Electric Vehicle Penetration in Indonesia from Economic, Energy and Climate Change Perspectives

A Joko Purwanto

Quarterly Discussion at the Indonesia Clean Energy Forum (ICEF)

Jakarta, 18 September 2019

www.eria.org

Economic Research Institute for ASEAN and East Asia

Outline

- What are *electric vehicles*?
- Motivation: *Why electric vehicles?*
- Assessing electric vehicle penetration's impacts on economy, energy and environment (3Es): an ERIA study
- Some conclusions and policy recommendations

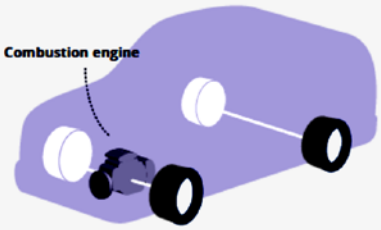
What are *electric vehicles*?

Combustion engine to electric vehicles

ICE

Conventional vehicle

Conventional vehicles use an internal combustion engine (petrol/diesel) to provide vehicle power.



ADVANTAGES

CHOICE OF DIFFERENT MODELS

MANY REFUELLING STATIONS

DISADVANTAGES

EXHAUST EMISSIONS

FOSSIL FUEL DEPENDENCY

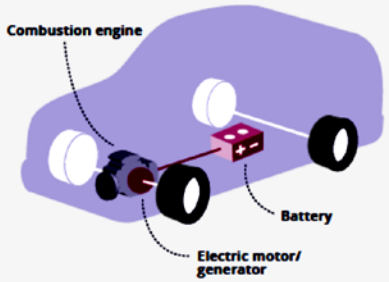
HIGHER ENGINE NOISE

LOW ENERGY EFFICIENCY

Non Plug-in: HEV

Hybrid electric vehicle

Hybrid electric vehicles combine a conventional (petrol/diesel) engine and a small electric motor/battery charged via regenerative braking or the engine.



ADVANTAGES

HIGHER EFFICIENCY

MANY REFUELLING STATIONS

DISADVANTAGES

EXHAUST EMISSIONS

FOSSIL FUEL DEPENDENCY

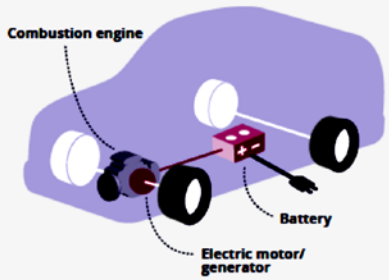
HIGHER ENGINE NOISE

TECHNOLOGICAL COMPLEXITY

Plug-in: PHEV

Plug-in hybrid electric vehicle

Plug-in hybrid electric vehicles have a conventional (petrol/diesel) engine complemented with an electric motor/battery with plug-in charging.



ADVANTAGES

HIGHER EFFICIENCY

HOME/ WORKPLACE RECHARGE

MANY REFUELLING STATIONS

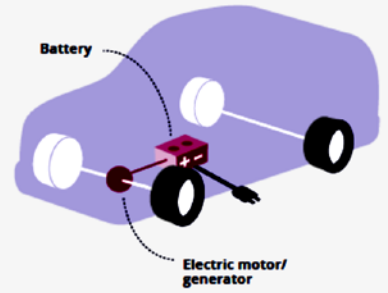
DISADVANTAGES

TECHNOLOGICAL COMPLEXITY

Plug-in: BEV

Battery electric vehicle

Battery electric vehicles are powered by an electric motor and battery with plug-in charging.



ADVANTAGES

HIGHER EFFICIENCY

HOME/WORKPLACE RECHARGE

LOW ENGINE NOISE

ZERO EXHAUST EMISSIONS

DISADVANTAGES

FEWER RECHARGING STATIONS

LONG TIME TO RECHARGE

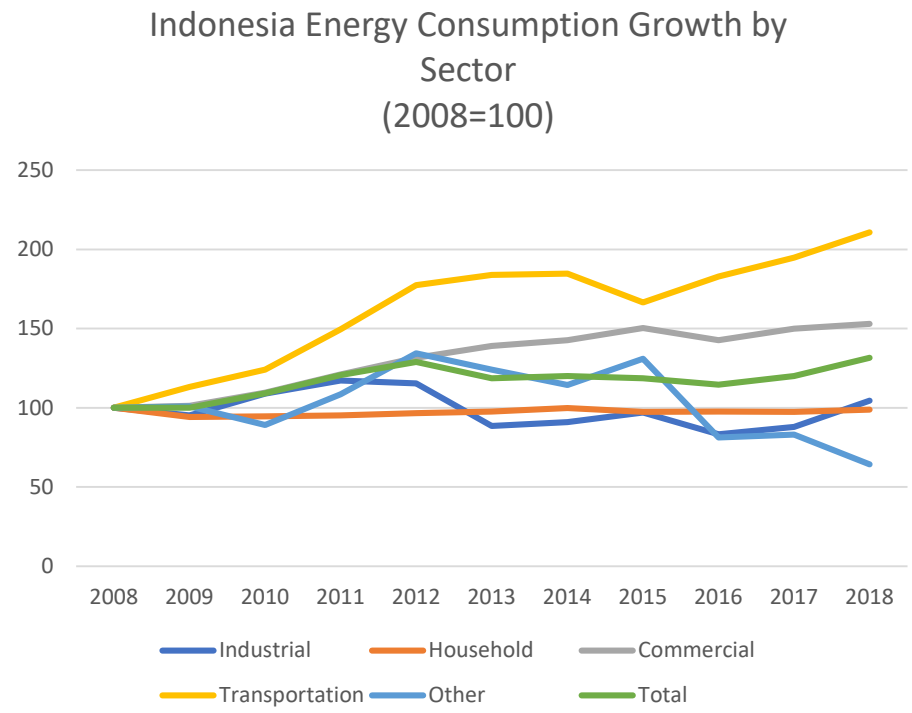
SHORT DRIVING RANGE

Source: EEA(2016), Electric Vehicles in Europe

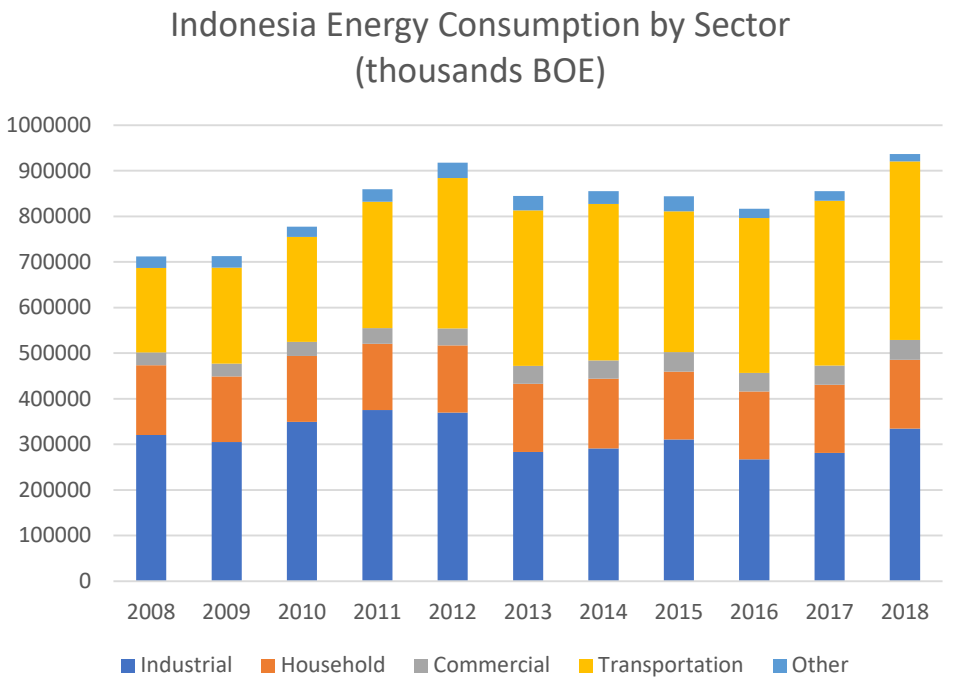
Why Electric Vehicles (1/2)?

Strong growth of transport energy demand

More than 2 times since 2008



Biggest share (42%) in 2018

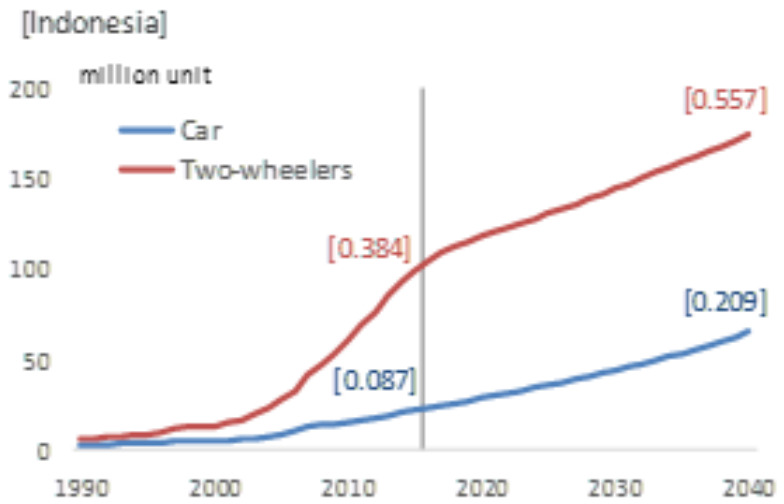


Source: Visualization from MEMR (2018) Handbook of Energy and Economic Statistics of Indonesia

Why Electric Vehicles (2/2)?

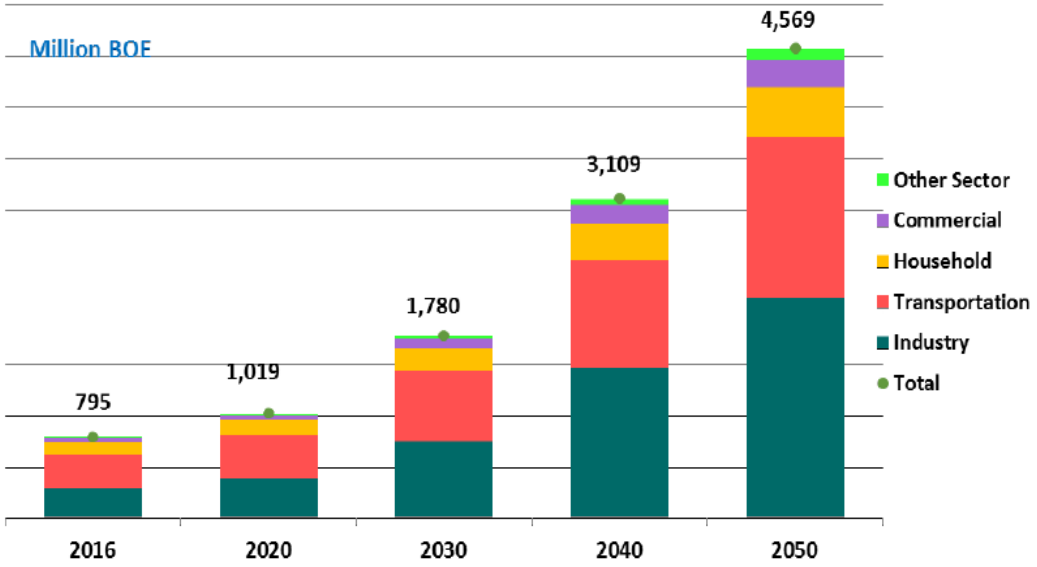
Transport demand, energy consumption, CO_2, pollutions shall continue to grow

Increase total stock by more than 2 times



Source: IEA(2017), Authors'analysis

2050 transport sector energy demand = 4.6x 2016



Source: BPPT, 2018: Indonesia Energy Outlook 2018

ERIA study (1/10): Definition

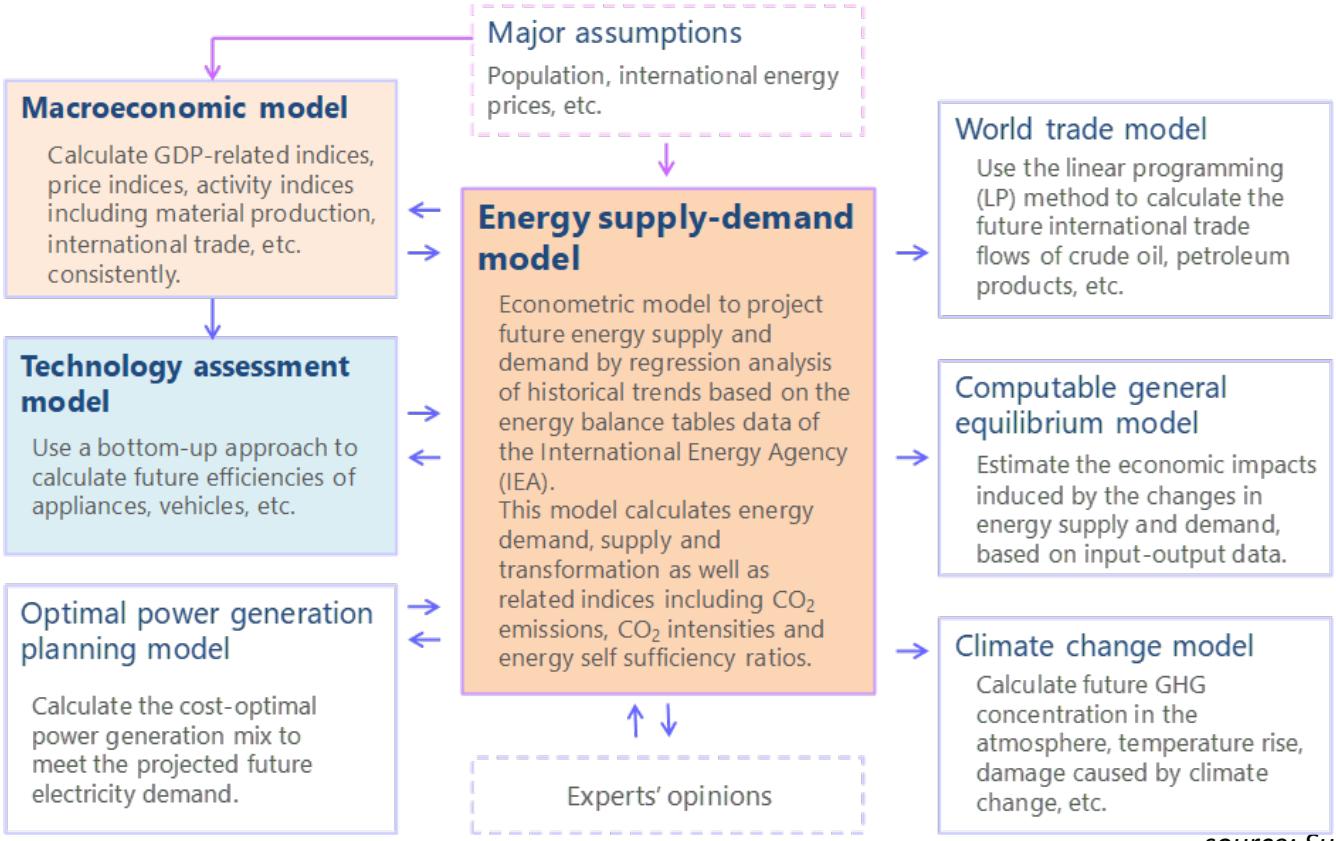
Assessing EV penetration's impacts on economy, energy & environment (3Es)

- EVs as ASEAN countries 'policies to reduce oil consumption, (urban) air pollution and greenhouse gases (GHG)
- … but EVs shall increase electric power demand
- and shall have economic consequences

ERIA study (2/10): Methodology

Comprehensive tool to assess EVs'impacts

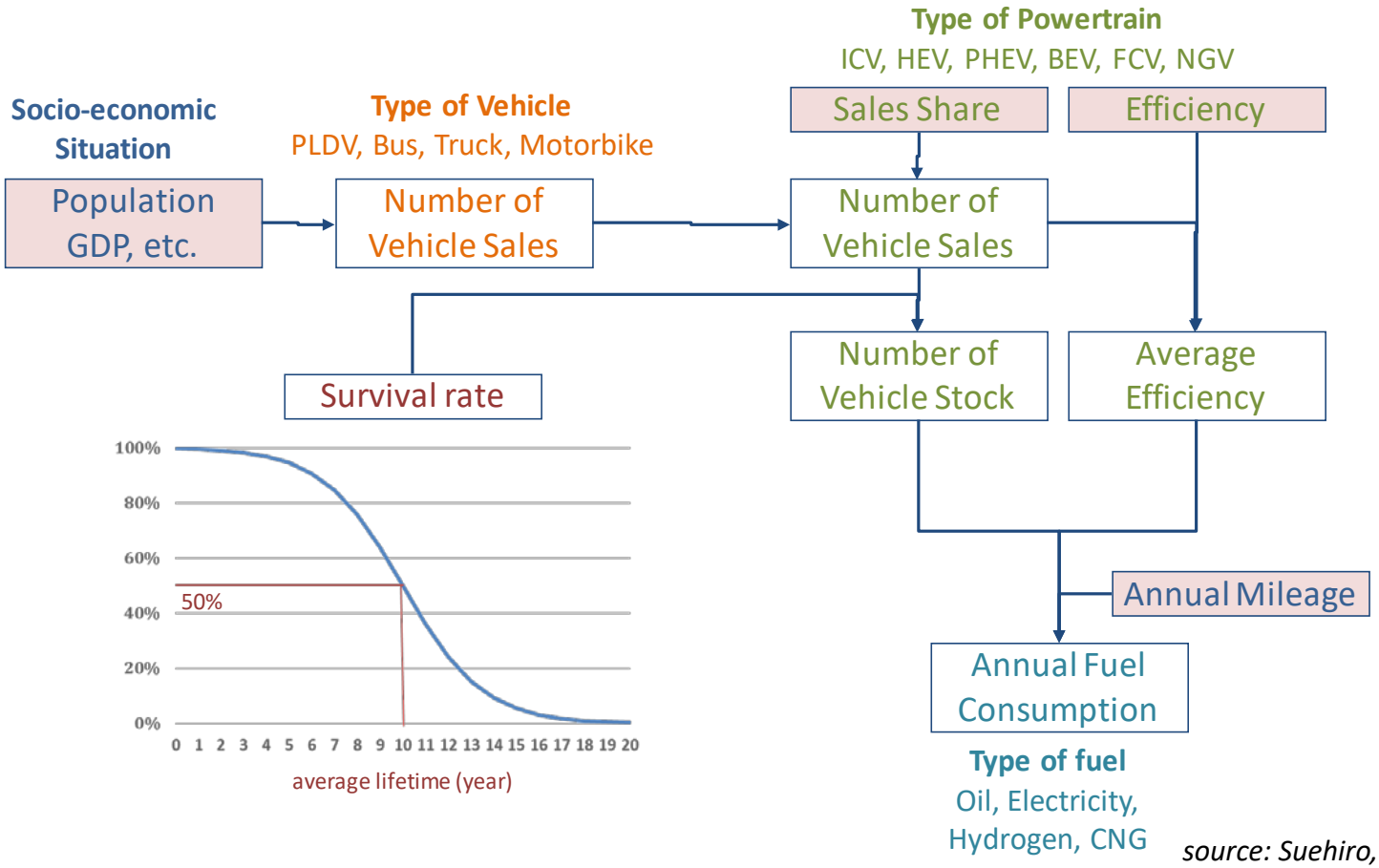
Energy analysis modelling suite of the Institute of Energy Economic of Japan (IEEJ)



source: Suehiro, Purwanto, 2019

ERIA study (3/10): Methodology

Bottom-up technology assessment model



source: Suehiro, Purwanto, 2019

ERIA Study (4/10): Assumptions

Improving fuel economy and decreasing EVs'prices assumptions

Fuel Economy in 2017 and 2040 (km/L-gasoline eq.): Indonesia

	ICV	HEV	PHEV	BEV
PLDV	12.3	24.6	39.2	49.0
Bus	6.4	9.5	19.5	25.3
Truck	6.0	9.0	19.6	23.9
Motorbike	30.8	-	-	115.0

	ICV	HEV	PHEV	BEV
PLDV	15.2	28.8	44.2	54.5
Bus	7.6	10.9	21.5	27.7
Truck	7.2	10.3	21.6	26.1
Motorbike	34.7	-	-	120.6

Assumptions for List Price in 2017 and 2040 (US$ in 2010 / unit)

	ICV	HEV	PHEV	BEV
PLDV	22,000	27,500	38,720	35,200
Bus	67,000	77,050	184,250	167,500
Truck	47,000	58,750	82,720	75,200
Motorbike	1,500	-	-	2,400

	ICV	HEV	PHEV	BEV
PLDV	22,169	25,347	27,564	24,401
Bus	67,547	74,052	91,378	77,398
Truck	47,384	54,913	54,743	50,238
Motorbike	1,498	-	-	1,837

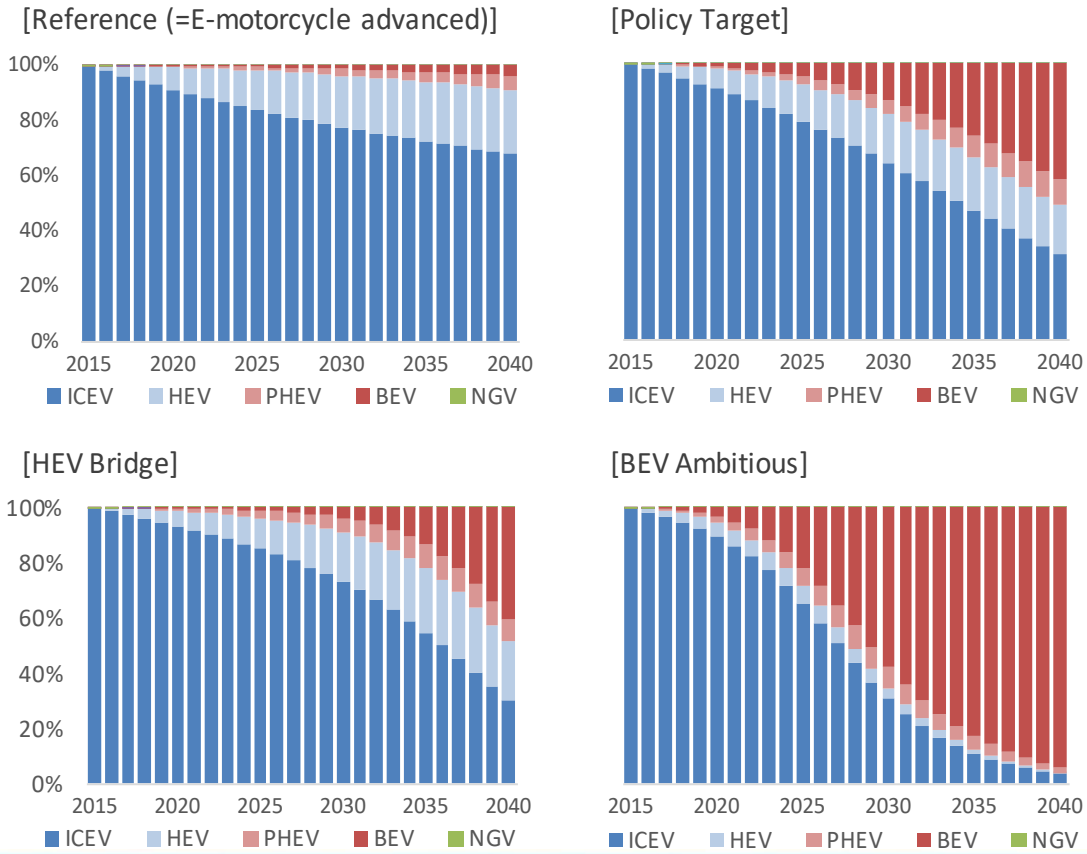
BEV = battery electric vehicle, ICV = internal combustion engine vehicle, PHEV = plug-in hybrid vehicle, PLDV = passenger light duty vehicle

source: Suehiro & Purwanto (2019)

ERIA study (5/10): EV Scenarios

Mild to extreme scenarios to test

Powertrain Sales Share of Cars by Scenario, Indonesia

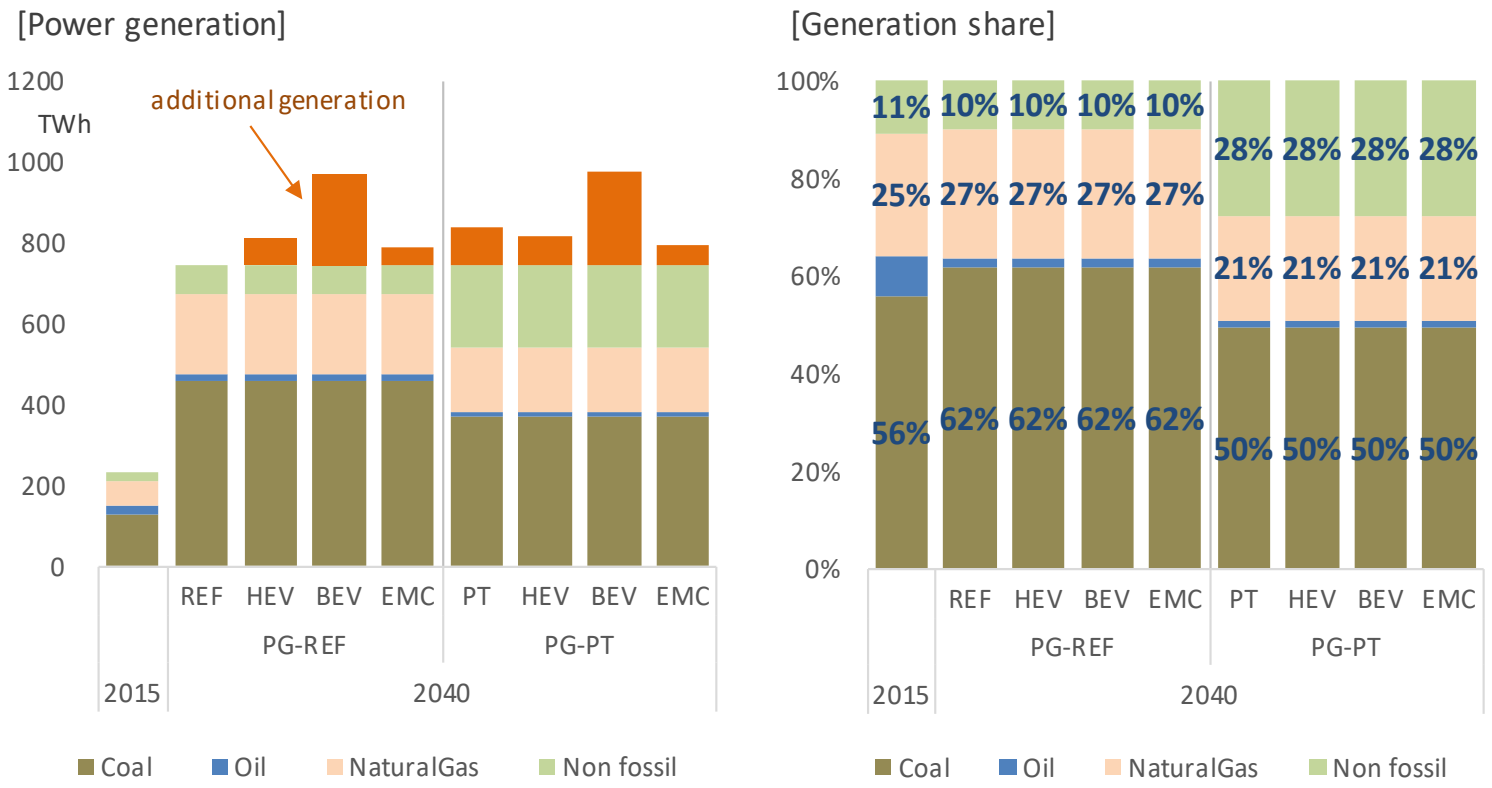


source: Suehiro, Purwanto, 2019

ERIA Study (6/10): PP Scenarios

Role of power generation's energy mix

Power generation and generation mix

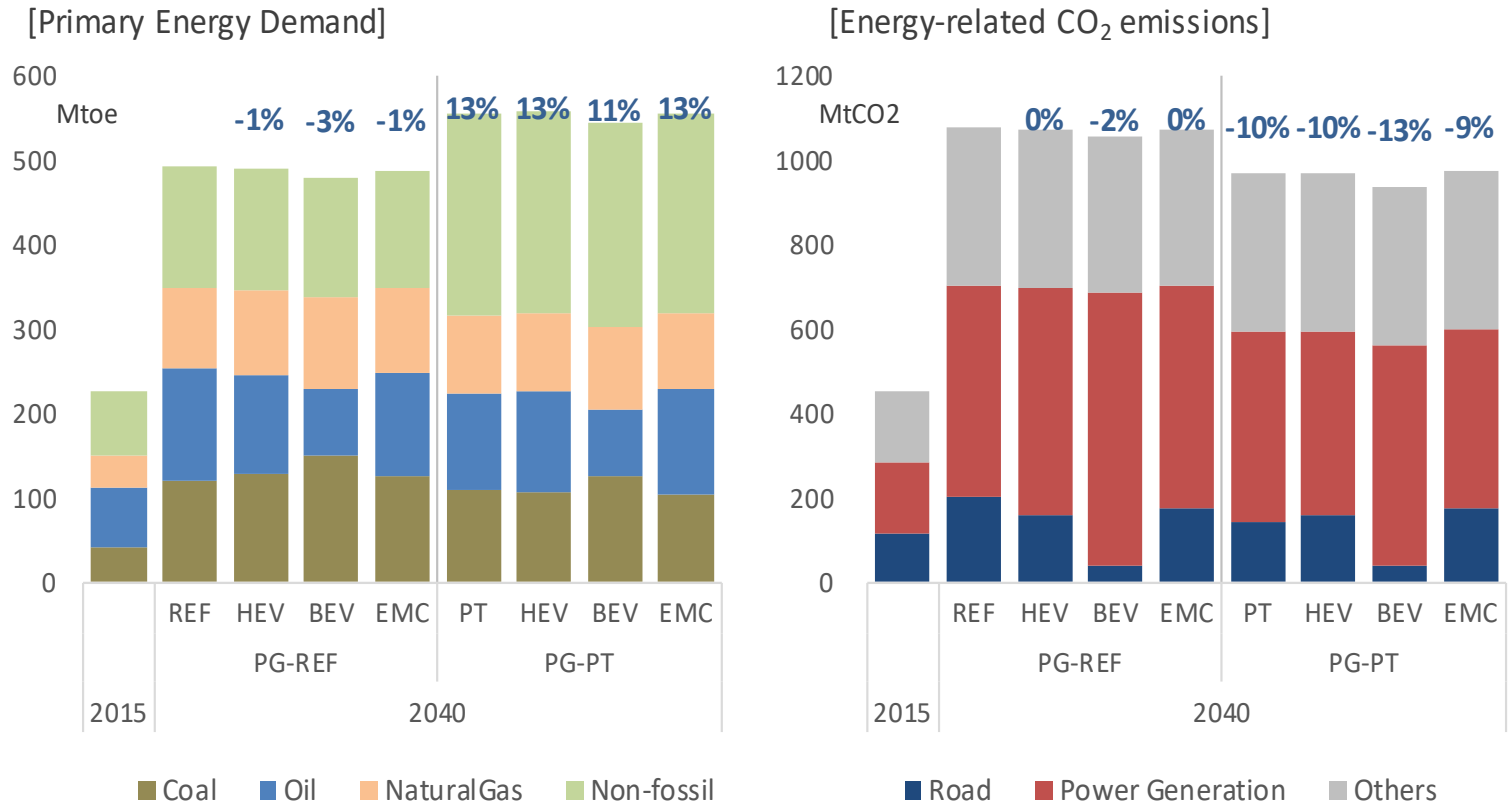


source: Suehiro, Purwanto, 2019

ERIA Study (7/10): Energy and CO_2

Significant only in a decarbonized system

Primary Energy Demand and Energy-related CO2 Emissions, Indonesia

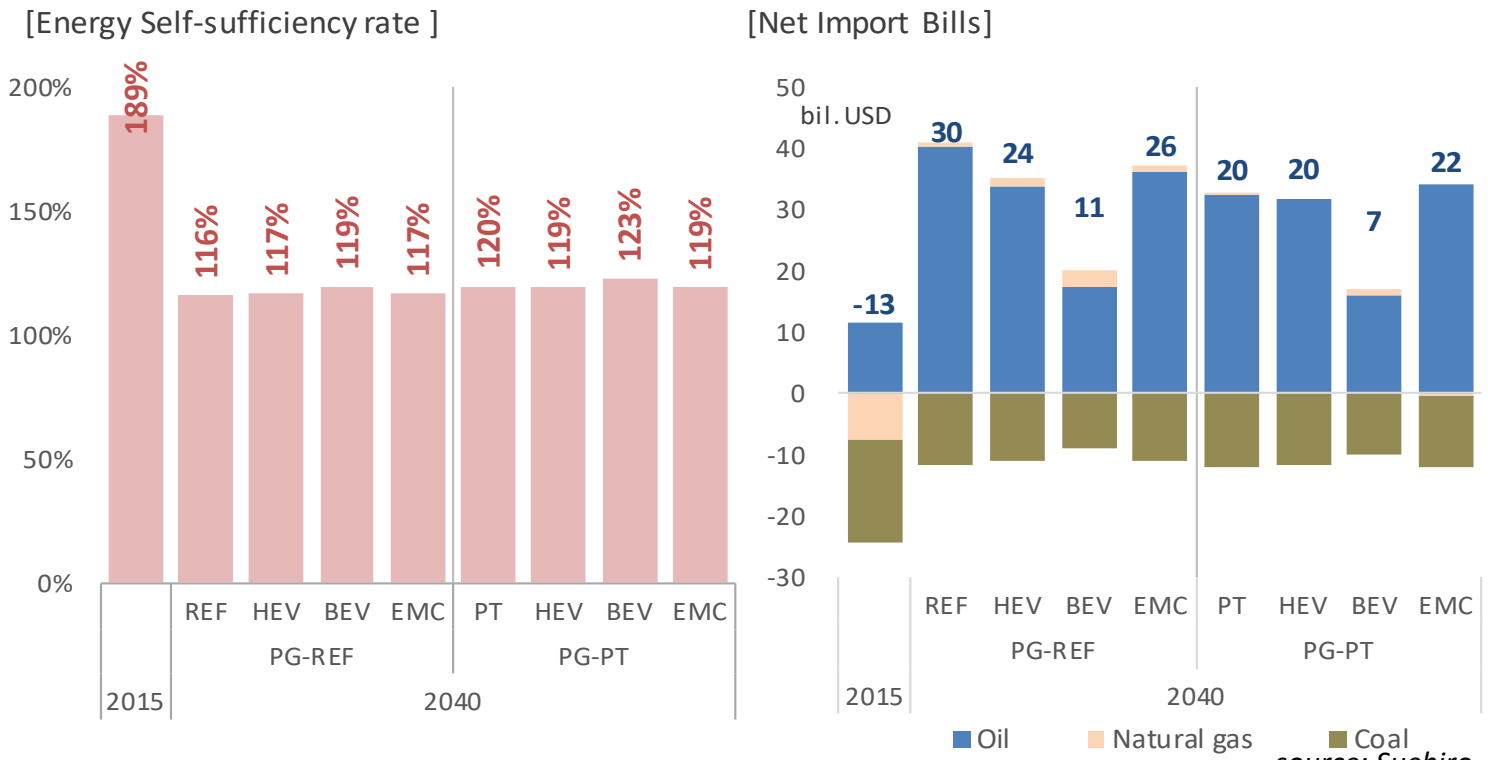


source: Suehiro, Purwanto, 2019

ERIA Study (8/10): Self-Sufficiency Rate and Net Import Bills

Not clear difference in self sufficiency rate but clear impact of BEV on net import bills

Energy Self-sufficiency Rate and Net Import Bills, Indonesia

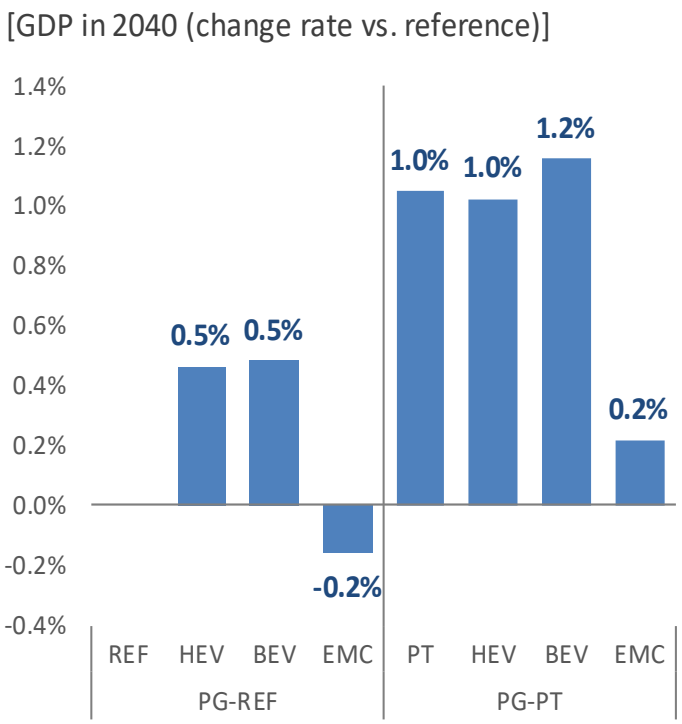


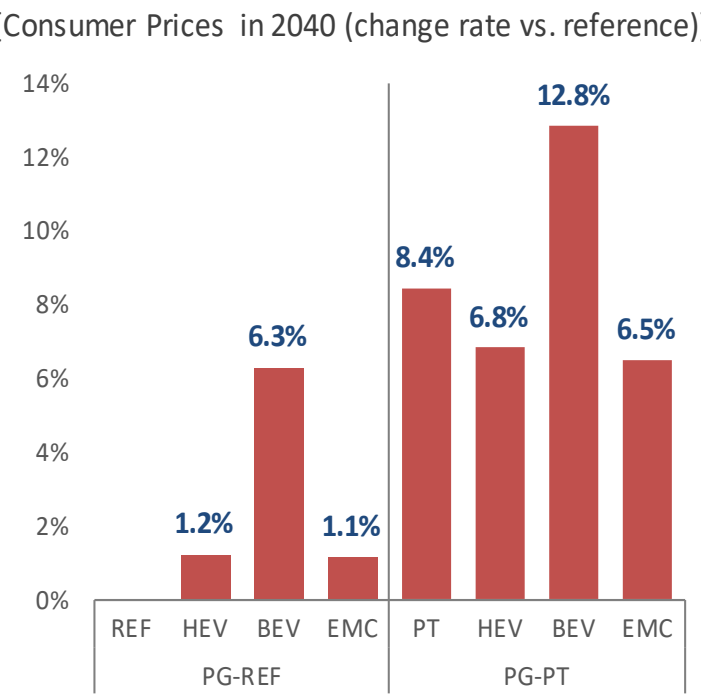
source: Suehiro, Purwanto, 2019

ERIA Study (9/10): GDP and CPI

Stimulated economy but tight supply-demand shall trigger price increase

Impacts on GDP and Consumer Prices, Indonesia



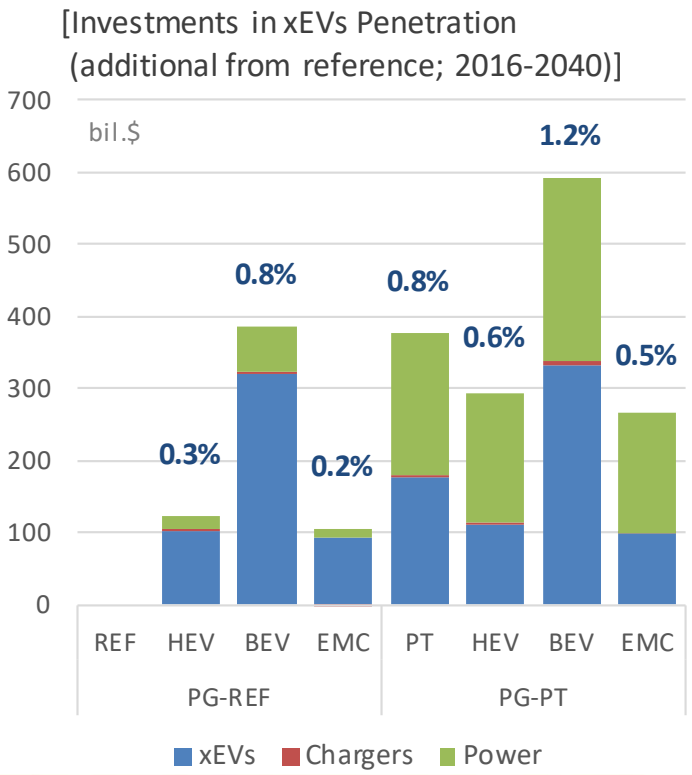


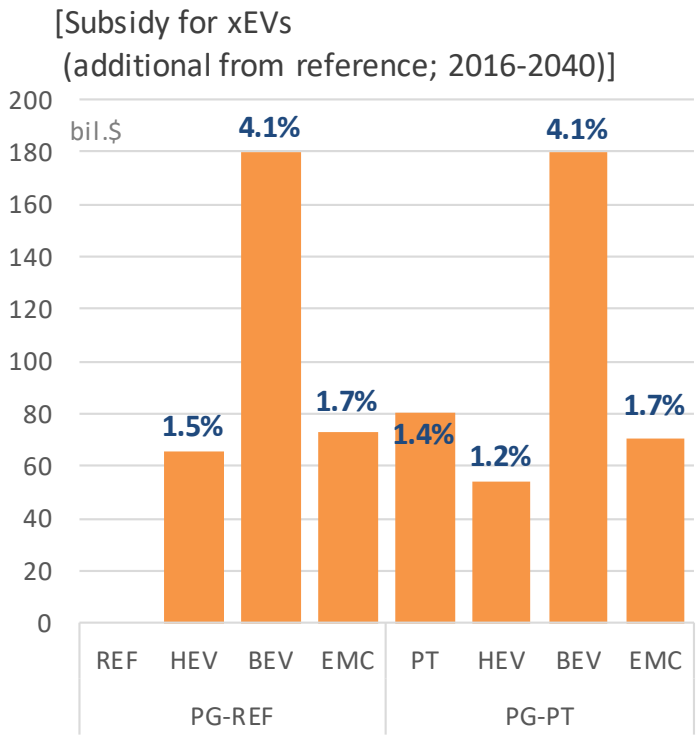
source: Suehiro, Purwanto, 2019

ERIA study (10/10): Cumulative (25y) Investment and Subsidy

Low carbon power generation needs more investment and subsidy would be need to bridge price gap

. Investments and Subsidy for xEVs, Indonesia





source: Suehiro, Purwanto, 2019

Conclusions

EVs fulfil various purposes but massive deployment might have negative effects

- Threat from future self-sufficiency rate drop and net-import bill increase
- Significant amount of subsidy and investment including in power sector
- Charging infrastructure is a key requirement

Policy recommendations

EV penetration needs realistic and affordable policies

- Harmonize automobile & energy policies
- Take a bridging pathway to mitigate negative side effects
- Create a clear long-term vision
- Consider country specific path to vehicle electrification

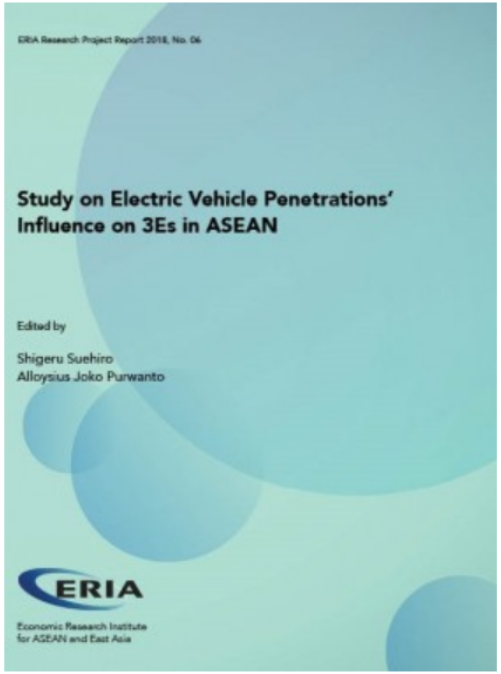
Reference

Not secure | eria.org/publications/

Preface – Principles... LEAP

ERIA
Economic Research Institute for ASEAN and East Asia

ABOUT RESEARCH EXPERTS DATABASE AND PROGRAMMES NEWS AND VIEWS EVENTS PUBLICATIONS



Study on Electric Vehicle Penetrations' Influence on 3Es in ASEAN

29 August 2019

Edited by Shigeru Suehiro, and Alloysius Joko Purwanto

The study analyses the effects of electric vehicle deployment on the economy, energy, and the environment (3Es) in Indonesia, Malaysia, Thailand, and Viet Nam. In the scenario that assumes a …

>> Find out more

ERIA