Indonesia and Vietnam power markets design, RES trends, FDIs attractiveness

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Enel leadership in the new energy world

1st network operator[1]

73 mn end users

World's largest player in renewables[2]

46 GW capacity

Largest retail customer base worldwide[3]

70 mn customers

Active in 5 continents

32 countries

Data updated to 31.12.2019

1. By number of end users. Publicly owned operators not included
2. By installed capacity. It includes managed capacity for 3.7 GW
3. Including customers of free and regulated power and gas markets

Enel Green Power

Global Footprint

Key figures	2019
Capacity (GW)	46
Production (TWh)	100

Key financials (€bn)	2017
EBITDA	4.1
Opex	1.4
Maintenance capex	0.3
Growth capex	3.6

Consolidated capacity (GW)	Wind	Solar	Hydro	Geo
	12.5	4.6	27.9	0.9

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Agenda

- **Power Mix, Capacity Additions, RES Development Scenarios**
- **Electricity Market Design, RES Regulatory Framework**
- **Clean Energy Investment**
- **Conclusions**

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Power Mix, Capacity Additions, RES Development Scenarios

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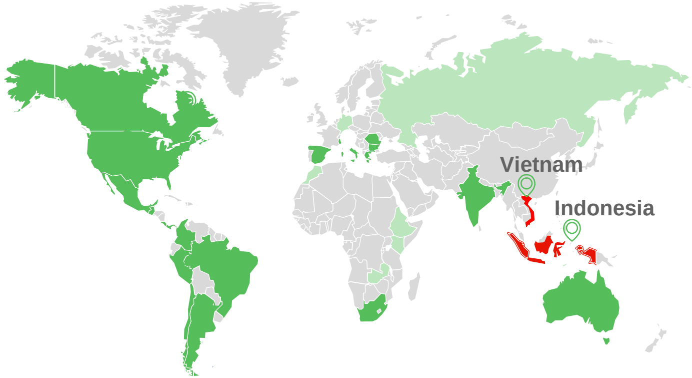
Indonesia and Vietnam at a glance

Structural KPIs overview

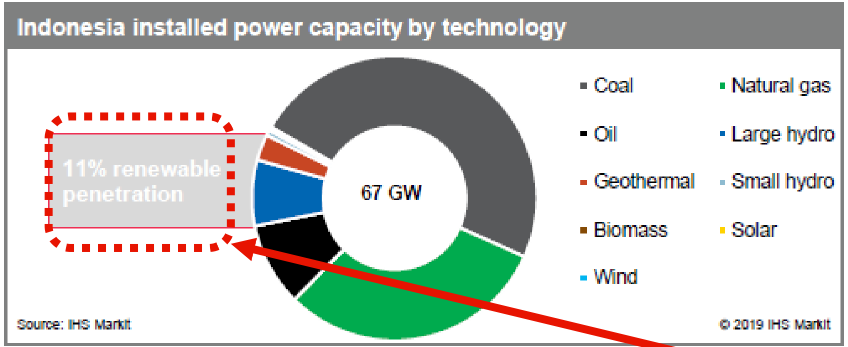
	Indonesia	Vietnam
Surface	1,904,569 km²	331,210 km²
Population	267 mln	96 mln
Population density	138 cap/km²	314 cap/km²
Median age	47.3	30.5
Urban population	148 mln	36 mln
GDP	1.200 bn$	245 bn$
GDP growth (2019 est.)	+5%	+7.0%
Credit Rating (Fitch)	BBB	BB
Per-capita GDP	4.4 kUS$	2.6 kUS$
CO2/pro capita	2.1 tCO2/cap	2.2 tCO2/cap
Total Installed Capacity	67GW	55GW
Electricity Demand	260 TWh	200 TWh

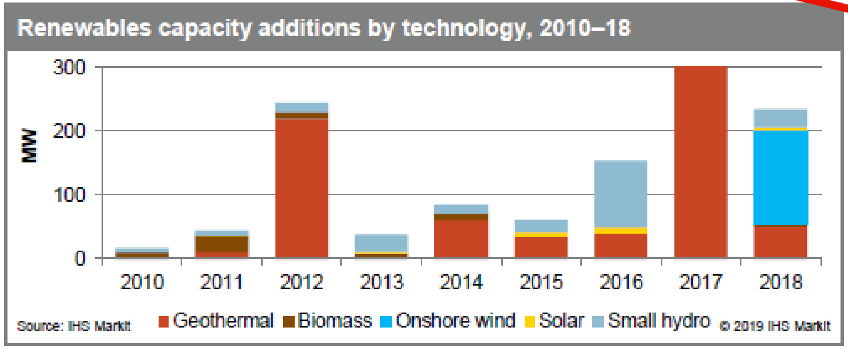


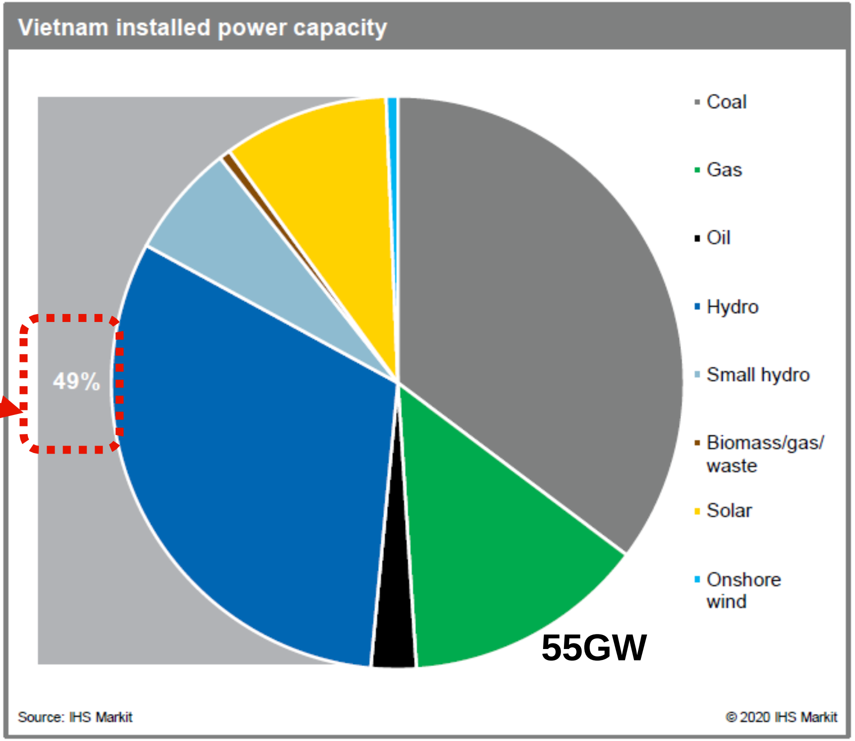
- Young and growing population.
- GDP growing double-digit since mid ‘80s and exceptionally robust through global downturns.
- Growing FDIs esp. in manufacturing (including relocations from China) pushing C&I power demand up.

Source: UN population dataset, World Bank, DEN Indonesia Energy Outlook (IEO) 2019

Indonesia and Vietnam Renewables Penetration



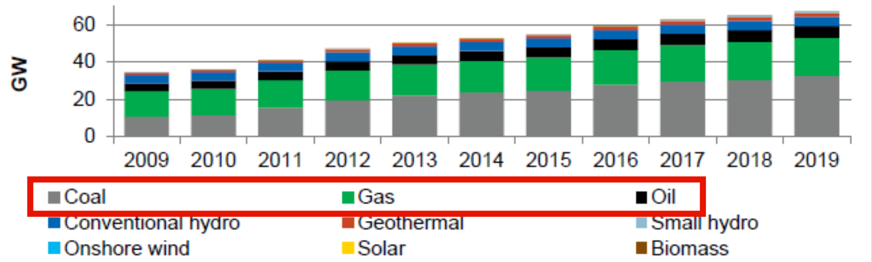




+5GW in 18 months (2018-2019)

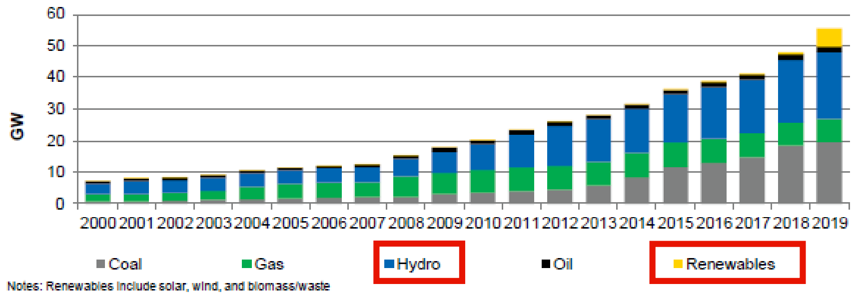
Indonesia and Vietnam Installed Capacity by Fuel 2010-2020

Indonesia power capacity by fuel



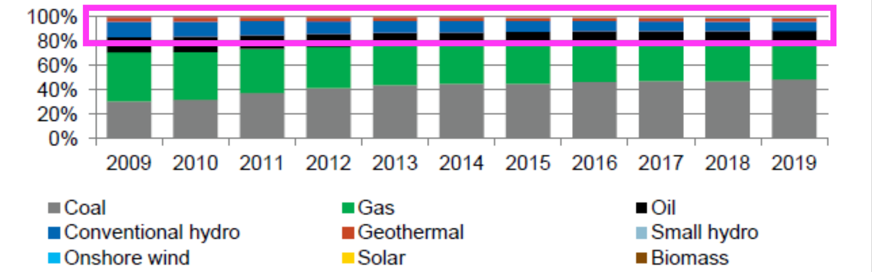
Source: IHS Markit

Vietnam installed capacity by fuel



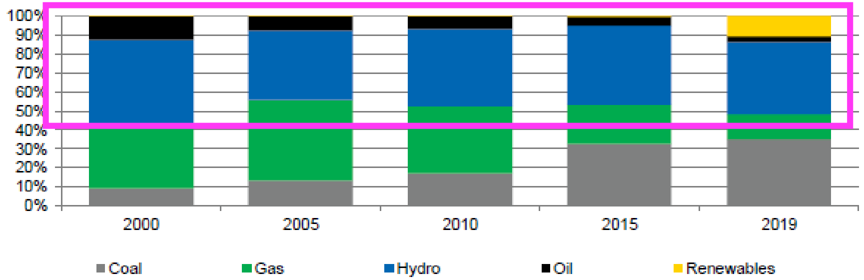
Notes: Renewables include solar, wind, and biomass/waste
Source: IHS Markit

Indonesia power capacity % by fuel



Source: IHS Markit

Vietnam installed capacity fuel mix %



Notes: Renewables include solar, wind, and biomass/waste
Source: IHS Markit

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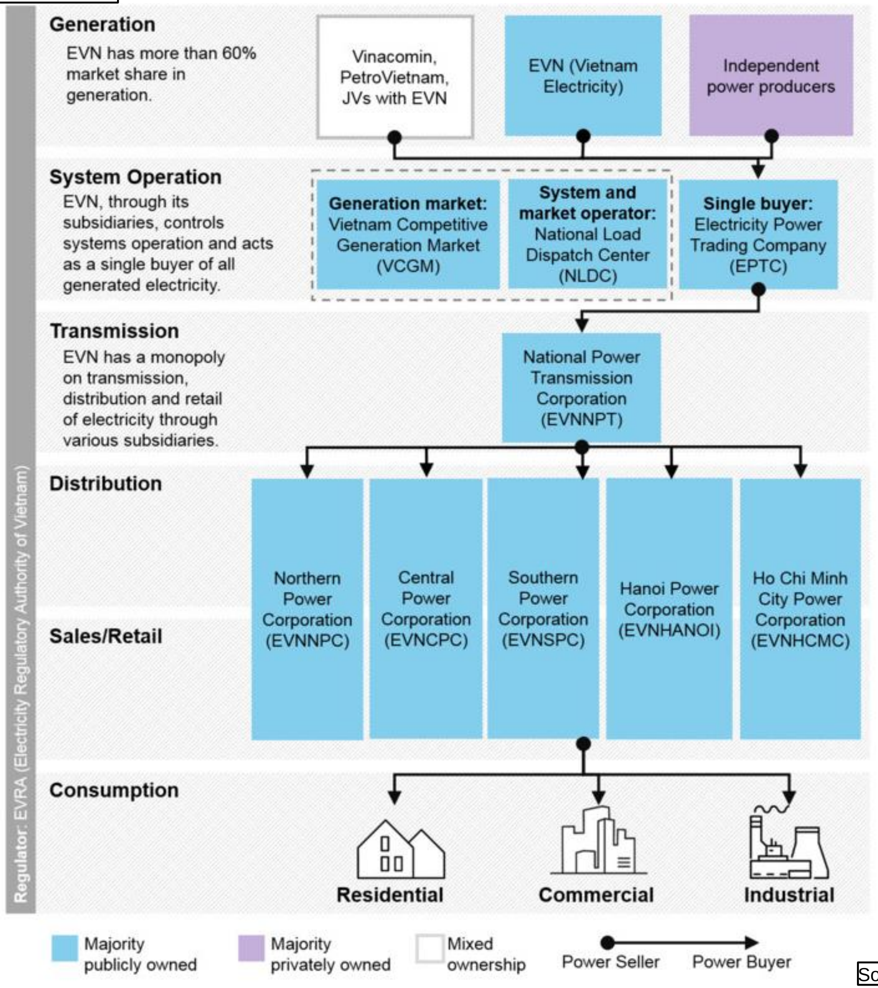
Power Mix, Capacity Additions, RES Development Scenarios

Electricity Market Design, RES Regulatory Framework

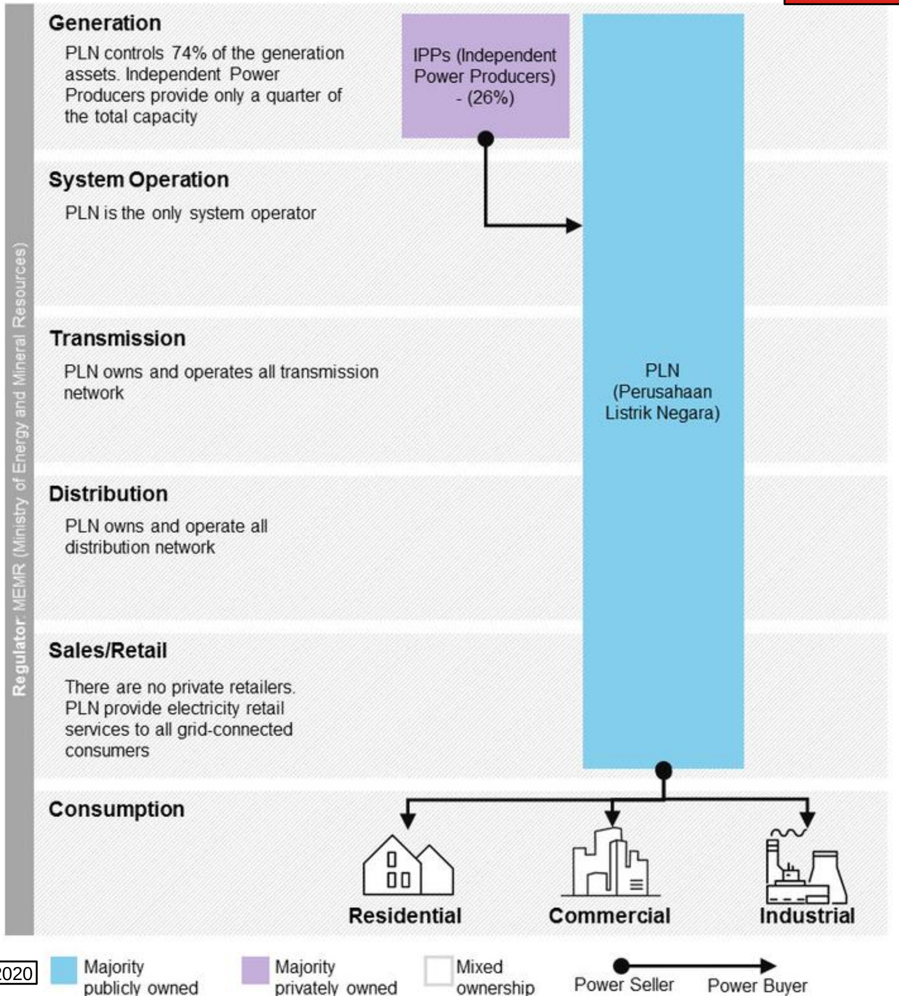
Clean Energy Investment

Conclusions

Market structure: Gencos, SMO, T&D, Retail



Source: BNEF 2020



Indonesia RES Support Policies

Latest Decisions and Proposals

enel Green Power

	2012-15	2016-18	2019-20	2021	2022	2023	2024

Solar

- **ESDM Reg. No.17/2013** PV projects based on capacity auctions FiTs (ceiling prices) In June 2014 the Supreme Court revoked (local content).
- **ESDM Reg.19/2016**: 5GW of capacity will be offered starting with 250MW. Fixed FIT.
- **May 2017**, PLN pre-qualify for a tender offering 168MW PV projects in Sumatra.
- **ESDM Reg. 13/2019 and 16/2019** increase the appetite for rooftop solar PV deployment

Hydro

- **2012 Ministerial Regulations** updating FIT for RES (Reg.4/12 for biomass, biogas, hydro, municipal solid waste, and 22/12 for geo) varying upon plant location and interconnection voltage
- **Ministerial Regulation 19/2015:** new FiT for Hydro < 10 MW

Geothermal

- **Geothermal Law 21/2014** Working Area Tenders to be performed by Ministry of Energy
- **Geothermal Law 7/2017** tariff after exploration

Wind

C&I Direct PPA

Auctions

2012-15:

- **2014 National Energy Policy:** RES target (incl. nuke): **23% by 2025, 31% by 2050**
- 2015: 2015, new interim target of 19% of RES by 2019.
- 2016: 35 GW Program which plans to develop 35GW of additional power capacity by 2019, and a further 45GW by 2025;

2016-18:

- MoI Regulation No. 5/2017 on local content
- ESDM issued Reg. No. 12/2017 (as amended by Reg. 50/2017) → **BPP**
- ESDM Reg. No. 10/2017 (as amended by MoEMR Regulation No. 49/2017) on the Principles of Power Purchase Agreements

2019-20:

ESDM Reg N. 4/2020

- direct appointment through assignment for: (a) hydropower; and (b) renewable projects partly or wholly developed by the Government, including funded with grant
- Additional provisions on electricity purchase price approval by the MEMR
- removes and no longer rules the requirement of BOOT
- PLN carries out the process of purchasing electricity according to the RUPTL.

Source: ESDM, Enel Data 2020

Vietnam RES Support Policies

Latest Decisions and Proposals

Green Power

2012-15 | 2016-18 | 2019-20 | 2021 | 2022 | 2023 | 2024

Solar

2017 Solar PPA template and FIT
- No deemed dispatch
- Unfavorable termination clauses
- FIT $93.5/MWh Valid up to 06/2019

2020 Solar FIT extension
- $70.9/MWh.
- Must achieve COD by 31 December 2020

Hydro

2012 MOIT Circular 43
<30MW, Power Development Plans

2014 MOIT Circular 32
Introduce Avoided Cost Tariff

2019 MOIT Circular 29
abolishes the option of ACT risk sharing mechanisms. floor price and the ceiling price applicable for up to 12 years

W2E

2014 MOIT Circular 24
Introduces Feed in Tariff

Wind

2011 Wind PPA Template and FIT
- Onshore: $78/MWh
- Offshore: $98/MWh

2018 Wind FIT
- Onshore increased to: $85/MWh extention to Q4 2021

Until Dec 2023
Possible extension
Pricing TBD

2015 Renewable energy development strategy
- Target res generation of 15% in 2030 and 33% in 2050
- FIT and accompanying policy and regulation for renewable generation to be implemented

2016 Revised power development plan VII
- 11% and 27 GW of renewable generation and capacity by 2030

C&I Direct PPA

Pilot expected to start Q3 2020
Target: 400-1000MW

Full Program

Auctions

Government announcement on transition to tenders for solar

Pilot

Source: MOIT, Enel Data 2020

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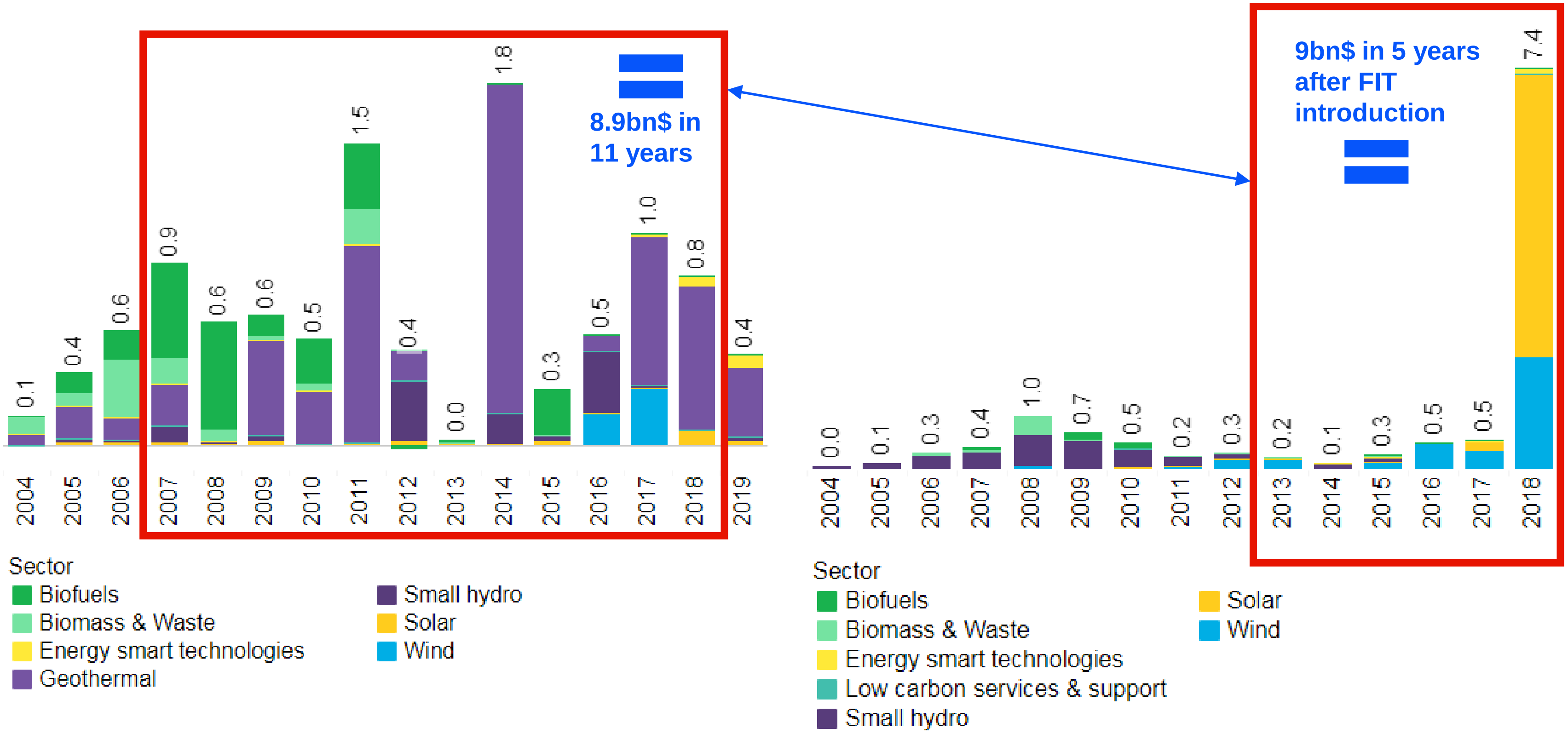
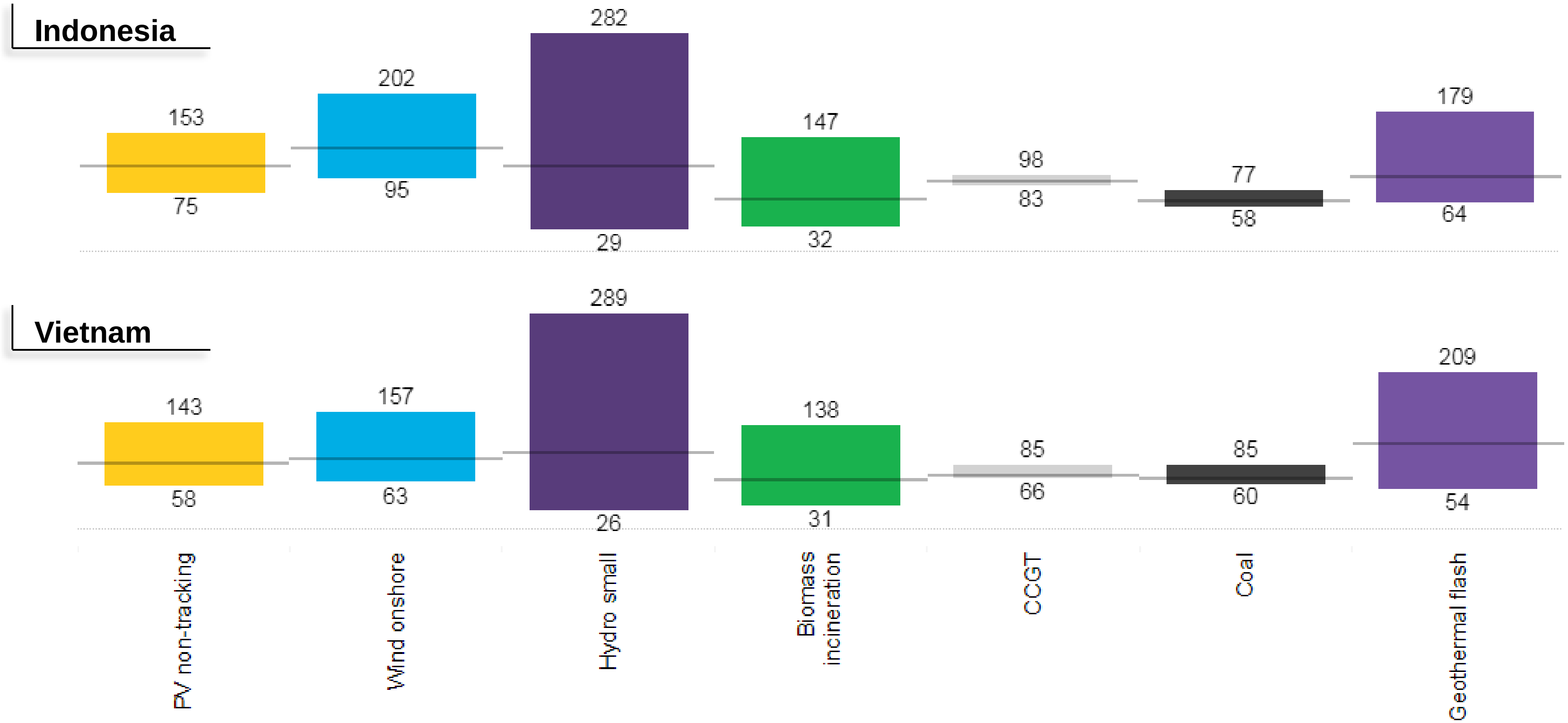
Clean Energy Investment ($bn)



Source: BNEF 2020

BNEF's LCOE Comparison in H1 2020



Source: BNEF 2020

Vietnam and Indonesia power markets design, RES trends, FDIs attractiveness

Green Power

- Countries at a glance
- RES Regulatory & Electricity Market Overview
- Clean Energy New Investment
- **Conclusions**

Elements for a successful remuneration scheme

Environmental factors: Market conditions and RES strategic view

1) Natural resource assessment.

2) Consistency of energy policy and stability of RES scheme rules.

Scheme factors: remuneration conditions and other enablers and constraints

1) Competitive tender process for generation quota allocation: in order to reduce the cost of electricity generation.

2) Predictably of investment return: Fx currency risk mitigation, CPI tariff indexation, Payment Guarantee, Compensation on termination in case of Buyer's default, Change in Law and economical context, International Arbitration, Force Majeure, Guaranteed electricity off-take.

3) Local content requirement should be set consistent with the county's long term industrial plan and with its ability to provide service. Too strict and unsustainable requirement that also do not match the country's local industry landscape may deter investors as entry barrier.

Execution factors: technical perspective and process & governance

1) Transmission grid requirement has to match the long term RES strategy of the country. It's advisable to have grid connection time tables in place and also clarify which party bears which part of the grid connection costs.

2) Central coordination with a single point of reference for permitting and authorization: shifting the license allocation process from local authorities to centrally governed bodies reduces complexity.

Highlight on Indonesia

1. Tenders' postponement and the government reneging on awarded tariffs are sending mixed signals to the market.
2. Digitalization is required to increase efficiency and transparency allowing better allocation of resources (i.e. increased financial support to PLN).
3. A well-designed auction system provides scalable and cost-effective renewable energy programs. Comparisons with other countries' programs shall be taken with a pitch of salt (e.g. solar tariffs in UAE are not comparable to Indonesia's environment).
4. Until recently Indonesia had one of the best bankable PPAs among ASEAN countries. There's no reason that Indonesia cannot return to becoming the destination of choice for RES investment in the region.

Back-up

Indonesia and Vietnam Electricity Final Consumption by Sector

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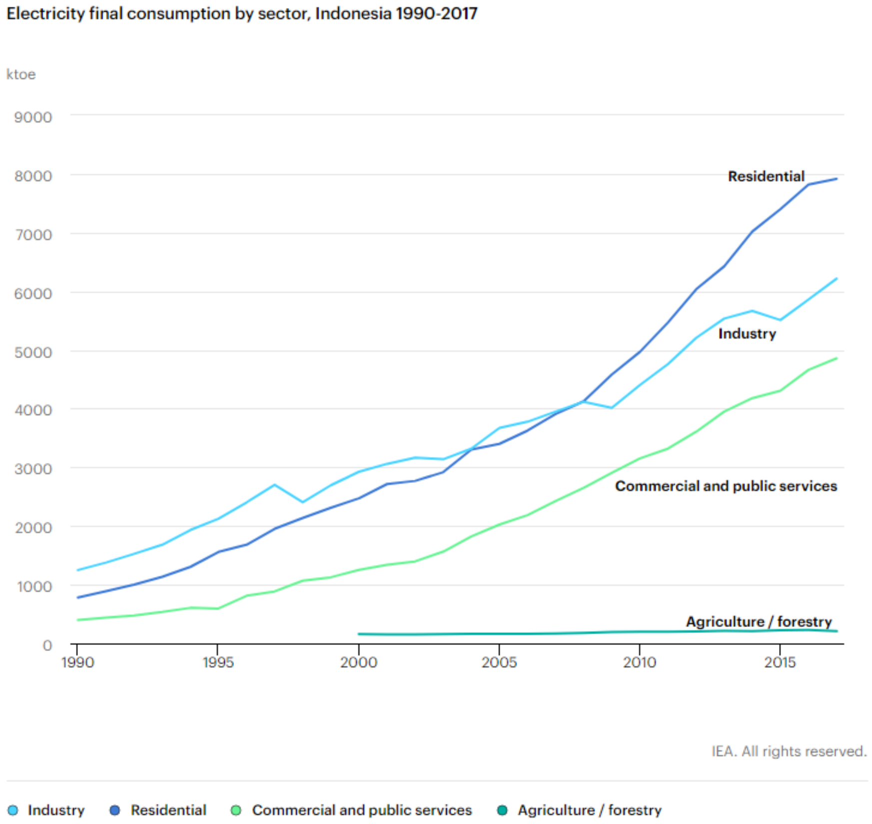
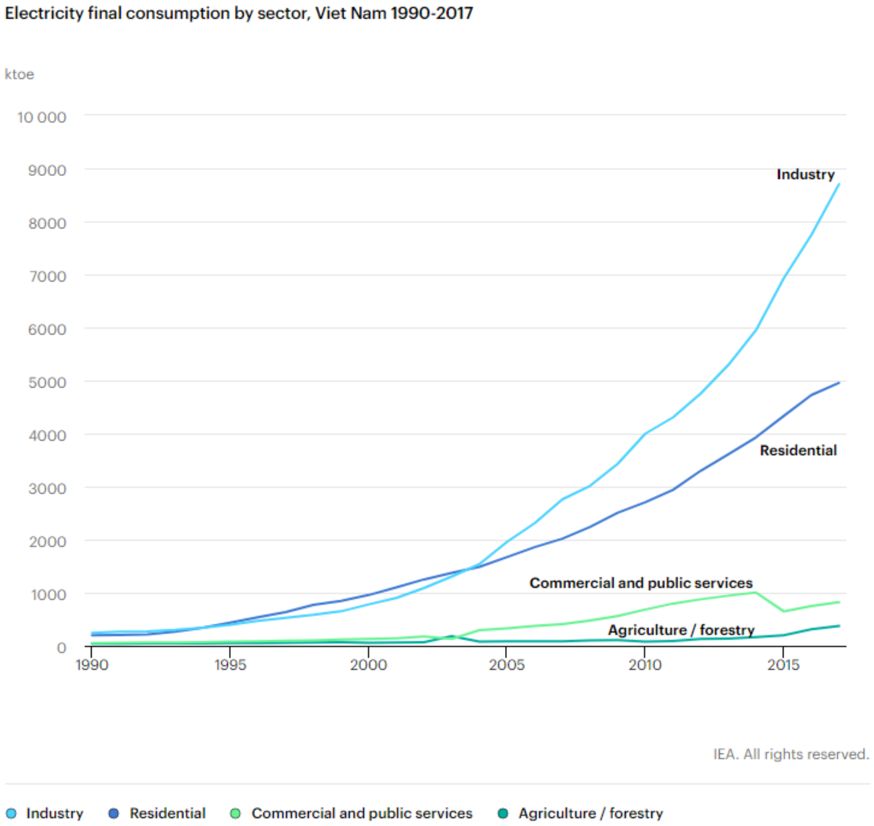
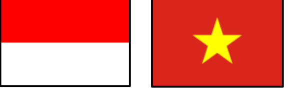
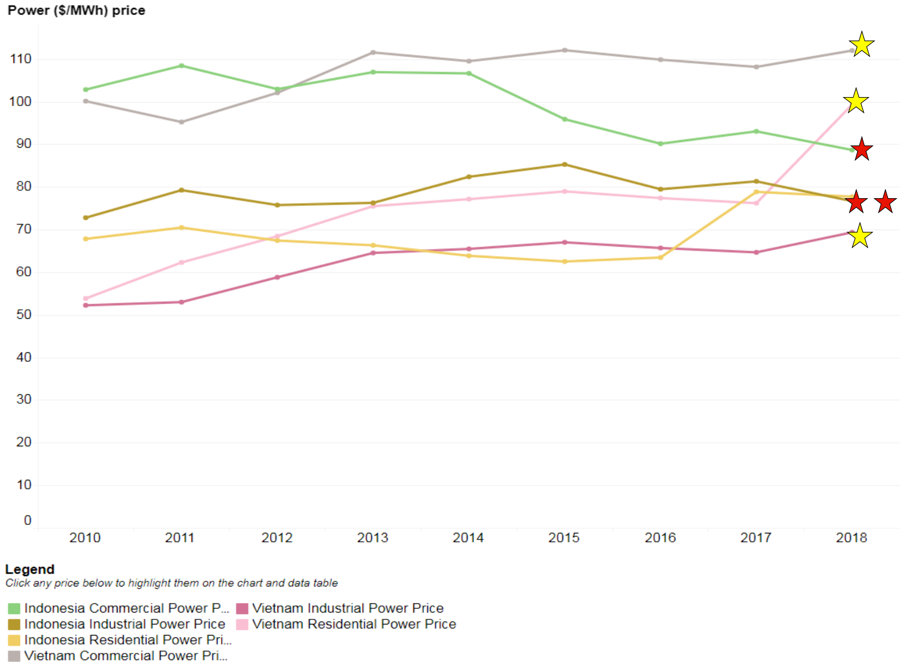




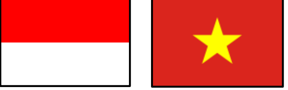


Indonesia and Vietnam Power Price by Segment



$/MWh	2010	2011	2012	2013	2014	2015	2016	2017	2018
Indonesia Commercial Power Price	102.81	108.41	102.92	106.91	106.61	95.86	90.12	93.02	88.65
Indonesia Industrial Power Price	72.76	79.23	75.73	76.25	82.36	85.26	79.44	81.29	76.65
Indonesia Residential Power Price	67.80	70.45	67.41	66.29	63.83	62.49	63.43	78.83	77.70
Vietnam Commercial Power Price	100.10	95.21	102.06	111.52	109.48	112.05	109.83	108.13	111.97
Vietnam Industrial Power Price	52.22	52.97	58.79	64.50	65.45	66.99	65.66	64.64	69.33
Vietnam Residential Power Price	53.82	62.27	68.42	75.47	77.12	78.93	77.37	76.17	99.30

Source: BNEF 2020



Indonesia and Vietnam Generation By Source

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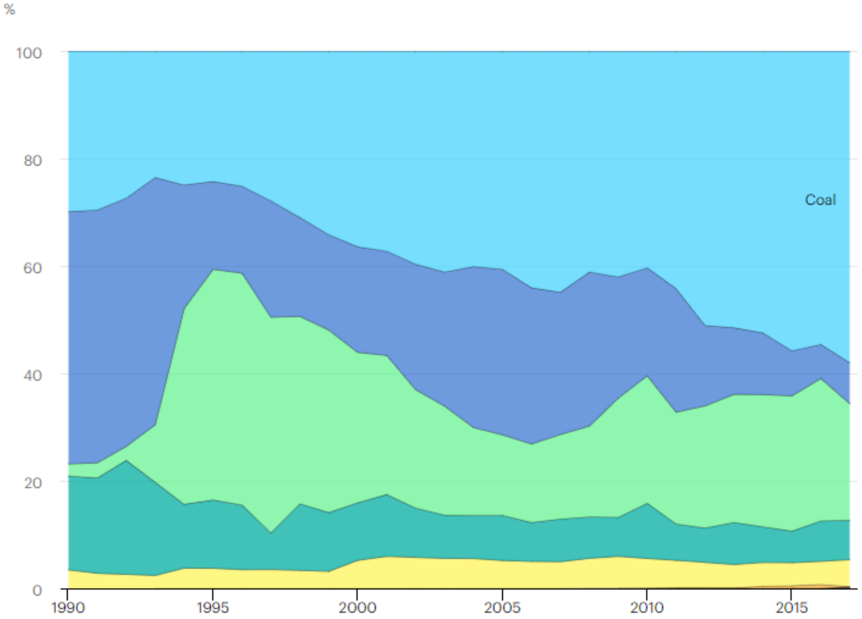
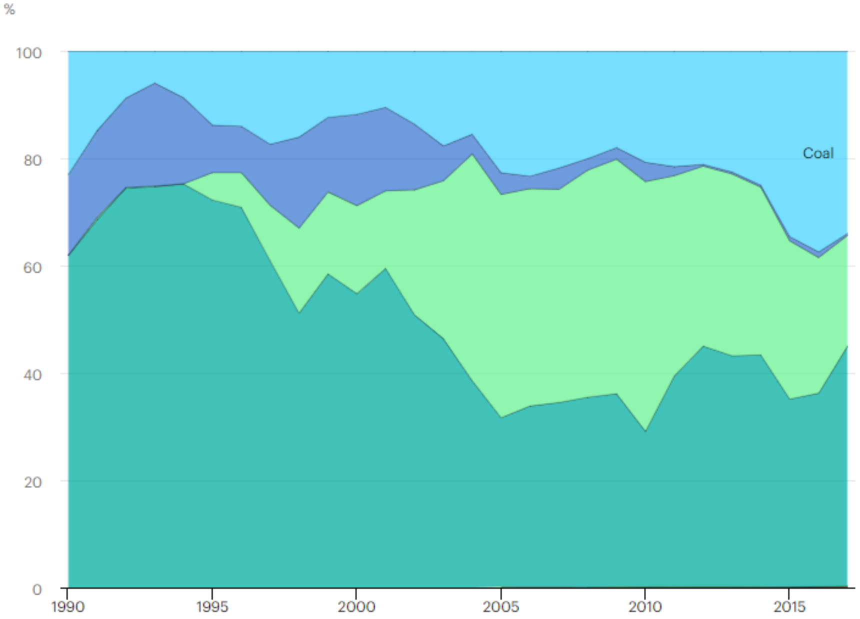
Electricity generation by source, Indonesia 1990-2017



Coal · Oil · Natural gas · Hydro · Geothermal · Biofuels · Wind · Solar PV · Waste

Electricity generation by source, Viet Nam 1990-2017



Coal · Oil · Natural gas · Hydro · Biofuels · Wind

Indonesia and Vietnam Total Primary Energy by Source

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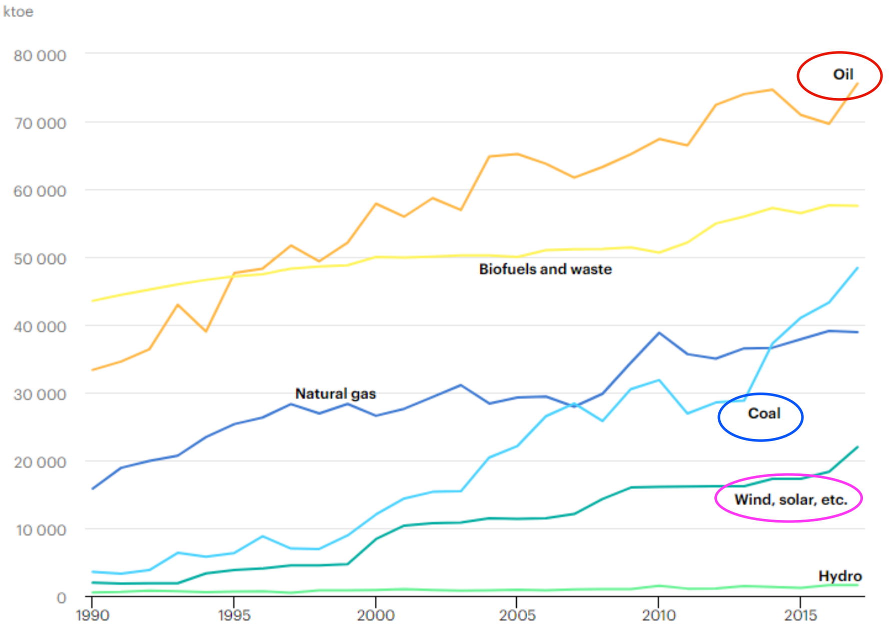
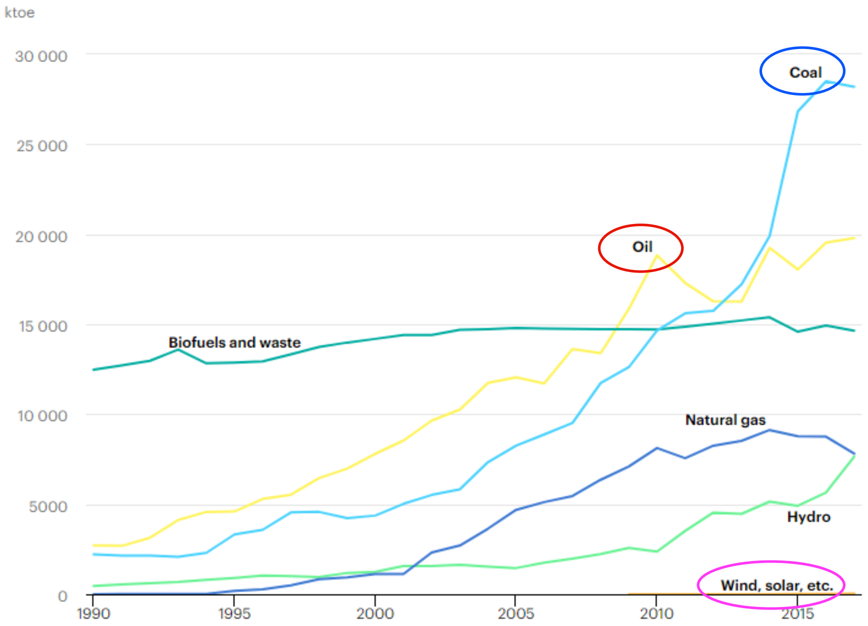
Total primary energy supply (TPES) by source, Indonesia 1990-2017



Coal Natural gas Hydro Wind, solar, etc. Biofuels and waste Oil

Total primary energy supply (TPES) by source, Viet Nam 1990-2017



Coal Natural gas Hydro Biofuels and waste Oil Wind, solar, etc.

Indonesia and Vietnam CO2 Emissions by Energy Source