IRENA
International Renewable Energy Agency

Role of Emerging Technologies in Achieving Net Zero Emission

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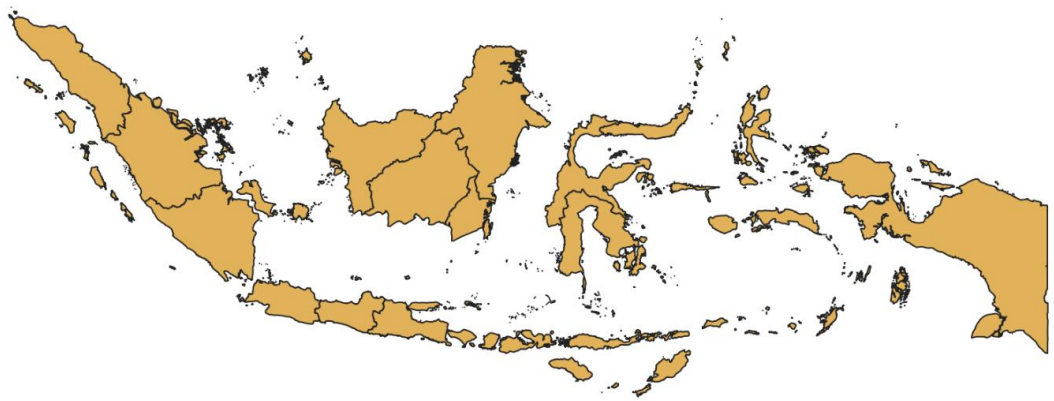
The 7 key pillars of the energy transition in Indonesia

An integrated planning of the regional energy transition is key



Energy transition pathway to 2050 with in-depth analysis of demand sectors, and an 18-node power sector model for Indonesia

- Expansion of renewables in electricity generation
- Expansion of the interconnection grid
- Sustainable Mobility
- Energy Efficiency
- End-use bioenergy
- Materials and manufacturing
- Battery and PV manufacturing

Key Messages – Indonesia Energy Transition Outlook

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By 2050, primary energy supply will triple. It is **cheaper to pursue the huge untapped potential of renewable sources**, with the share of **renewable energy reaching two-thirds of the country's energy mix** in 2050

Electricity will meet half of final energy consumption, with a **quarter of final energy coming from renewable direct-use**. **Electricity generation will need to rise up to fivefold, to over 1 700 terawatt hours (TWh).**

In **1.5°C Scenario**, there is a need for **80 gigawatts (GW) additional renewable power capacity**, coupled transmission, distribution and storage. **Biofuel supply and EV chargers** will need to grow rapidly, with the **investment needs in technologies to amount to USD 300+ billion up to 2030.**

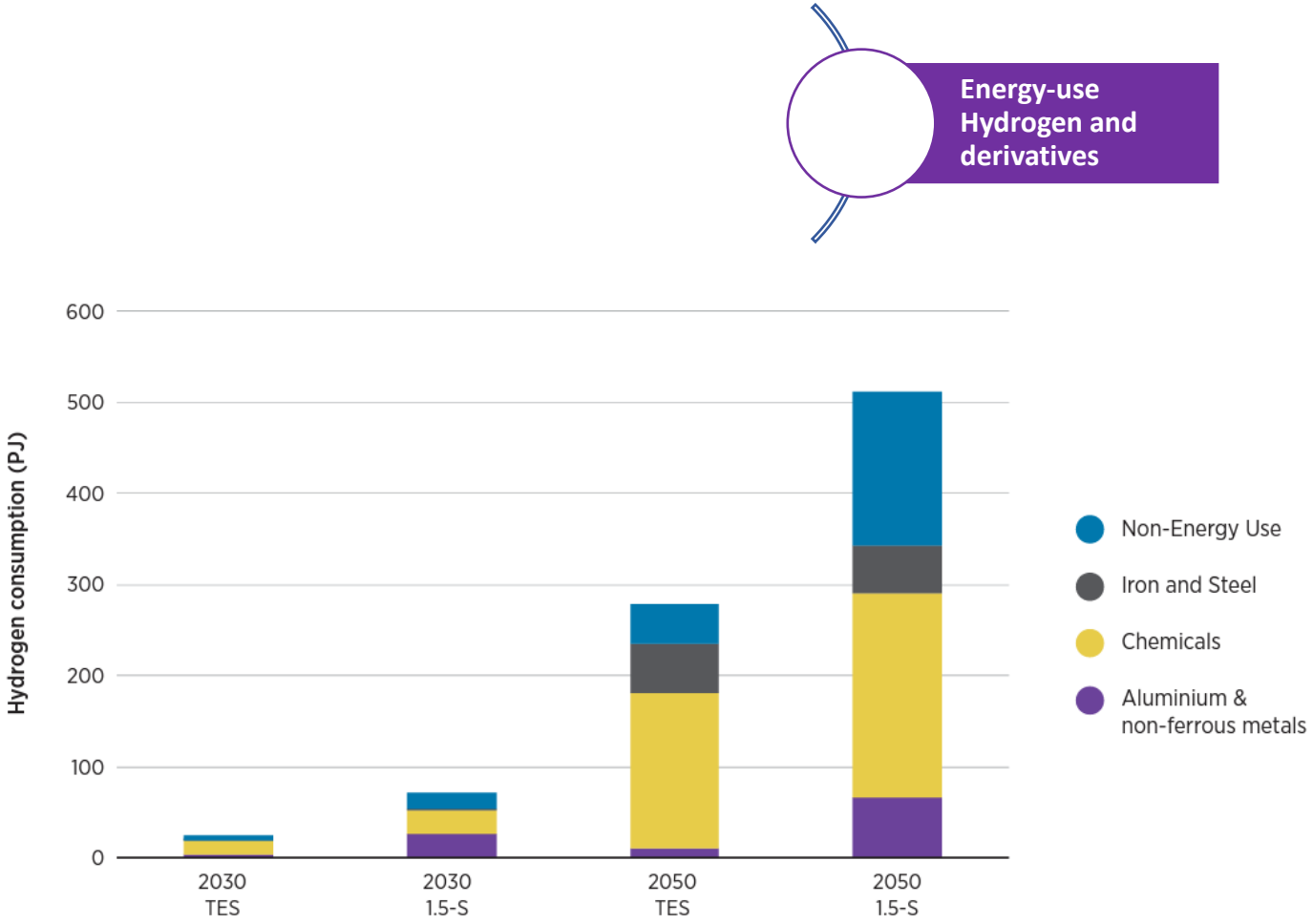
Over the **longer-term, up to USD 2 400 billion in cumulative investment to 2050 needed** across the energy system, from generation, to efficiency and enabling infrastructure

IRENA's energy transition scenarios see Indonesia's energy-related **emissions peaking by 2030 and reducing to just above one-third of today's level in the 1.5-S**. Additional CO2 removal measures will be needed to reach net zero, as well as measures related to CO2 emissions outside the energy sector.

The **1.5-S is lower cost overall**, resulting in **savings of USD 0.4-0.6 trillion cumulatively to 2050**, with significant **additional costs savings** in the 1.5-S associated external costs from **USD 0.2 to 0.6 trillion cumulatively to 2050**.

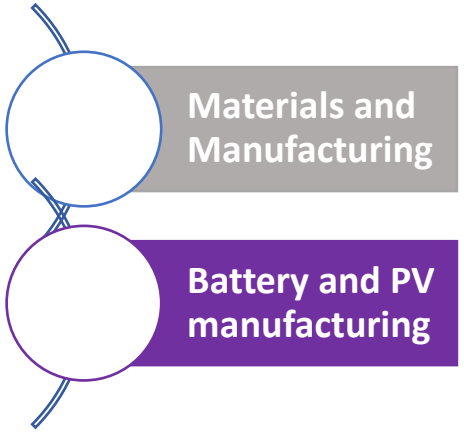
Hydrogen provides a complementary solution in the country's ambitious climate objectives

- **Green hydrogen** has a role towards 2050, **with around 5 Mt of consumption, largely in iron and steel, aluminium and chemicals industry,** and also in international bunkering**.**
- Zero-carbon hydrogen is either considered green, produced **from electrolysis using carbon-free electricity, or blue, produced generally from natural gas utilising CCS** to capture the significant CO2 emissions produced during production
- ASEAN region as a whole **has further technical potential to become a hydrogen hub**. It is estimated that between 6 EJ and 60 EJ of low-cost green hydrogen (less than USD 2/kilogramme [kg]), can be produced in the region (IRENA, 2022g).

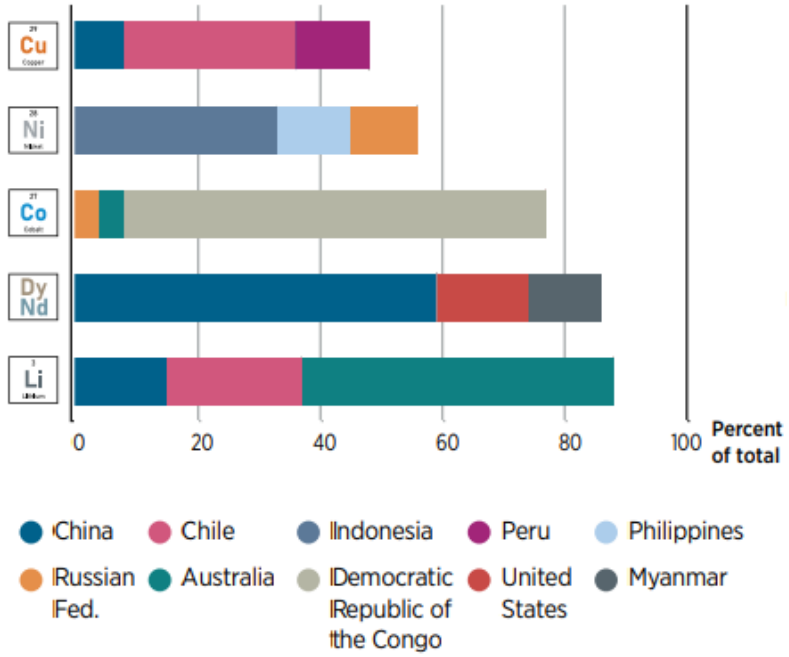


Energy transition technologies can provide new opportunities for industry

- Indonesia has significant mineral resources, such as nickel, that are important for key energy transition technologies and could develop an **integrated EV supply chain and become a battery producer and exporter.**
- To reach 1.5-S, **solar PV capacity additions** will need to expand to 5 GW per year in the short-term and to as high over 30 GW per year longer-term
- In 2021 Indonesia's PV **manufacturing capacity was in the range of 50-100 MW** per year

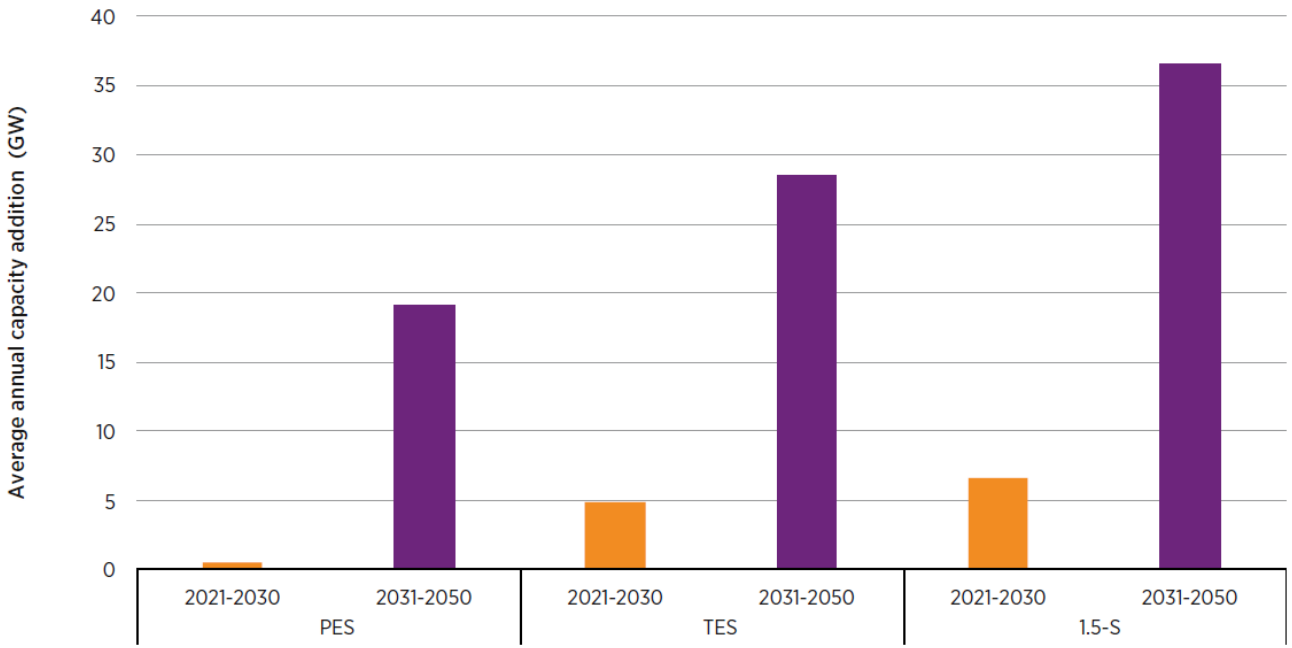


Top producers



Source: (IRENA, 2022i)

Solar PV annual additions



Total Indonesia Power sector transformation requirement by sector and scenario until 2050 (Billion USD)

- **Wide-scale and significant investment** scale-up between **USD 12 billion – 13 billion annually** will be required to achieve 1.5-S by 2050
- Renewable energy total **investment in Power sector will need to reach 83 billion** in short term, and reaching **USD 0.7 to USD 0.8 trillion by 2050**
- **Solar PV** installed **capacity reach 66 GW**, requiring **investment of USD 44 billion within this decade**. The investment in 1.5-S will be **more than double over PES by 2050**
- Total power sector investment in 1.5-S **is almost double that needed in PES**
- Significant **investment in national/international transmission, distribution and storage is essential**

		PES	TES	1.5-S RE85	1.5-S RE90	1.5-S RE100
Renewables	Solar PV	195	314	405	415	434
	Hydro	71	109	146	145	147
	Wind	1	43	25	75	67
	Geothermal	23	63	87	85	89
	Biomass	3	27	50	28	45
	Hydrogen	-	-	-	-	51
	Ocean	-	-	-	-	8
Nuclear		90	-	232	-	-
CCS	Coal w/CCS	132	307	-	-	-
	Biomass w/CCS	-	-	-	93	135
	Natural gas w/CCS	-	-	-	56	-
Fossil fuels	Coal	25	25	25	25	25
	Natural gas	10	10	10	12	10
Transmission		109	142	190	190	190
Distribution		82	107	143	143	143
Battery storage		28	47	73	61	92

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