A critical look on rice husk gasification in Cambodia: engineering and sustainability

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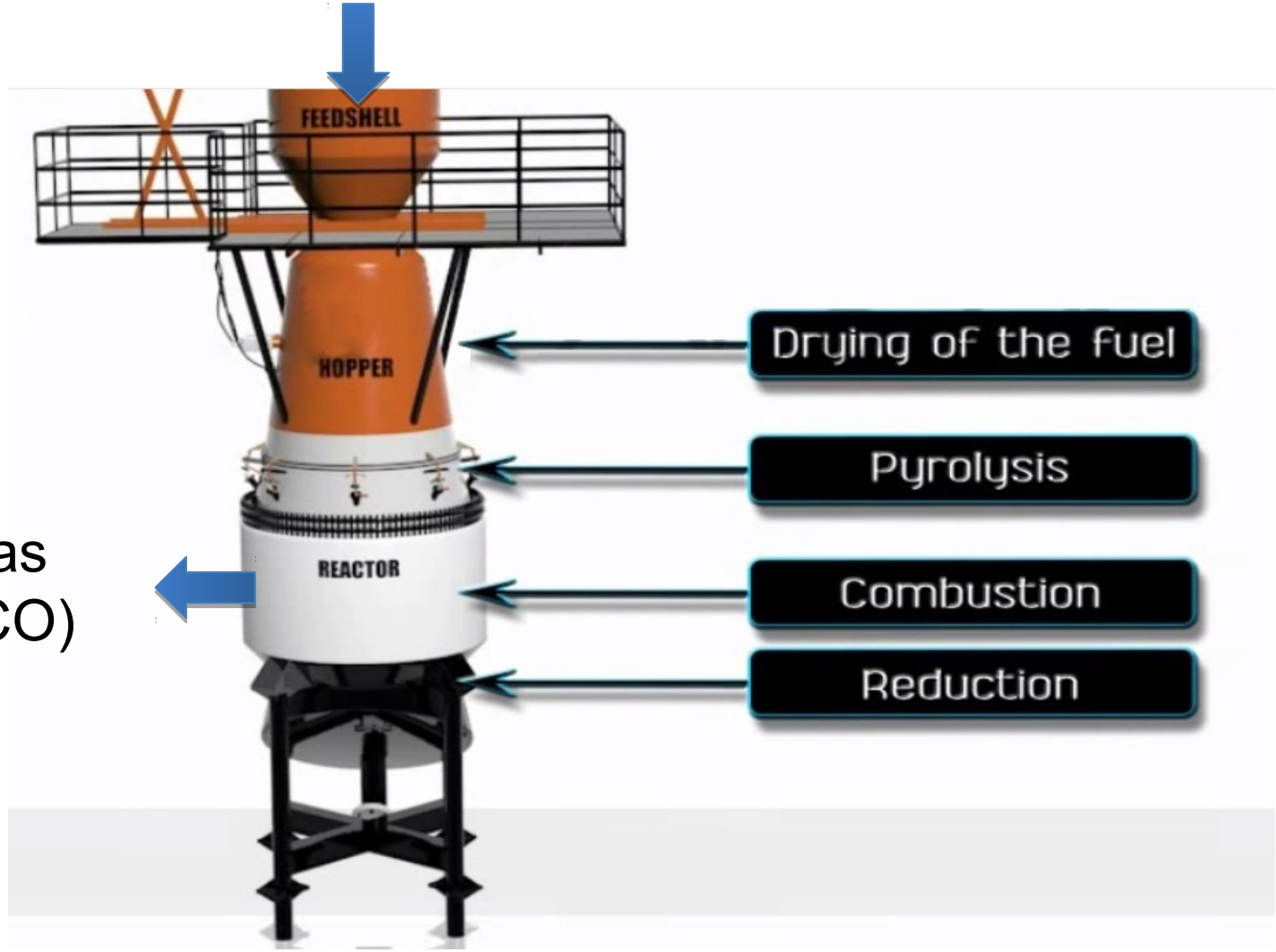
Gasification, an appropriate technology for Cambodia ?

Lessons learned

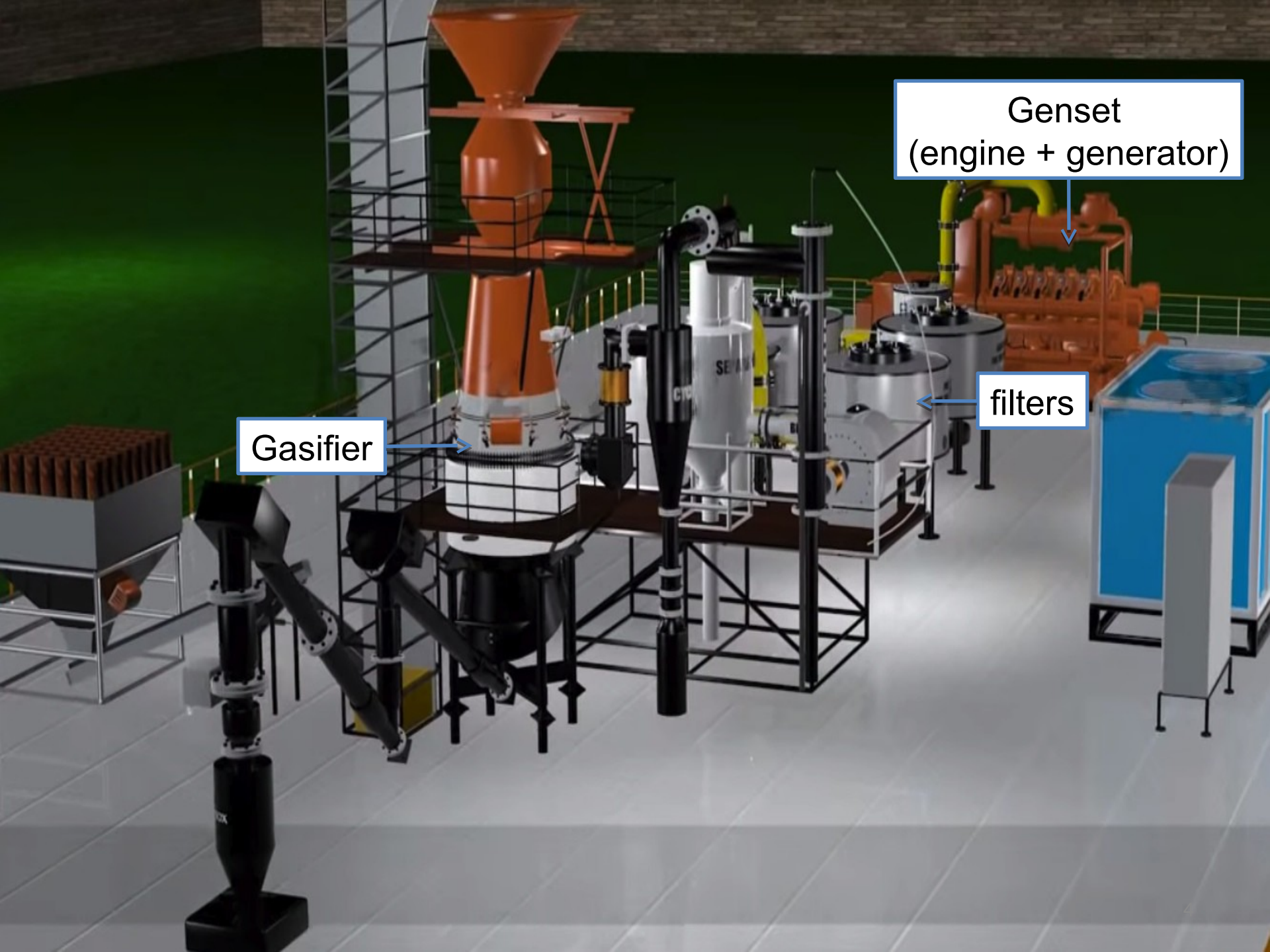
Summary and concluding remarks

Rice husk Gasification technology

Rice husk



Syngas
(H2+CO)


Genset
(engine + generator)
filters
Gasifier

Technical potential of rice husk power

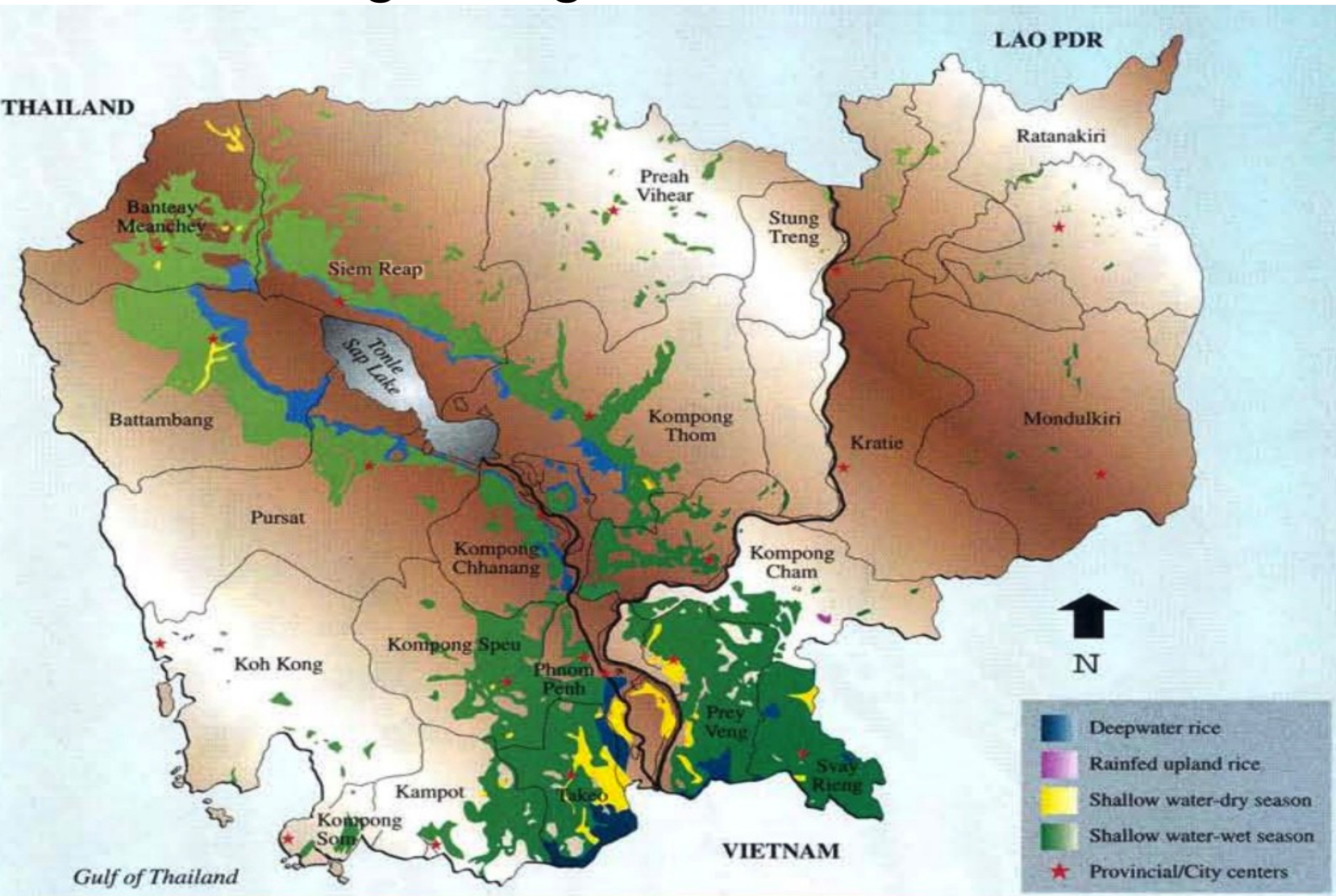
4-6 kg rice husk ≈ 1 liter diesel ≈ 3 kWh*

1.5 Million tons rice husk/year = 300 Million liters diesel = 900 GWh (30% of electricity demand**)

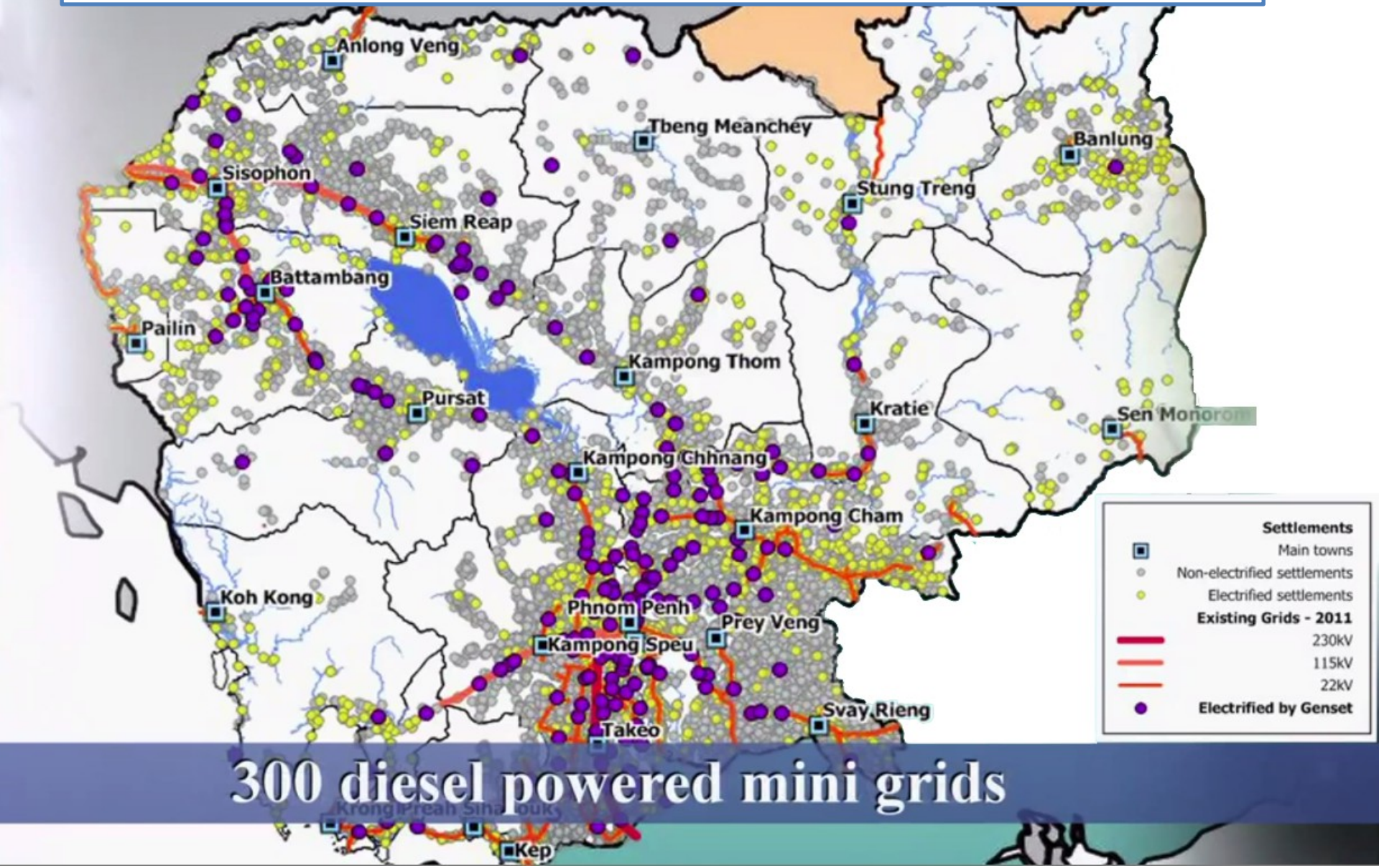
**Source: Baseline study waste to energy for the rice milling sector in Cambodia, SNV Netherlands Development Organization, 2012*

*** Electricity consumption in 2014 = 3 000 GWh, Independent Statistic and analysis IEA)*

Rice growing areas in Cambodia



Electricity tariff from diesel based generation: $0.75 - $1/kWh



Source: Cambodia Consulting Development Engineering (CCDE), 2014

Rice husk gasification, an appropriate technology for Cambodia ?

- Appropriate technology: “small-scale, decentralized, labor-intensive, energy-efficient, environmentally sound, and locally controlled” (*Hazeltine, B.; Bull, C.,1999).*

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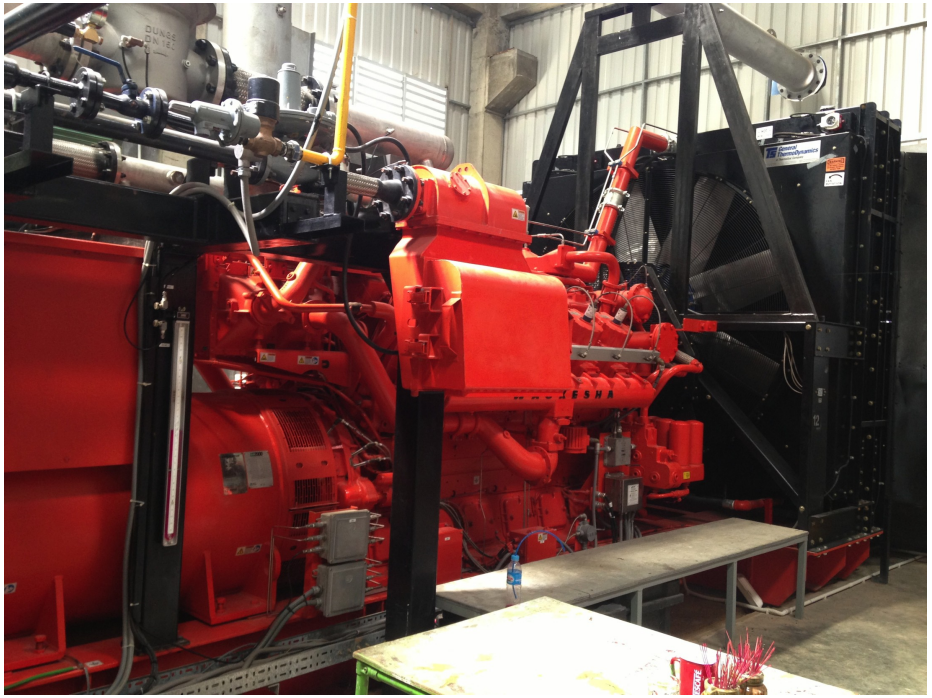
1. Gasification technology works in Cambodia

Dual fuel gas-diesel engine at Golden Daun Keo rice mill, Battambang, Cambodia, 2014-12-20



100% gas engine at HAK SE Plant, Kompong Cham, Cambodia, 2014-12-21

2. Pollution is a problem. Who assess technologies for foreign aid ?

Liquid waste from the gasification system- Deum Pou village, Cambodia. 2014-12-19

Solid and liquid wastes from gasification system at Yam Chan rice mill, Battambang province, Cambodia, 2014 - 12 – 20

Wastes from the gasification system at rice mill- Deum Pou village, Cambodia, 2014-12-19

3. Government lacks technology planning or regulation

Royal Government of Cambodia

Ministry of Industry, Mines and Energy

Electricity Authority of Cambodia

Banks

Electricité Du Cambodge

Gasification system

SME Renewable Energy

Federation of Cambodian Rice millers' Association

Local manufacturers

Rice mills

Brick kilns

Ice plants

Rural electricity enterprises

4. Technology has been transfered in 2 ways: formally and informally

600kW Gasifier at Golden Daun Keo rice mill, Battambang, Cambodia, KH. 2014-12-20

600kW gasifier, local manufacturer at Yam Chan rice mill, Battambang province, Cambodia, KH. 2014 - 12 – 20

5. If a locally built gasifier is operated at high pollution levels, is it because copycats are bad or because management decision ?

Profitability objective

Technology choice

Pollution level

Black water pond - rice mill at Deum Pou village, Cambodia. 2014-12-19

Cleaning water system - UNIDO Project in Siem Siep Province, Cambodia. 2014-12-20

6. Markets change: Rice husk is now a commodity, sector is concentrating

Rice husk truck for Thailand. Baitang trading mill, Cambodia, 2014-12-20

Baitang PLC , Battambang province, Cambodia

Rice mill at Deum Pou village, Cambodia, 2014-12-19

Yam Chan rice mill, Battambang province, Cambodia, 2014 - 12 – 20

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Summary

- Hundreds rice husk gasifiers have been installed in Cambodia.

- Pollution from gasification systems starts to be adressed now, after 10 years.

- Technology choices driven by market forces and foreign aid, not by parliamentary assessment.

Minh Ha-Duong, Hong Nam Nguyen. Rice husk gasification for electricity generation in Cambodia in December 2014. [Research Report] Université de Sciences et Technologies de Hanoi. 2014. <hal-01107615>

Gasification may not remain an appropriate technology in Cambodia.

Small-scale	Yes
Decentralized	Yes
Labor-intensive	Yes, compared to a power plant
Energy-efficient	>steam engine, <steam turbine
Environmentally sound	No
Locally controlled	To some extend

FINAL REPORT

SERVICES FOR AN EMISSION REDUCTION PROJECT BASELINE, FEASIBILITY AND ENVIRONMENTAL STUDY

EU SWITCH-Asia funded project:
"Waste to Energy (WtE) for the Rice Milling Sector in Cambodia", EuropeAid/130830/C/ACT/CAI



SURVEY REPORT

STATUS OF RICE HUSK GASIFIERS, RICE HUSK AND RICE HUSK CHAR FROM GASIFIERS in 12 provinces of Cambodia

EU SWITCH-Asia funded project:
"Waste to Energy (WtE) for the Rice Milling Sector in Cambodia", EuropeAid/130830/C/ACT/CAI


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Thank you for your attention!