POST-2015 CONSENSUS

Post-2015 Development Agenda

Indonesian Perspectives

Energy

SPEAKERS

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Since 1996 Amy has worked in the energy sector as an advisor, market analyst and consultant, focusing more recently on the regulatory and policy aspects of energy systems. In addition, she has directed quantitative risk management studies for natural gas producers, utilities, industrial end-users, and municipal electric utilities. Amy has created price forecasts for energy markets in Ontario and Alberta as well as the Pacific Northwest day-ahead electricity markets. She completed a PhD at the University of Victoria where her dissertation work focused on the impacts of differing regulatory structures on the energy systems of Alberta and British Columbia.

*All work contributed by Amy Sopinka is not on behalf of the provincial government.

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Summary: White Paper Report by Amy Sopinka

Indonesia has vast reserves of fossil fuels and is a major exporter of coal and liquefied natural gas. The overall energy sector is a large one, accounting for 15.6% of GDP. Energy has also made its contribution towards the country's 6% annual growth rate over recent years. But despite the strength of the economy and these energy reserves, nearly half the rural population has no access to electricity, and 42% of the nearly quarter of a billion population cook using traditional fuels, including firewood, leaves and animal dung.

90% of people in towns have electricity, and bringing the rural population up to the same standard would be a great improvement. Not only that, but providing clean, gas-fired cooking stoves for everyone would reduce the burden of poor health and death caused by indoor air pollution.

With over 40% of Indonesians living on less than 25,000 IDR a day, despite overall economic growth, it is not surprising that the government's policy to subsidize a whole range of energy products has been very popular. However, by 2014, these subsidies accounted for over 20% of central government spending and disproportionately benefitted richer households. After all, it is only the better-off who can afford motorbikes, cars and fuel.

The amount spent on subsidies was three times greater than the budgets for health or infrastructure. Despite their popularity, energy subsidies cost the country 1,650 trillion IDR over the last five years, with little apparent benefit. Making this money available for other uses could help to provide electricity and clean cooking stoves for more of the population, as well as improving roads, healthcare and education.

Recently, President Widido has removed nearly all fuel subsidies. Although the government has to take action to cushion the poor from the impact of this, the overall effect of removing all energy subsidies would be overwhelmingly positive. Already, government spending on infrastructure, healthcare and education has been increased.

Previous regimes have tried to reduce energy subsidies but public pressure has forced their reinstatement. If the new president can manage the transition, the longer-term benefits for Indonesians will be very significant.

The Copenhagen Consensus analysis of the energy situation shows that, if the government is able to make the new policy stick, then an elimination of energy subsidies by 2018 would allow 3.3% of GDP to be spent on infrastructure and poverty reduction. This could cover the costs of universal healthcare or permit cash transfers to the poorest families.

To minimize the direct impact on the poorest citizens, a social protection program would be needed, estimate to cost about 6,600 billion IDR every year, but for each thousand IDR spent, there would be net benefits worth 16,000 IDR. Part of this would come from increasing the efficiency of fuel use and the rest in social benefits including reduced congestion, fewer accidents and less pollution.

The National Energy Council's target of bringing an electricity supply to 90% of all citizens by 2030 would mean connecting an additional 21 million households. This would also be a large investment – 5,850 billion IDR each year – but each thousand IDR would bring 9,300 IDR of benefits and help transform the lives of poor people in rural communities.

Another way to help would be to make sure everyone has access to clean cooking facilities. At present, the World Bank estimates that there will still be 18 million households suffering from the indoor air pollution

caused by indoor burning of traditional solid fuels by 2030. It would cost over 14,000 billion IDR to provide clean stoves and fuel to everyone by that date, but benefits would significantly outweigh the costs except at the very lowest valuation of human life and ill health.

With 249.9 million inhabitants, Indonesia is the world's fourth most populous country. Between 2008 and 2012, the country's GDP grew by 6% per year to 10,854 trillion IDR in 2013[1]. Indonesia is endowed with some of the world's largest reserves of fossil fuels, and in 2011, it was the global leader in steam coal exports and the fourth-largest exporter of liquefied natural gas (LNG). Energy represents approximately 15.6% of Indonesia's total GDP. Once a member of OPEC, it now imports oil in part due to lack of private investment, a problem that is compounded by aging infrastructure.

Since the 1970s the Indonesian government has been subsidizing numerous energy products (e.g., electricity gasoline, diesel, kerosene and liquefied petroleum gas) to reduce the cost of these fuels to end users. Massively popular, these energy subsidies amounted to nearly 20% of central government spending in 2012. In November 2014, Indonesia's new President Joko Widido reduced subsidies on both gasoline and diesel. Although there were protests against Widodo's action, the new President has announced budget benefits in the form of infrastructure, health care and education spending, which are aimed at placating the public.

Fuel subsidies are a contentious issue in Indonesia and Widodo is re-enacting a historical cycle. Former president Suharto quit after 1,200 people died in riots protesting (amongst other things) fuel price increases of nearly 71%. The previous President Yudhoyono raised gasoline prices between 2005 and 2008 and gave cash to the poorest in the country to dispel unrest. However, he lowered fuel prices in 2009 prior his re-election. In 2012, Yudhoyono proposed increasing fuel prices but protests between students, labour groups and police on live television, along with opposition from his own party, ended that idea. .

President Widodo is going further than others On January 1, 2015, he virtually eliminated all other fuel subsidies, although a small diesel fuel subsidy (approximately 1,000 IDR /litre) aimed at helping fisherman and public transportation, was kept in place. Whether Widodo can withstand the political challenges of this new policy, particularly if the market price of oil increases, remains to be seen.

Despite its large natural resource base, Indonesia is one of the few countries that has achieved a lower middle income status and at the same time has a significant portion of its population without access to the region's abundant energy resources. In 2014, 42% of the population used traditional fuel for cooking and 24% of the population does not have electricity access. The electrification rate is over 90% in urban areas but only 56% in rural regions.

Suggested targets relevant to Indonesia

Removing energy subsidies

Indonesia has significant opportunities to improve access to energy both in terms of a transition away from solid fuels and by providing electricity access to a larger segment of its population. The greatest benefit is achieved by removing energy subsidies and channeling those expenditures into other areas such as health care, education and investment in energy infrastructure. Energy subsidies are estimated to have cost Indonesia 1,650 trillion IDR over the past five years and the positive impacts of the policy appear to be negligible.

[1] Exchange rate used in the calculations 1 USD = 13,213 IDR

In 2014, Indonesia spent 2.6% of its GDP and 21% of the central government budget on fuel subsidies – more than three times the allocation for infrastructure such as roads, water, electricity and irrigation networks, and three times government spending on health.

Energy subsidies are available to all consumers, however, these subsidies disproportionately benefit rich households. Indonesia's Coordinating Ministry for Economic Affairs (2008) reported that the top 40% of households by income consumed 70% of subsidized gasoline. These types of distributional inequalities are not surprising as the poorest households would not have the income to purchase a means of transportation (there are about 40 passenger vehicles per 1000 people) or fuel at almost any price.

Studies show that eliminating energy subsidies by 2018 would allow 3.3% of GDP to be spent on infrastructure and poverty reduction. The reallocation of funds from fuel subsidies could cover the costs of universal health care or could be used to implement a cash-transfer program to prevent poverty from increasing. One study suggests that the 301,256 billion IDR that Indonesia was anticipating allocating towards fuel subsidies could add roadways, ports and railways – infrastructure investment that is currently missing and is impeding private investment. Subsidy cuts could create inflationary pressure, which will raise the price of goods for all Indonesians – a potentially devastating reaction given that over 40% of the Indonesian population lives on less than 25,000 IDR per day.

The economic inefficiency associated with fuel subsidies, also known as a deadweight loss, also represents the benefits of the subsidy removal. Deadweight loss is reversed when the price of the commodity, in the case of gasoline, reflects the private supply and demand and the social deadweight loss represents the wastage and overutilization of gasoline and diesel fuel in the Indonesian economy. The estimated deadweight loss reversal is 29,068 billion IDR for gasoline and 21,140 billion IDR for diesel, combining for a total benefit of 50,209 billion IDR. The social benefit of removing fuel subsidies is estimated to be 55,495 billion IDR, which includes: 27,747 billion IDR in congestion costs, 16,648 billion IDR in accident costs, and 11,098.billion IDR in local pollution costs.[2]

Costs are based on the impacts of the fuel subsidy on the poorest segments of Indonesian society. As most of the benefits of the subsidy currently accrue to the middle and higher income earners, the costs of removing the subsidy to the poor are likely to be low. Clement (2007) estimated that 25% increase in fuel prices would lead to a less than 1% change in consumption .The World Bank data indicates that the Gross National Income (GNI) of Indonesia's 10% poorest is 381,538 billion IDR. Doubling the impact of the subsidy removal to account for difficulties in program administration, poor targeting, transaction costs and other inefficiencies, would require a social protection program costing roughly 6,618 billion IDR.

Benefits:	**105,704 billion IDR per year**
Costs:	**6,618 billion IDR per year**
BCR:	**16**

Improve access to electricity

In 2012, Indonesia had 44 GW of installed capacity and generated over 210 TWh of electricity. The majority of Indonesia's electricity supply comes from the country's fossil fuel resources, with some hydroelectric and geothermal production. Indonesia has vast stores of energy including its coal and oil, as well as hydroelectric, geothermal and variable resources such as wind and solar. Despite the growth in capacity and the abundance of energy resources, the latest figures indicate that 60 million people, approximately

[2] , Social benefits are calculated using the proportions provided by Parry (2007) with respect to the social cost of fuel use of $1.11 per gallon which is equivalent to 14,666.43 IDR

24% of the national population, are without access to electricity, the majority of which inhabit the country's rural areas.

Creating a bulk electricity system to provide electricity access is hampered by the country's physical geography which is comprised of over 17,000 islands and 1,904,569 km^2 of landmass, a large portion of which is rugged and remote. Electricity demand is outpacing capacity additions. Subsidies on electricity prices and feed-in-tariffs contribute to financial losses and limit the ability of the country's electric utility to invest in generation and transmission infrastructure.

The Indonesian National Energy Council has set a goal of achieving 90% access to electricity by 2020. The plan calls for an additional 20 GW of installed capacity to be added to the grid, 10 GW in each of two phases. To date 7 GW of coal capacity has been added. The country's growing population will require even more electricity generation. Growth in electricity demand, according to Indonesia's Draft Energy Plan, will grow to 402 TWh in 2020 and 1,068 TWh by 2030 and an additional 237 GW of capacity will need to be added by 2030 to meet the country's peak load.

For the purposes of estimating the costs and benefits of electricity access in Indonesia, a 90% electrification target is assumed. By 2030, an additional 21 million households will require access to electricity. The United Nations (2013) estimates that the welfare gain association with electrification is 1.5 million - 3.2 million IDR per household per year[3]. The total benefit of achieving a 90% electrification rate is 33,444 – 66,888 billion IDR per year, however, this benefit would only be achieved once the 90% electrification goal is met, thus the BCR for this goal would be, slightly less than the calculated value below.

The total cost of achieving Indonesia's 90% access goal by 2030 is estimated to be 4,906 – 6,756 billion IDR per year[4]

Benefits:	**50,167 billion (33,444 – 66,889 billion IDR per year)**
Costs:	**5,850 billion (4,906– 6,756 billion IDR per year)**
BCR:	**9.3 (5.0 - 13.6)**

Improve access to modern cooking fuels

Although endowed with abundant fuel resources, the International Energy Agency (IEA) estimated that in 2012, 105 million Indonesians relied on traditional biomass (i.e., animal dung, leaves, grasses and firewood) for cooking. This type of solid fuel use leads to illness and death from the associated indoor air pollution, which causes respiratory diseases and lung cancer. Globally, indoor air pollution is the world's deadliest environmental problem – killing 4.3 million people per year.

The impacts of the use of modern cooking fuels is measured in the years of life lost or illness suffered, adjusted for severity. The term used in health economics is disability adjusted life years or DALYS. The World Bank estimates that the number of households using solid fuels will fall from 20.5 million in 2010 to 18 million in 2030. The associated IAP will lead to another 23,270 deaths per year by 2030 from indoor air pollution. Illness from IAP associated with solid fuel use would be approximately 331,200 DALYS per

[3] World Bank (2011) One Goal, Two Paths:p.1 available from elibrary.worldbank.org/doi/abs/10.1596/9780821388372_EXEC

[4] Electricity for all: Increasing Access in Indonesia p. 25 available from sitesresources.worldbank.org/INTEAPASTAE/Resources/Electricity_for_All-Increasing_Access_in_Indonesia.pdf

year. If modern cooking stoves are provided, about an 80% reduction in DALYS are anticipated as modern stoves will not immediately and completely alleviate all IAP costs. Using standard DALYS values of 13,213 – 66,065 million IDR per year yields a total annual benefit ranging between 13,375 – 66,879 billion IDR

The US Millennium Project estimated that the capital expenditure for the equipment (stoves and cylinders) is assumed to be 660,657 IDR per household in 2005. Escalating that price using the US CPI calculator increases the capital expenditure required for stoves and fuel to 790,542 IDR per household.

Providing stoves and fuel to the estimated 18 million households using solid fuels in 2030 will cost 790,533 IDR per household which yields a total cost of 14,230 billion IDR.

Benefits: **40,127 (13,375 – 66,879) billion IDR per year**

Costs: **14,230 billion IDR per year.**

BCR: **2.8 (0.9 – 4.7)**

Summary Table with BCRs for each of the three targets

Target	Benefit per year (IDR)	Cost per year (IDR)	BCR
Eliminate Fossil Fuel Subsidy	105,704 billion	6,618.1 billion	16
University Electricity Access	33,444 – 66,889 billion	4,906– 6,756 billion	9.3 (5.0 – 13.6)
Universal Access to Modern Cooking Fuels	13,375 – 66,879 billion	14,230 billion	2.8 (0.9 - 4.7)

Conclusion

Indonesia is a country of vast resources and has significant opportunities to improve energy access. The elimination of energy subsidies will permit the reallocation of nearly 301,256 billion IDR per year into a number of key areas including energy and transportation infrastructure. Redirecting government expenditures into these areas will have the added benefit of helping to achieve the goals of electrification and provision of modern cooking fuels. Providing modern cooking fuels will reduce both disease and death, and funding for fuel subsidies redirected toward energy infrastructure, Indonesia may be able to become self-sufficient in its oil consumption by attracting additional private investment.

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Energy in the context of Sustainable Development Goals

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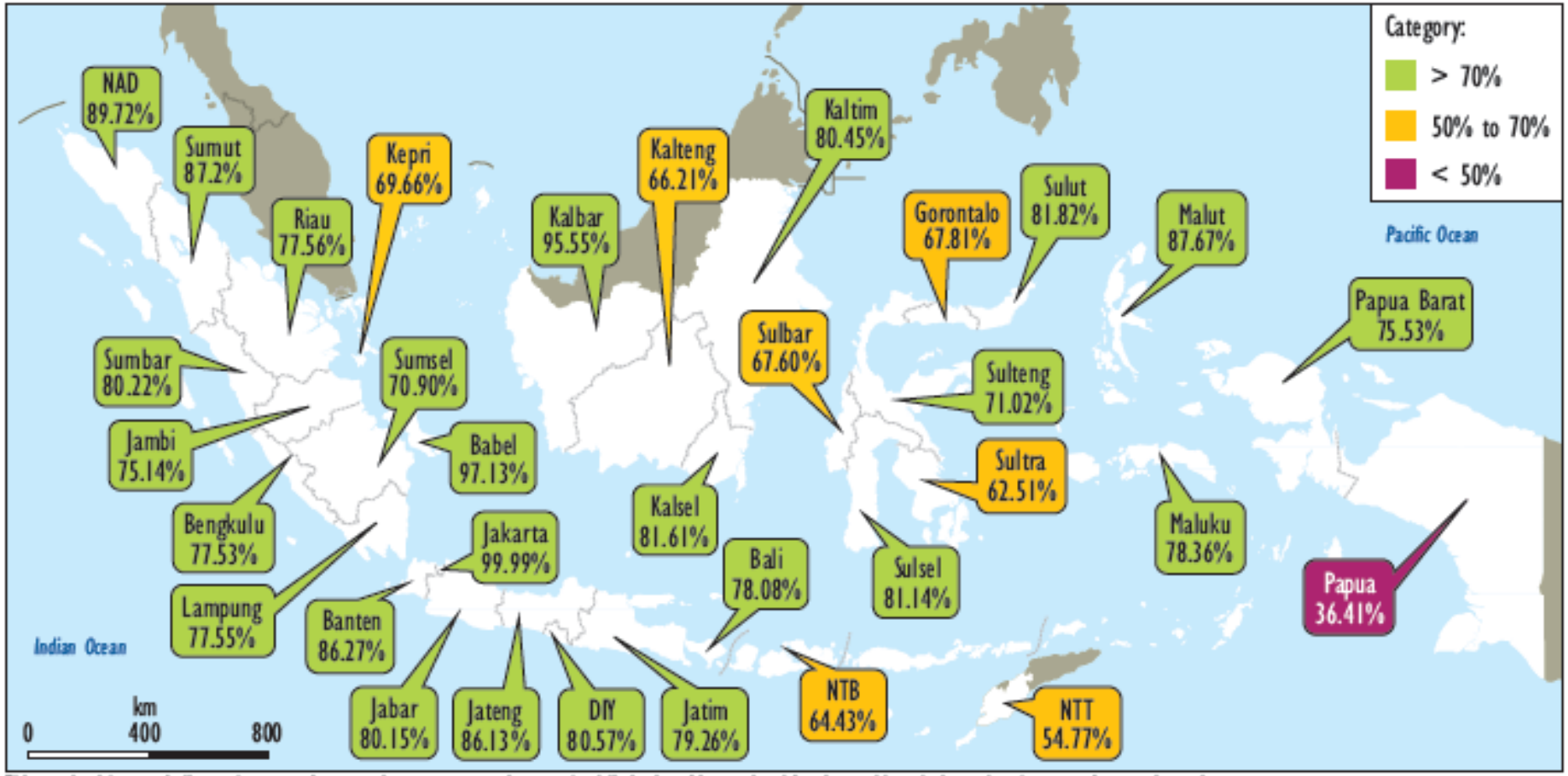
National Energy Policy
(Government Regulation No.79/2014)

- National energy policy is a guideline to provide direction in managing national energy, in order to establish self-sufficient energy and energy security to support national sustainable development

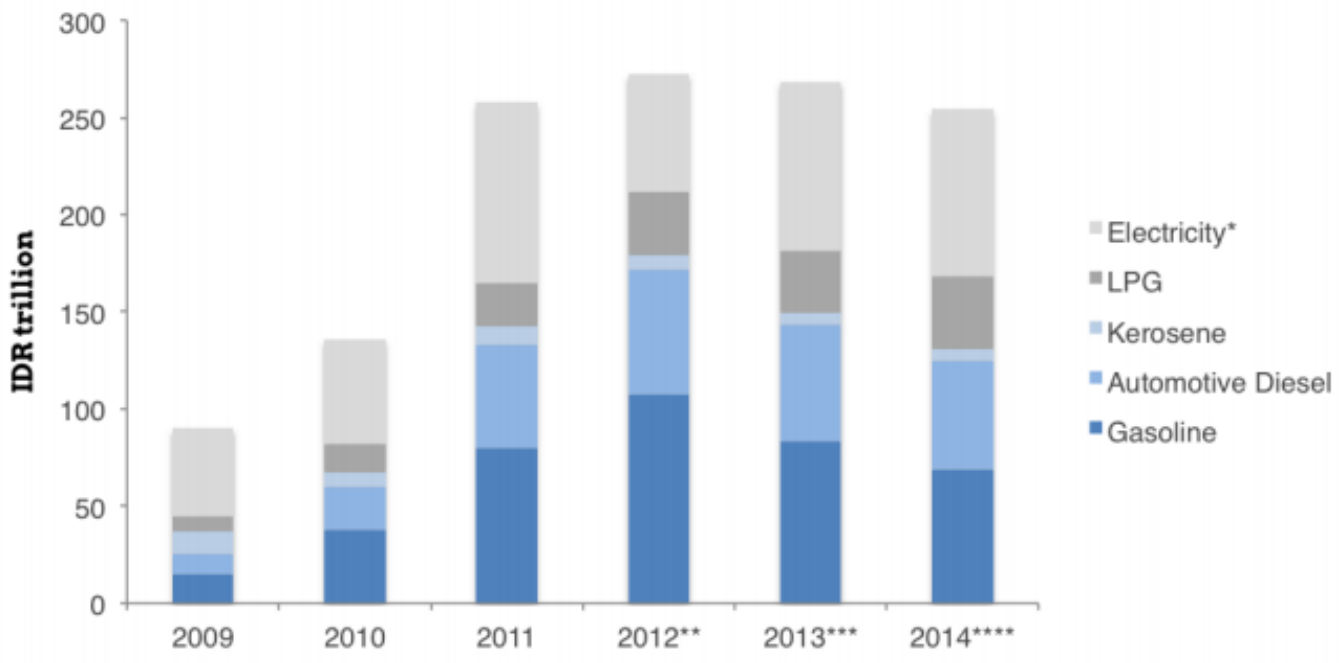
- Targets:
  - Energy elasticity < 1 by 2025
  - Energy final intensity decreased 1%/year
  - Electrification ratio 100% by 2020
  - Household gas ratio >85% by 2015
  - Energy Mix: Oil <25%; Coal ≥30%; Natural gas ≥ 22%; New&Renewable ≥ 23%

Electrification Ratio in 2013



This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

Energy Subsidy Reform



- Subsidy reform is underway, per Jan.1/2015, gasoline subsidy was eliminated, diesel subsidy Rp.1000,-/L,

Role of Renewable Energy in SDGs

- Economic growth
- Social development
- Modern energy access
- Energy security
- Climate change mitigation and Other env.impact

Renewable Energy in Indonesia for SDGs

- Umumnya energi terbarukan dapat dimanfaatkan dalam sekali kecil, meskipun nilai ekonominya menjadi lebih tinggi dibanding skala besar
- Energi Terbarukan skala kecil sangat sesuai untuk memenuhi kebutuhan listrik dengan *demand* rendah seperti didaerah terpencil atau pulau-pulau kecil di Indonesia
- Pengembangan Energi Terbarukan di daerah terpencil akan mendukung, antara lain :
  - pertumbuhan ekonomi lokal untuk penggunaan produktif
  - perbaikan kehidupan sosial
  - peningkatan kesehatan masyarakat setempat, puskesmas berlistrik dapat menyediakan vaksin dan obat-obatan, mengurangi angka kematian ibu melahirkan dsb.
  - Terpacunya keterlibatan masyarakat langsung dengan pembangunan energi setempat
- Energi Terbarukan skala besar seperti panas bumi dan air skala besar, akan mendukung sistem penyediaan listrik nasional, mengurangi emisi CO2 secara signifikan

Geothermal

- Continuous, for based load in national grid
- Zero emission

Biomass

- Availability , across the country
- Continuous, for based load
- Can be converted into solid/liquid/gas fuel
- Local job creation

Solar/Wind Energy

- Ketersediaannya intermitten
- Dapat diaplikasikan pada skala besar ataupun kecil
- Cocok untuk daerah terpencil dengan demand rendah
- Zero emisi

Pada aplikasi skala besar/on-grid:

- Kapasitas suplai terbatas hanya hingga 15-20% kapasitas grid
- Tidak dapat menjadi suplai untuk base load
- Membutuhkan lahan yang luas

Pada aplikasi skala kecil (*stand alone*/terpusat):

- Membutuhkan keterampilan penduduk lokal baik dalam pengoperasian maupun perwatan
- Membutuhkan baterai
- Biaya investasi pengguna rumah tangga mahal

Micro/Minihydro

- Tersedia banyak didaerah pedesaan ataupun terpencil
- Ketersediaannya kontinyu
- Teknologi sederhana, mudah perwatannya

- Perlu studi kelayakan yang baik untuk menjamin keberlanjutan
- Perlu sistem kelembagaan lokal dalam pengoperasian
- Perlu akses finansial untuk investasi yang masih cukup tinggi
- Perlu infrastruktur jaringan