



2nd Biomass-Asia Workshop

Rice husk potential of Vietnam

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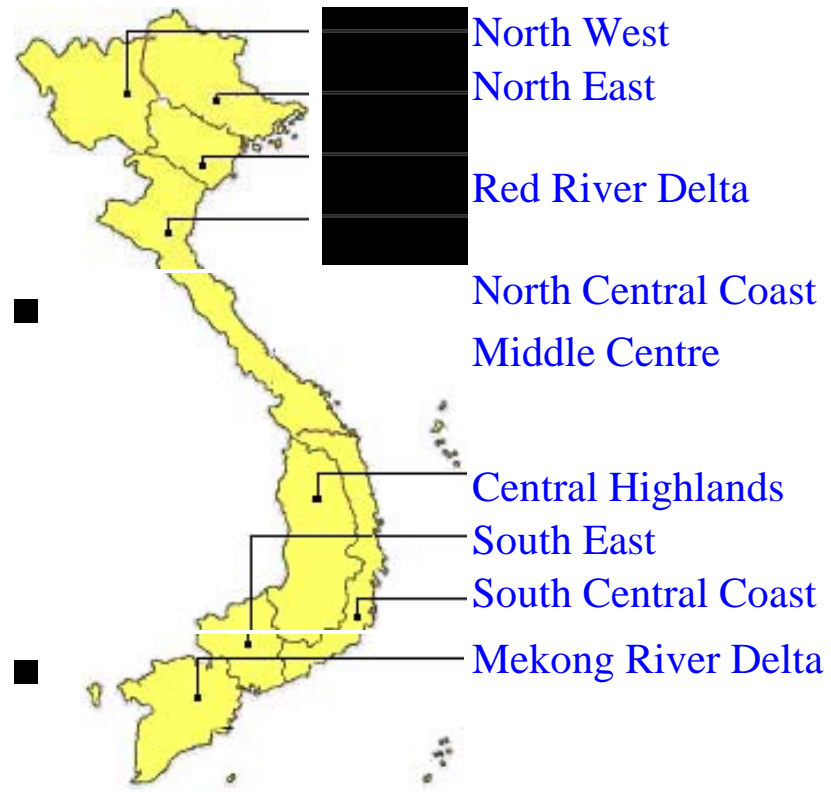
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Regions and Provinces of Viet Nam





Rice husk: 1.Area

Planted area of paddy by regions

No	Region	Thous. ha				
		1995	1999	2000	2001	2002
	Whole country	6765.6	7653.6	7666.3	7492.7	7485.4
1	<i>Red river Delta</i>	1193	1202.8	1212.6	1202.5	1196.7
2	<i>North East</i>	522.3	535.2	550.3	558	562.5
3	<i>North West</i>	134.5	132.9	136.8	139.6	140.8
4	<i>North Central Coast</i>	682.2	677.9	695	701.2	700.4
5	<i>South Central Coast</i>	42.5	434.8	422.5	414	399.5
6	<i>Central Highlands</i>	173.2	166	176.8	180.8	186.1
7	<i>South East</i>	447.3	518.8	526.5	504.6	485.6
8	<i>Mekong River Delta</i>	3190.6	3985.2	3945.8	3792	3813.8

Rice husk: 2. Rice husk output (straw = rice husk)

Rice husk output. 20% of paddy

No	Region	Thous.tons				
		1995	1999	2000	2001	2002
	Whole country	4992.74	6278.76	6505.9	6421.68	6812.7
1	<i>Red river Delta</i>	1018.08	1276.68	1317.32	1283.88	1337.06
2	<i>North East</i>	291.52	382.26	413	449.98	465.78
3	<i>North West</i>	65.78	74.44	80.72	88.14	90.3
4	<i>North Central Coast</i>	428.16	526.92	564.8	593.38	627.78
5	<i>South Central Coast</i>	283	340.74	336.32	341.42	341.08
6	<i>Central Highlands</i>	85.9	102.48	117.36	129.24	121.9
7	<i>South East</i>	253.96	316.3	335.84	336.14	333.22
8	<i>Mekong River Delta</i>	2566.34	3258.94	3340.54	3199.5	3495.58

Rice husk: 3. For power generation

Potential for electricity generation (30% of rice husk) (LHV: 3330Kcal/kg, Humidity: 13%)

No	Region	Thous.tons				
		1995	1999	2000	2001	2002
	Whole country	922.60	1169.18	1188.76	1152.45	1249.17
1	<i>Red river Delta</i>	152.7	191.5	197.6	192.6	200.5
2	<i>North East</i>	0	0	0	0	0
3	<i>North West</i>	0	0	0	0	0
4	<i>North Central Coast</i>	0	0	0	0	0
5	<i>South Central Coast</i>	0	0	0	0	0
6	<i>Central Highlands</i>	0	0	0	0	0
7	<i>South East</i>	0	0	0	0	0
8	<i>Mekong River Delta</i>	769.90	977.68	1002.16	959.85	1048.67

Rice husk: 4. Rice mills dispersion

	Province	Number of rice mills available in the list	Province rice production -2002-Thous. tons
1	An Giang	144	2452
2	Bac Lieu	31	699
3	Ben Tre	4	392
4	Binh Duong	11	35
5	Ca Mau	3	418
6	Can Tho	24	2206
7	Ho Chi Minh	10	182
8	Long An	176	1729
9	Phu Yen	21	289
10	Soc Trang	40	1633
11	Tien Giang	13	1281
11	Tay Ninh	57	570
12	Tra Vinh	47	986
13	Others	34	
14	Total	615	



Current uses of rice husk

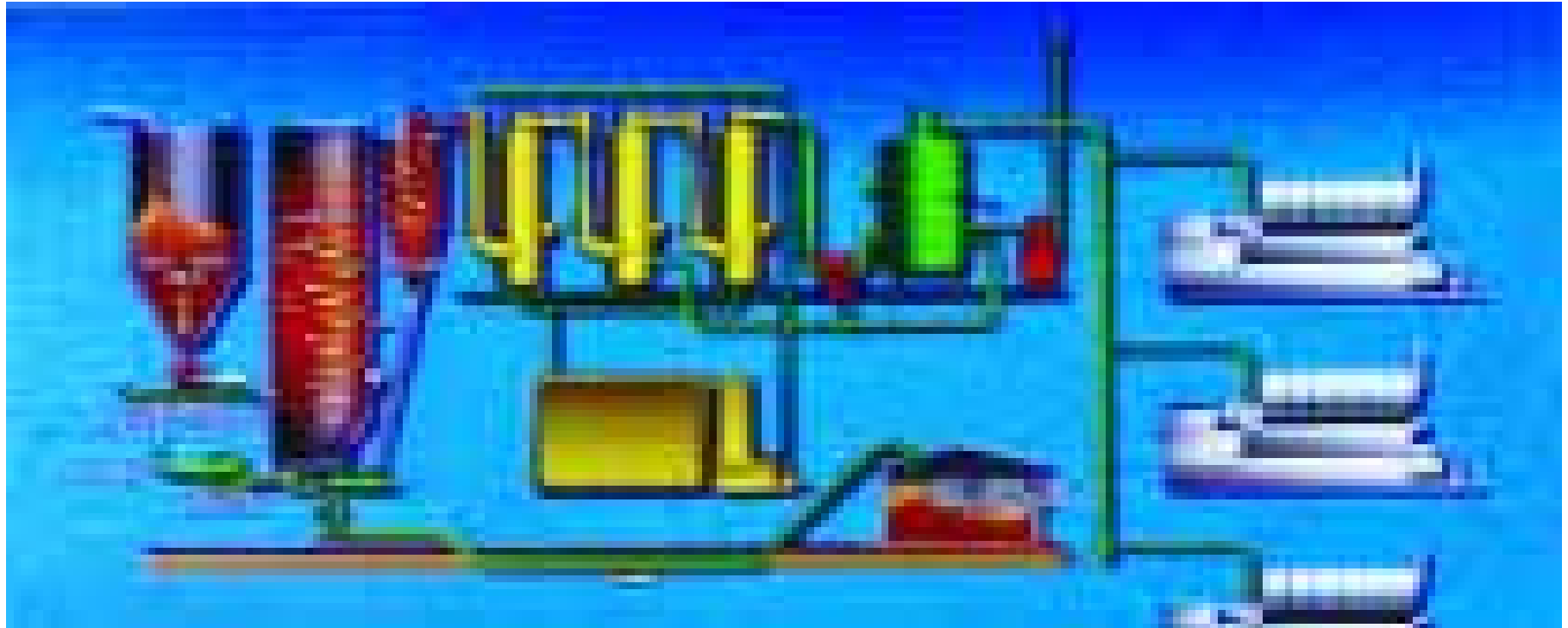
- Fuel for brick, ceramic kilns, open burning, cooking.
- Price: seasonal price, from 5US\$-8US\$/tonne, or 0.36-0.6US\$/GJ.
- Comparison:
 - + Rice husk: 0.36-0.6 US\$/GJ.
 - + Coal(good coal): 1.64 US\$/GJ (50US\$/t)
 - + DO: 11US\$/GJ (retail: 0.5US\$/kg)

Power generation



- Siting:
 - + Large rice mill >100,000t paddy/year available >20,000t of rice husk or >2MW installed (5000hrs)-very few. But rice husk supply, heat and electricity demands are stable.(one site identified by Institute of Energy)
 - + Collection in area of radius 20km, available for 3-5 MW. But rice husk supply, heat and electricity demands are not stable.(one site identified by Peakovinhloi Co. and RCEE)
 - + Need to show, that the use for power generation does not cause the deficit of rice husk for other use.

Gasification technology



Gasification technology



2005/12/26

Rice husk-second biomass-Thai

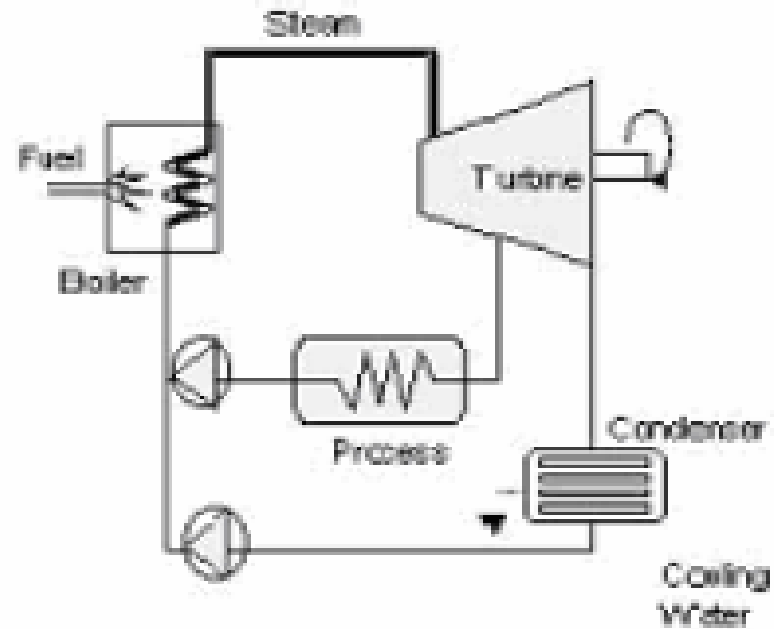
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Gasification technology



Item	Unit	Value	Remark
Specific investment	MUS\$/MW	0.693	
Discount rate	%	12	
O&M	% of investment	3	
Fuel cost	USD/kg	7.75	
Fuel HV	Kcal/kg	3000	
Installed capacity	MW	3	
Operation time	hrs/year	7000	
Output	MW h	21000	
Fuel consumption	T/MW	2	
Project lifetime	year	20	
Electricity purchase price	US\$/MW h	45.2	
CDM contribution			20 years CO2 purchase
Reduction	tCO2	17902	
CO2 price	US\$/tCO2	4	
CO2 revenue	US\$	71608	
Finance results			
NPV	MUS\$	2.1	
NPV+CDM	MUS\$	2.65	
Payback period	Year	5.2	
Payback period + CDM	Year	4.5	
IRR	%	26.6	
IRR+CDM	%	30.1	

Steam technology



Extraction-condensing steam turbine



Steam technology

PROJECT IDENTIFICATION

Company:	Hoa An Commune- An Giang province	Case: 10 - Power-only mode 2,880 h/yr
Project description:	4 MW Full Condensing Steam Turbine Cogeneration Plant	Cogen mode 2,160 h/yr
Calculation done by:	COGEN 3	Other Identification: Ash sale 30 USD/ton

SUMMARY FINANCIAL RESULTS

Pre-tax Project IRR <i>Pre-tax project nominal Internal Rate of Return (IRR)</i>	18.1%	
Pre-tax Project NPV <i>Pre-tax Net Present Value (NPV)</i>	38,150,111 ('000) Dong	2,424 ('000) US \$
Post-tax Project IRR <i>Post-tax nominal project Internal Rate of Return (IRR)</i>	17.5%	
Post-tax Project NPV <i>Post-tax Net Present Value (NPV)</i>	32,728,665 ('000) Dong	2,060 ('000) US \$
Post-tax Equity IRR <i>Post-tax nominal equity Internal Rate of Return (IRR)</i>	27.8%	
Discounted payback time	9.8 Years	
Simple payback time	5.7 Years	
Total investment costs (Incl. contingency)	81,549,082 ('000) Dong	5,182 ('000) US \$
Financial project lifetime	20 Years	
Cash flow coverage ratios	Minimum	Average
Pre-tax	of interest	11.81
	of debt service	2.63
Post-tax	of interest	11.41
	of debt service	2.60



CDM opportunity

- CO2 reduction:
 - + Grid connected: 0.615 kgCO₂/kWh.
 - + Off grid: DO substitute: 0.8kgCO₂/kWh (default value).
- Leakage: Do not reduce rice husk supply for other rice husk use as fuel.
- Problem: Very small scale.



Thank You