

# CAPTURING WASTE-TO-ENERGY OPPORTUNITIES IN THE MEKONG REGION

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OVERVIEW, OPPORTUNITIES AND BEST PRACTICES TO SUCCEED IN WASTE TO ENERGY

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February 2018

Business Sweden in Thailand and Vietnam

# LARGE OPPORTUNITIES EXIST IN W-T-E – PARTNERSHIPS & MID-RANGE SOLUTIONS ARE KEY



## Financing partnerships

Partnerships with banks or export credit institutions -crucial to finance the purchase of Swedish solutions



## Utilizing partnership

Good relationship with companies having license in waste treatment - key factor to break through the market



## Offering mid-range localized products

Mekong market is price-sensitive and generally cash-starved, having a mid-range offering may be a powerful way to target the market

3

## RECOMMENDED ACTIONS



2

## OPPORTUNITIES FOR SWEDISH COMPANIES



### Machinery and equipment

Waste handling equipment, recycling technology, sorting equipment, landfill equipment and incinerators



### Technology /Licensing

Know-how and expertise in waste-to- fuel/energy



### Consultancy /Plant design

Experienced engineering to support with planning and designing waste treatment plant



### EPC projects

EPC is common project type

1

## OVERVIEW OF WASTE-TO-ENERGY IN THE MEKONG REGION



**Energy consumption** is growing rapidly, leading to strong demand on energy alternatives

- ▶ **Thailand & Vietnam** are the main markets



**Waste management sector** is not yet mature, presenting strong need to modernize the sector to fully capture W-t-E potentials

- ▶ Open dump and landfill are dominant waste treatment methods
- ▶ Waste is currently not common as energy source



## Renewable energy development plans

formulated. Clear policies and incentives are needed to boost the sector

- ▶ Renewable energy targets range from 15% to 30% of energy consumption



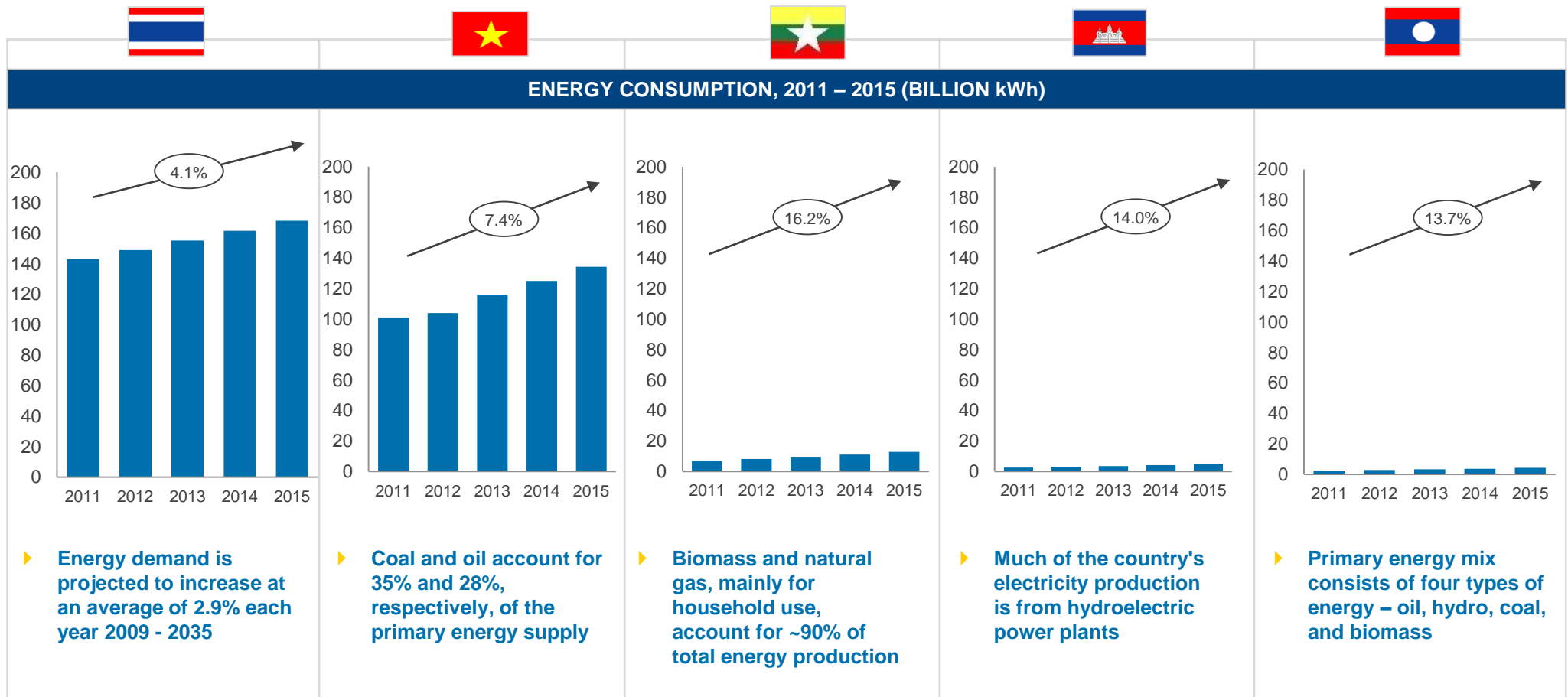
**Government** dominates the market

- ▶ State-owned companies handle the majority of waste collection and waste treatment



OVERVIEW

# ENERGY DEMAND IN MEKONG REGION IS GROWING RAPIDLY – THAILAND & VIETNAM MAIN CONSUMERS



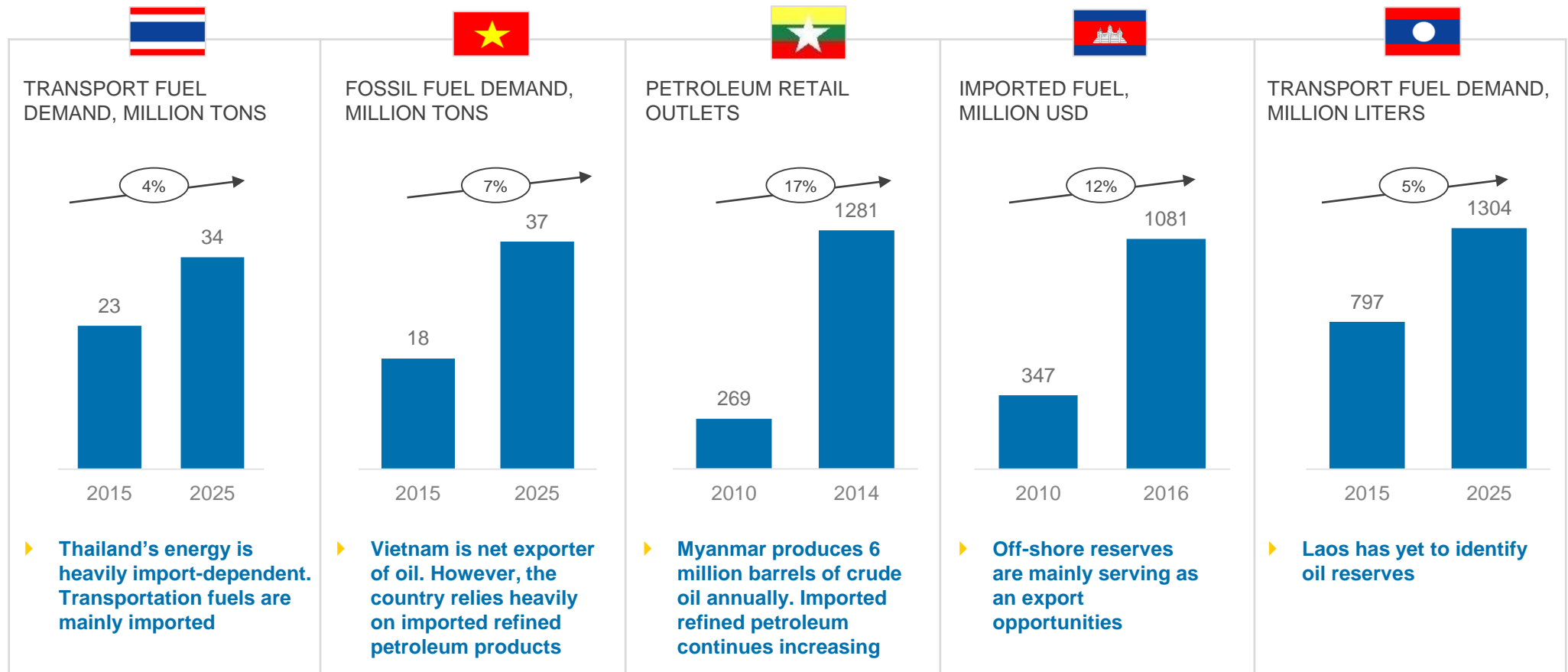
## ENERGY CONSUMPTION EXPECTED TO CONTINUE INCREASING

SOURCE: IRENA, ADB, NATIONAL MASTER PLANS, EIC, UNCRD, IGES, RECYCLING INTERNATIONAL, WORLD BANK



## OVERVIEW

# THE DEMAND FOR TRANSPORT FUEL IS EXPECTED TO INCREASE SIGNIFICANTLY



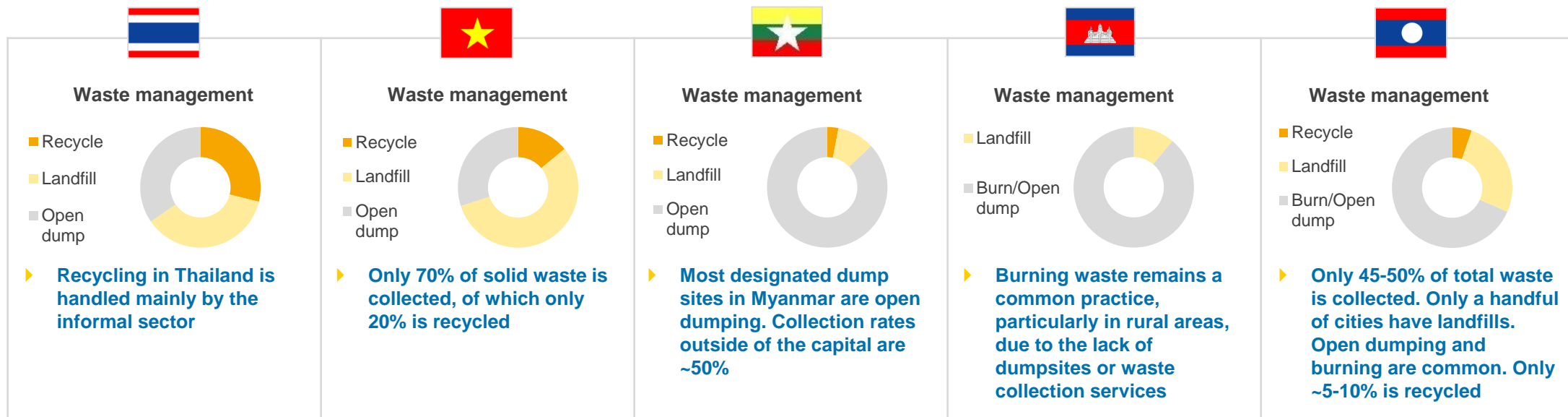
AS FUEL DEMAND INCREASES, FINDING ALTERNATE FUEL SOURCES IS BECOMING A PRIORITY

SOURCE: IRENA, ADB, NATIONAL MASTER PLANS, EIC, UNCRD, IGES, RECYCLING INTERNATIONAL, WORLD BANK



## OVERVIEW

# WASTE MANAGEMENT REMAINS AN IMMATURE SECTOR WITH LOW COLLECTION AND RECYCLING RATE



## COMMENTS

- ▶ Municipal waste management is still a nascent sector in the Mekong region
- ▶ Collection rates are low (~50 – 70%), especially in rural areas, due to under-developed waste collection services. The remaining waste is dumped into the environment, creating severe pollution and health problems
- ▶ Burning, open dumping and landfilling are the three most popular ways to deal with solid waste
  - ▶ Outdated technology, together with lack of competent human resources, means sometimes more pollution is created from waste processing facilities
- ▶ Only Thailand has considerable recycling rate (30%). However, like other Mekong countries, recycling is handled mostly by the informal sector with waste pickers scavenging through waste piles to look for materials to sell to recycling facilities

SOURCE: IRENA, ADB, NATIONAL MASTER PLANS, EIC, UNCRD, IGES, RECYCLING INTERNATIONAL



## OVERVIEW

# MEKONG HAS SET RENEWABLE ENERGY TARGETS IN ORDER TO REDUCE RELIANCE ON IMPORTED ENERGY



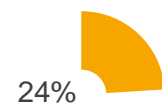
## RENEWABLE ENERGY TARGET

2036



- ▶ Thailand offers a well-designed feed-in tariff differentiated by technology and scale plus other support

2020



- ▶ Vietnam offers feed-in tariff, but tariffs are assessed to be low. Revision of tariff is under consideration

2020



- ▶ Myanmar offers incentives in the form of tax reductions

2025



- ▶ All investments in renewable energy projects are entitled to investment incentives

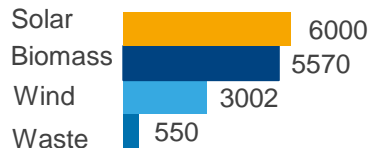
2020



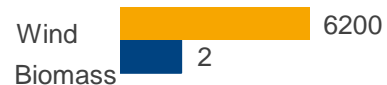
- ▶ Cambodia currently offers no feed-in tariffs nor incentives for the development of renewable energy

## TARGET RENEWABLE ENERGY GENERATION, MEGAWATT

2036



2030



2020



2025



- ▶ The adopted policies do not set out a specific target for each type of renewable resources, such as biomass and solar power, in the total energy mix

## LOCAL PRODUCTION / FUEL DISPLACEMENT TARGET

2036



- ▶ Domestic biofuel is targeted to reach **25%** of total fuel consumption

2025



- ▶ Ethanol and vegetable oils output are up to 1.8 million tons to meet **5%** of total nationwide gasoline and oil demand

2020



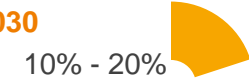
- ▶ It is expected that locally produced biodiesel and bio-ethanol will substitute for **10%** of imported oil and gasoline

2025



- ▶ Biodiesel and bio-ethanol will replace **10%** of local diesel and gasoline consumption

2030



- ▶ Biodiesel and bio-ethanol will displace **10%** of diesel consumption and **20%** of gas consumptions.

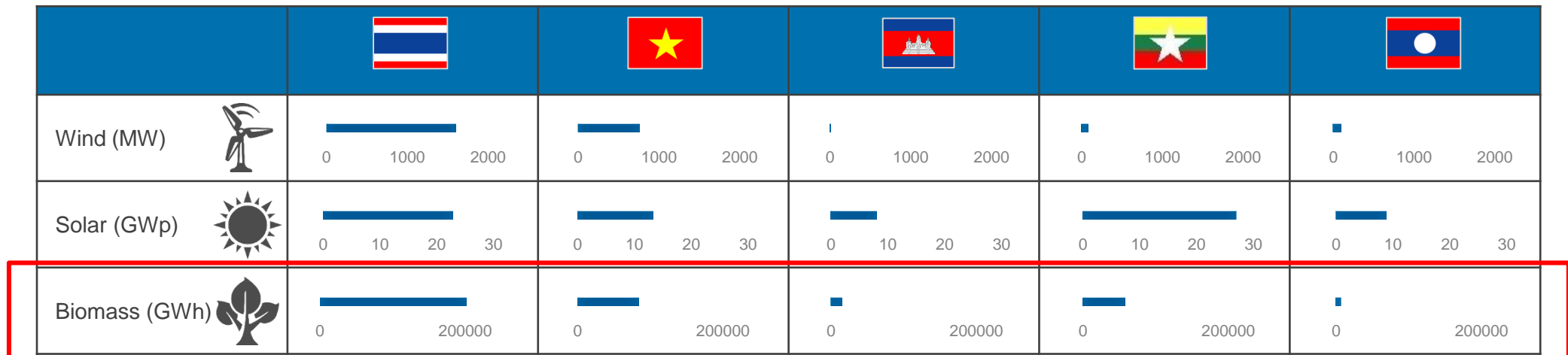
CLEAR POLICIES, PLANS AND INCENTIVES ARE NEEDED TO BOOST CLEAN ENERGY SECTOR

SOURCE: IRENA, ADB, NSDTA, NATIONAL MASTER PLANS, EIC



## OVERVIEW

# MEKONG PRESENTS HUGE POTENTIAL FOR A VARIETY OF RENEWABLE ENERGY SOURCES



## COMMENTS

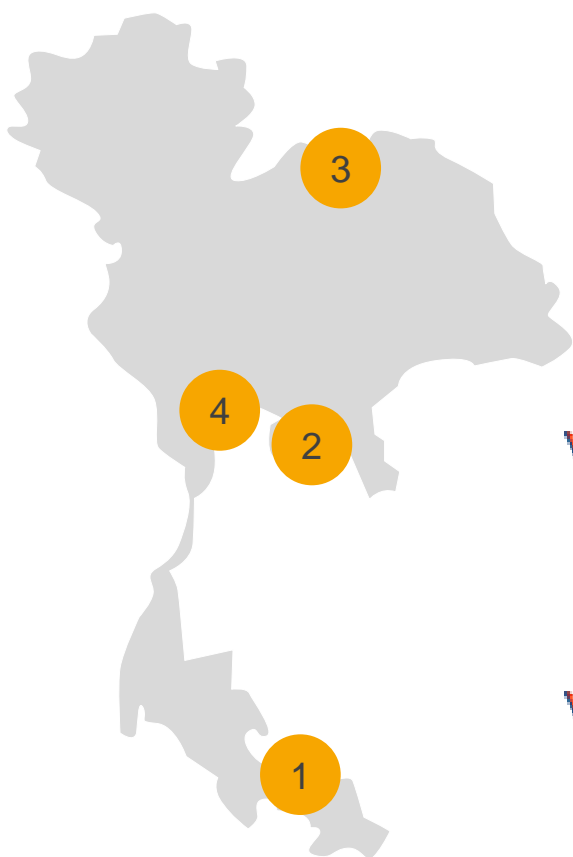
- ▶ The potential for renewable energy in the Mekong region has only begun to be tapped due to technical and financial restriction
  - ▶ Thailand has installed about 224 MW capacity of wind power (2014) and 2142 MW of solar power (2016)
  - ▶ In Vietnam, about 20 MW of solar energy have been developed and another 470 MW are under various stages of development
- ▶ **The Mekong region is largely agriculture-dependent, which means it produces an enormous volume of waste every year from agriculture and forestry.** This results in excellent potential for using biomass materials in generating energy and biofuels.
- ▶ Diverse input materials include rice, coconut, cassava, maize, sugarcane, etc.
- ▶ Among Southeast Asian countries, **Thailand remains the biggest biofuel producer**, producing 0.9 billion liters of molasses-based ethanol in 2016. Other producers use cassava and sugarcane as inputs with production capacity of 0.5 and 0.1 billion liters, respectively. Thailand has a master energy plan that aims to push both consumption and production of ethanol, biodiesel, and others biofuels

CAPTURING FULL POTENTIAL REQUIRES INSIGHTFUL KNOWLEDGE OF SOCIO-ECONOMIC DETERMINANTS



# THAILAND REMAINS THE FRONTRUNNER IN MEKONG WITH VARIOUS PROJECTS IN OPERATION AND PIPELINE

## EXAMPLE PROJECTS



1

### Chana Green Power Plant in Songkhla Province

- ▶ Status: Initial Environmental Examination completed (October 2017)
- ▶ Financier: ADB
- ▶ Description: Biomass power plant using rubber wood and acacia wood
- ▶ Capacity: 25 MW

2

### Waste-to-energy power plant at the Hemaraj Chonburi Industrial Estate in Chonburi

- ▶ Expected completion: Q4 2019
- ▶ Investment: 59 MUSD
- ▶ Construction is done by Chonburi Clean Energy (CCE) – a joint venture company established by Suez (🇫🇷), WHA Utilities and Power (🇩🇪) and Glow Energy (🇩🇪)

3

### Nongkhainayu Co., Ltd.'s waste-to-energy plant in Nong Khai Province

- ▶ EPC contractor: KPN Green Energy Solution, Thailand (🇹🇭)
- ▶ Technology sub-contractor: Hitachi Zosen, Japan (🇯🇵)
- ▶ Expected completion: March 2018
- ▶ Processing capacity: Stoker-type waste incinerator 370 t/d, power output 6,000 kW

4

### Mahachai plant turning coconut waste into energy in Samut Sakhorn Province

- ▶ The first power plant in the world to turn coconut residues (husk, shell, bunch, frond, leaves, trunk) into clean energy
- ▶ Investor: Mahachai Green Power Co., a Thai-German JV
- ▶ EPC contractor: DP CleanTech, Denmark (🇩🇰)



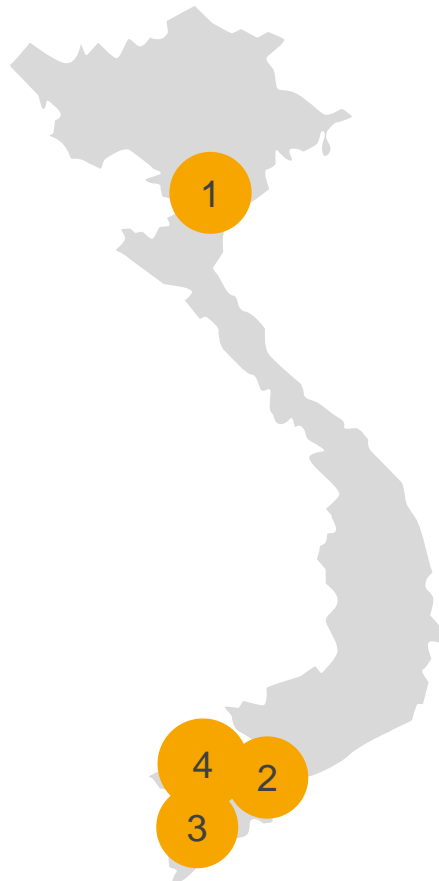
Key project





# WASTE-TO-ENERGY IS STILL AN EMERGING CONCEPT IN VIETNAM WITH SMALL SCALE PILOT PROJECTS

## EXAMPLE PROJECTS



1

### Watrec Waste-to-Energy Plant in Hanoi

- ▶ Watrec is the leading biogas technology company in Finland (🇫🇮)
- ▶ Description: The project in Hanoi aims to manage the mixed waste that has not been classified and treat urban solid waste
- ▶ Size of investment: 33 MUSD
- ▶ Status: Initial negotiation stage

2

### Go Cat Plant in Ho Chi Minh City

- ▶ Investors are Citenco (🇻🇳) and HMC (🇻🇳)
- ▶ From when the factory became operational in April to June 2017, the factory has processed 500 tons of waste, generating 7MW of power

3

### First series of clean municipal waste-to-energy PPP projects in the Mekong Delta in southern Vietnam

- ▶ Investor: China Everbright International Limited (🇨🇳)
- ▶ Description: The projects aim to treat household waste in multiple cities in Vietnam in order to provide on-grid electricity
- ▶ Donor: ADB provides a loan of 100 million USD for the construction and operation of these projects. This initiative will be the first municipal waste-to-energy public-private-partnership project in the country

4












- ▶ Other related project: Everbright International secured Can Tho waste-to-energy project in 2016. The project is expected to complete construction and commence operation in 2018 with financial support from ADB.



Key project

## STAKEHOLDERS

# PUBLIC SECTOR REGULATES THE MARKET WHILE PRIVATE SECTOR DRIVES WTE\* INITIATIVES [1/2]

Country	Market Structure	Key regulatory authorities	Comments	Example companies
		Central governments including: <ul style="list-style-type: none"> <li>▶ Pollution Control Department</li> <li>▶ Department of Environmental Quality Promotion</li> <li>▶ ONEP*</li> <li>▶ Department of Local Administration</li> <li>▶ Public Health Department</li> </ul>	<ul style="list-style-type: none"> <li>▶ State-owned companies handle majority of waste treatment in Thailand, where Bangkok Metropolitan Administration is the biggest operator</li> <li>▶ Private sectors has pursued national interest in waste to energy plans</li> </ul>	<p>▶ <b>Public companies:</b></p>  <p>Bangkok Metropolitan Administration Metropolitan Electricity Authority</p> <p>▶ <b>Private companies:</b></p>  <p>genco BWG ENGIE Glow UBN BIO ETHANOL group</p>
		<ul style="list-style-type: none"> <li>▶ Ministry of Natural resources and environment</li> <li>▶ Ministry of Construction</li> <li>▶ Ministry of Energy</li> </ul>	<ul style="list-style-type: none"> <li>▶ The sector is largely dominated by state-owned companies including collection, transportation and management while private companies are mainly taking charge of collecting waste</li> </ul>	<p>▶ <b>Public companies:</b></p>  <p>URENCO CITENCO EVN PETROVIETNAM</p> <p>▶ <b>Private companies:</b></p>  <p>VIETNAM WASTE SOLUTIONS</p>
		<ul style="list-style-type: none"> <li>▶ Ministry of Environment</li> <li>▶ Ministry of Mines and Energy</li> </ul>	<ul style="list-style-type: none"> <li>▶ Cintri, GAEA and Sarom are sole providers in waste collection/management in main provinces while municipalities/small private players take charge of this service in other areas</li> </ul>	<p>▶ <b>Private companies:</b></p>  <p>CINTRI GAEA Sarom Trading Co., LTD</p>











\*ONEP: Office of Natural Resources and Environmental Policy and Planning

\*WTE: Waste to energy



STAKEHOLDERS

# PUBLIC SECTOR REGULATES THE MARKET WHILE PRIVATE SECTOR DRIVES WTE\* INITIATIVES [2/2]

Country	Market Structure	Key regulatory authorities	Comments	Example companies
		<ul style="list-style-type: none"> <li>▶ Ministry of Natural Resources and Environmental Conversation</li> <li>▶ City and Township Development Committees</li> <li>▶ Pollution Control and Cleansing Departments</li> <li>▶ Ministry of electricity and energy</li> </ul>	<ul style="list-style-type: none"> <li>▶ Local municipal authorities are responsible for their own waste management. Each development committee handles waste independently, therefore the practices may vary from one township to another</li> <li>▶ NGOs (for example UNICEF) are currently more active on national level</li> </ul>	<p>▶ <b>Public sector:</b></p>  <p>Yangon city development committee</p> <p>▶ <b>Private companies:</b></p>  <p>Dowa Eco-system</p>  <p>Zeya &amp; Associates</p>  <p>PARAMI ENERGY GROUP OF COMPANIES</p>
	 <p>SOEs dominate energy sector while private companies control waste management sector</p>	<ul style="list-style-type: none"> <li>▶ Ministry of Natural Resources and Environment</li> <li>▶ Ministry of Energy and Mine</li> <li>▶ Ministry of Science and Technology</li> </ul>	<ul style="list-style-type: none"> <li>▶ Local authorities are responsible for municipal solid waste treatment while private sector takes charge of waste collection</li> <li>▶ The informal sector presents a large part of the sector while the public sector plays key role in managing waste at high level</li> </ul>	<p>▶ <b>Public companies:</b></p>  <p>Lao State Fuel Company</p> <p>Vientian Solid Waste Service company</p> <p>▶ <b>Private companies:</b></p>  <p>Sunlabob Renewable Energy</p>

IT'S CRITICAL TO FORM PARTNERSHIP WITH KEY LOCAL STATE-OWNED COMPANIES



## INVESTMENT TRENDS

# STRATEGIC PARTNERSHIP ARE OFTEN USED TO IMPLEMENT WASTE-TO-ENERGY PROJECTS

## St1 signed a MOU for a bioethanol pilot project



- ▶ **Description:** St1, a Finnish energy company signed a MOU with Ubon Bio Ethanol, the largest cassava ethanol producer in Thailand to launch a pilot project, with the aim of setting up a joint venture for local ethanol production
- ▶ **Product:** Bioethanol from cassava waste
- ▶ **Target:** To build as many as 20 Etanolix plants in Thailand, with a combined production capacity of 400 million liters of ethanol per year.

## Toray established a joint venture to manufacture bioethanol



- ▶ **Description:** In January 2017, Toray Industries, together with Mitsui Sugar Co., Ltd in Bangkok established a joint venture to manufacture bioethanol
- ▶ **Product:** Bioethanol from bagasse, which is the waste fiber left over from sugarcane
- ▶ **Demonstration project:** The demonstration plant to handle 15 tons of bagasse per day (dry weight) and will manufacture 4.2 tons of cellulosic sugar.
- ▶ The project is aimed at examining the possibilities of commercialization of the cellulosic sugar production system.

## Hitachi Zosen and Laos PDR sealed partnership agreement in environment and green energy



- ▶ **Description:** Hitachi Zosen entered into a comprehensive cooperation agreement with Laos Ministry of Energy and Mines in the field of environment and green energy
- ▶ **Areas of collaboration:** Hitachi Zosen will examine potential green energy projects then present recommendations suitable to the actual needs of Lao PDR including:
  - ▶ Power-to-gas using hydroelectric power
  - ▶ Methane fermentation for converting organic waste into energy
  - ▶ Energy-from-Waste for waste treatment
  - ▶ Biofuel production from agricultural produce

## Partnership between China Everbright International and ADB for waste-to-energy projects in Vietnam



- ▶ **Description:** China Everbright International have secured a series of municipal waste-to-energy plants in the Mekong Delta, Vietnam
- ▶ **Areas of collaboration with ADB:** The company signed a loan agreement with ADB to facilitate the construction of municipal waste-to-energy plants. This is typical example of public-private-partnership projects at the municipal level in Vietnam.

SOURCES: TORAY, HITACHI ZOSEN, BIOMASS JOURNAL, ST1

## OPPORTUNITIES

# SWEDISH COMPANIES CAN CONTRIBUTE WITH EQUIPMENT AND TECHNICAL KNOW-HOW



## Machinery & equipment

- ▶ There is a need for waste handling equipment, recycling technology, sorting equipment, landfill equipment and incinerators
  - ▶ Bangkok Metropolitan Administration (BMA) spends approximately USD15-20 million a year for waste collection, transportation and landfill operation



## Technology /Licensing

- ▶ There is a strong demand for know-how & expertise in waste-to-fuel/energy due to lack of experience
- ▶ Waste-to-energy is an emerging concept in the region. Therefore, it's important to merge advance expertise with local practicalities to facilitate the establishment of WTE plants



## Consultancy /Plant design

- ▶ Waste in Mekong is wet and inconsistent due to large amount of organic waste coming from different sources. Experienced engineering can support with planning and designing waste treatment plant to optimize the system
- ▶ Consultancy services include project bidding, engineering, technology, etc.



## EPC\* projects

- ▶ EPC is common project type in which the contractors take charge of full-scale project including planning, supplying and installing relevant equipment
- ▶ This type of project will help to optimize and capture all competence of the company and ensure quality control

COMPETENT PARTNERS NEEDED ON SITE IN ORDER TO BE ABLE TO ACCESS OPPORTUNITIES

\*EPC: Engineering, Procurement and Construction

# THAILAND'S FIRST COCONUT WASTE-TO-ENERGY POWER PLANT COMMENCED COMMERCIAL OPERATION

## DESCRIPTION OF THE PROJECT

- ▶ **Introduction:** The plant was designed to utilize coconut waste to clean energy
- ▶ **Supply:** The plant sold electricity to Provincial Electricity Authority and had Fuel Purchase contract with Coco Biofuel Management Company Limited for power generation
- ▶ **Investor:** The Mahachai Green Power Co., LTD, a member of TPC Power Holding
- ▶ **Type of fuel:** Coconut shell and coconut frond
- ▶ **Plant performance:** > 8 000 hours per year

## PROFILE OF EPC CONTRACTOR

- ▶ **Type of company:** 100% foreign-owned company
- ▶ **Establishment year:** 1990
- ▶ **Products/Services:**
  - ✓ Biomass      ✓ Consulting      ✓ Waste to Energy
  - ✓ Water treatment    ✓ Emissions control    ✓ R&D
- ▶ **DP in South East Asia:** Thai office was established in 2009 to capture opportunities for biomass in the region
- ▶ The company has strong portfolio in groundbreaking R&D

## SUCCESS FACTORS

<p><b>Competent contractor</b></p>	<ul style="list-style-type: none"> <li>▶ The contractor has strong portfolio in bioenergy projects with innovative technologies</li> <li>▶ Having local presence enables DP CleanTech to gain tremendous local practicalities</li> </ul>
<p><b>Professional investor</b></p>	<ul style="list-style-type: none"> <li>▶ TPC Power Holding has investment in 7 subsidiaries generating and distributing electricity from biomass</li> <li>▶ Due to a strong portfolio in energy sector, the company got loan from the biggest bank in Thailand, the Bangkok Bank</li> </ul>
<p><b>Innovative technology</b></p>	<ul style="list-style-type: none"> <li>▶ The plant can utilize all types of coconut waste, leading to the Purchasing contract with Provincial Electricity Authority and Fuel Purchase contract with Coco Biofuel Management Company</li> </ul>
<p><b>Experienced staff</b></p>	<ul style="list-style-type: none"> <li>▶ The team consists of international and local professionals dedicated to achieve the strategic objectives of the project</li> </ul>

With more than 150 employees working at 8 offices in 6 countries, DP CleanTech is recognized as one of the world-leading companies in renewable energy and environmental management.

SOURCE: DP CLEANTECH, TPC POWER HOLDING, BIOENERGY INTERNATIONAL



# FINANCING, PARTNERSHIPS AND MID-RANGE PRODUCTS ARE CRITICAL TO SUCCESS



## FINANCING PARTNERSHIPS

- ▶ Due to lack of financing options in Mekong, partnerships with banks or export credit institutions (SEK/EKN) are crucial in order to finance the purchase of Swedish solutions
- ▶ Using a local / regional partner with strong financial capabilities is recommended



## UTILIZING PARTNERSHIPS

- ▶ The right local partners are essential to get access to government tenders and key stakeholders in Mekong
- ▶ Good relationships with companies having license in waste treatment is a key factor to break through the market
- ▶ Strategic partnership raises trust concerning WTE projects and increase the level of commitment among partners



## OFFERING MID-RANGE LOCALIZED PRODUCTS

- ▶ As the Mekong market is price-sensitive and generally cash-starved, having a mid-range offering may be a powerful way to target the local market
- ▶ Top-range offerings are affordable to only a small minority.

WITH KEY SUCCESS FACTORS IN PLACE, SWEDISH COMPANIES HAVE GOOD POTENTIAL IN THIS FIELD



# BUSINESS SWEDEN SUPPORT SWEDISH COMPANIES' REVENUE GROWTH IN APAC

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..with a well-spread footprint in APAC..

..driving growth for Swedish companies

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Strategic support in **20+** markets  
150 Growth experts  
Projects performed yearly **500+**  
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95 Companies housed in our facilities



**MARKET EXPANSION**

- Market Entry
- Market Growth
- Customer Segmentation
- Sales Channel Optimization
- M&A and Alliances

**PUBLIC AFFAIRS**

- Market Access Strategy
- Stakeholder Analysis and Engagement
- Government-to-government business promotion

**SALES ACCELERATION**

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- Partner Search & Selection
- Sales & Partner Management
- Mega Deals (Tender Support)

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- Recruitment and Operational support
- Office Space, Finance and HR Back Office

Companies who work with us perceive us as:

Specialized on revenue growth in APAC	Unique in combining analytical skills with government access	Local, hands-on and agile	Passionate about the success of Swedish companies
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