AMBITION TO ACTION PROJECT UPDATE AND INTERIM ECONOMIC RESULTS

September 2019

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Project overview

Economic Impact – Methodology

Economic Impact – Interim Results

Industrial development

Final project event



Ambition to Action project (A2A)



- Working with 4 countries; focus on NDC in the energy sector and cobenefits
- 3 years from 2017 to end 2019 (Thailand started Oct 2017)
- Partnering globally with NewClimate Institute and with local experts
- In Thailand:
 - During 2018 worked with EPPO and DEDE on NDC Action Plan for Energy Sector
 - Since Nov 2018 we have been working on economic co-benefits

Ambition to Action: Focus on co-benefits

Ambition to Action

Investment and Employment

- What do different power generation scenarios mean for investment and job creation?
- What is Thailand's local content share of key technologies and components?

Industrial Development

- What industrial development opportunities are offered by renewable energy?
- How could local share be increased?
- What policies are needed to realise these opportunities?



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Our model calculates total power sector investment and employment





Installed capacity 2018-2036

- Capex jobs exist during the construction period of the new capacity
- Opex jobs exist throughout the operational lifetime of the plant. Fuel supply is the largest source

Methodology: Direct investment and jobs

variable)

MW







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New capacity: PDP 2018 adds more capacity with more gas, much more solar, and less coal

MW





Source: A2A Employment Impact Model (Sept 2019); AEDP 2015; PDP 2018



Total capacity additions 2018-36



Generation: more generation from gas in PDP 2018; solar doubles share but biomass reduces



Total generation 2018-36 PDP 2015 PDP 2018 2000.000 2000.000 Total 4,532 TWh Total 4,191 TWh 1800,000 1800,000 Waste **Biogas** 1600,000 1600,000 **Biomass** Solar PV 1400.000 1400,000 Wind Nuclear 1200,000 1200,000 Gas CHP Hydro GWh GWh 1000,000 1000.000 800,000 800,000 Gas CCGT 600,000 600,000 400.000 400,000 Coal 200,000 200,000 Lignite 2018-23 2024-29 2030-36 2018-23 2024-29 Nat gas 58% 59% 55% 63% 70% Percent Biomass 6% 7% 11% 5% 6% 9% from: Solar PV 2% 2% 3% 2%

Source: A2A Employment Impact Model (Sep 2019); AEDP 2015; PDP 2018

Total generation 2018-36







Source: A2A Employment Impact Model (Sept 2019)

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Waste Biogas Biomass

Solar PV Wind

Gas CHP

Gas CCGT

Coal Lignite



Capex local share: high value components are usually imported, especially for gas, PV and wind, but balance of system sourced locally





Source: A2A Employment Impact Model (Sept 2019); South Pole research; OECD IO Table for Thailand 2015; NESDB IO Table for Thailand 2010; TNO Desk Research

 Capex local shares are based on a combination of sources including desk research, interviews, and Input Output tables for Thailand

- South Pole are currently undertaking further research with private sector to improve local share assumptions
- Capex local shares are kept constant over time in the model



Solar PV capex cost and local shares

			(OECD) IO Table Sector	OECD	NESDB IO	Desk research	Survey (WIP)	Final Model input
100 90 80 70 Percent cost 50 40 30 20	9%	Fees & contingencies	Financial & insurance	89%	Banking and insurance services 99%	Mostly local	Mostly local 60-90%	89%
	12%	Developers costs	Other business services	76%	76%	Mostly local	Mostly local 60-100%	76%
	 17%	BOS & grid	Electrical equipment	40%	Electrical industrial machinery 32%	-	Mostly imported 25-50%	32%
	12%	Installation	Construction	67%	Construction of electric plants 63%	-	Mostly local 60-90%	63%
	9%	Racking	Fabricated metal products	44%	Structural metal products 47%	-	Mostly local 50-75%	47%
	6%	Inverter	Electrical equipment	40%	Electrical machinery	Mostly imported - 10%	Mostly imported 12.5%	10%
	34%	PV module	Electrical equipment	40%	Electrical machinery and apparatus 55%	Mostly imported 10%	Mostly imported 12.5-25%	10%
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0	Solar PV		Total weighted average	53%				39%

Source: A2A Employment Impact Model (Sept 2019); South Pole research; OECD IO Table for Thailand 2015; NESDB IO Table for Thailand 2010; TNO Desk Research

Ambition to Action



Local capex investment is driven by capacity additions. Solar PV (inc. floating) accounts for 36% of local capex in the PDP 2018





Source: A2A Employment Impact Model (Sept 2019)



Biomass and biogas fuels have high local share; local share is much lower for imported fuels





Source: A2A Employment Impact Model (Sept 2019); OECD IO Table for Thailand 2015



Current high domestic share of natural gas is expected to decline substantially so we have reduced gas local share in future years











Local opex investment is dominated by fossil fuels even with heavily reduced local value share of gas







Gas 64%, biomass 12%



Total 76.1 bn USD Gas 70%, biomass 10%

Total (capex and opex) local expenditure occurs mainly in the extractive and manufacturing sectors Total local expenditure in Thailand





Source: A2A Employment Impact Model (Sept 2019)

Methodology: From investment to jobs







Solar PV accounts for most direct capex jobs in the PDP 2018 scenario, which has less total capex jobs than the PDP 2015 Direct capex jobs



Source: A2A Employment Impact Model (Sept 2019). PV job totals in box includes floating PV





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Total opex jobs are dominated by technologies with large fuel supply needs. Biomass supports relatively more jobs due to low salaries





Total 2.5m job years Gas 52%, Biomass 25%



Total 2.6m job years Gas 59%, Biomass 22%

Source: A2A Employment Impact Model (Sept 2019)



PDP2018 creates slightly more total employment, with relatively more in the extractive sector





Source: A2A Employment Impact Model (Sept 2019)



Job creation occurs in different sectors for different technologies



Total job years 2018-2036 (PDP 2018)



- For gas and biomass the majority of jobs are related to opex (and especially jobs from gas and biomass fuel supply)
- For PV most jobs are from capex and relate to component manufacture and project development and construction

Source: A2A Employment Impact Model (July 2019). PDP 2018 scenario.

Summary investment results: PDP 2018



Source: A2A Employment Impact Model (Sept 2019). PDP 2018 scenario. Total investment 2018-36



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There is growing interest in the industrial development opportunity presented by renewables





Industrial development: questions we hope to answer



- What is Thailand's current local content share in key RE technologies?
- How does local share vary across the value chain?
- Which technologies / components could be opportunities for local industrial development?
- How does current policy affect local content share?
- What additional policies or measures might help maintain or grow Thai local content share?

Key activities



Scoping Study (Feb-Mar)

Interviews (July-August)

Private sector workshop (17 Sept)

Desk research (July-Oct)

- Mapping of current policies and plans
- Identification of Thai players along key RES value chains
- 21 interviews with key stakeholders
 - 10 public
 - 7 private sector
 - 4 academic / international

- Workshop with 23 private sector attendees
- Discussed current local share and key opportunities, policy recommendations
- Focus on solar and biomass

- Supporting research on key topics
 - Local share
 - Technology
 costs
 - Case studies

Many local companies are already active in the solar PV value chain in Thailand



Raw materials, manufacturing and transportation	Project planning and development	Implementation (construction)	Use and service (operation)
 Main local players Solar cell and module assembly: Bangkok Solar, Ekkarat, Solar Power Technology, Solartron Module (Imported cells, assembly in Thailand): Spot Solar, Sharp, Solartron Terminal box: Bangkok Solar Inverter: Leonics Solar charging controller: Leonics Cable: Bangkok Cable, Jaroong Thai Structure: Kemrex , Leonics Esco Combiner box: Leonics, EIC MV Transformer: Ekarat Engineering, Charoeanchai TF 	 ItalThai, Toyothai, Leonics ESCO, SPCG, Gunkul, Impact solar, Thai Solar Energy, Glow, BLCP, Symbiosolar, Solaris, EGCO, BGrimm, Solartron, Bangkok Solar 	 Ekarat Solar, Bangkok Solar Power, Leonics ESCO, Thai Solar Future, CH.Karnchang, Power Solution Technologies, Pro Solar Group, Energy & Environmental Management, SPCG, Gunkul, Impact solar, Thai Solar Energy, Glow, BLCP, Symbiosolar, Solaris, EGCO, BGrimm, Solartron 	Local system monitoring: Leonics-MoC, SPCG, Gunkul, Impact solar, Thai Solar Energy, Glow, BLCP, Symbiosolar, Solaris, EGCO, BGrimm Local O&M: Leonics ESCO, Power Solution Technologies, Energy & Environmental Management

• SPCG

Source: Industrial Development Scoping Study conducted by South Pole for Ambition to Action

Emerging insights (1)



- Local share of high tech components (PV module, inverter, biomass generating unit) is low (<10%), and Thailand unlikely to be able to compete (price, brand recognition)
- However local share of balance of system is already quite good (>50%) and local capability has been developed
- Consistent deployment policy support is needed to maintain this local share and reduce risk of Thai companies leaving the market due to difficult conditions
- Other barriers to market development could be removed (e.g. regulations slowing solar market; community resistance to biomass)

Emerging insights (2)



- There are potential opportunities for development of Thai capability, e.g.
 - Solar focus on after-sale service, longer warranties, niche customers who are happy to pay premium for quality Thai service
 - Biomass develop capability in smart agriculture and harvesting; possibly boilers
- Additional technology areas such as energy storage / smart networks (considered important to enable 10GW PV target) could offer opportunity but need to move quickly
- Prioritised innovation support could help ensure coherence of government grant funding and transfer early research to commercialisation





- Complete final private sector interviews
- Develop insights and recommendations
- Select case studies to support recommendations
- Prepare final report



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Timeline and final event



- September Mission for validation workshops re industrial development opportunities and further stakeholder engagement (w/c 1 Sept)
- **October** Integration of final inputs and development of final outputs and report(s)
- **November** Final mission to share final results
 - Aiming for multi-stakeholder final project meeting
 - Proposed date: 12/13 November
 - Target stakeholders: ONEP, MoE; EPPO; DEDE; MoI / DIP; NESDC
 - c. 3 hour event, presentations plus discussion

THANK YOU FOR YOUR ATTENTION

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