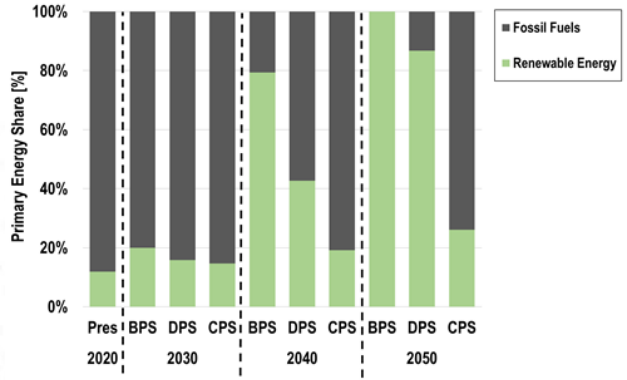
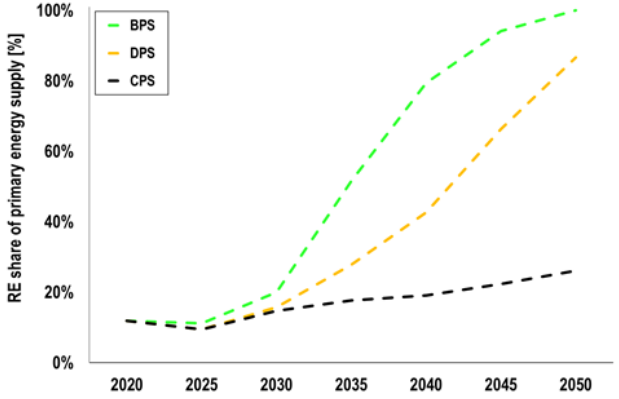
Indonesia Deep Decarbonisation 2050 and the Role of Hydrogen

Fabby Tumiwa
Institute for Essential Services Reform (IESR)
fabby@iesr.or.id

Singapore International Energy Week
28 October 2021

Deep decarbonization with 100% renewable energy supply in 2050 is technically feasible and financially viable

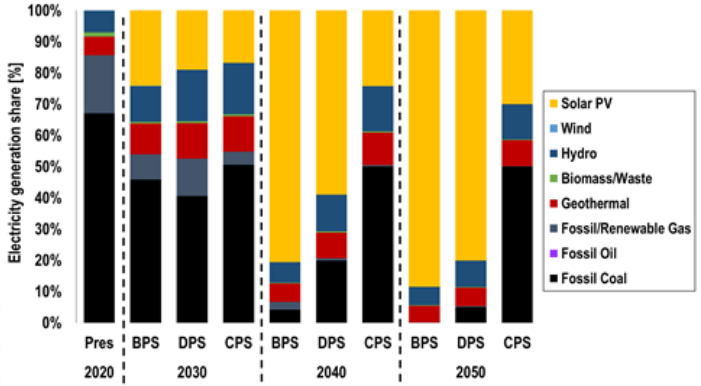




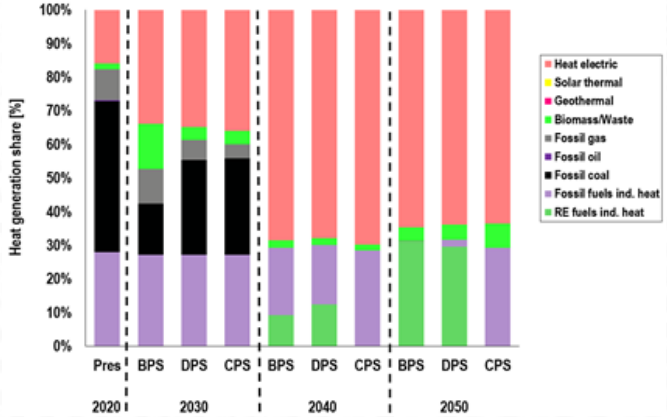
- The Primary Energy (PE) generation shares of **renewable energy across Indonesia is around 14% in 2020**, this share grows rapidly to more than 96% by 2040, more steady growth in the DPS scenario with 95% by 2050.
- **Fossil fuels have a significant share of around 86%** of the primary energy in 2020
- After 2030, a **rapid decrease** in coal generation is observed, as large-scale renewables and storage technologies is cost competitive
- By 2050, renewables could supply 100% energy demand.

Source: IESR, Agora, LUT's study on Indonesia Energy Transition Pathways 2050

Electricity generation

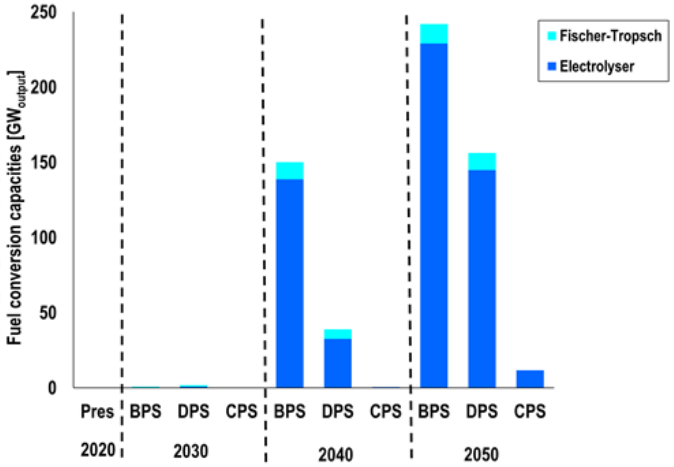


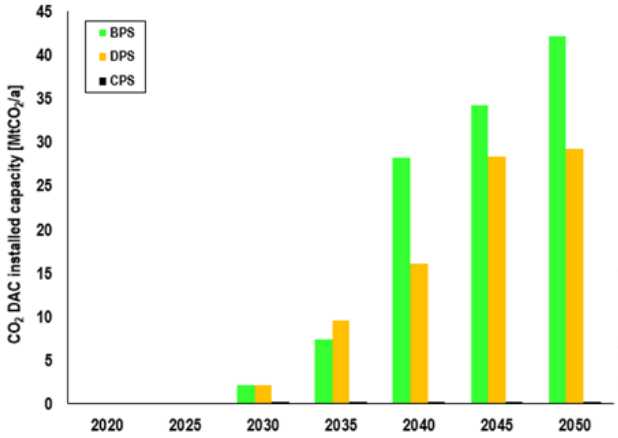
Heat generation



- Electricity generation is comprised of demand for all sectors (power, heat and transport) across Indonesia
- **Solar PV emerges as the primary source of electricity generation** across all the scenarios by 2050, with about 89% in the BPS scenario, about 80% in the DPS scenario and about 30% in the CPS scenario
- Comparatively, **solar PV and batteries emerge as major technologies**, while hydropower and geothermal shares are almost similar in 2050 as in 2020
- Coal-based generation declines through the transition
- The share of electricity based industrial heating increased significantly from 2030 onwards to about 50% by 2050
- Fossil fuel-based heating decreases significantly through the transition and is replaced by electricity-based heating solutions

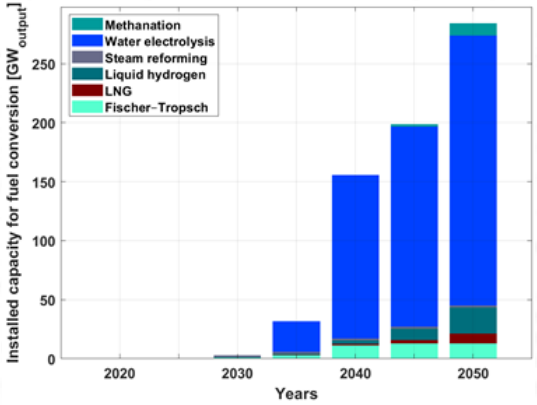
Source: IESR, Agora, LUT's study on Indonesia Energy Transition Pathways 2050 (upcoming)

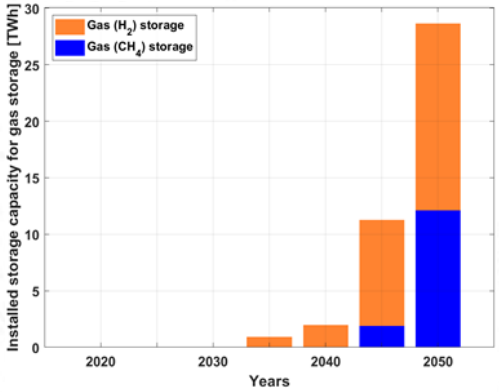


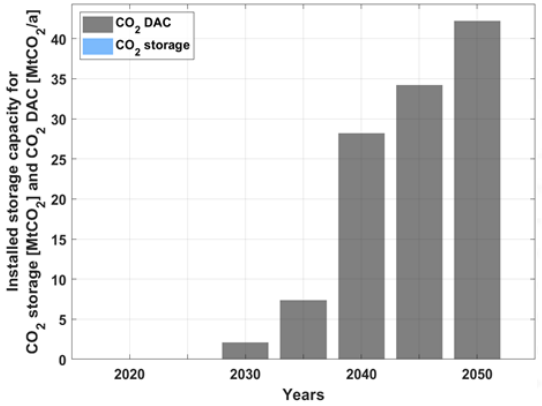


- Synthetic fuel conversion technologies including direct air capture of carbon dioxide (CO_2 DAC), play **a vital role in providing energy for applications** where direct electrification is not possible and the hard-to-abate sectors, such as marine, aviation and some industrial processes
- Synthetic fuel conversion additionally provides vital flexibility to the energy system via the power-to-fuels integration, greater capacities provide higher flexibility enabled by electrolysers, but also add to the overall energy demand
- Installations grow across all 3 scenarios, with most of the installed capacities increasing significantly beyond 2040, with a major share of water electrolysis along with CO_2 DAC as the basis for Fischer-Tropsch (FT) and hydrogen production up to 2050
- Electricity input for the FT fuels production is **159 TWh** in 2050 for the BPS scenario, while for the DPS it is **187 TWh**

In the best scenario hydrogen plays higher role therefore the need for storage infrastructure increased significantly by 2050





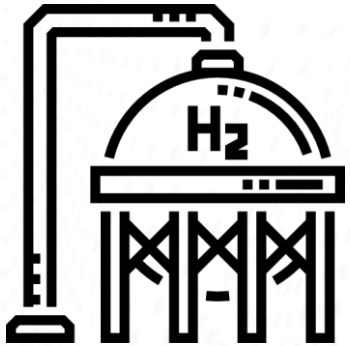


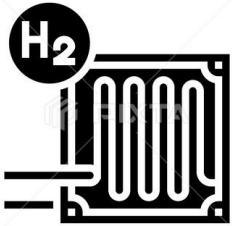
- Synthetic fuel conversion technologies play a significant role in the BPS scenario and installed capacities increase significantly from 2035 onwards, with a major **share of water electrolysis as the basis for Fischer-Tropsch and hydrogen production** up to 2050

- Installed capacity of gas storage comprising of hydrogen and methane reaches just over **25 TWh by 2050**, with major share of hydrogen storage

- Installed CO_2 DAC increases significantly from 2035 onwards, with **over 40 MtCO_2/a** installed in 2050

Interest in hydrogen production is emerging, but policy and regulatory support is limited





- Domestic market potential up to 2.5 Mt/day, $40bn annually
- A combine renewable – hydrogen power plant is expected COD in 2024
- Pertamina plans to produce green hydrogen from electricity from geothermal, started 100 kg/day in 2022 from 0.3 MW geothermal power.
- Few coal companies explore to produce brown hydrogen from coal
- Blue hydrogen from natural gas with CCU/CCUS, for ammonia production

Integrated planning and policy approaches are need to overcome barriers of green H2 production and utilization is required

- **Policy makers must understand** the importance of green hydrogen for climate neutral/net-zero emission target.

- **Integrated planning and policy approaches** to overcome barriers and reach minimum threshold for market penetration.

  - Develop National (Green) Hydrogen Strategy
  - Identify policy support: R&D, commercialization
  - Increase renewable energy penetration
  - Make electrolyser system cost become more competitive
  - Develop potential market (demand)
  - Incentives for green hydrogen
  - Regulatory sandbox

IESR
Institute for Essential Services Reform

Thank You

Accelerating Low Carbon Energy Transition

www.iesr.or.id
iesr.id
iesr.id
IESR
iesr