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

One Pagers

Household Sector

Domestic Lighting

In general, factor attributing to the lighting intensity is the composition of lighting technology which comprises: bulb, Compact Fluorescent Lamp (CFL), Light Emitting Diode (LED), Lighting Sensor, and natural lighting. LED technology truly affects lighting consumption in household sector . For each level, the energy consumption of lighting activity in household is given as follows:

Level 1

Level 1 assumes in the period of 2011-2025, the lighting consumption intensity will increase at 30%. Number of lightings per household is predicted to increase owing to the improvement of living standard and government's endeavor to increase electrification ratio. Standard policy instrument and save energy labeling are not binding, LED penetration is estimated only 20%. In the period 2026-2035, the lighting consumption intensity in 2035 increase as much as 30% compare to base year (2035). In the period of 2035-2050, composition of lighting in household is still dominated by CFL, bulb technology is no longer in use, and LED penetration is 40% out of total lighting technology. Such conditions cause a decline in energy consumption per household compare to the previous period; however the energy consumption is still 25% higher than the consumption in base year.

Level 2

Level 2 assumes in the period of 2011- 2025, 35% households have used LED. The increase in household's lighting consumption intensity in 2025 as much as 20% compare to base year. In the period of 2026-2035, energy intensity will still increase yet with lower pace. Electrification ratio will be 100% by 2035. LED penetration is only 40% out of total lighting technology. Combination of the above factors contributes toward the increase in lighting consumption intensity in 2035 as much as 25% compare to base year. In 2050, lighting technology for household will be dominated by CFL and LED, with 50% share each; bulb technology will not be utilized anymore. Standard policy instrument and save energy labeling are not binding. The energy intensity is lower compare to previous period; however the energy consumption is still 5% higher than the consumption in base year.

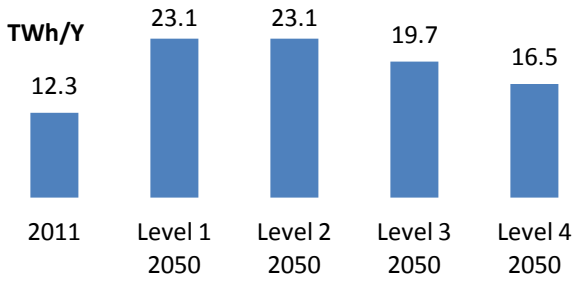
Level 3

Level 3 assumes in the period of 2011-2035, energy intensity in 2025 is predicted to be 10% higher than base year. In the period of 2026-2035, energy intensity will still increase yet with lower pace, energy intensity is predicted 15% higher than base year. In 2050, lighting technology will be dominated by LED. This situation is achieved due to the mandatory implementation of Minimum Energy Performance Standard (MEPS) and voluntary labeling policy. These measures cause the energy intensity in 2050 become 10% lower than base year.

Level 4

Level 4 assumes in the period of 2011-2025, LED penetration is predicted to be 90% in 2025. Energy intensity of lighting activity in 2025 is predicted to be 5% higher than base year. In the period of 2026-2035, energy intensity will still increase yet with lower pace, energy intensity is predicted 8% higher than base year. In 2050, energy intensity is assumed to be 25% lower than the base year due to high LED penetration, massive adoption of natural lighting and lighting sensor. This situation is triggered by the implementation of mandatory MEPS and labeling for lighting.

Source: http://eksplorasi.co/kesdm-terbitkan-peraturan-label-hemat-energi-lampu-swabalast/



Energy consumption projection for lighting

Domestic Cooking

In general, factors contributing to energy intensity in cooking activity are type of stove, type of fuel, type of appliance used for cooking, and habits developed in cooking. Biomass, kerosene, natural gas, LPG, biogas, and electricity are type of energy that is used generally for cooking in Indonesia. Stove efficiency is one of important factors that determine the amount of energy consumed for cooking activity. Government applies the policy to reduce the consumption of biomass and kerosene for cooking in order to reduce our dependency on imported fuel and to improve people's living standard.

Level 1

Level 1 assumes in the period of 2011-2025, the energy consumption for cooking is 30% compare to base year. In the period of 2026 - 2035, number of household with access to LPG increases yet with slower pace compare to the previous period. The share of efficient stove and cooking appliances in 2035 is only 35%. Thus, the energy consumption for cooking in this period is predicted to be 35% higher than the base year. In 2050, there is no significant government policy yet in changing the fuel composition for cooking. The share of efficient LPG stove is only 40% out of total LPG stove population. Standard policy instrument and save energy labeling for cooking appliances are still not binding. Energy intensity for cooking is lower than the previous period, but still 25% higher than the base year's figure.

Level 2

Level 2 assumes in the period of 2011-2025, it is predicted that 30% household would have used high efficiency LPG stove. The condition leads to an increase in energy consumption for cooking by 20% compare to the base year. In the period of 2026-2035, number of household with access to LPG increases yet with slower pace compare to the previous period. The share of efficient stove and cooking appliances in 2035 is only 40%. Thus, the energy consumption for cooking in this period is predicted to increase with slower pace, it is predicted to be 25% higher than the base year. In 2050, 50% household would have used the efficient LPG stove. Energy consumption for cooking to be 15% higher than the base year.

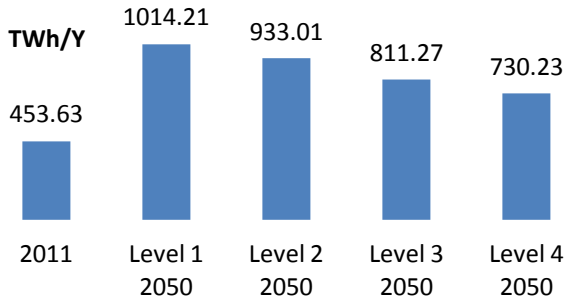
Level 3

Level 3 assumes in the period of 2011-2025, the number of household with access to LPG is predicted to increase in both urban and rural areas, natural gas infrastructure has been built in big cities. The condition leads to an increase in energy consumption for cooking by 10% compare to the base year. In the period of 2026-2035, number of household with access to LPG, natural gas, and biogas increases yet with slower pace compare to the previous period. High efficiency LPG stove has been adopted by 95% household in Indonesia by 2035. Energy consumption for cooking is predicted to be 15% higher than the base year.In 2050, LPG would be the fuel in rural area. The energy consumption for cooking activity in each household is predicted to be similar with the base year.

Level 4

Level 4 assumes in the period of 2011-2025, the number of household with access to LPG is predicted to increase, natural gas infrastructure has been built massively in big cities, and so has biogas installation in rural area. Energy consumption for cooking will increase by 5% compare to the base year.

In the period of 2026-2035, energy consumption for cooking is predicted to be 8% higher than the base year. In 2050, the standard policy instrument and energy save labeling for stove and cooking appliances are binding. The energy intensity for cooking to be 10% lower than the base year.



Energy consumption projection for cooking

Domestic Cooling

Energy consumption for cooling is affected by the penetration of efficient air conditioning (for instance inverter technology), insulation and building design. For each level, the factors that determine the amount of energy consumption for cooling activity in household sector are described below.

Level 1

Level 1 assumes in the period of 2011-2025, there would be an improvement of living standard and government efforts to increase electrification ratio, thus the energy intensity for cooling activity is predicted to be 30% higher than the base year. Penetration of air conditioning with low wattage is still low . By 2025, the share of air conditioning with low wattage technology is estimated 40% out of total air conditioning used by household in Indonesia. In the period of 2026-2035, energy intensity is estimated to be 35% higher than the base year. The penetration of air conditioning with low wattage technology is predicted to be 70% out of total air conditioning used by household in Indonesia. In 2050, energy intensity for cooling activity decreases, yet still 25% higher than the base year. For all periods, the standard policy instrument and save energy labeling for air conditioning are still not binding. MEPS and labeling are still voluntary.

Level 2

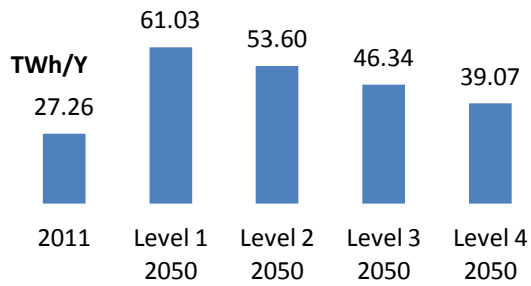
Level 2 assumes in the period of 2011-2025, the share of air conditioning with low wattage technology is estimated 70% out of total air conditioning used by household in Indonesia by 2025. Increase in energy consumption for each household by 20% compare to the base year. In the period of 2026-2035, the use of air conditioning with low wattage technology causes an increase in energy intensity, yet with lower pace, the energy intensity is predicted to be 25% higher than the base year. In 2050, the Air Handling Unit (AHU) and inverter technology start to be adopted due to economic reason. MEPS and labeling are still voluntary. Energy intensity decreases will still be 10% higher than the base year.

Level 3

Level 3 assumes in the period of 2011-2025, the penetration of air conditioning with low wattage technology and inverter technology is 70% and 20% respectively, thus the energy intensity for cooling activity is predicted to be 10% higher than the baseline. In the period of 2026-2035, the share of air conditioning with low wattage technology and inverter technology would be 50% each. Energy intensity is predicted 15% higher than base year. Air conditioning with inverter system will be widely adopted in 2050 owing to the government policy on MEPS and labeling for air conditioning. At this level, it is assumed that the community has realized the importance of insulation to reduce the cooling load. These efforts contribute to reduce the energy intensity for cooling, thus the intensity of 5% lower than the base year.

Level 4

Level 4 assumes in the period of 2011-2025, there would be an improvement of living standard and government efforts to increase electrification ratio. The penetration of air conditioning with low wattage technology and inverter technology is 80% and 30% respectively, thus the energy intensity for cooling activity is predicted to be 5% higher than the baseline. In the period of 2026-2035, the share of air conditioning with low wattage technology and inverter technology would be 30% and 70% respectively. The energy consumption per household for cooling will be 15% higher than the base year. Air conditioning with inverter system will be widely adopted in 2050 owing to the government policy on MEPS and labeling for air conditioning. In addition, the design of new building has considered the air circulation principal in order to reduce demand for cooling. Energy intensity for cooling activity will be 20% lower than the base year.



Energy consumption projection for cooling

Other Appliances

It is assumed that other appliances in household sector also use electricity. Other appliances refer to household appliances, apart from the appliances used for lighting, cooking and cooling. An efficient motor technology is one important factor that determines the amount of energy consumption in this sub-sector. Variable Frequency Drive (VFD) technology is an electric motor technology that could adjust the speed and torsion based on the frequency and voltage inputs. This technology and implementation of Minimum energy Performance Standards (MEPS) are expected to save the energy significantly.

Level 1

Level 1 assumes in the period of 2011-2025, there would be an improvement of living standard and government efforts to increase electrification ratio, thereby the number of appliances in each household would increase. In 2025, the penetration of high efficiency household appliances will be just 20%. The increase in energy consumption for other household appliances sub-sector is predicted to be 30% higher than the base year. In the period of 2026-2035, there are 30% household that would have used the efficient appliances. This condition trigger an increase in energy consumption of each household for other appliances sub-sector as much as 35% higher than the base year. MEPS and labeling are introduced yet not binding, the decrease in energy intensity is caused more by economic reason. In 2050, the energy intensity will still be 25% higher than the base year because there are only 40% households that use efficient appliances.

Level 2

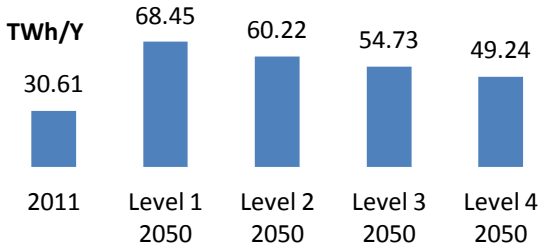
Level 2 assumes in the period of 2011-2025, the penetration of efficient appliances will be 30%. The increase in energy consumption is predicted to be 20% higher than the base year. In the period of 2026-2035, there are 40% household that would have used the efficient appliances. The increase in energy consumption of each household for other appliances sub-sector as much as 25% higher than the base year. In 2050, MEPS and labeling are introduced yet still not binding. Efficient appliances are easy to find in the market. There would be 50% households that use efficient appliances. These factors will contribute to increase the energy intensity of this sub-sector to be 10% higher than the base year.

Level 3

Level 3 assumes in the period of 2011-2025, the penetration of high efficiency household appliances will be close to the prediction (65%). The increase in energy consumption for other household appliances sub-sector is predicted to be 10% higher than the base year. In the period of 2026-2035, there would be an increase in electrification ratio but the pace is slower. There are 95% household that would have used the efficient appliances. This condition trigger an increase in energy consumption of each household for other appliances sub-sector as much as 15% higher than the base year. In 2050, high efficiency appliances have been used widely. MEPS is mandatory but labeling is still not binding. These factors will cause the energy intensity to be similar to the base year.

Level 4

Level 4 assumes in the period of 2011-2025, the penetration of high efficiency household appliances will be higher than the prediction, the penetration is expected to be 80%. The increase in energy consumption for other household appliances sub-sector is predicted to be 5% higher than the base year. In the period of 2026-2035, all household would have used the efficient appliances, and the energy intensity is predicted to be 8% higher than the base year. In 2050, MEPS and labeling are mandatory for all appliances. At this level, community awareness on energy saving is high, the energy saving habits have been adopted massively. The above measures reduce the energy consumption in this sub-sector as much as 10% lower than the base year.



Energy consumption projection for other appliances

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Commercial Sector

Lighting

Commercial sector consists of trade, hotels, restaurants, financial institutions, government agencies, schools, hospitals, communication and others. The higher the floor area of this sector, the higher energy required for lighting. In general, the energy intensity for lighting is predicted to decrease due the penetration of high efficiency technology for example CFD, LED, lighting sensor and etc. Adoption of passive design in building through maximizing the use of natural lighting also contributes to reduce the energy intensity.

Level 1

Level 1 assumes that the energy intensity for lighting in commercial sector will decrease by 10% in 2050 compare to the base year. The use of CFL has been used widely in commercial sector. Bulb is not used any longer in commercial sector.

Level 2

Level 2 assumes that the energy intensity will decrease by 25% in 2050 compare to the base year. Commercial sector adopts the efficient technology such as CFL and LED. MEPS (Minimum Energy Performance Standards) Program enables the commercial sector to purchase the high efficiency products

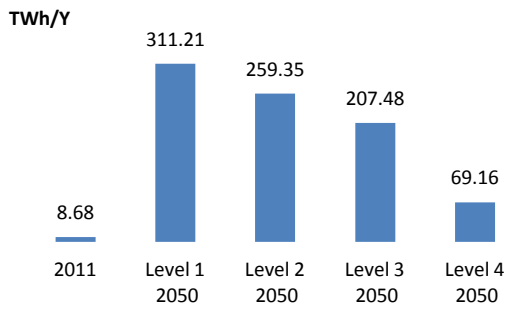
Level 3

Level 3 assumes that the energy intensity will decrease by 40% in 2050 compare to the base year. Government policy on labeling and MEPS program for the building that consumes more than 6,000 TOE encourage the commercial sector to adopt the high efficiency technology for lighting.

Level 4

Level 4 assumes that there will be a reduction in energy intensity for lighting activity that 80% lower than the base year (2011). This situation is a result of the penetration of LED, natural lighting and lighting censor that have been widely used due to mandatory labeling and improved awareness on the importance of natural lighting in reducing energy consumption.

Source: http://www.housing-estate.com/read/2014/09/17/pakai-lampu-led-alfamart-hemat-rp46-miliar/



Energy consumption projection for lighting

Cooking

Types of energy used in commercial sector for cooking activity are (1) biomass (2) gas (3) kerosene (4) LPG, and (5) electricity. Cooking activity in commercial sector is expected to increase in the future because the consumers are predicted to order food from restaurant. Energy intensity for cooking activity is predicted to decrease following the penetration of high efficiency cooking appliances as well as government policy to reduce kerosene consumption.

Level 1

Level 1 assumes the energy intensity for cooking activity will be 10% lower than the base year in 2050. The high efficiency stove has been introduced, yet the adoption remains low. High efficiency stove is purchased mainly due to economic reason.

Level 2

Level 2 assumes the energy intensity for cooking activity will be 25% lower than the base year in 2050. Commercial sector starts using high efficiency stove and reduce kerosene consumption. The adoption of high efficiency stove is higher than level 1 due to active campaign by the government on the benefit of the stoves. In addition, the government also enforces the policy to reduce dependency on kerosene for cooking.

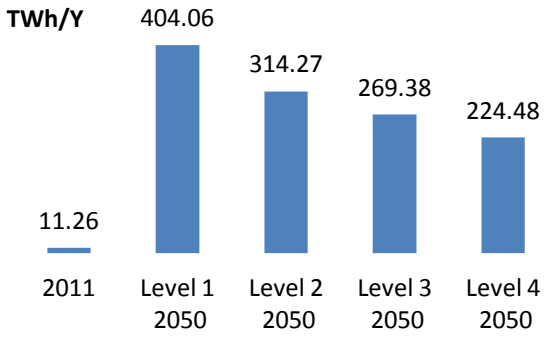
Level 3

Level 3 assumes that that the use of high efficiency stove has been widely used by the commercial sector. Standardization of efficient stove is imposed by government, thus the stove makers produce standard high efficiency stove. Commercial sector also shift from kerosene to natural gas. This situation leads to a decrease in energy intensity for cooking which is 40% lower than the base year in 2050.

Level 4

Level 4 assumes that the energy intensity will be 50% lower than the base year in 2050. This situation is caused by the wide adoption of high efficiency stove and cooking appliances. Kerosene is not used any longer for cooking activity. Natural gas will be used widely and there will be a shift to electric stove.

Source: http://www.restoransoftware.com/fitur/



Energy consumption projection for cooking activity

Cooling

The current government policies related to air conditioning efficiency are labeling and the Minimum Energy Performance Standard (MEPS). Labeling is expected to provide information to community on the efficiency level of an appliance and encourage the producer to improve the efficiency of their products. MEPS is expected to limit the distribution of inefficient appliances in the market. In addition, it is mandatory for the commercial building with that uses more than 6,000 TOE of energy to conduct energy efficiency measures including the programs recommended from the energy audit such as bulb replacement to LED, efficient air conditioning and etc. Air conditioning with inverter technology currently develops significantly along with the production cost that continues to decrease. Ultimately, it will affect the use of air conditioning in the future and reduce the energy intensity. Passive design of a building such as the use of insulation will reduce the use of air conditioning.

Level 1

Level 1 assumes that the energy intensity of air conditioning for commercial sector will be 10% lower than the base line because the conventional air conditioning is replaced by the new air conditioning technology (change of technology occurs without any significant government intervention). Air conditioning with efficient technology feature starts to be adopted in commercial sector.

Level 2

Level 2 assumes that there is a decrease in energy intensity for cooling activity in commercial sector that is 20% lower than the base year. Labeling and MEPS are able to provide options, particularly efficient air conditioning products for commercial sector, to the buyers.

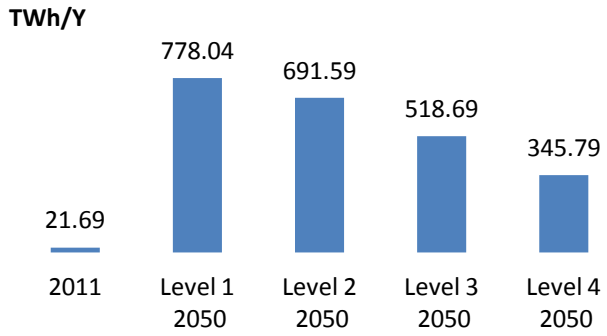
Level 3

Level 3 assumes that the energy intensity will be 40% lower than the base year in 2050. Air conditioning with energy saving technology is adopted in commercial sector. Labeling, MEPS and mandatory for building that consumes more than 6,000 TOE of energy to conduct energy efficiency measures have endorsed the commercial sector to use the efficient air conditioning.

Level 4

Level 4 assumes that the energy intensity of cooling activity in commercial sector will be 60% lower than the base year in 2050. Efficient air conditioning is massively adopted in commercial sector. Labeling, MEPS and mandatory for building that consumes more than 6,000 TOE of energy to conduct energy efficiency measures have endorsed the commercial sector to use the efficient air conditioning massively. The use of inverter, magnetic and AHU technologies as well as retrofitted chiller would lead to a significant decrease of energy intensity.

Source: http://web.ipb.ac.id/~tepfteta/elearning/media/Teknik%20Pendinginan/bab1.php



Energy consumption projection for cooling activity

Other Appliances

Number of other electronic appliances in commercial sector is predicted to increase in the future. Electronic appliances found in commercial sector are electric motor, fan, oven, washing machine, and television. Currently, more people own electronic appliances and more electronic appliance producers in the market that compete to offer new technology and environmentally friendly products. Therefore, the energy intensity for other appliances is predicted to decrease because of the energy saving technology as well as energy efficiency awareness of appliances' users.

Level 1

Level 1 assumes that the energy intensity of other appliances in commercial sector will be 5% lower than the base year in 2050. Energy saving habit and energy saving technology have not been adopted widely.

Level 2

Level 2 assumes that the energy intensity of other appliances in commercial sector will be 10% lower than the baseline in 2050. Consumers start to develop the energy saving habit and the penetration of energy saving technology enables the consumers to replace their old appliances to the new efficient appliances.

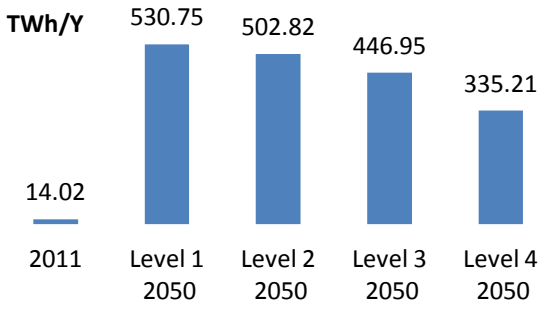
Level 3

Level 3 assumes that the energy intensity of other appliances in commercial sector will be 20% lower than the baseline in 2050. The issuance of standardization policy and energy saving labeling causes the electronic producers to produce the energy saving products. Given the situations, the commercial sector customers have more product options and the labeling educates them to use the energy saving appliances.

Level 4

Level 4 assumes that the energy intensity of other appliances in commercial sector will be 40% lower than the baseline in 2050. The issuance of standardization policy and energy saving labeling causes the electronic producers to produce the energy saving products. Consumer chooses to utilize the energy saving products. The standardization policy is fully and strictly implemented, thus most of electronic appliances in the market are the energy saving ones. Thus, most appliances in commercial sector are the appliances with energy saving and environmentally friendly features.

Source:
http://www.uin-alauddin.ac.id/foto/uin1.jpg



Energy consumption projection for other appliances

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Industry Sector

Energy Mix in Industry sector

In terms of fuel mix in the industry sector, it assumed that there will be a decline in the percentage of solid fuels in 2050. In return, the percentage of electricity, gas will increase and there will be the use of biodiesel. Detail on percentage of fuel for each level is described as follows.

Level 1

Level 1 assumes the energy mix in 2050. Detail on the percentage of fuel for each level is described as follows:
Solid fuels (biomass, coal, and briquette) 41.12%, liquid fuels (FO ,other petroleum) 17.05%, gas 26.12%, kerosene 0.15%, ADO 7.97%, IDO 0.14%, LPG 0.13%, and electricity 7.32%.

Level 2

Level 2 assumes the energy mix in 2050. Detail on the percentage of fuel for each level is described as follows:
Solid fuels (biomass, coal, and briquette) 35%, liquid fuels (FO ,other petroleum) 11%, gas 30%, kerosene 0.15%, ADO 7%, IDO 0.14%, LPG 0.13%, and electricity 17%.

Level 3

Level 3 assumes the energy mix in 2050. Detail on the percentage of fuel for each level is described as follows:
Solid fuels (biomass, coal, and briquette) 30%, liquid fuels (FO ,other petroleum) 8%, gas 30%, kerosene 0.%, ADO 0%, IDO 0%, LPG 2%, electricity 25%,and biodiesel 5%.

Level 4

Level 4 assumes the energy mix in 2050. Detail on the percentage of fuel for each level is described as follows:
Solid fuels (biomass, coal, and briquette) 23%, liquid fuels (FO ,other petroleum) 5%, gas 23%, kerosene 0%, ADO 0%, IDO 0%, LPG 6%, electricity 37% and biodiesel 8%.

Source: http://listrikindonesia.com/ebt__perlu_dukungan__dan_komitmen_389.htm