871 '000 Rps/yr

STEP5: Annual Cost Saving by Fuel Switch

- Cost saving amount is the reduction of fuel procurement cost

Annual cost saving (Rupees/year)	=	Oil procurement cost (Rupees/year)	-	Biomass fuel procurement cost (Rupees/year)

(Case 1)	=	19,800 (Rupees/year)	-	3,750 (Rupees/year)	=	16,050 '000 Rps/yr
(Case 2)	=	19,800 (Rupees/year)	-	6,300 (Rupees/year)	=	13,500 '000 Rps/yr
(Case 3)	=	19,800 (Rupees/year)	-	6,534 (Rupees/year)	=	13,266 '000 Rps/yr

2 (t/d) × 300 (d/y) ×33 (Rps/t)

STEP6: Income / Expenditure

Summary/Conclusions

- What are the lessens learned through the exercise?
  - Biomass procurement plan (transportation distance, price of biomass, availability, seasonal fluctuation etc) is a very significant factor for biomass CDM project
  - Detail design of boiler such as size and technology will be affected by biomass type (quantity, characteristics of biomass)
  - Range of initial cost will be restricted by income and expenditure of the project