

Renewable Energy in Thailand

Background Potential CDM Opportunities

ENERGY  CONSULTING NETWORK

CEERD

Centre for Energy Environment
Resources Development

SUSTAINABLE ENERGY



TECHNOLOGY AT WORK

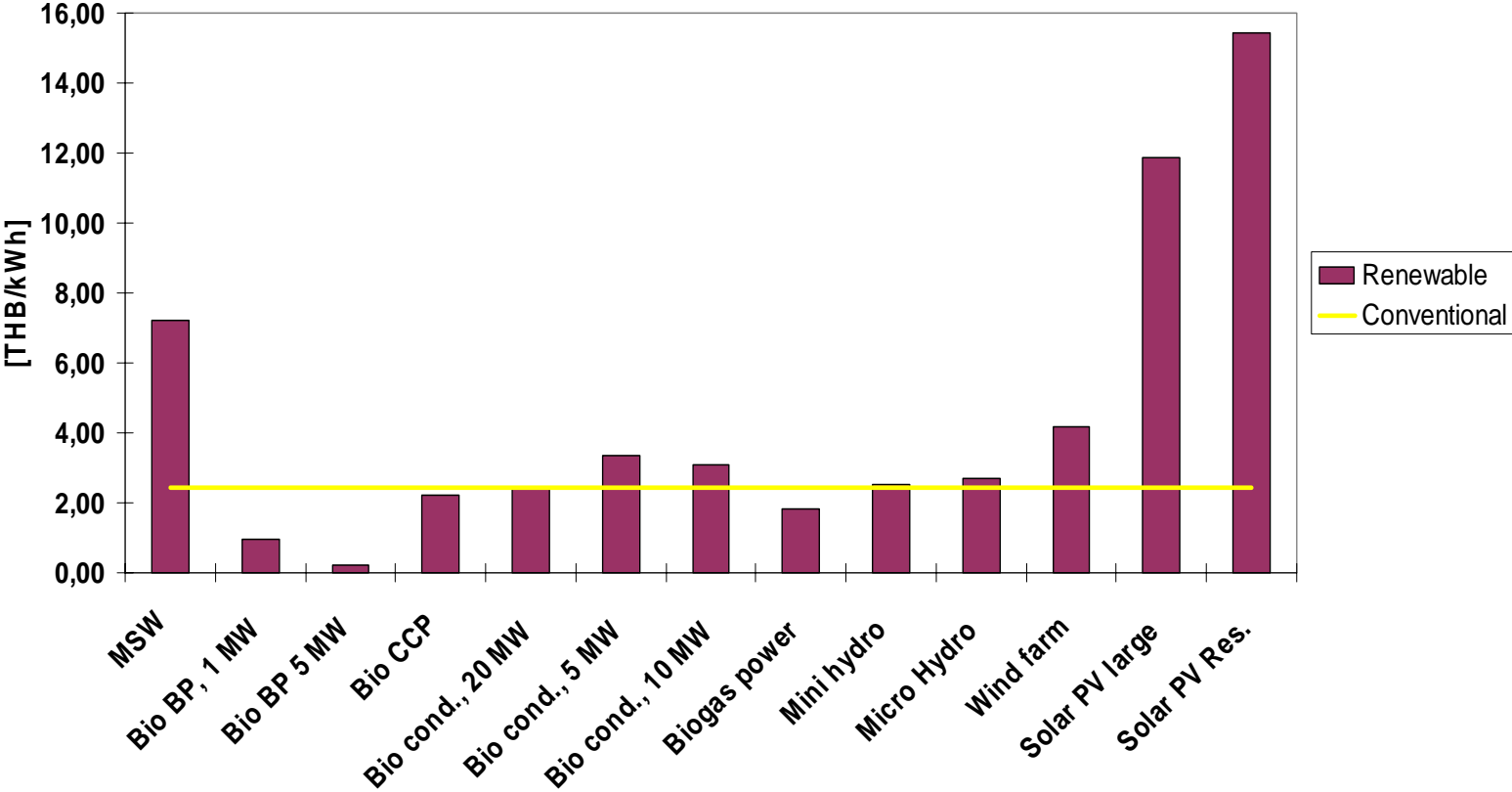
Steps	Tool/analysis
Problem Analysis	<ul style="list-style-type: none"> • Political Analysis
Identification of objectives	<ul style="list-style-type: none"> • Political targets
Reference year analysis	<ul style="list-style-type: none"> • Energy outlook for Thailand (2003) • National energy balance from National Statistics • Resource analysis and overview? • Renewable Energy Technology Assessment (RETEAS)
Baseline scenario analysis	<ul style="list-style-type: none"> • Business as-usual operation: Economic financial, technological, knowledge, awareness, institutional, organizational, legal
Alternative scenario analysis	<ul style="list-style-type: none"> • Technology data catalogue • Barriers and Incentives Catalogue • Formation of scenarios
Scenario comparison	<ul style="list-style-type: none"> • Impact Assessment Modeling (RED Model)
Policy analysis and action plan	<ul style="list-style-type: none"> • Financial and Economical Report • Recommended action plan to meet political targets!
RE field test (Testing recommended incentives in communities)	<ul style="list-style-type: none"> • Stake holder identification • RE resources survey • Demand side analysis • Analyze local administration procedures and stakeholder participation in local RE systems • Adjust the Action Plan to Promote RET's

2003 Target for Renewable Power

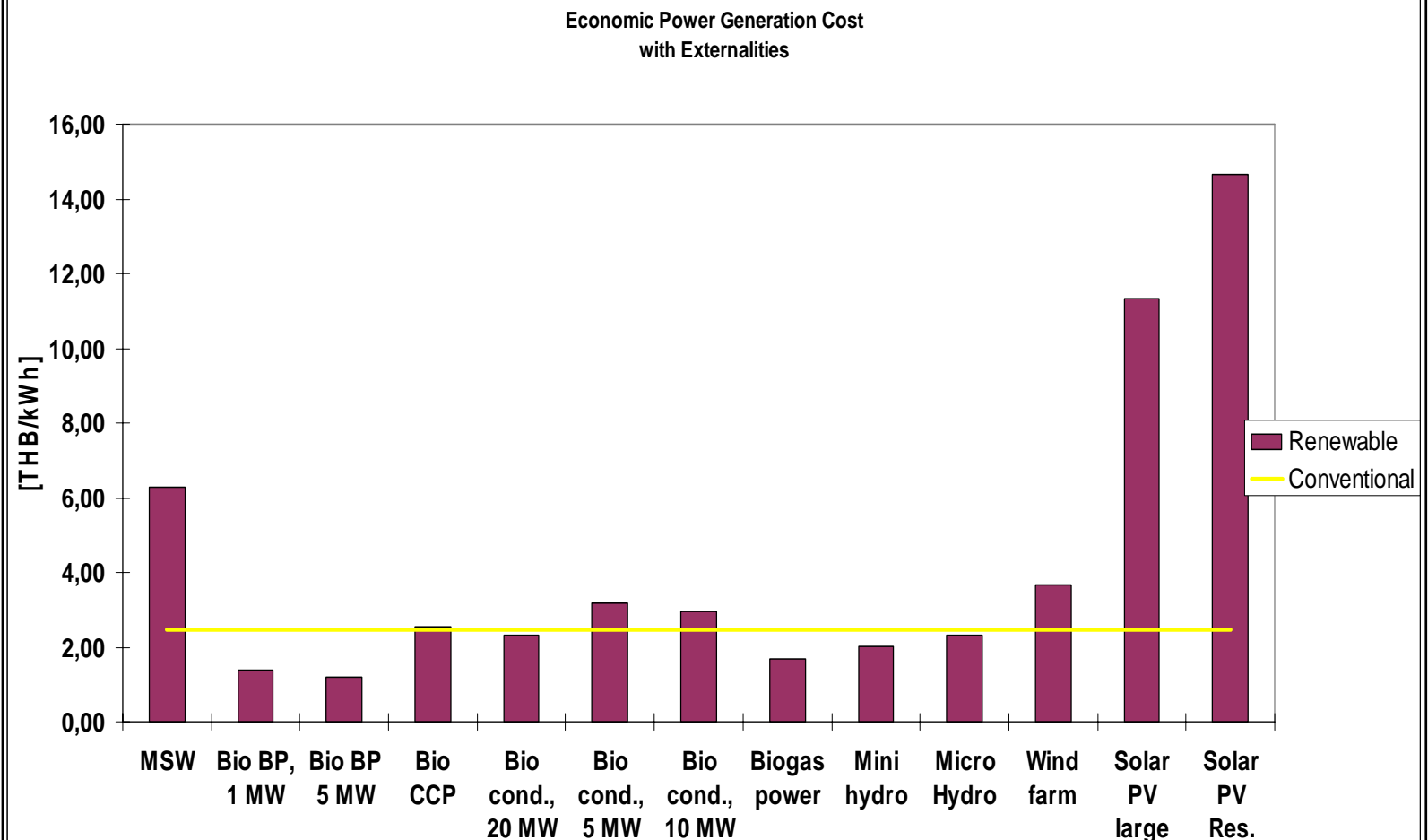
	Year 2004	Year 2011		
		RPS	Incentives	Total
	[MW]	[MW]	[MW]	[MW]
Biomass	800	120	630	1.550
Hydro	60	60	280	400
Solar PV	23	20	207	250
Wind	-	35	65	100
MSW	-	45	55	100
	883	280	1.237	2.400

Financial power generation costs

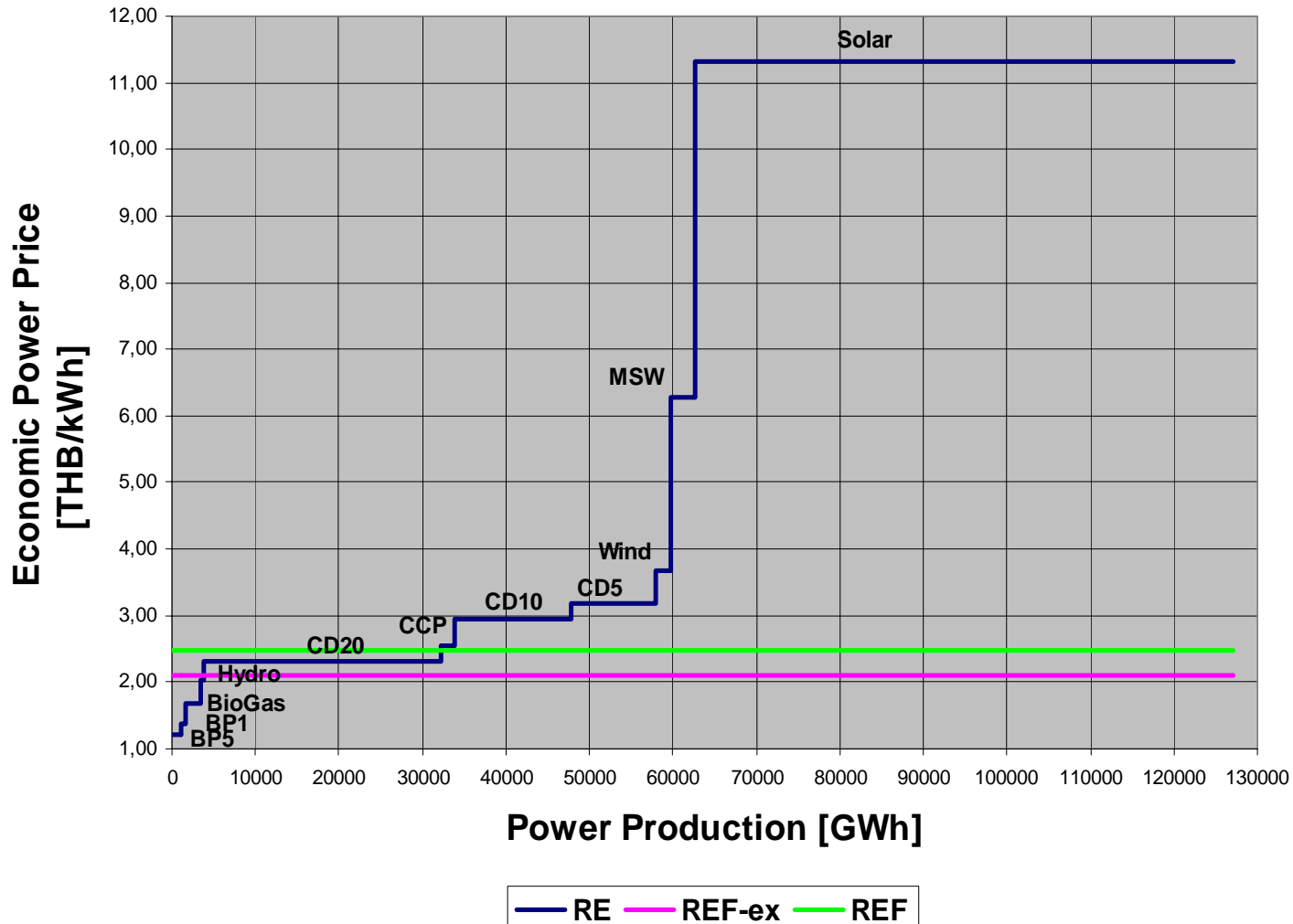
Power Generation Costs
Financial



Economic power generation costs *incl. externalities*



Cost Supply Curve - Full Potential



Year 2024 Results: Different Feed-in schemes

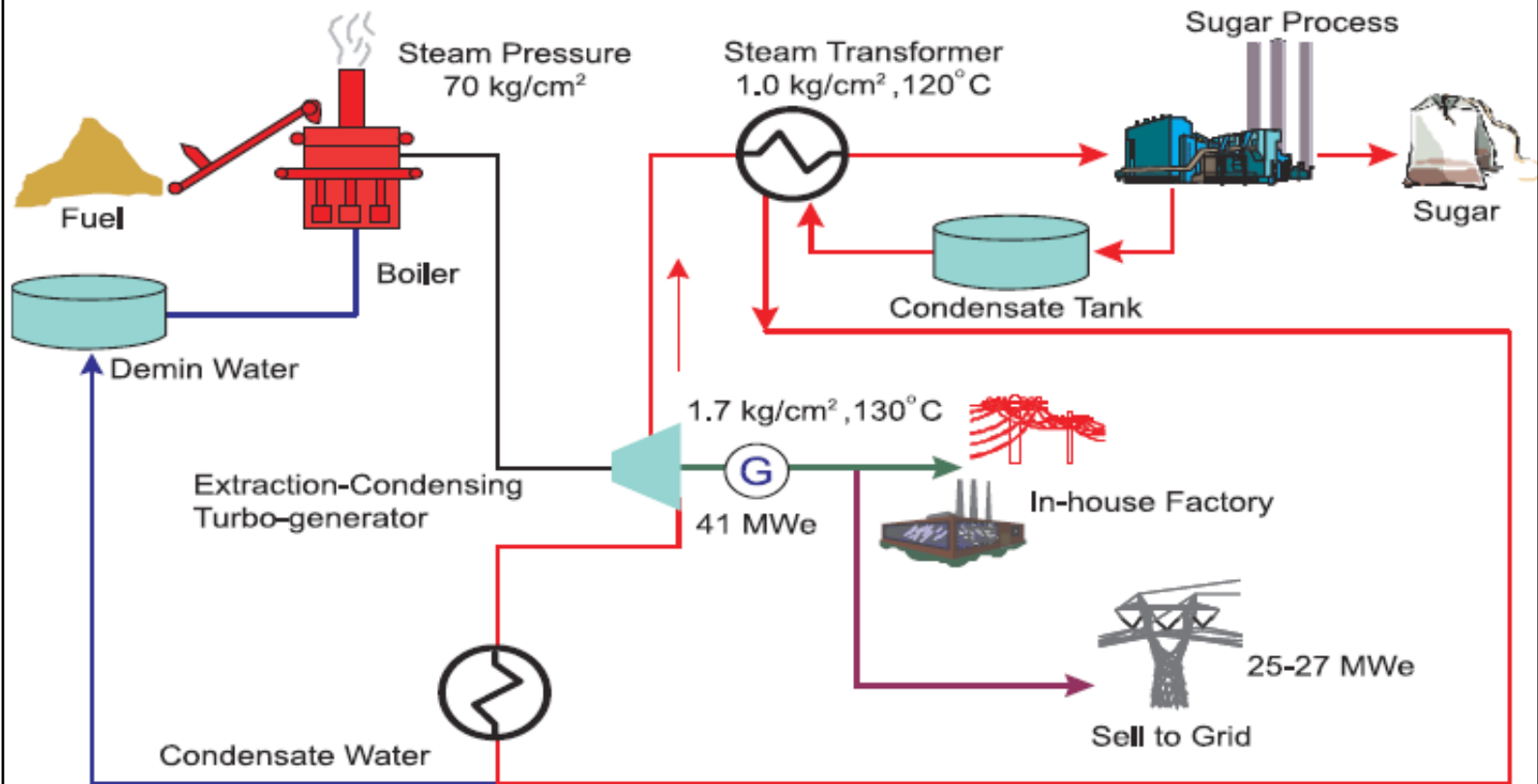
Incentive scheme	Economic Viable GWh/y	CO2 1000 t/y	Equal Feed-in GWh/y	CO2 1000 t/y	Reach 2011 target GWh/y	CO2 1000 t/y
MSW Incineration	0	0	0	0	979	3,194
Bioma. CHP 1 MW	451	1,217	587	1,584	451	1,217
Bioma. CHP 5MW	1,200	3,238	1,064	2,871	1,200	3,238
Bioma. C.Cool&P	0	0	1,602	2,515	0	0
Biomass el. 20MW	18,038	10,098	11,876	6,649	9,450	5,290
Biomass el 5 MW	0	0	1,065	596	0	0
Biomass el 10 MW	0	0	3,713	2,079	2,168	1,214
Biogas Electricity	747	3,605	562	2,712	489	2,360
Mini Hydro	83	46	46	26	905	507
Wind Farm 20 MW	0	0	0	0	293	164
Large Solar PV	0	0	0	0	926	518
Total	20,519	18,206	20,515	19,032	16,861	17,703

Potential CDM Projects in Thailand

- **Sugar Mills in Thailand have a very low energy efficiency and inefficient use of bagasse.**
 - If all Sugar Mills in Thailand were build as modern state of the art sugar mills and energy production facilities there would be a bagasse surplus, after own consumption for electricity and steam, big enough to produce 8% of the electricity produced in Thailand in the year 2005 (The total installed electrical capacity in Thailand in 2005 was 26,372 MW)
- **Thailand has got 50 Sugar Mills!**

Modern Cogeneration at Thai Sugar Mill

STEAM AND ELECTRICITY SUPPLIED BY HIGH PRESSURE BOILERS AND EXTRACTION - CONDENSING TURBO-GENERATORS



Potential CDM Projects in Thailand

- **Oil Palm Mills in Thailand have a very low energy efficiency and inefficient use of residues from CPO processing.**
 - The POME from a standard **45 ton of FFB/hour mill** can produce biogas for continuous generation of more than 1 MW electricity (400 Nm³ of CH₄/h), the electricity demand for processing is around 600 kW
 - Heat in the flue gas from the gas engine can cover the hot water demand for processing
 - With 6,500 operation hours/year; 1,857 ton CH₄/year, or **39,000 CER's/year** will be captured
 - Investment costs for local biogas plant and Western gas engine is around 60 million THB
 - Electricity generation cost 1.8 THB/kWh
 - FIRR on the project with sale of CER's is around 50%

Channel Digester Adapted to Thai Conditions



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Potential CDM Projects in Thailand

- The EFB's (~9 t/h) from a **45 ton of FFB/h** CPO mill contain enough energy to produce steam at (3-4 bar) for processing.
- If the EFB's today are dumped, there will be a methane generation corresponding to **~40,000 CER's/year**.
- The investment costs for a new boiler system for generation of process steam, fuelled by EFB's will be around 60 million THB.
- A simple pay back time around 3 years.



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Potential CDM Projects in Thailand

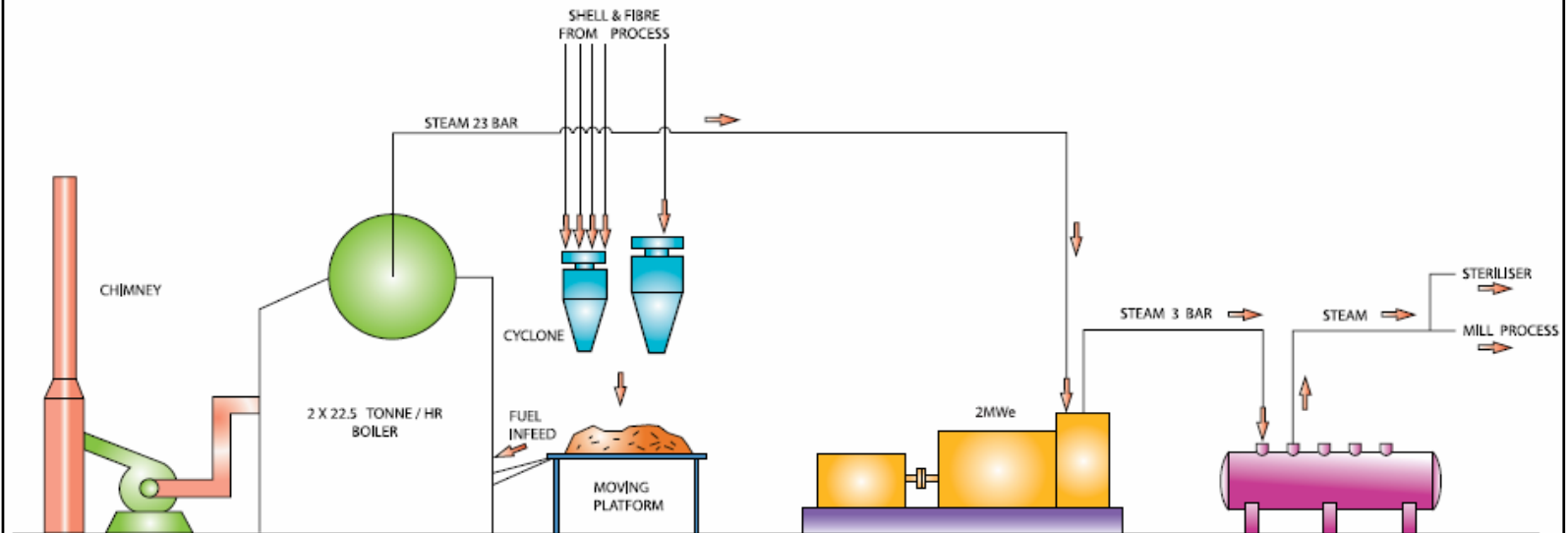
- Fibres and shells (from a 45 t/h CPO mill) contains enough energy to fuel production of 15 MW electricity in a high pressure (70 bar) condensing steam turbine (34 % electrical efficiency)
- If 2 mills join forces, a 30 MW power plant can be kept in operation 6,500 hours/year with a production around 175,000 MWh/year; corresponding to a CER generation around 95,000/year
- The investment costs will be around 35-45 million EUR, depending on share of locally supplied parts
- The IRR including sale of CER's will be from 10-20% depending on the price of fibres and shells being used as fuel, and depending on share of local supply.



Common fiber fueled boiler at a palm oil mill. 30 ton of steam/h at 26 bar (a), 250 °C

Conventional Energy Production Facility for a Crude Palm Oil Mill

SUNGEI DINGIN PALM OIL MILL (GUTHRIE) COGENERATION PLANT





TSH 14 MW
European
state of the art
Cogeneration
on EFB's at
Sabah

Potential CDM Projects in Thailand

- If all Palm Oil Mills in Thailand were build with modern state of the art energy production facilities:
 - There would be a residue surplus, after own consumption for processing, big enough to produce 4 % of the electricity produced in Thailand in the year 2005
 - The total installed electrical capacity in Thailand in 2005 was 26,372 MW.
- Thailand has got 16 Palm Oil Mills
- Malaysia has got more than 200 Palm Oil Mills
- Indonesia has got **a lot** of Palm Oil Mills

Do you need additional information?

- **After the next presentation we, at the T@W team, will still be here to discuss with you about possible support related to your CDM business and or project**

Let us launch a lot of CDM projects for the benefit of our common world!



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