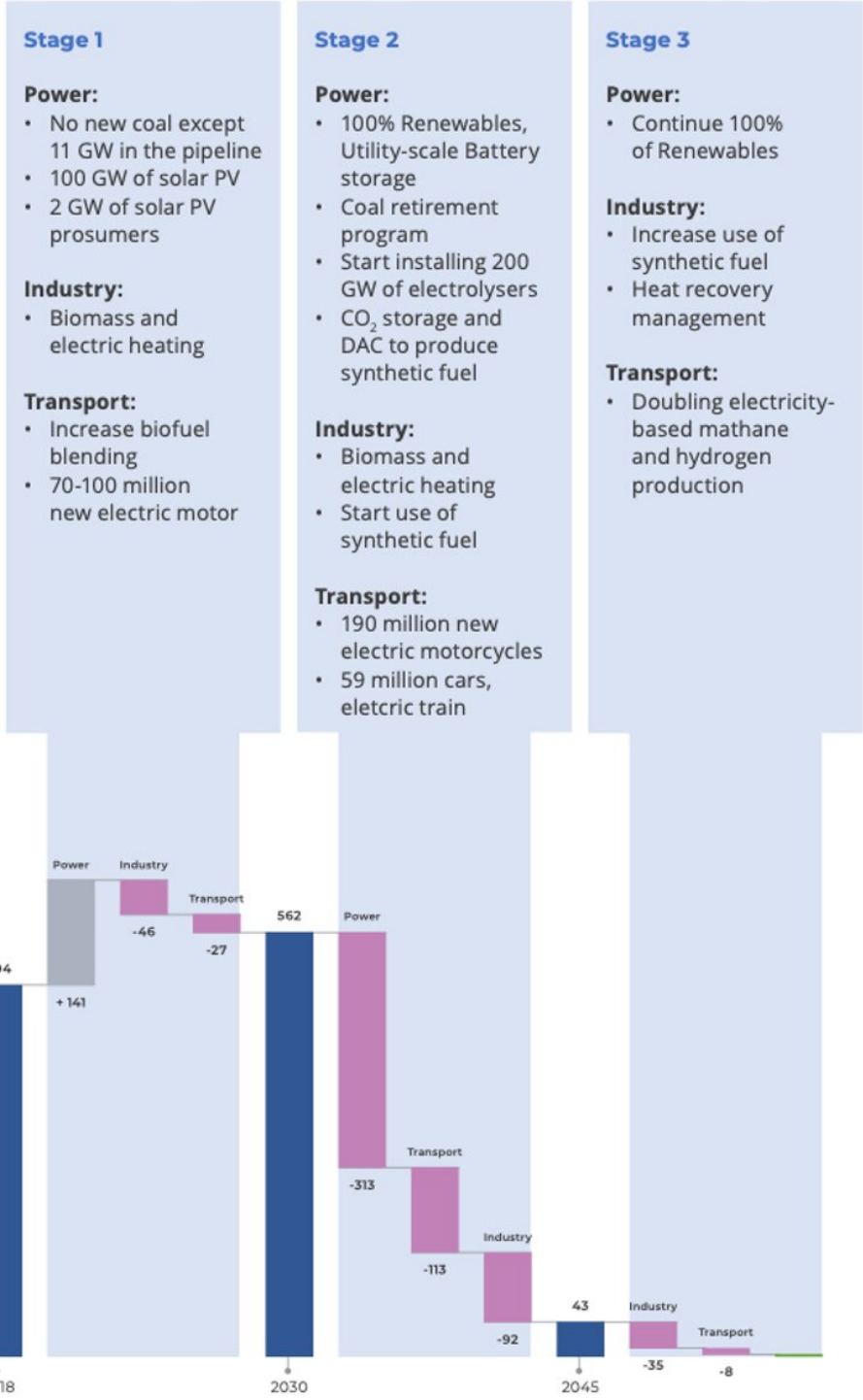


# Here's how Indonesia could get to zero emission in its energy sector by 2050

October 25 2021, by Pamela Simamora

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A pathway to zero emissions. (Note: increased emissions in the power sector from 2018 to 2030 due to growing demand and emissions from both existing and newly entering operation- fossil power plants. The model assumed that PV+battery is not yet cost-competitive with coal power in 2020 so a cost-optimal

solution is reached with peak coal generation as observed in 2025. Credit: IESR

As one of the [largest emitters](#) in the world, Indonesia has an important role to play in the global race to net-zero emissions. Sadly, the government only targets 2060 to achieve net-zero emissions in Indonesia, a longer timeframe than [what is needed](#).

The less ambitious target is mainly due to fears that decarbonization would lead to economic losses and technical challenges in the energy system. The energy sector is set to achieve net-zero only in 2060, much later than other sectors.

Those fears, however, are ill-founded. Achieving zero [emission](#) in the [energy sector](#) by 2050 is technically and economically possible, according to a study by the Institute for Essential Services Reform (IESR), LUT University and Agora Energiewende.

[The study](#), which used one of the world's most advanced energy models, is the first study that provides a pathway to achieve zero emission in Indonesia's energy system ([power](#), transport and industrial heat) by 2050 using 100% renewable energy.

## **The defining decade**

What is unique about the study is that it shows how relying on 100% renewable energy could be reliable and affordable at the same time.

Thanks to advances in [clean technologies](#) in recent years, [the costs of solar and wind power](#) have been falling to a point where they are now cheaper than fossil power.

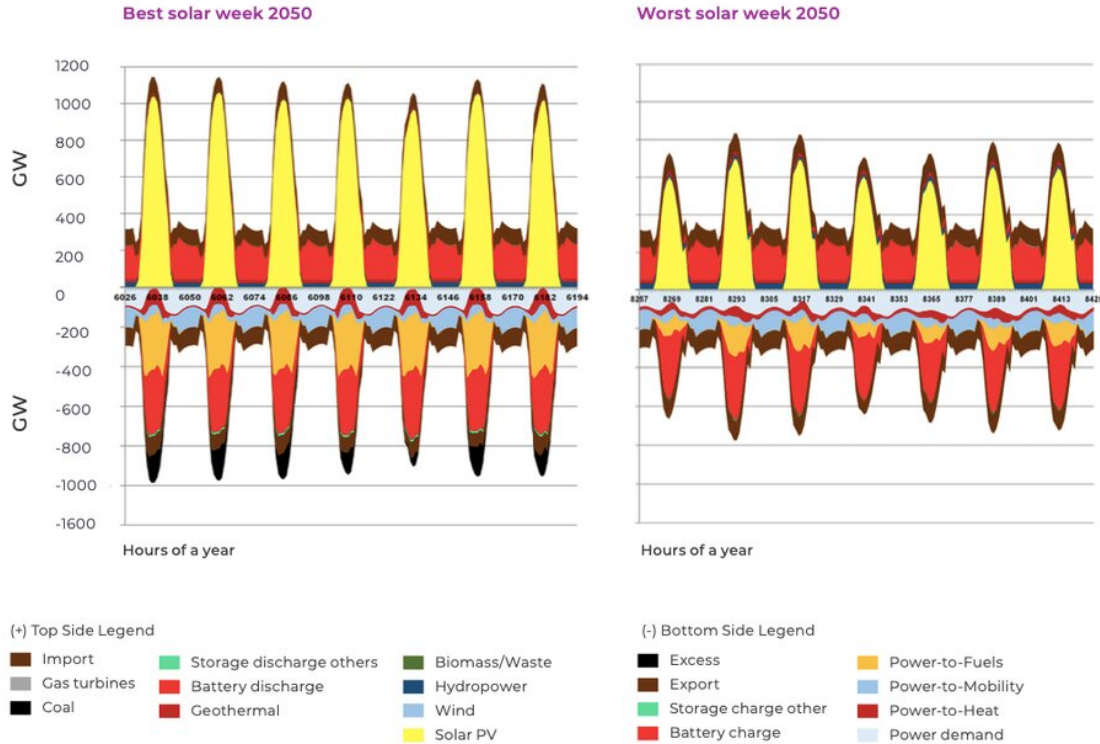
The same trend applies to [battery technologies](#) that have seen significant cost declines in the past decade. This makes electric vehicles (EV) more affordable and intermittency—inconsistency of power production—soon no longer an issue for solar and wind energy.

The study suggests Indonesia needs to start the transformation today and make revolutionary changes within this decade to stay on track for zero emission.

This decade is critical because it sets the emission trajectory for the next three decades. Achieving zero emissions by 2050, therefore, means that by 2030:

Almost half of the electricity would need to be sourced from renewable energy such as solar, hydropower, geothermal and biomass, up from 14% today. Solar would dominate renewable generation by accounting for 50% of total renewable power.

CO<sub>2</sub> emissions would peak by 2025. No new coal-fired power plants would be built after 2025. Renewable energy capacity would reach a new high at 140 gigawatts (GW), up from 10 GW today, with solar photovoltaic/PV accounting for 108 GW.



Hourly generation in best and worst solar weeks. Credit: IESR

Around 10% of new cars and 60% of new motorcycles would be battery-powered, up from virtually zero today.

Industries such as steel, cement and aluminum also need to switch to electric boilers and heat pumps to get their low-temperature process heat. Electric heating installation would be as high as 54 GW, covering 43% of heat demand.

The national power grid capacity would expand to more than 13 GW to integrate more renewables, up from 8 GW today. Some inter-island connections would already be established.

## Getting zero emission

The government hopes to put Indonesia as a [developed country](#) at its centenary in 2045, an aspiration that should be cherished by all Indonesians.

But what is equally important is that we achieve growth sustainably. Indonesia should embed the Sustainable Development Goals into its long-term development plan and ensure all sectors adopt a roadmap to zero emission.

To get to zero emission by 2050, the power sector should be carbon-free from 2045 onwards.

All electricity generation would be sourced from renewable energy. Solar energy would supply 88% (1,500 GW) by 2050. The rest would come from 60 GW of hydropower and geothermal power combined.

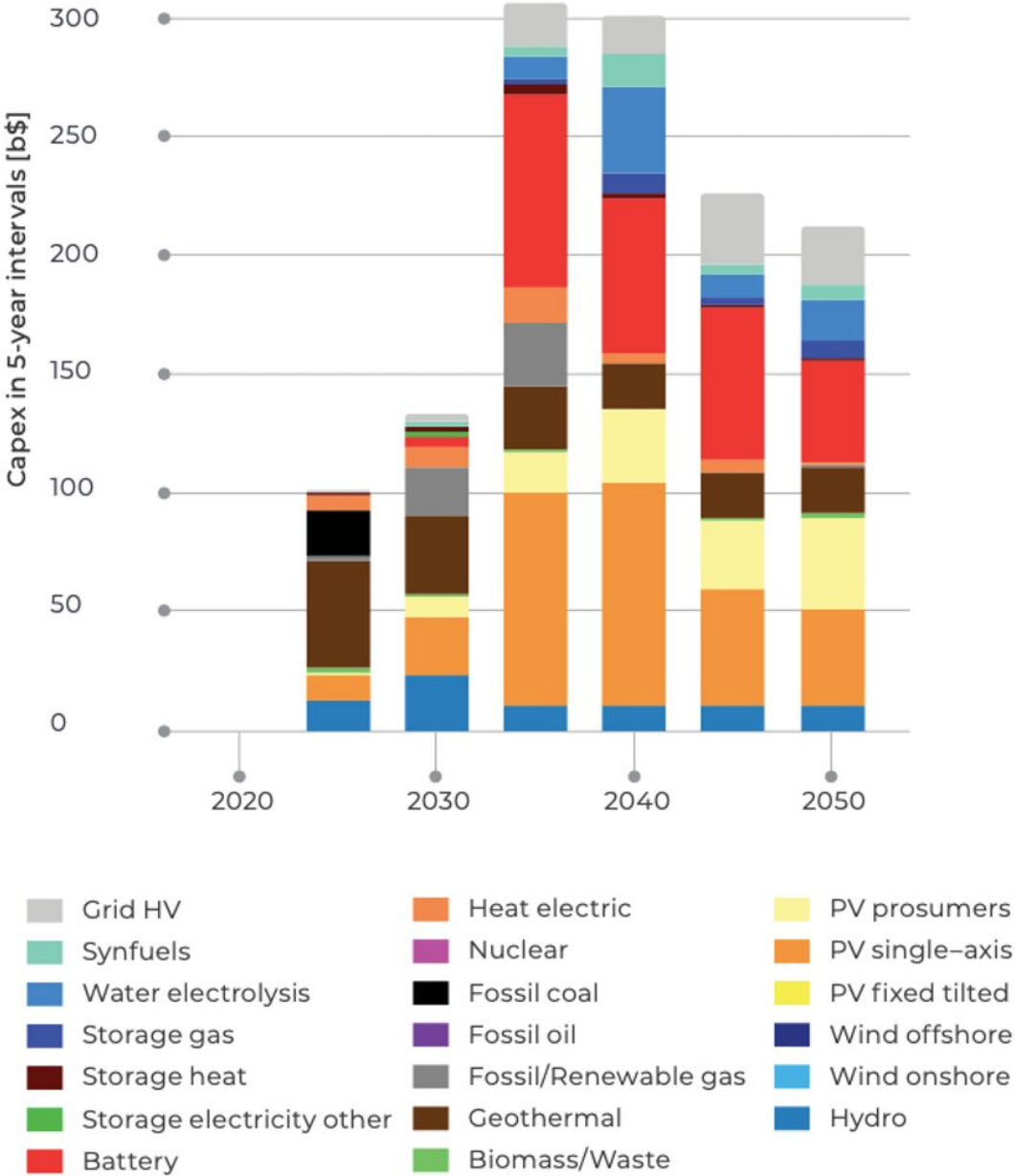
The large role of [solar energy](#) is in line with the fact that solar power is by far the largest renewable source in Indonesia at around [20,000 GW](#). Making it the backbone of the [energy system](#) is therefore very sensible.

To ensure electricity supply, Indonesia needs to install 360 GW of batteries and expand the national power grid to 126 GW, with all major islands in the country being fully integrated to allow power exchange.

Other than [renewable energy](#), electrification is also crucial in the decarbonization process. Electrification should be carried out whenever possible as decarbonizing the power sector is relatively easier than the transport and industry sectors.

To achieve zero emission, the market share of battery, [fuel cell](#) and plug-in hybrid (with clean fuels) [electric vehicles](#) would reach an all-time high

at 93% of the light-duty vehicles segment by 2050. This covers passenger cars, pick-up trucks, and light commercial vehicles.



Capital expenditure distribution in best policy scenario. Credit: IESR

Meanwhile, indirect electrification for transportation through power-to-fuels would start from 2035 onwards with renewables-based hydrogen and synthetic fuels. These fuels would cover 21% and 6% of transport's final energy demand in 2050, mostly for the harder-to-abate aviation and maritime sectors.

Overall, direct and indirect electrification would contribute to 80% of transport's 2050 final energy demand. The remaining share would come from sustainable biofuels. With clean alternatives becoming readily available throughout the country, all fossil-powered vehicles could be banned by mid-century.

In the industrial sector, electric heating would cover 67% of heat demand. Hydrogen would contribute to 26% of heat demand, mainly for very high-temperature processes such as in the steel, cement and aluminum industries. The remaining heat would come from biomass.

While technology adoption is key to this transition, technology use alone isn't enough to achieve the emission target. Behavioral changes are important too.

To begin with, we need to see more people use public transport and non-motorized vehicles (bicycles). The government must expand and integrate public transit.

People should also be encouraged to use more energy-efficient equipment in their houses and factories. Business leaders should allow their employees to work from home post-pandemic to reduce mobility.

## **Opportunities ahead**

Deep decarbonization is not an easy process for any country. However, this should not obscure new opportunities that await. The study shows



deep decarbonization would create at least 3.2 million direct jobs in Indonesia by 2050.

Other co-benefits such as avoided costs of climate damage, improved public health, increased water and food security, and lower [energy](#) expenditure (and subsidies) should also be taken into account. Not to mention that stranded assets as little as \$26 billion in 2045 could be avoided if Indonesia phased out its coal fleet early.

With investment needs sitting at \$20–60 billion per year between 2020 and 2050, Indonesia can modernize its economy through various green projects and later compete in a global market that is swiftly moving towards a sustainable future.

But, to attract investors, the Indonesian government first and foremost needs to show its unwavering commitment to climate action and make deep decarbonization its top priority. The political will should be demonstrated in policies and regulations to improve the investment climate in Indonesia.

We have learned from the pandemic that there is no economy without public health. We should also realize that there will be no economy without the environment.

With Glasgow's COP26 approaching, it's time for the Indonesian government to step up action and work together as a team with other countries to ensure that the world can achieve net-[zero emissions](#) by mid-century.

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