Increasing the Share of Biomass Energy Opportunities and Challenges in Thailand

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Outline

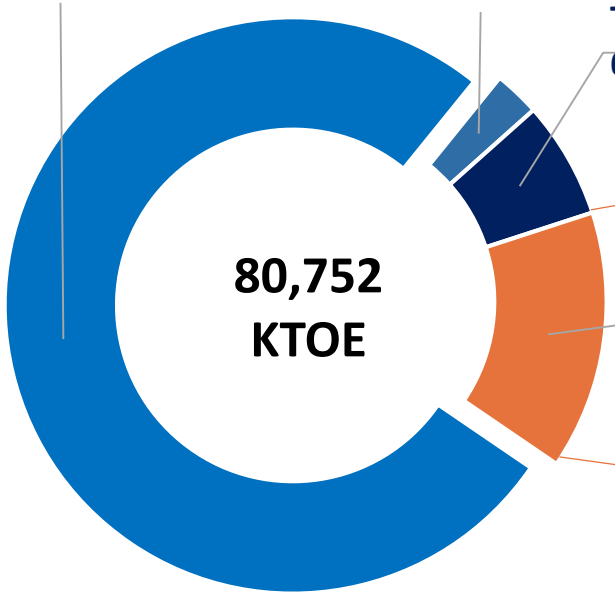
Current Status of Biomass Energy in Thailand

Opportunities and Challenges

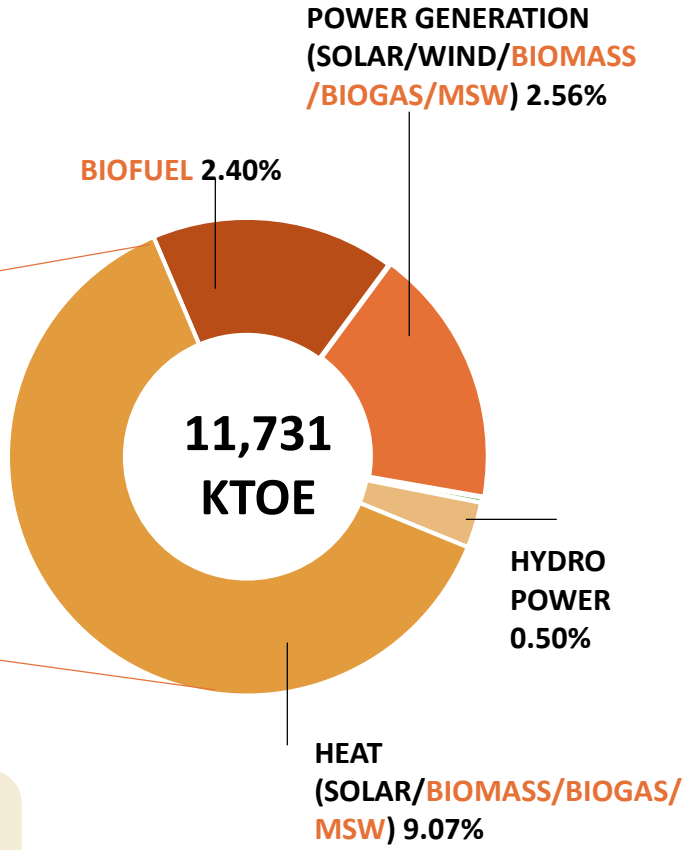
Role of STI for Increasing the Share of Biomass Energy and TISTR's Perspective

Thailand Energy Situation 2017

Final Energy Consumption



Alternative Energy Consumption

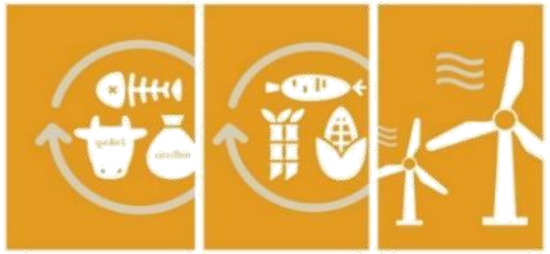


Decreasing of Energy Imports =155,788 Million Baht

Decreasing of CO_2 Emission = 35.98 Million Tons

Source: Thailand Alternative Energy Situation 2017, Department of Alternative Energy Development and Efficiency

Alternative Energy Development Plan (2015-2036)



Increase Share of Renewables in Total Energy Consumption

30% 2036

Sector Breakdown

Power sector

Target of Renewable Energy Share

20.11 % of Electricity

1. MSW + Industrial Waste (550 MW)
2. Biomass (5,570 MW)
3. Biogas (1,280 MW)
4. Small Hydro (376 MW)
5. Wind (3,002 MW)
6. Solar (6,000 MW)
7. Large Hydro (2,906 MW)

Heating

36.67 % of Heat

1. MSW + Industrial Waste (495 ktoe)
2. Biomass (22,100 ktoe)
3. Biogas (1,283 ktoe)
4. Solar Heat (1,200 ktoe)
5. New-Energy (Geothermal, Used Tire Oil, etc) (10 ktoe)

Transport

25.04 % of Transportation Fuel

1. Biodiesel (14 ML/Day)
2. Ethanol (11.3 ML/Day)
3. Pyrolysis Oil (0.53 ML/Day)
4. CBG (4,800 t/Day)
5. Alt. Fuels (10 ktoe)

Source: Department of Alternative Energy Development and Efficiency

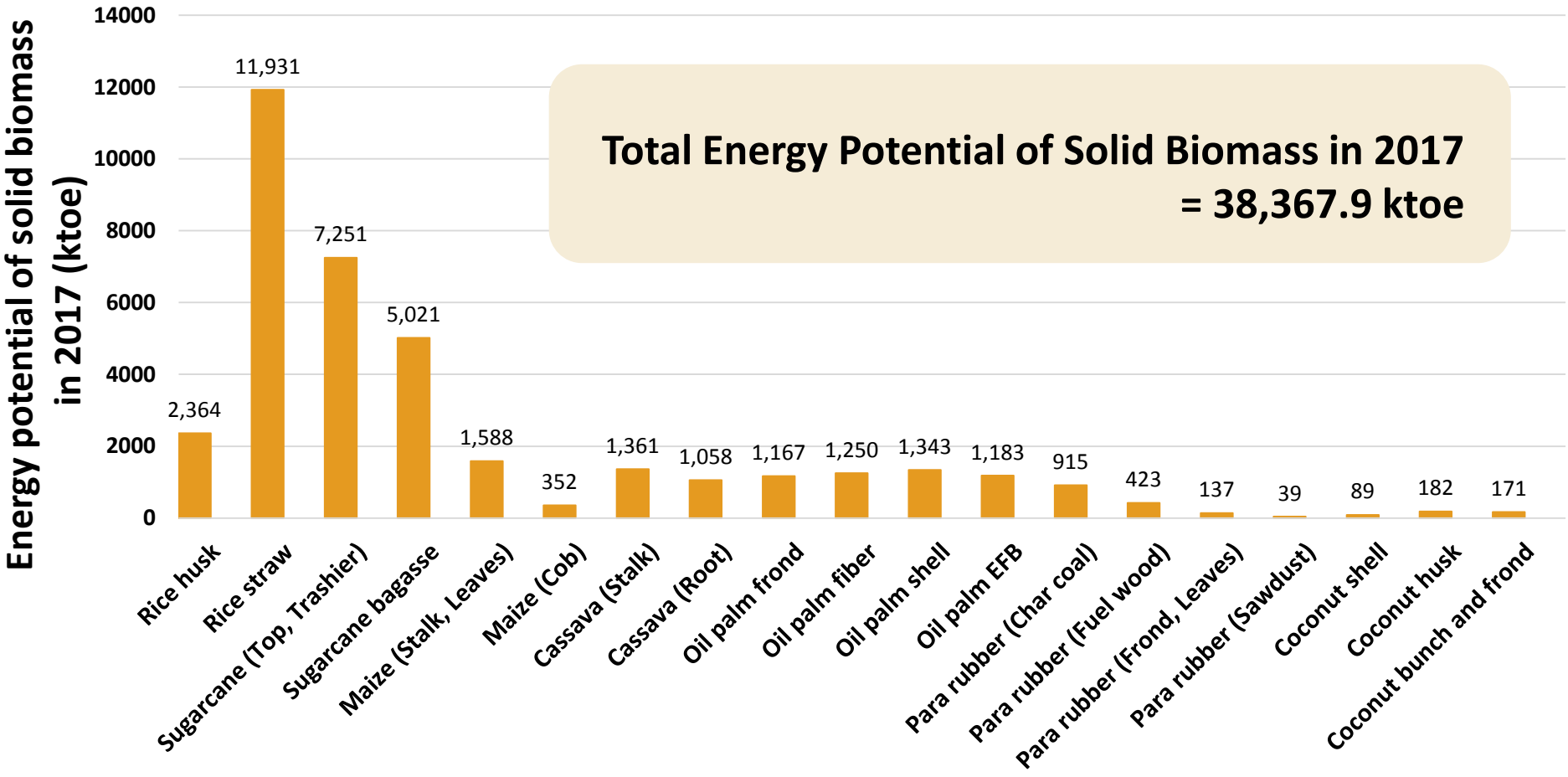
Current Share of Biomass Energy and Target

Alternative Energy	Performance 2017			Target 2036		
	Electricity*		Heat (ktoe)	Electricity (ktoe)	Heat (ktoe)	Biofuels (ktoe)
	(MW)	(ktoe)				
Solar Power	2,697.3	387	9.3	716.6	1,200	
Wind Power	627.8	95	-	403.4		
Small Hydropower	182.3	43	-	115.1		
MSW	191.5	87	63	287.3	495	
Biomass	3,157.2	1,355	6,616	2,910.4	22,100	
Biogas	475.4	146	634	709.4	1,283	
Large Hydropower	2,906.4	360		446.1		
Biofuels	Ethanol: 3.9 Million liters/Day (733 ktoe) Biodiesel: 3.8 Million liters/Day (1,203 ktoe)					8,712.8
Alternative Energy Consumption (%)	14.53			30		

*Installed capacity, including off grid power generation

Source: Thailand Alternative Energy Situation 2017, Department of Alternative Energy Development and Efficiency

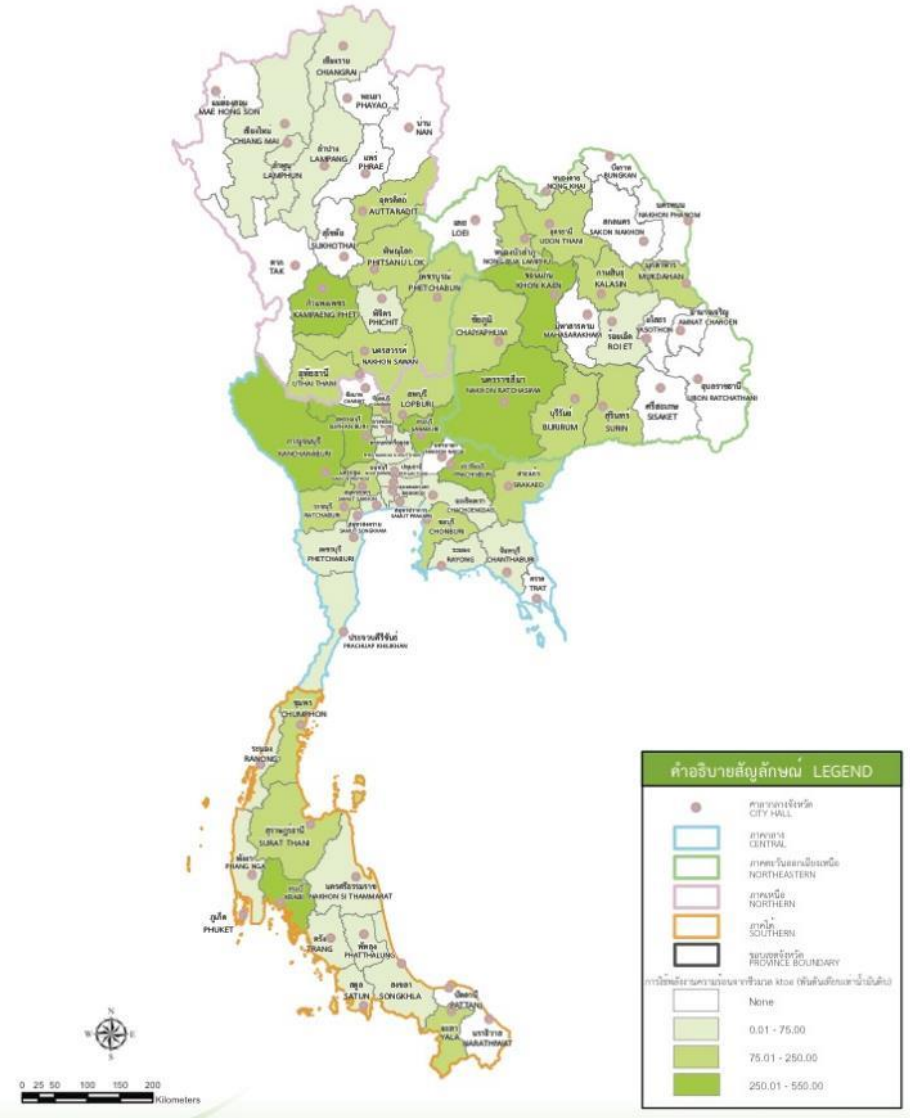
Biomass Potential in Thailand 2017



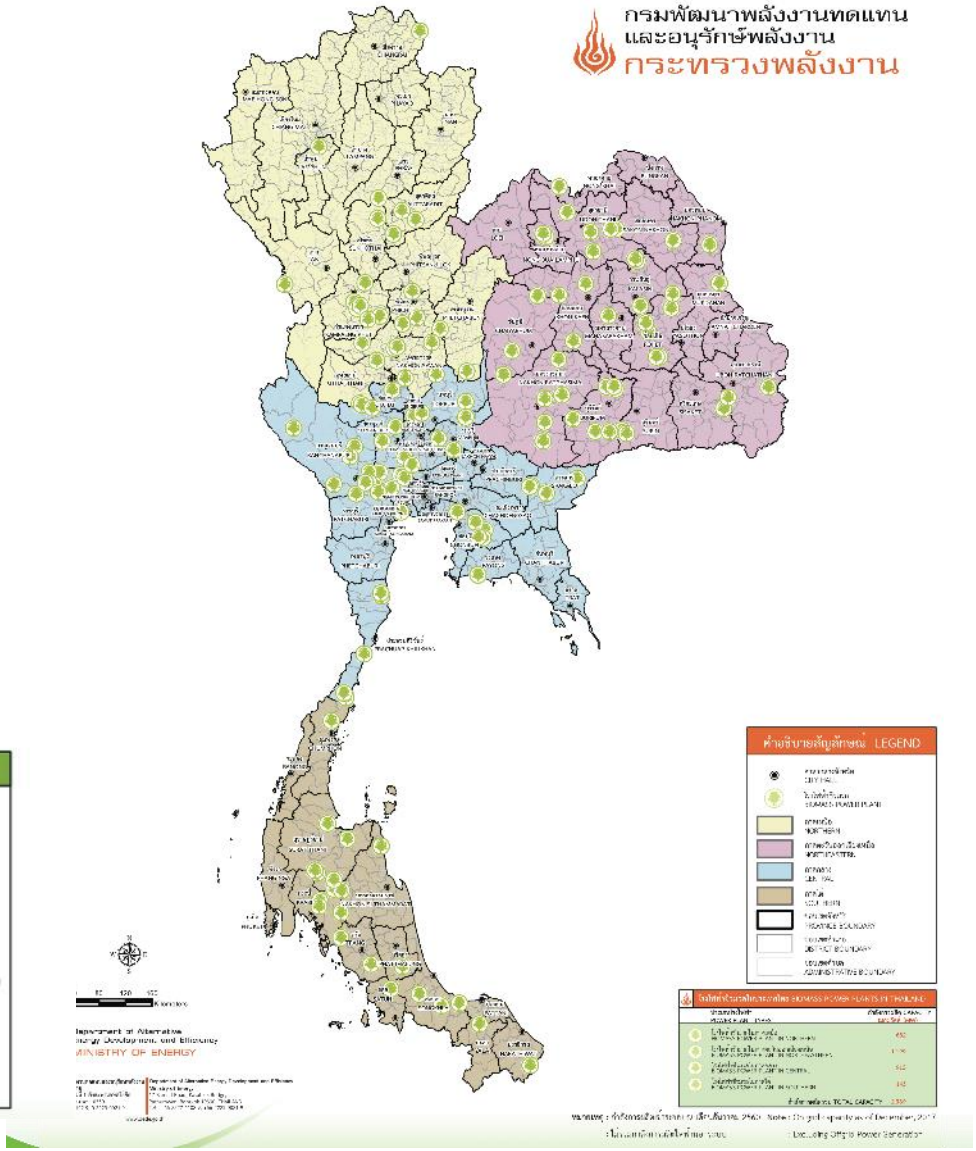
Total Energy Potential of Solid Biomass in 2017 = 38,367.9 ktoe

Source: Thailand Alternative Energy Situation 2017, Department of Alternative Energy Development and Efficiency

Map of Heat Consumption from Solid Biomass, 2017



Map of Solid Biomass Power Plant, 2017



Source: Thailand Alternative Energy Situation 2017, Department of Alternative Energy Development and Efficiency

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Opportunities for Increasing Share of Biomass Energy

IMPROVING ENERGY SECURITY

- Biomass energy can assist in advancing energy security by diversifying the country's energy mix, reducing demand and decreasing impact of fossil fuel..

LEVERAGING TECHNOLOGY ADVANCES

- Recent advance technology have improved the performance and reliability of technologies
- **Research, development and demonstration efforts focusing on technology applications promise continued cost, performance, efficiency and environmental gains.**

IMPROVED WASTE MANAGEMENT

- Biomass technologies can enhance waste management practice in Thailand
- Using a range of agricultural, forestry and crop residues as a feedstock to produce biomass energy

CLIMATE CHANGE

- GHG emission mitigation and carbon tax

Challenges

BIOMASS RESOURCE AVAILABILITY

- Biomass can contribute to energy security, but its sources are finite
- Biomass is scattered and difficult to collect, which placing a barrier to large scale deployment of energy production
- Food vs fuel
- Increasing yield of biomass via smart agriculture
- Diversification of biomass utilization and improvement of feedstock collection and processing
- Promote fast growing trees plantation

Challenges

BIOMASS ENERGY PRODUCTION

- Develop or employ reliable, cost-effective, energy-efficient, and environmental friendly biomass conversion technologies
- Breakthrough technology/Integrated process for biomass energy and value added product
- Scale of production: A risk of bioenergy development is the tendency toward large industrial projects, given the economies of scale
- Strengthen collaboration between R&D organization and industry

BIOMASS ENERGY STANDARD AND UTILIZATION

- Promote and support the sustainable utilization of biomass energy
- Develop standard of biomass energy (i.e. biomass pellets)
- Improvement on integration with existing generation systems to resolve transmission bottle-neck

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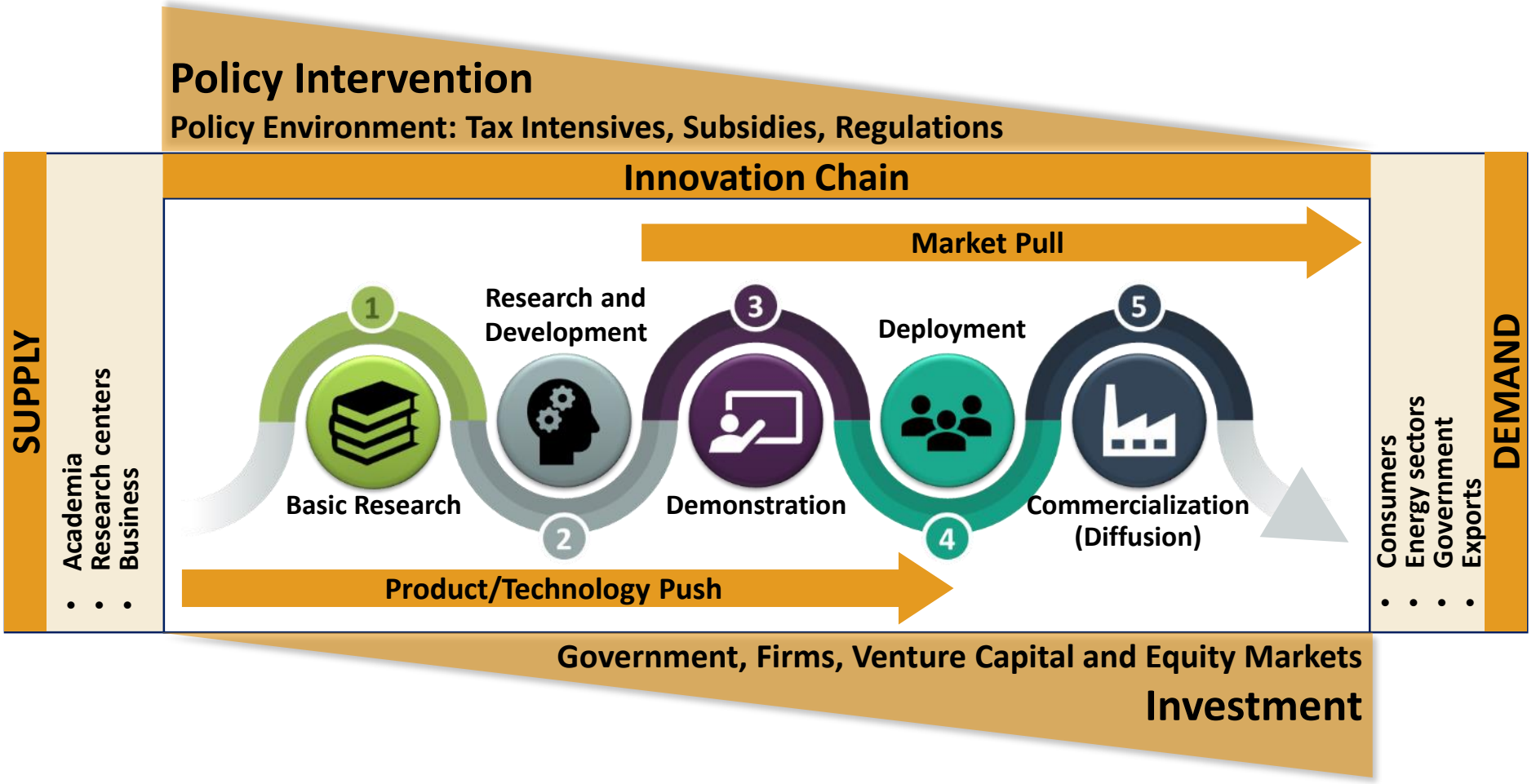
Science, Technology & Innovation System for Development and Transfer of Biomass Energy Technologies



Source: Adapted from IEA 2008

ASEAN Network of Excellence Centre of Biomass Conversion Technology

Objective To setup of ASEAN network of excellence centre of biomass conversion technology (ANEC) to be a platform network for sharing biomass infrastructure, conversion Technology for R&D and technology transfer among AMS.

" Scope of Activities "

5. SETUP ANEC
(at the beginning TISTR can be hub and other AMS that willing to share can be spokes).

2. SCREEN AND RECOMMEND POTENTIAL RESOURCES AND APPROPRIATE TECHNOLOGIES

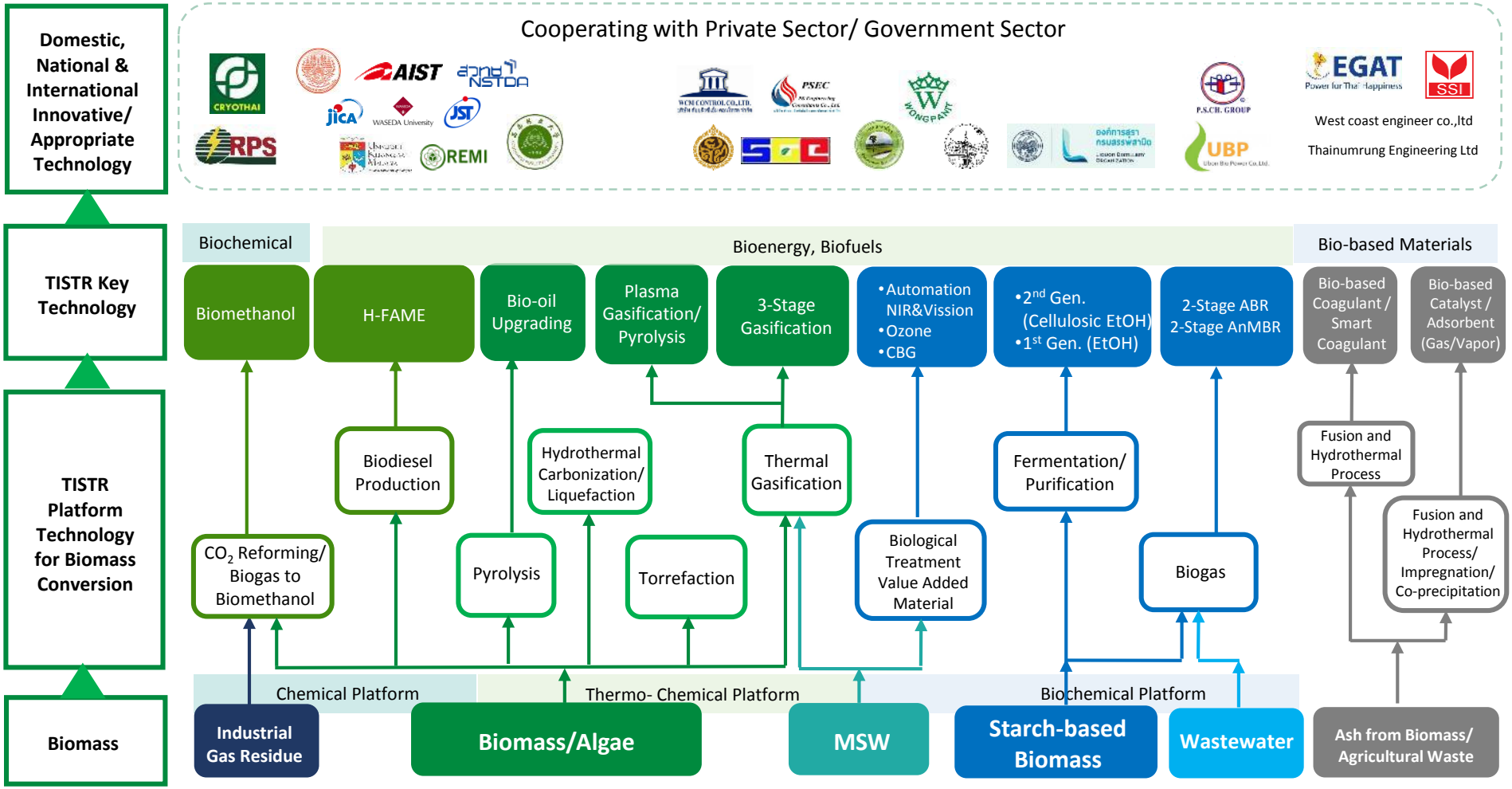
1. SITE VISIT AND SURVEY DOMESTIC RESOURCES AND CURRENT TECHNOLOGIES
in each AMS including introducing TISTR infrastructure and technology ready for sharing as well as seeking for sharing from other AMS for network development.

4. DEVELOP ASEAN INFRASTRUCTURE, RESOURCES AND TECHNOLOGY PLATFORM
base on TISTR's and other AMS that willing to share.

3. WORKSHOP/TRAINING/CONSULTATION
meeting arrangement and implementation of joint action research.

ASEAN Network of Excellence Centre of Biomass Conversion Technology

TISTR Technology Available for Sharing



ASEAN Network of Excellence Centre of Biomass Conversion Technology

TISTR Facility Available for Sharing

3-stage Gasification,
7.5 Ton Biomass/Day

Circulating Fluidized Bed Pyrolyzer
0.2 Ton Biomass/Day

ASEAN Network of Excellence Centre of Biomass Conversion Technology

TISTR Facility Available for Sharing

Pilot plant for biodiesel production
(1000 L/day)

Bio-methanol production from biogas
(Semi-pilot scale : 1 L/day)

Biodiesel upgrading unit
(H-FAME, 100 L/batch)

Autothermal reforming reactor for bio-methanol production (0.025 L/day)

Cellulosic ethanol production
(99.95%, 10 L/day)

ASEAN Network of Excellence Centre of Biomass Conversion Technology

TISTR Facility Available for Sharing

2-stage ABR
(Anaerobic baffled reactor)
10 ton/day , 1,600 m^3

ABR (2-stage digestion)
20 L/day

SLBR-UASB (Sequential leach bed reactor with upflow anaerobic sludge blanket)
(2-stage digestion) 30 L/day

Syngas production by steam reforming process

Compress biomethane gas; CBG

TISTR Facility Available for Sharing

Outdoor Continuous Algal Biomass Cultivation System (200,000 L)

SCADA control

IC

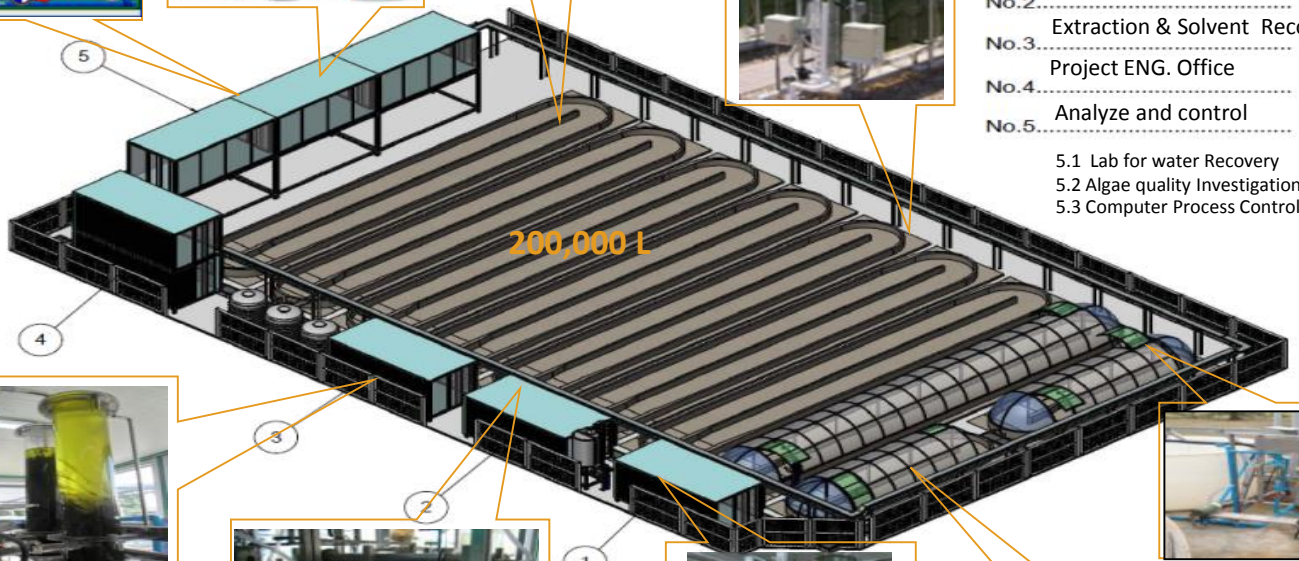
20,000 L raceway pond

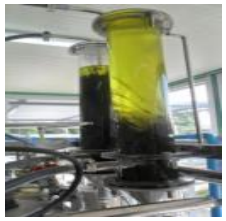
Inoculums

Developing Fully Automated Plant

No.1 Harvesting Unit
No.2 Cell Braking Unit
No.3 Extraction & Solvent Recovery
No.4 Project ENG. Office
No.5 Analyze and control

5.1 Lab for water Recovery
5.2 Algae quality Investigation
5.3 Computer Process Control





Extraction

Cell Disruption System

Dewatering

Controlled Dome

Dosing unit for reclaimed water

Thank you

More information please contact: aparat@tistr.or.th