One Pagers

Indonesia 2050 Pathway Calculator

Cooperation of Ministry of Energy and Mineral Resources and Department of Energy & Climate Change United Kingdom

http://calculator2050.esdm.go.id/pathways

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New and Renewable Energy Power Plant

Geothermal Power Plant

Geothermal potential in Indonesia is around 28.91 GW which cover 40% out of world geothermal potential. Geothermal potential area is spread in 285 location. Currently, only 9 location has been exploited. 5 of them located in Java. The biggest capacity of PLTP is located in Cibeureum area, West Java with capacity 0.377 GW. Total installed capacity of PLTP in 2011 reach 1,21 GW or 4.2% of total geothermal potential.

Level 1

Level 1 assumes geothermal power plants capacity in 2050 at 5.78 GW or 20% of geothermal potential, increase 4.57 GW from base year (2011). The increase in significant geothermal capacity reflects the development of geothermal in the current condition, where within last 10 years (2001-2011), the addition of geothermal development is less than 0.44 GW. Such condition shows the geothermal development constraints still cannot be resolved.

Level 2

Level 2 assumes the increase in capacity still insignificant, yet the increase will be higher than Level 1. The increase will be 8.67 GW by 2050 compare to 1.21 GW in base year. Basically, the constraints of geothermal development still exist, yet it is assumed the investment climate will be improved by government who also performing equity participation investment. Such conditions will encourage all parties to invest in geothermal.

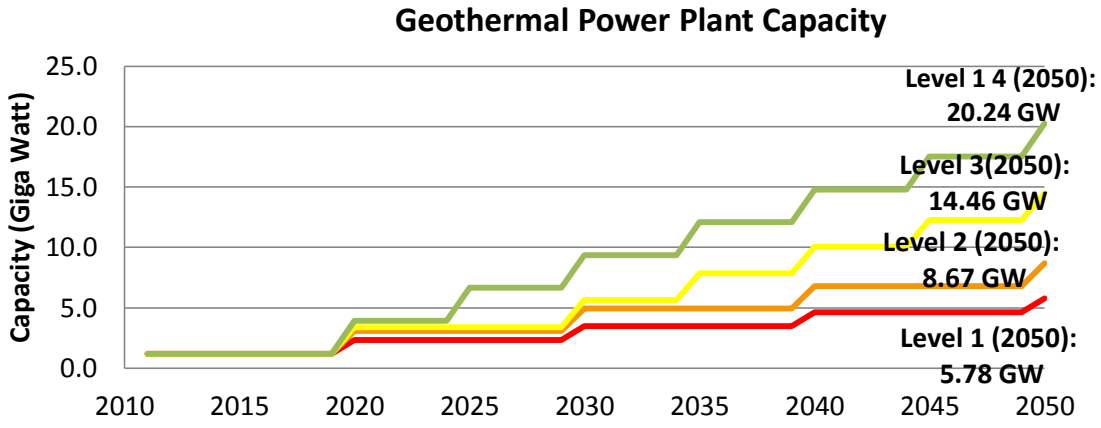
Level 3

Level 3 assumes the installed capacity of geothermal power plant by 2050 amounted to 14.46 GW or 50% higher than the geothermal potential. It could be achieved due to the improvement of investment climate, the easiness to get permit and more geothermal expert in the country. However, in the absence of understanding between institutions will cause the exploration of geothermal in protected forest cannot be implemented. In addition to the issues of geothermal in protected forest, the optimal exploration of geothermal in the unreached area still an issue.

Source: http://m.energitoday.com/2014/07/20/pltp-sarulla-gunakan-turbin-toshiba/

Level 4

Level 4 assumes 70% of geothermal has been utilized or approximately 20.24 GW. In I2050 PC stakeholder consultation, it is agreed that maximum energy capacity of geothermal that can be utilized is 50% (± 14.4 GW). However, based on the series of discussion with core team, the capacity of 14.4 GW will penetrate Level 3 and after that Level 4 will use the optimist percentage at 70%. The high capacity will be acquired from the assumption that all economic constraints, bureaucracy, human resources as well as land overlapping have been handled well. In addition, unreached geothermal location will remain feasible to explore.



Biomass Power Plant

Indonesia is endowed with huge and abundant bioenergy potential. The potency of biomass production can be achieved 146.7 million ton. In addition, animal waste can be utilized as biogas. Indonesia can produce biogas around 160 million kg/day. Moreover, city waste has a potency to be utilized as power plant. In this calculator 2050, Biomass power plants are plants obtained from dry biomass from forestry, agriculture and plantation. The potency of power capacity can reach 24,64 GW.

Level 1

Level 1 assumes the installed capacity of bioenergy power plant by 2050 amounted to 4.92 GW or 20% of biomass potential. At this level, Biomass development still facing number of constraints such as the feedstock is not fully available continuously, uneconomic price, an expensive investment, and land issues.

Level 2

Level 2 assumes the capacity of biomass power plant by 2050 is 9.86 GW or 40% of biomass potential. The increase in capacity in this level will occur due to the technology of biomass power plant in the country has been developed. The development of biomass power plant technology is sourced from domestic producer. However, the continuity of biomass feedstock remains a main issue in developing biomass power plant.

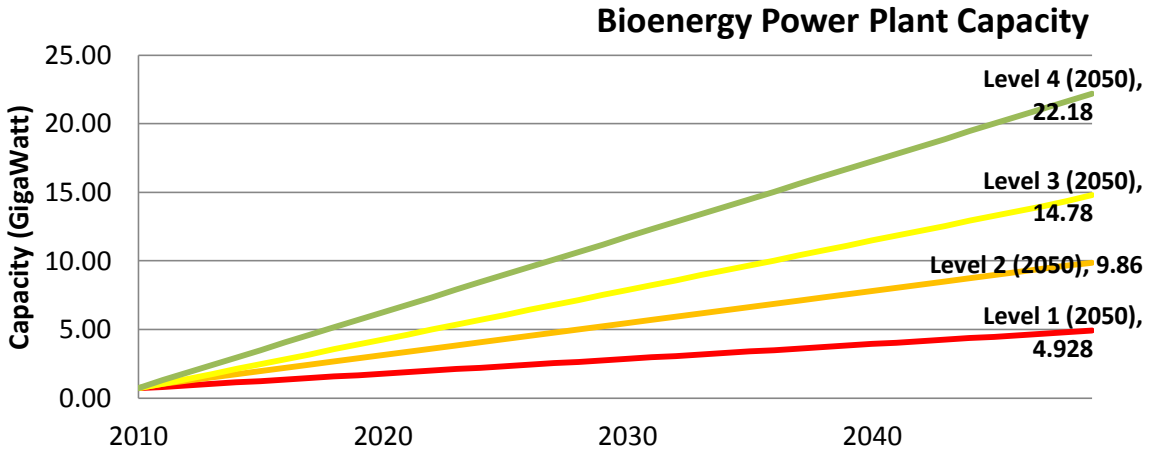
Level 3

Level 3 assumes the capacity of biomass power plant will reach 14.78 GW by 2050 or 60% of biomass potential. The capacity is higher than Level 2 since it is assumed biomass power plant technology has been mastered in the country. As a result, the investment cost is affordable. In addition, biomass feedstock has reached an economic price and still can support the bioenergy power plant with economic price. The limitation of electricity infrastructure in east of Indonesia still become the constraints to develop biomass power plant and will lead to inequality development of biomass power plant in each area.

Source: http://m.energitoday.com/2014/07/21/pembangkit-biomassa-pertama-di-indonesia-telah-diresmikan/

Level 4

Level 4 assumes the capacity of biomass power plant by 2050 is 22.18 GW or 90% of biomass potential. Biomass utilization for power plant at this level is close to maximum. The triggers are the improvement of technology mastering while investment value to develop biomass can be minimized so investors become interest, availability of feedstock can be supplied continuously within economic price, government support in the form of feed in tariff, the utilization of unproductive land and industrial plantation forest for biomass feedstock.



Hydro Power Plant

Hydro power plant is one of the power plants that have been prioritized to fulfill electricity needs. Based on the study of Hydro Power Potential Study/HPPS, 1983, the potency of hydro in Indonesia is around 75 GW. Yet, based on Master Plan Study for Hydro Power Development in Indonesia by Nippon Koei in 2011, the potency of hydro after screening is 26.32 GW. In I2050 PC, it is assumed the figures of the hydro potential is 75 GW.

Level 1

Level 1 assumes the installed capacity of hydro power plant by 2050 amounted to 11.25 GW. At this level, hydro power plant still difficult to develop due to facing number of constraints among others the power plant still rely on fossil fuel, lack of protection of water catchment area,the difficulty to get permit as well as lack of support from people in the area of planned power plant.

***Level* 2**

Level 2 assumes the installed capacity of hydro power plant by 2050 is 18.75 GW. At this level, it is assumed the development of hydro power plant facing number of technical constraints among others the difficulty to obtain protected water catchment area, the effort of government to maximize the hydro potential still depends on the excess demand for electricity so the hydro power development still focus in Java, Sumatera and Kalimantan.

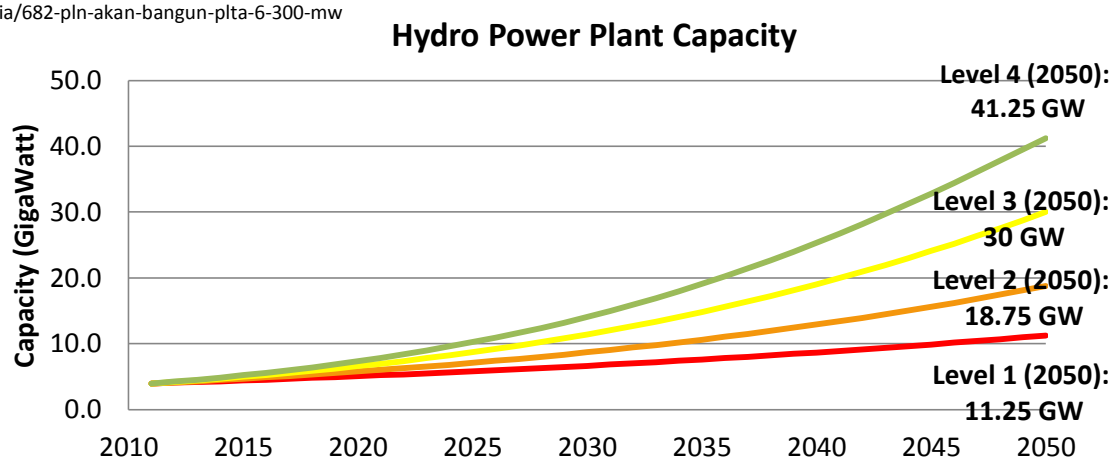
Level 3

Level 3 assumes the installed capacity of hydro power plant by 2050 is 30 GW (40% of its potency). At this level,it is assumed hydro power plant development will maximize the existing hydro potential in the east area of Indonesia like Maluku and Papua. Technically, the development will be supported by water catchment area that still protected and the support of local people given those areas have undergone electricity crises.

Source:
http://www.ptpjb.com/index.php/id/artikel/berita-media/682-pln-akan-bangun-plta-6-300-mw

Level 4

Level 4 assumes the hydro power plant capacity by 2050 will reach 41.25 GW or 55% of its potency. This level assumes the use of fossil fuel for power plant is no longer uneconomic so the power plant will need other energy sources to fulfill the shortage. Government will publish policy on the acceleration of hydro power plant development either in the small or big scale. The policy will encourage the coordination improvement in cross-sectoral and will result the easiness to obtain permit. In addition, the effort to improve water catchment area will take place.



Ocean Power Plant

Indonesia as archipelagic country has sea area of 5.8 million km2 or three-quarters of the total area. Indonesia has ocean energy reserves stored in ocean namely ocean current, wave, ocean thermal and tidal. the total of practical energy potential reach 60.98 GW (Yosi, 2004). According to Indonesian Ocean Energy Association (2011), the practical potential of ocean energy in Indonesia amounted to 49 GW, with details of tidal, wave and ocean thermal potential respectively are 4.8 GW, 1.2 GW and 43 GW.

Level 1

Level 1 assumes the total of installed capacity of ocean energy by 2050 is 3.05 GW or 5% of its potency. The slow addition of this capacity is mainly due to the generating technology is still under development and demonstration. In addition, the cost of investment needed is still quite expensive. evel 1

Level 2

Level 2 assumes a total generating capacity of the sea in 2050 reached 9.15 GW (15% of the potential). Additional capacity is assumed every 10 years with an additional constant of 2.29 GW. At this level it is assumed marine plant technology has begun to proven reliability and can be applied to Indonesian marine conditions, but this power generation is still not economical to develop.

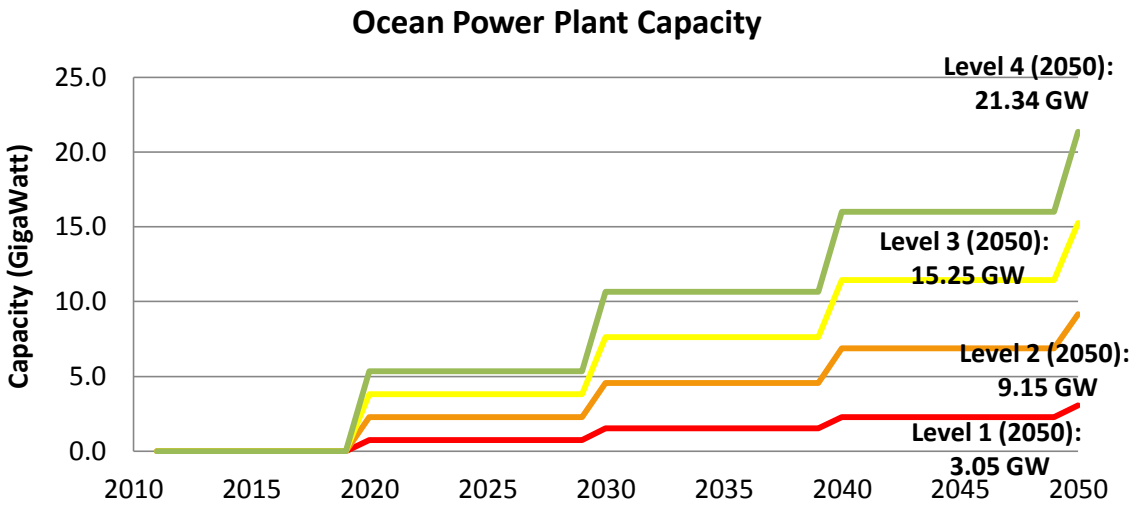
Level 3

Level 3 assumes in 2050 the total of generating capacity amounted to 15.25 GW (25% of its potential). At this level, it is assumed that the reliability of technology has been proven and can be applied. However, the majority of the development of ocean power generation will be built by the government, while the private sector will invest in this sector is still limited due to the incentives initiated by the Government is not attractive.

Level 4

Level 4 assumes the total of installed capacity of ocean power generation amounted to 21.34 GW or 35% of its potential by 2050. At this level, it is assumed the reliability of generating technology has been proven and can be implemented. In addition, investment costs is affordable by the investors with the stimulus of the Government in the form of incentives and attractive feed in tariff in order to encourage the private sector to participate in building the power generation.

Source: http://listrikindonesia.com/pembangkit_listrik_tenaga_gelombang_laut_tanpa_bahan_bakar_fosil__dan_ramah_lingkungan_70.htm



Wind Power Plant

Currently, wind energy is one of renewable energy potential which has relatively small attiontion for development. This is partly because of the understanding that Indonesia has less potential of wind energy in terms of wind speed. Northern part of Sumatera, some location in southern part of Java, some locations in Southern and Northern part of Sulawesi, Most of NTT, and some location in Maluku and Papua are indicated as locations which have wind speed more than 6 m/s. Based on the available *dataset reanalysis* combined with the on sine validation, it is predicted that wind energy potential in Indonesia is around 61.97 GW (Wargadalam, 2014).

Level 1

Level 1 assumes that in 2050 the installed capacity of wind power is 2 GW. It means that, only a small increase of capacity i.e. 1.07 GW from the base year. It is assumed that reliability issues of low-speed wind technology has not been proven.

Level 2

Level 2 assumes that in 2050 the installed capacity of wind power is 3.1 GW or 5% of total potential. Condition of wind turbine technology is actually the same with the level 1. In addition, the are some improvement in generation technology which finally foster installed capacity to be higher than level 1.

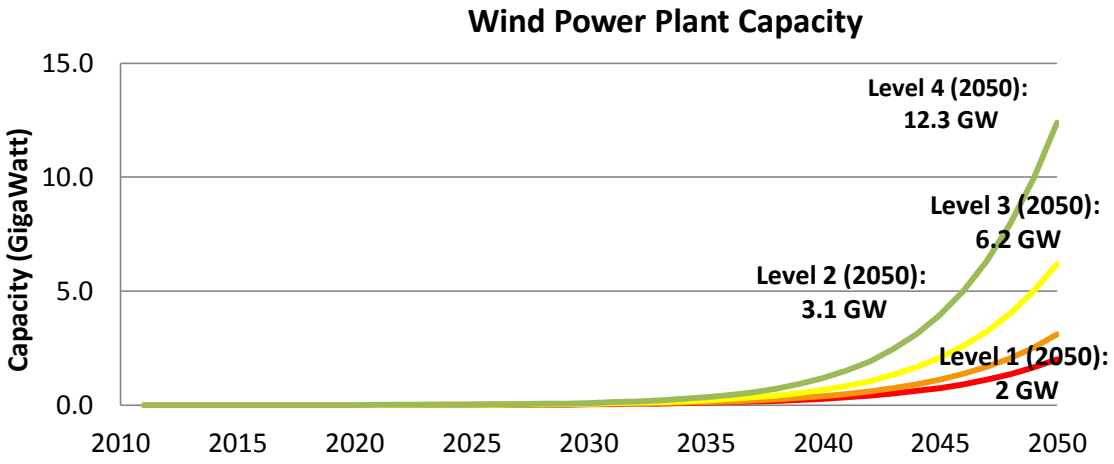
Level 3

Level 3 assumes that in 2050 the installed capacity of wind power is 6.2 GW or 10% of total potential. This condition is triggered by the innovation in the low-speen wind technology with higher reliability. But, it is assumed that private sector insvestment still have small contribution due to the less attractive insentive from the Government.

Level 4

Level 4 assumes that in 2050 the installed capacity of wind power is 12.4 GW or 20% of total potential. It is assumed that low-speed wind technology is considered as well proven technology both technically and economically. In addition, government is very concern on the development of wind energy by giving attractive insentive. This condition attract private sector to invest in this area.

Source:
http://www.rri.co.id/post/berita/105277/teknologi/kincir_angin_tim_wooden_windmill_innovation_hasilkan_energi_listrik_terbesar.html



Solar Power Plant

Although Indonesia has sun shine duration of around 4-5 hour perday , the installed capacity of solar power is only 0.00116 GW. i Indonesia, kapasitas terpasang PLTS pada tahun 2011 adalah 0,00116 GW. This one pager describes the projection of installed capacity of solar power plant. Currently, solar technology is already reliable and proven. The problem is on the battery which has a short life time period. Another problem is the public behavior in Indonesia in accepting new technology. They often consider that new technology is always difficult to operate.

Level 1

Level 1 assumes the solar power capacity in 2050 amounted to 5 GW. It is assumed that the battery technology is still the same as it is now. Therefore, people do not compelled to switch to solar power.

Level 2

Level 2 assumes the installed solar power capacity in 2050 amounted to 10 GW. It is assumed that solar technology already has high reliability, but the the community is still lack of understanding in swithing to solar energy. In addition, large-scale solar installation program is constrained by the availability of land.

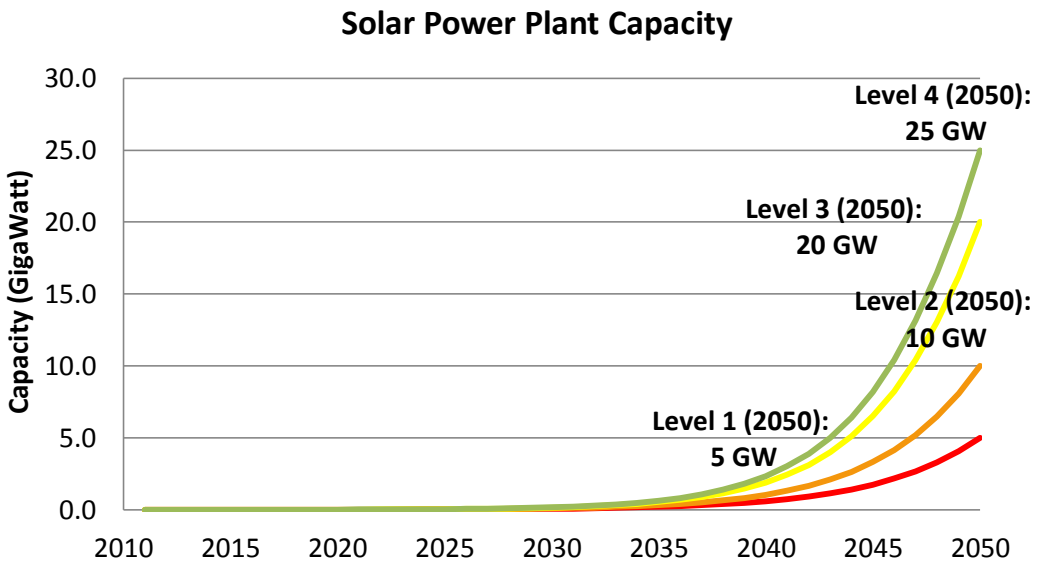
Level 3

Level 3 assumes installed solar power capacity in 2050 amounted to 20 GW. The increasing amount of installed capacity is attributed to the increasing public understanding on the importance of renewable energy as well as increasing PLN's electricity price.

Level 4

Level 4 assumes installed solar power capacity in 2050 amounted to 25 GW. It is assumed that solar technology is reliable both technically and economically. Storage technology to replace the conventional battery has been invited. In addition, public understanding on the importance of renewable energy especially solar has been encouraged people to switch more to solar energy as compared to level 3.

Source:
http://energitoday.com/2014/02/13/brantas-energi-menangi-tender-plts-2-mw-di-gorontalo/



Pembangkit Listrik Tenaga Nuklir (PLTN)

Nuclear Power Plant (PLTN) is the one of the new energy form used in power generation. However, this form of energy is considered as the last choice of energy resources in Indonesia.

Level 1

Level 1 assumes that until 2050 Indonesia does not have any nuclear power or nuclear capacity remains 0 GW. At this level, it is assumed that nuclear has not received the support from society and and the government. Society is particularly rise the issue of nuclear safety.

Level 2

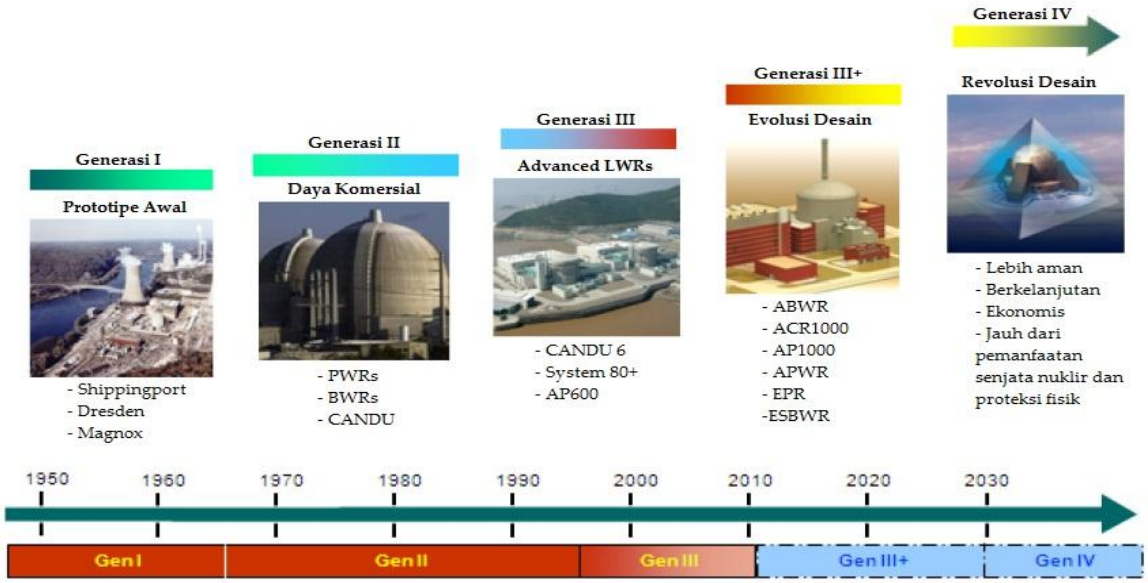
Level 2 assumes the capacity of nuclear power plants in 2050 amounted to 5 GW. At this level of nuclear capacity is assumed to incrrase 1.25 GW every 10 years. Another assumption of this level is a feasibility study of the site, where one or all sites are eligible for the construction of nuclear power plants. Therefore, there are additional capacities from those sites.

Level 3

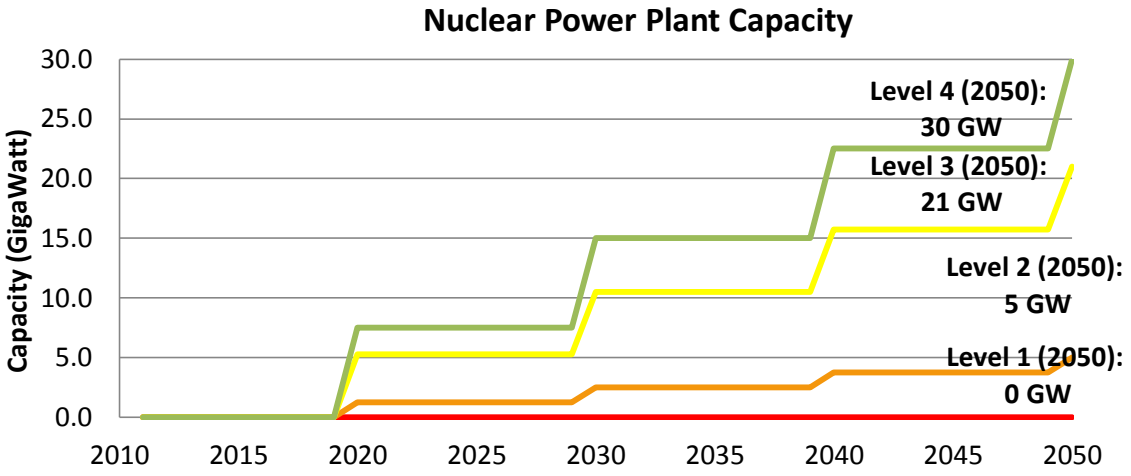
Level 3 assumes the capacity of nuclear power plants in 2050 amounted to 21 GW. Draft of document Indonesian Nuclear Energy Outlook, 2014 stated that the projected nuclear capacity reaches 21 GW.

Level 4

Level 4 assumes the capacity of nuclear power plants in 2050 amounted to 30 GW. At this level, it is assumed that beside the full support from the society and government, the increasing capacity of nuclear power plant is also driven by the effort of reducing the oil import.



Source: Next Generation Nuclear Reactors 1: Status of SFR Technology Development (Hahn, D. 2012)



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Fossil Fuel Power Plant

Coal Combustion Technology

Based on the utilization of Clean Coal Technology, the technology at combustion is a technology that increases the efficiency of the boiler, for example, Super Critical Boilers, Ultra Super Critical Boilers, and Advance Ultra Super Critical Boilers which still in the research stage.

Option A

Option A assumes 80% of steam power plant use *Sub Critical* boiler and 20% of steam power plant use *Super Critical boiler*.

Option B

Option B assumes the use of boilers in power plants is still dominated by the Sub Critical Boilers (50%), followed by Super Critical Boilers (30%) and and 20% use Ultra Supercritical boiler.

Option C

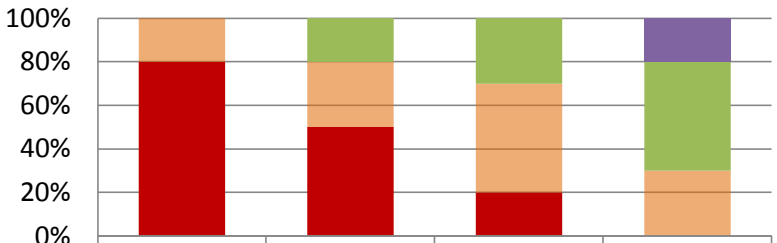
Option C assumes the use of *Sub Critical* boiler for PLTU decrease to 20% and the use percentage of Super Critical and Ultra Supercritical boiler for steam power plant increase to 50% and 30% respectively.

Option D

Option D assumes Sub Critical boiler is not being used anymore for steam power plant. Yet, Advance Ultra Supercritical boiler technology has been used for 20% of steam power plant. While Super Critical and Ultra Supercritical boiler are used with percentage of 30% and 50%.

Source: http://www.alstom.com/en/press-centre/2014/3/alstom-concludes-contract-with-bhel-to-supply-2x800-mw-supercritical-boilers-for-ntpcs-darlipalli-coal-power-plant/

Coal Combustion Technology for Steam Power Plant



	Opsi A	Opsi B	Opsi C	Opsi D
Advance Ultra Super Critical	0%	0%	0%	20%
Ultra Super Critical	0%	20%	30%	50%
Super Critical	20%	30%	50%	30%
Sub Critical	80%	50%	20%	0%

Combined Cycle Power Plant

Combined cycle power plant is an installation of equipment to convert thermal energy (from combustion of fuel and air) into electricity. Basically, combined cycle power plant is a combination of gas power plant and steam power plant. In Indonesia, currently more combined cycle power plant installed in Java, which is 53 power plants. Total installed capacity of combined cycle power plant in 2011 reach 8.48 GW.

Level 1

Level 1 assumes capacity of combined cycle power plant remain the same from base year (2011) until 2050 at 8.48 GW. This level assumes new development of combined cycle power plant facing the problem of natural gas shortage. Beside the declining gas reserves, the access to big gas reserves location is difficult to obtain since it is already included in a long term contract with foreign buyer.

Level 2

Level 2 assumes capacity of combined cycle power plant in 2050 reach 10.42 GW. Additional capacity of combined cycle power plant is assumed from conversion of power plant and unit size of existing power plants, such as combined cycle power plant Muara Karang with additional capacity of 0.8 GW and combined cycle power plant Grati of 0.75 GW. Additional capacity of these power plants are possible supported by existing 97 km gas pipeline and planned 113 km gas pipeline. Besides, the gas supply for additional capacity of combined cycle power plant for this level is assumed to be obtained from several field including Offshore North West Java (ONWJ), Cepu and Santos.

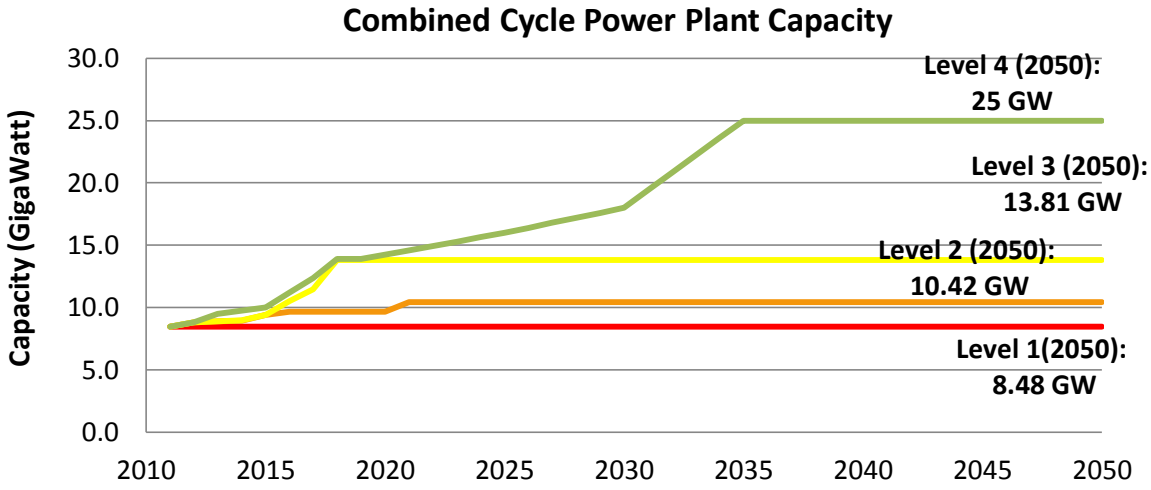
Level 3

Level 3 assumes capacity of combined cycle power plant in 2050 reach 13.81 GW. Increase of combined cycle power plant capacity in this level is caused by the increase of electricity demand and higher peak load than Level 2. This level also assumes the infrastructure planned in MEMR Ministerial Decree No 2700 K/11/MEM/2012 has been built 100% (25,754 km) and the gas supply is available from potential reserves that already under contract.

Level 4

Level 4 assumes capacity of combined cycle power plant in 2050 reach 25 GW. Significant increase of combined cycle power plant capacity in this level is caused by the significant increase of electricity demand and higher peak load than Level 3. This level also assumes the infrastructure planned in MEMR Ministerial Decree No 2700 K/11/MEM/2012 has been built 100% (25,754 km) and also other infrastructure such as FSRU and new LNG plant.

Source: http://www.kitanews.co/pemerintahan/988-pgn-siapkan-60-bbtud-untuk-pltgu-tenayanraya--riau-di-tagetkan-rampung-2016-mendatang.html



Gas fired Power Plant

According to PLN Statistics 2011, the number of gas fired power plant and combined cycle power plant are 71 units and 61 units with installed capacity of 2839.44 MW and 7833.97 MW and average capacity for each plant of PLTG dan PLTGU of 39.99 MW and 128.42 MW. Based on this data, gas fired power plant is still needed to fulfill moderate electricity demand especially for outside Java. The number of gas fired power plant outside Java in 2011 is 40 units, more than outside Java (13 units) .

Level 1

Level 1 assumes capacity of gas fired power plant remain the same from base year (2011) until 2050 at 4.23 GW. This level assumes new gas fired power plant plants facing the problem of natural gas shortage due to the low activities in exploration and exploitation of new gas field. Besides, the development of new gas fired power plant outside Java is hindered by insufficient gas pipeline and infrastructure.

Level 2

Level 2 assumes capacity of gas fired power plant in 2050 reach 6.65 GW. Additional capacity of 2.4 GW compared to base year data is assumed from gas fired power plant in Sumatera region of 0.88 GW, east Indonesia East of 1.34 GW and Java-Bali system of 0.21 GW.

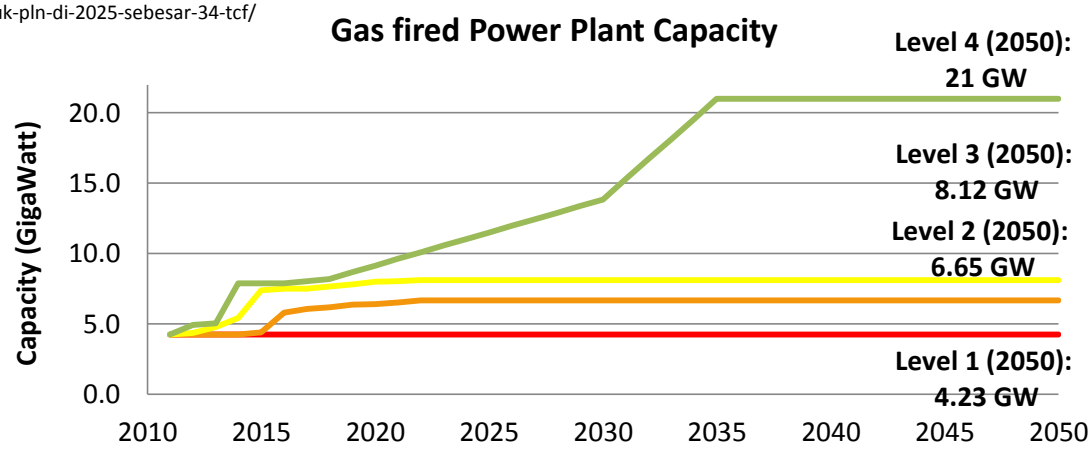
Level 3

Level 3 assumes capacity of gas fired power plant in 2050 reach 8.12 GW. Increase of PLTG capacity in this level is caused by the increase of electricity demand and higher peak load than Level 2. This level also assumes the infrastructure planned in MEMR Ministerial Decree No 2700 K/11/MEM/2012 has been built 100% (25,754 km).

Source:
http://energitoday.com/2013/01/30/kebutuhan-gas-untuk-pln-di-2025-sebesar-34-tcf/

Level 4

Level 4 assumes capacity of gas fired power plant in 2050 reach 21 GW. Significant increase of gas fired power plant capacity in this level is caused by the significant increase of electricity demand higher than Level 3. This level also assumes the infrastructure planned in MEMR Ministerial Decree No 2700 K/11/MEM/2012 has been built 100% (25,754 km) and also other infrastructure such as Floating Storage and Regasification Unit (FSRU) and new LNG plant, for example Arun Regassification unit, FSRU Labuhan Maringgai (Lampung), FSRU Cilegon (Banten), FSRU Central Java, LNG Plant Donggi Senoro, LNG Plant South Sulawesi and LNG Plant Masela.



Diesel Power Plant

In 2011, installed capacity of diesel power plant in Indonesia reaches 5,47 GW. It belongs to PLN owned power plant of 5.02 GW and private owned of 0.45 GW. Most of diesel power plants are installed outside Java-Bali grid system (5.24 GW), and the rest of 0.23 GW is installed in Java-Bali grid system. Outside Java-Bali, diesel power plant is used for base load, peak load and also captive power..

Level 1

Level 1 assumes capacity of diesel power plant remain the same from base year (2011) until 2050 at 5.47 GW. This level assumes diesel power plant is used to fulfill electrification ratio target of 100%. Therefore, diesel power plant is still used in remote islands in east Indonesia which is difficult to reach by PLN grid. The replacement technology using renewable energy resources is assumed to be not fully developed so that diesel power plant is still being used.

Level 2

Level 2 assumes capacity of diesel power plant in 2050 decrease to 2 GW. This level assumes high price of fossil fuel with fluctuated supply cause diesel power plant to be uneconomical to be maintained. On the other hand, the replacement technology using renewable energy resources is assumed to be ready that diesel power plants in Maluku, Nusa Tenggara and Papua region have been replaced.

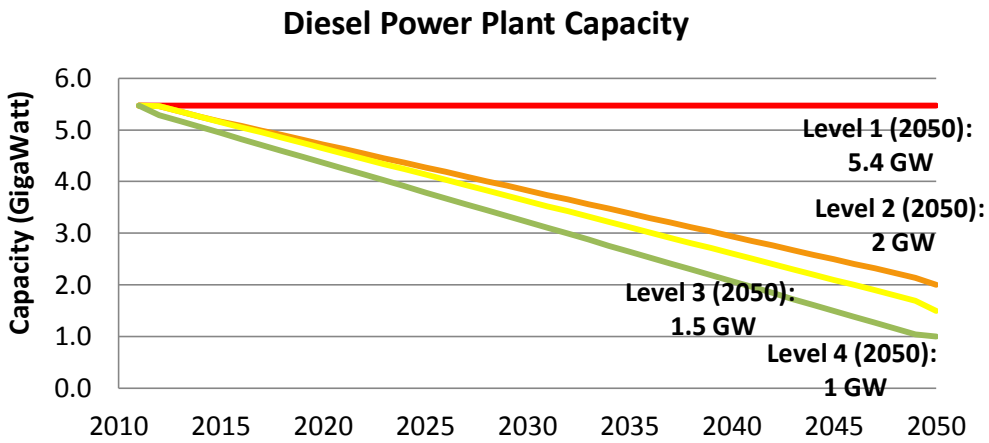
Level 3

Level 3 assumes capacity of diesel power plant in 2050 decrease to 1.5 GW. This level assumes high price of fossil fuel with fluctuated supply cause diesel power plant to be uneconomical to be maintained. The use of green diesel also uneconomical for small scale diesel power plant . On the other hand, the replacement technology using renewable energy resources is assumed to be ready that diesel power plant in Nusa Tenggara is totally replaced.

Level 4

Level 4 assumes capacity of diesel power plant in 2050 decrease to 1 GW. This level assumes high price of fossil fuel with fluctuated supply cause diesel power plant to be uneconomical to be maintained. On the other hand, replacement technology of smallscale PLTU has been proven to be reliable. Therefore the use of diesel power plant has been replaced all over Indonesia.

Source: http://bisnis.liputan6.com/read/2147632/pemerintah-pilih-pltd-buat-terangi-47-wilayah-perbatasan



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Fossil Energy Production

Oil Production

Indonesia had ever become part of the oil exporting countries. Now Indonesian oil production continues to decline and even turned into a net importer of oil. In 2006, Indonesia was still able to maintain its production over 1 million barrels per day. However, oil production continues to decline, and in 2011 production reached only 902,000 barrels per day.

Level 1

Level 1 assumes oil production in 2050 is estimated to reach 82 thousand bpd. This number is obtained from the rate of decline in production which can be held on the 6% of current production (860 thousand bpd). At this level it is assumed oil reserves at existing fields have been exhausted, but with the development of new fields, the production rate can be retained at 6%.

Level 2

Level 2 assumes oil production in 2050 is projected to reach 180 thousand bpd. This amount is assumed to come from the addition of production of Cepu Block and Bukit Tua in 2015 amounted to 130 thousand bpd, the existence of EOR projects ini Tanjung Field at 60 thousand bpd in 2022, the Limau field at 14 thousand bpd in 2023 and 184 thousand bpd from Minas field in 2030.

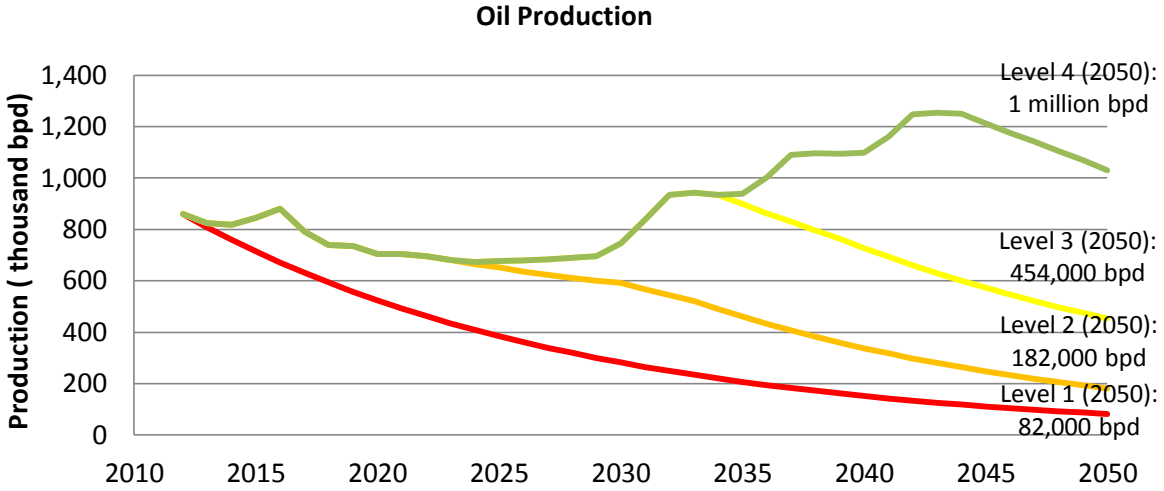
Level 3

Level 3 assumes oil production in 2050 is projected to reach 454 thousand bpd. This amount is assumed to come from the additional production and EOR project as at Level 2 also from EOR project of 50% pof the exisiting field with peak production in 2031 and the existence of the offshore project which begin in 2030. This significance increase in production is assumed to occur due to the support of Government such as permits simplification, improved data and technology and tax incentives.

Source: http://bacatransportasi.com/produksi-minyak-indonesia-sampai-titik-nadir/

Level 4

Level 4 assumes oil production in 2050 is projected to reach 1 million bpd. This amount is assumed to come from the increased production by 23% of the potency and also due to additional production of various business such as at Level 3 also the addition of offshore projects in 2030, 2035 and 2040. A very significant increase in production is assumed to occur due to the Government support such as permits simplification, improved data and technology, tax incentives and the presence of more attractive of PSC contracts.



Natural Gas Production

Currently natural gas reserves in Indonesia is approximately 150,700 BSCF, consists of proven reserves at 103,300 BSCF and potential reserves at 47,400 BSCF. Production of natural gas in the base year (2011) is 7,181 MMSCFD. Natural gas production in the period of 1970 to 2005 continued to increase, but within the period of 2011-2014 tended to decrease. In addition to conventional gas, Indonesia also has potential reserves of non-conventional gas. Based on Directorate General of Oil and Gas and *Advance Resources International*, Inc. (ARI) research in 2003, a non-conventional gas resource in the form of Coal Bed Methane (CBM) in Indonesia is allegedly about 453 trillion cubic feet (TCF).

Level 1

Level 1 assumes natural gas production in 2050 is projected at 371 MMSCFD, even though natural gas production in 2012 was at 7,181 MMSCFD. Due to the development of the field, the rate of decline is assumed to retain to about 6%.

Level 2

Level 2 assumes natural gas production in 2050 is projected at 968 MMSCFD. The production is mainly assumed to come from the addition of production supply project, among others is Donggi Senoro, Masela, IDD and Tangguh, and is derived from the *potential supply* production of East Natuna field.

Level 3

Level 3 assumes natural gas production in 2050 is projected at 5,224 MMSCFD. The amount of the production is assumed to come from the additional production of, among others, *project supply* and *potential supply*, new gas discovery about 26% of the potential, CBM production amounted to 2% of the potential which begin production in 2031 also 0.5% of shale gas which begin to production in 2040. The significant increase in production is assumed to occur due to the support of the Government, such as some simplification permits, an increase of data and technology also tax incentives.

Source: http://m.energitoday.com/2014/09/15/gas-ruby-produksi-gas-sebesar-85-miliar-bbtuhari/

Level 4

Level 4 assumes natural gas production in 2050 is projected at 9,479 MMSCFD. The amount of the production is assumed to come from the additional production of, among others, project supply and potential supply, new gas discovery about 34% of the potential, CBM production amounted to 4% of the potential which begin to production in 2031 and 1% of shale gas which begin to production in 2040. This significant increase in production is assumed to occur due to the efforts of the Government, such as some simplification permits, an increase of data and technology, as well as tax incentives and also more attractive PSC contracts.