Advancing Buildings Energy Efficiency in Southeast Asia

Launch of Online Course on Energy Efficiency in Buildings

Organised by International Energy Agency (IEA)

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INSTITUT TEKNOLOGI BANDUNG

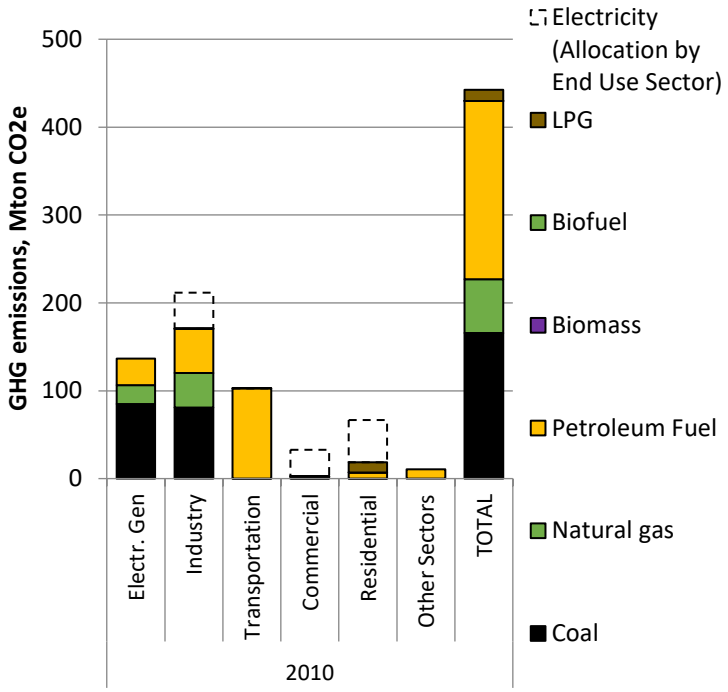
1. GHG Emissions from Energy Sector
2. Energy Efficiency as Mitigation Measures and the New Sources of Energy
3. Energy Efficiency is the Pillar of Decarbonization for The Indonesia NDC 2030
4. Improving Energy Performance Potential and Addressing Growing Demand in Buildings Sectors
5. Requirements for Implementing the EE

GHG Emissions from Energy Sector

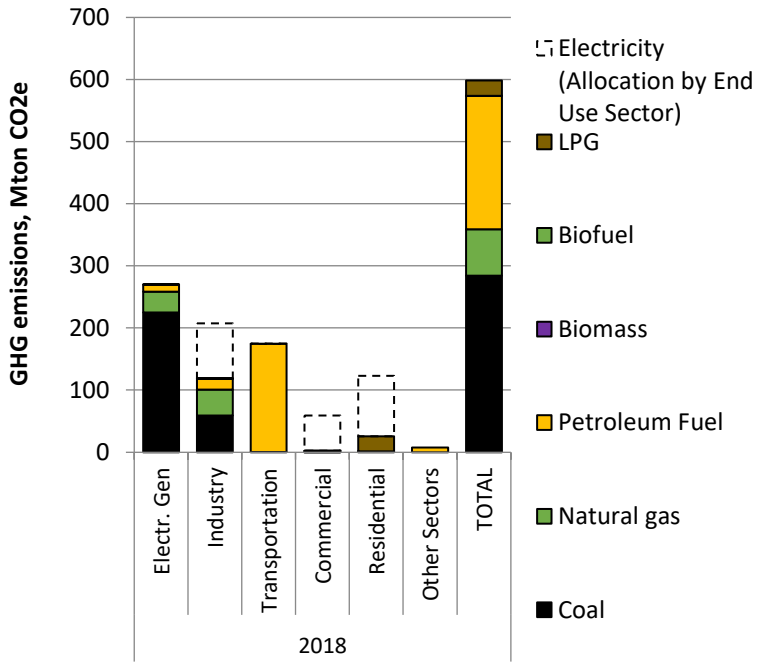
Historical GHG Inventory

GHG Emissions Projections (BaU)

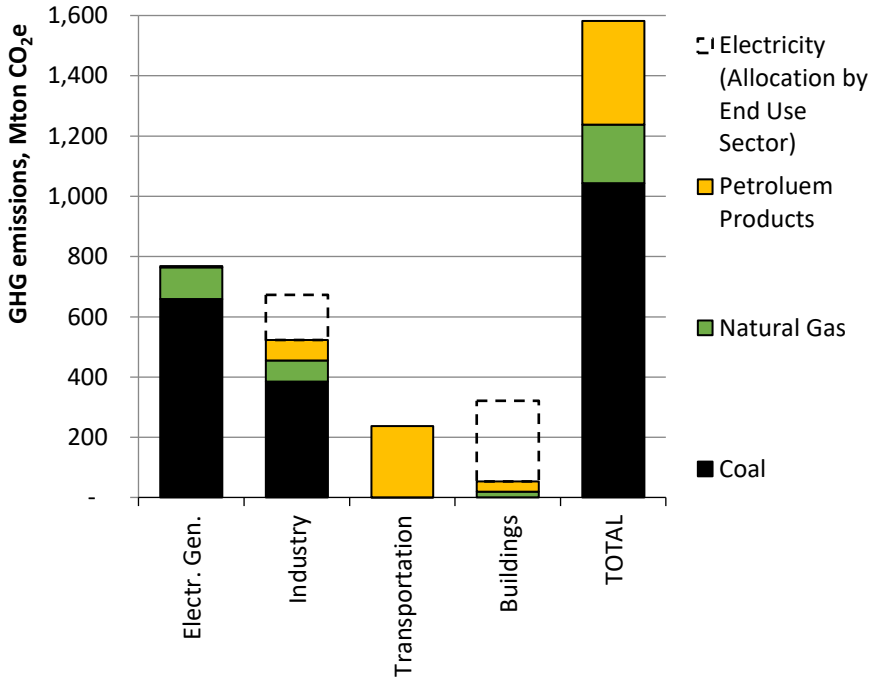
GHG Emissions in 2010 (by fuel & sector)



GHG Emissions in 2019 (by fuel & sector)



Projected GHG Emissions in 2030, by fuel & sector



- End-use Sub-sector: In 2010, more than half of direct combustion emissions are from fuel burning in industry. The direct emissions in 2018 shows that power sector has surpassed the industry and the projection (2030) shows power sector is the largest sources of GHG emissions.
- Emissions from indirect (electricity supply) is accounted by building (40-40.4%) and industry (34.5-36.5%)

EE as Mitigations Measures and New Sources of

Energy Efficiency Measures in the Demand Side:

- EE target (2025): 6% industry, 5% transport, 5% Households, 1% commercial buildings (RIKEN, National Energy Conservation Plan)
- Efficiency Standard and Labelling (ES&L)
- Indonesia NDC 2030

Energy Efficiency Measures in the Supply Side:

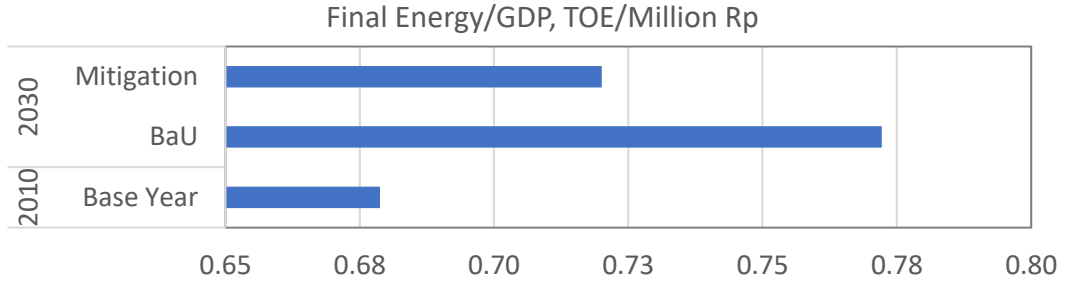
- Energy efficiency measures in Power Plants: higher efficient technology (clean Coal technology such as sub-critical, supercritical, and ultra supercritical coal, gas combine cycle, etc.)
- Indonesia NDC 2030

Innovation and research for development :

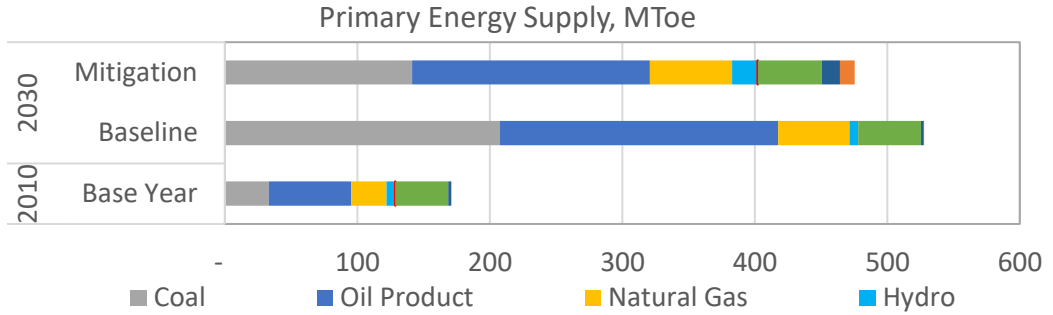
- Technology householder energy efficiency (lightings, AC, refrigerator, electric motors, etc.)
- System design for equipment and process for less energy consumption
- Office and Commercial Building System Design (Green building)
- Low Energy System Designs, Building's Code, and Electric Appliances
- City or Town System Design, efficient energy consumption

Energy Efficiency is the Pillar of the Decarbonization for The Achievement of Indonesia NDC 2030

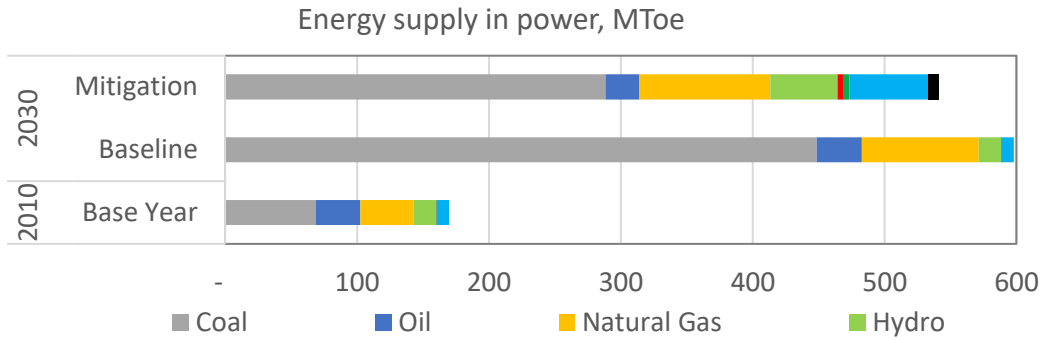
Pillar 1
Energy efficiency measures would decrease energy intensity of GDP (Energy per GDP)



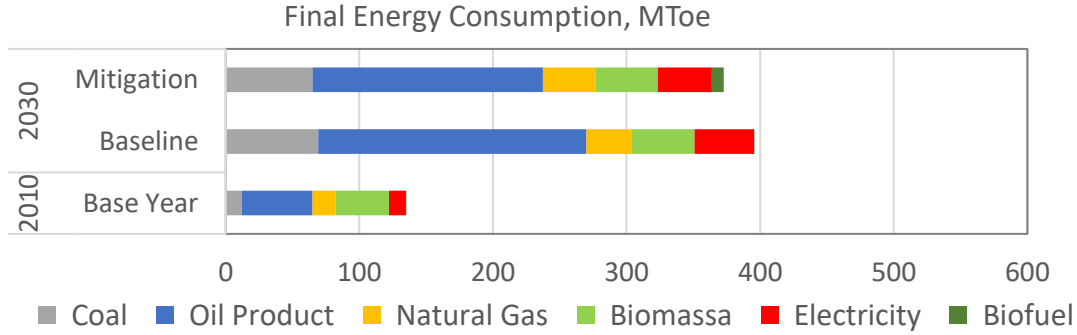
Pillar 2
Renewable Energy will reduce fossil fuel combustions and reduce emission



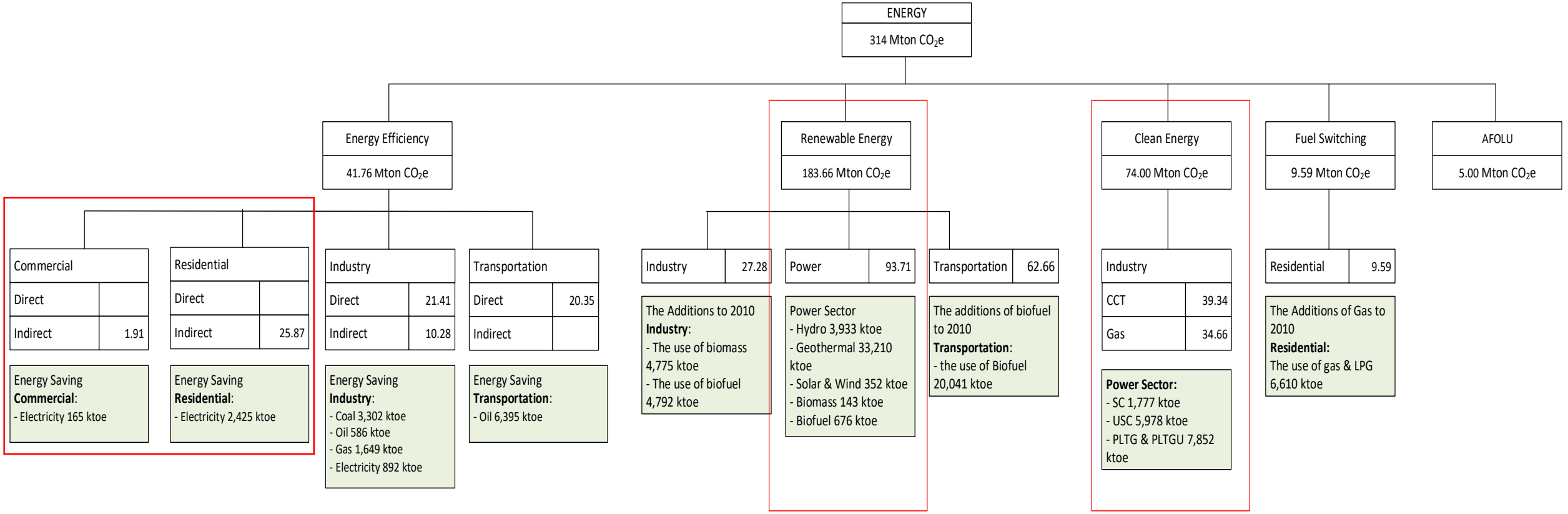
Pilar 3
Decarbonization of electricity will reduce fossil fuel combustions and reduce emission (as long as the power generation is also decarbonized)



Pillar 4
Fuel Switching to low carbon emitting fuels (from kerosene to LPG or natural gas) would decrease GHG emission in Households

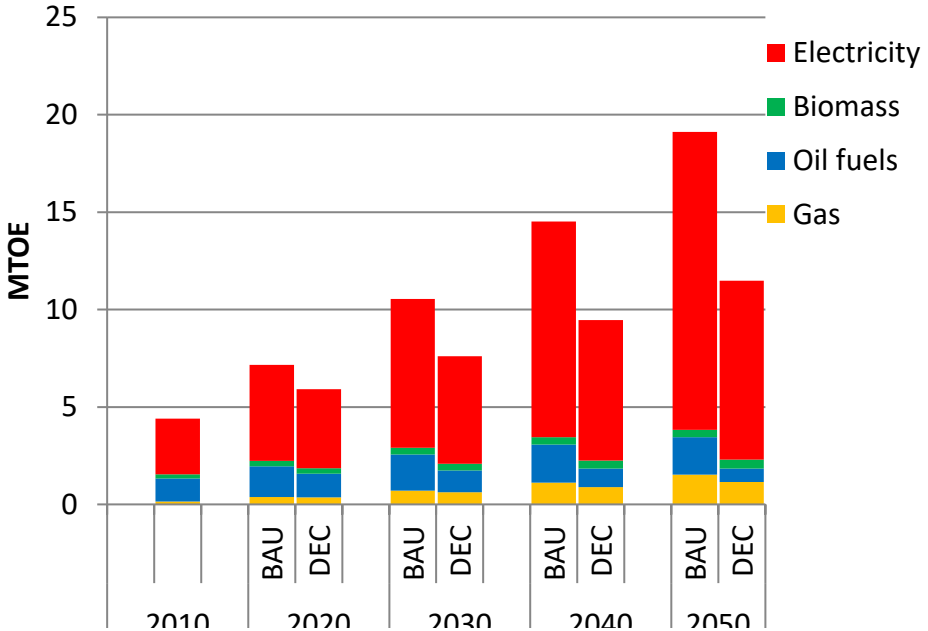


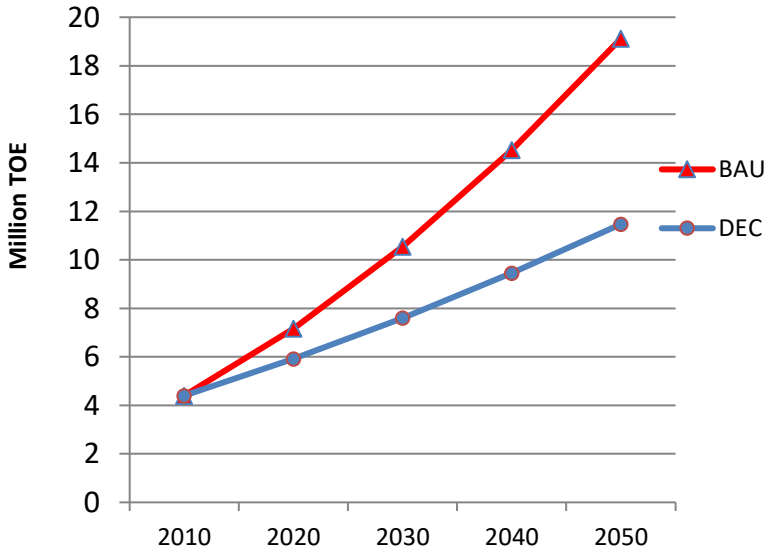
GHG Emissions Reduction from Energy Sector (Sub-sector contribution)

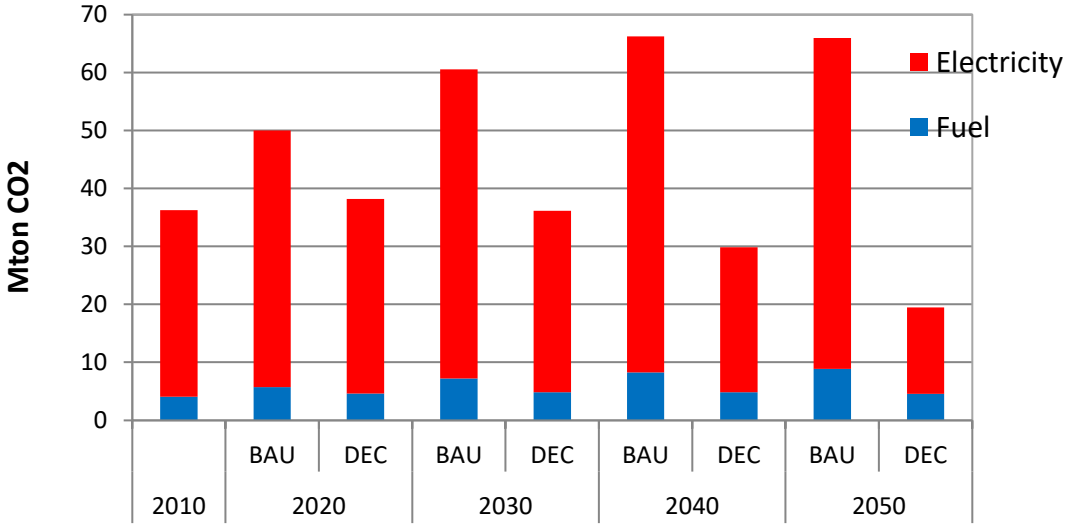


- The dynamics of building (residential & commercial) sector development are driven by population growth, economic development, per capita income, and commercial sector development.
- For residential sector, increasing per capita income will increase energy demand, but this will be balanced by more efficient appliances and the expectation that homes will remain relatively small.
- For commercial building, increasing size of service economy &modernization of building equipment will result in increase of energy consumption.
- De-carbonization in building would result from fuel switching, i.e. from oil fuels to gas/LPG and from oil fuels to electricity along with deployment of more energy-efficient electric appliances.
- Switching from on-site fuel combustion to electricity would reduce direct emissions from buildings, and with a decarbonized electricity generation sector, this switch would lead to emission reductions.

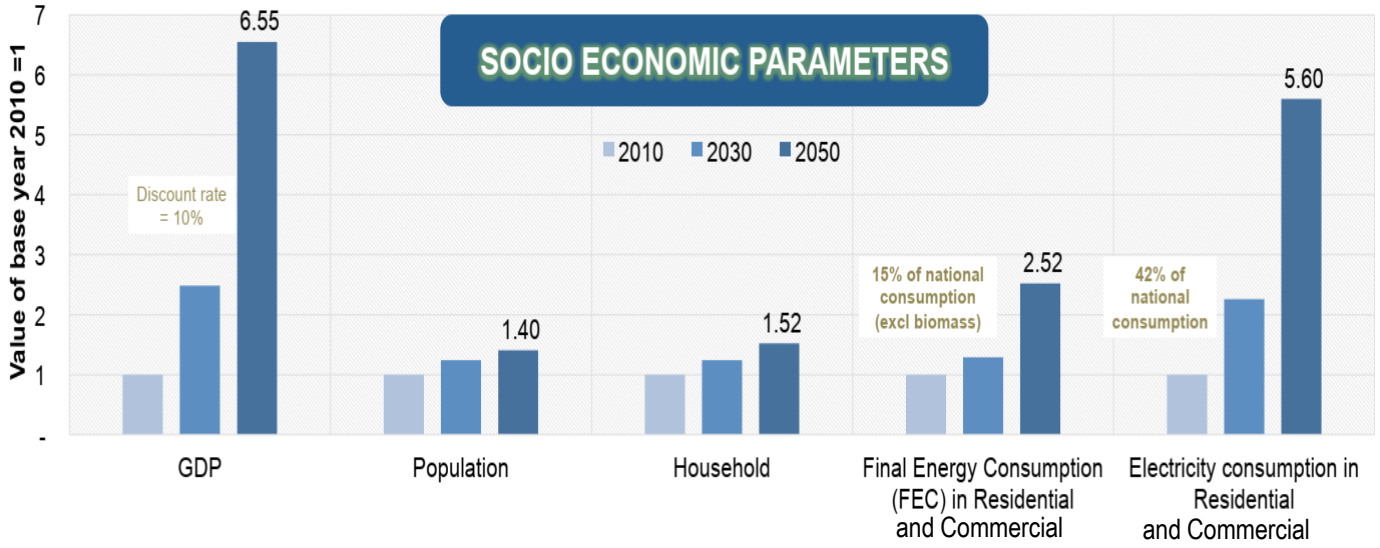
Evolution of Final Energy Demand in Commercials and the associated GHG Emissions

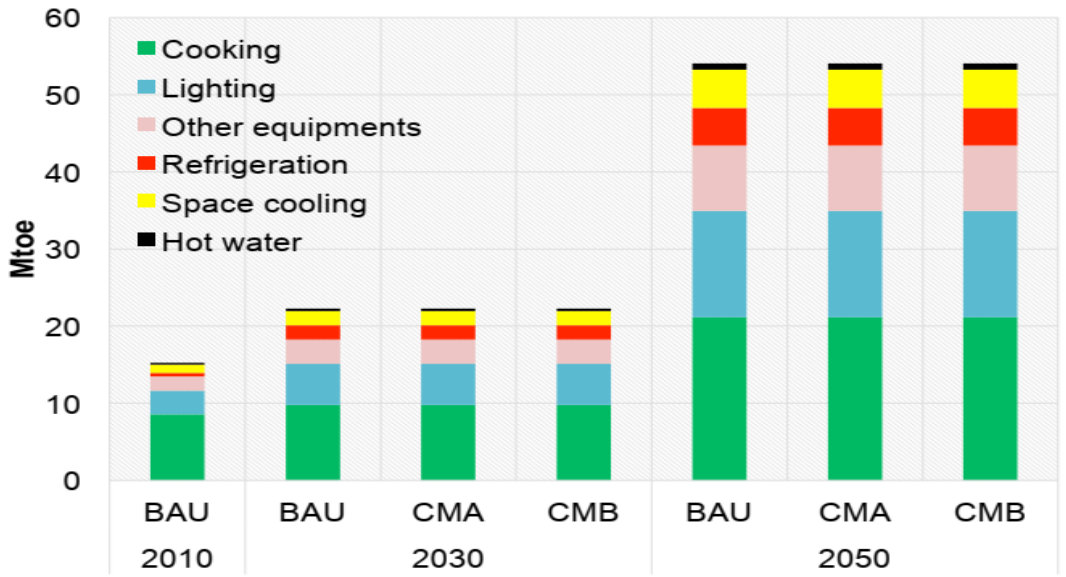




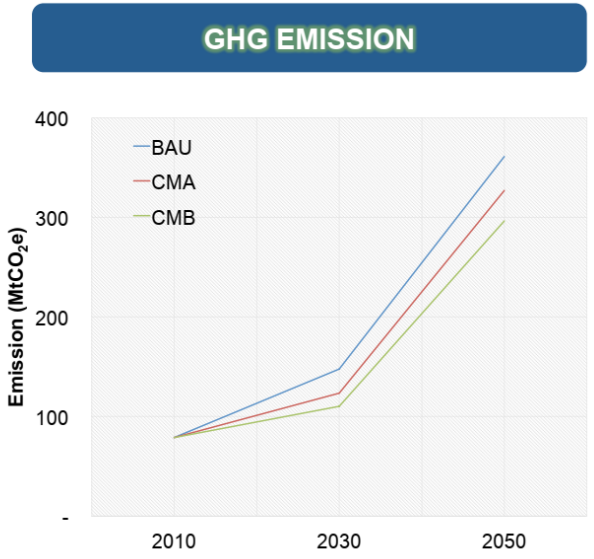


Efficiency Standard and Labeling as Policy Measures in the Indonesia's NDC





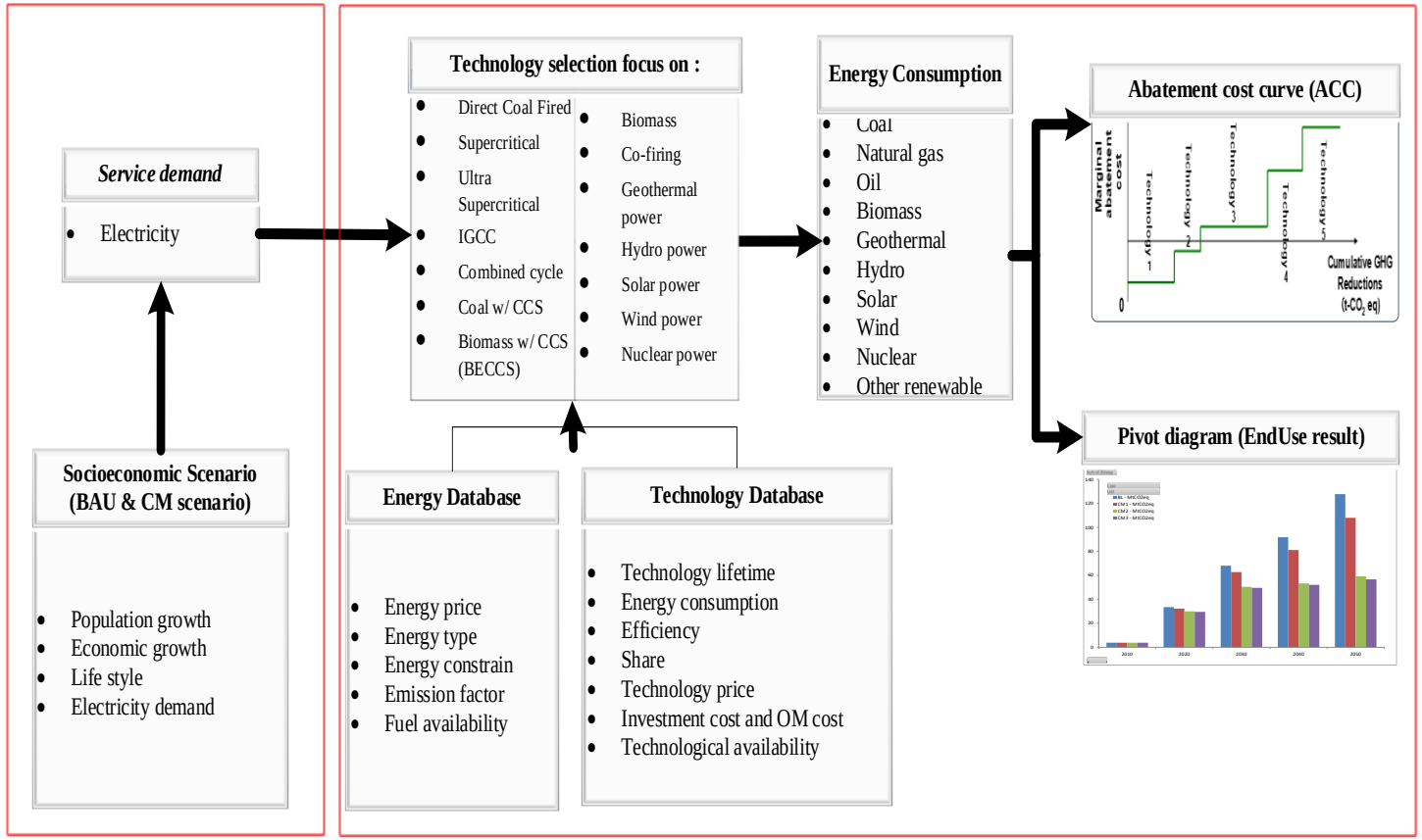
ES&L in Indonesia is limited for only two home appliances so far and still lower than international standard. Through increased and full penetration of efficiency, residential sector could contribute to 38 $MtCO_2e$ reduction or 39% of EE contribution target in NDC (reduction roadmap in 2030 from EE is 96 $MtCO_2e$). Energy savings from the electrical appliances account to 42 TWh in 2030 and 90 TWh in 2050, which is equal to quite reduction in power sector load (5 GW in 2030 and 11 GW in 2050). Consumer expenses could be reduced up to USD 4 billions in 2030. The long term projection shows reductions achieved can be doubled.



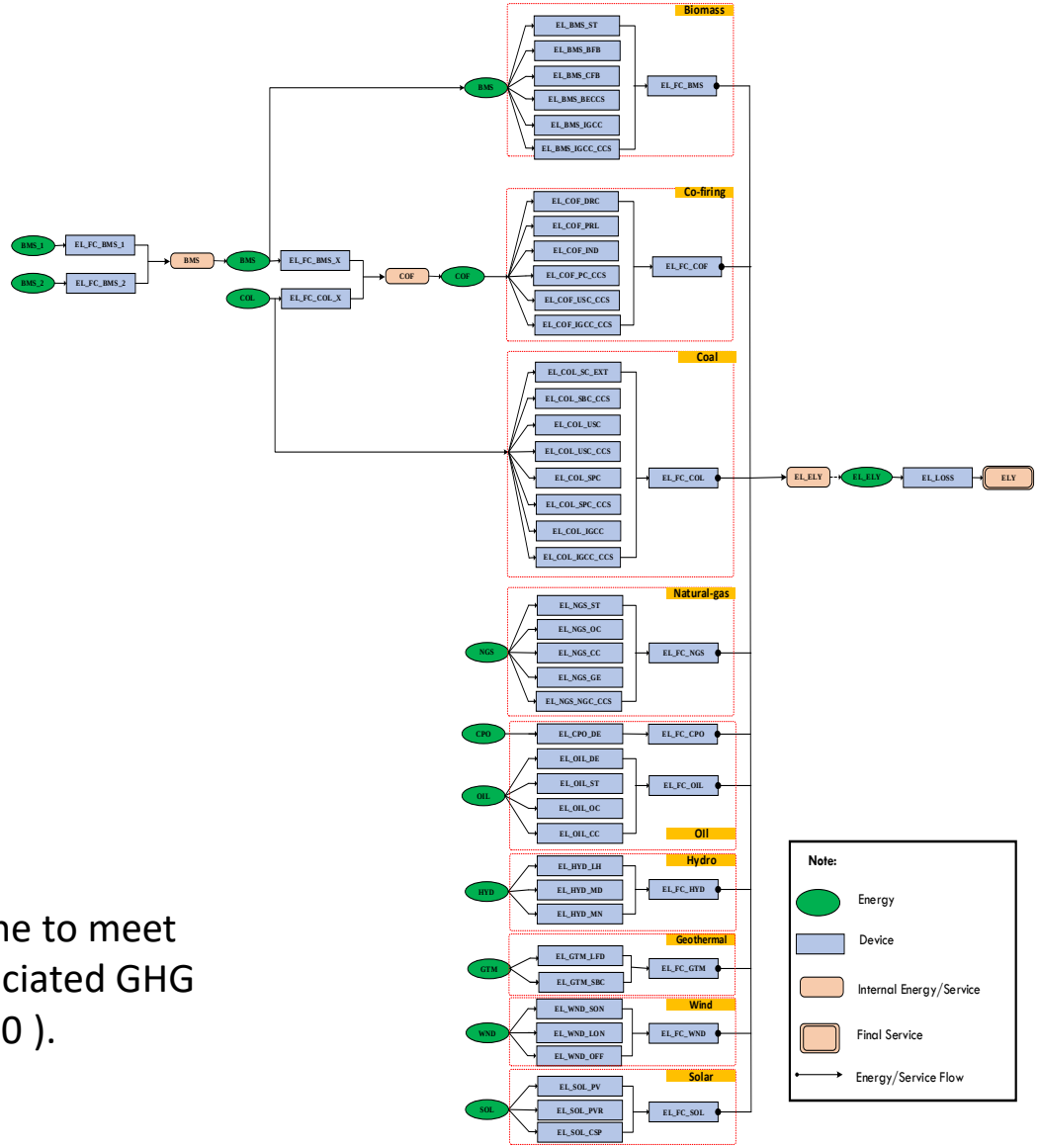
"BaU" no mitigations taken place, it is projected with assumed socio--economic parameters.
"CMA" unconditional target under the NDC-CM1 (2030) and extended to 2050 (long term).
"CMB" increased efficiency penetration to show the potency of EE in residential /commercial

Type of Appliances	Unit	Consumers		
		Office Buildings	Hotels	Hospitals
Air conditioning	%	66	48,50	56,60
Lighting	%	17,4	16,97	18,99
Elevator	%	3,0	8,05	3,46
Water Pumps	%	4,9	5,32	11,62
Utility	%	-	18,67	3,82
Others	%	8,7	2,49	5,51
Total		100	100	100

Methodology: AIM/EndUse

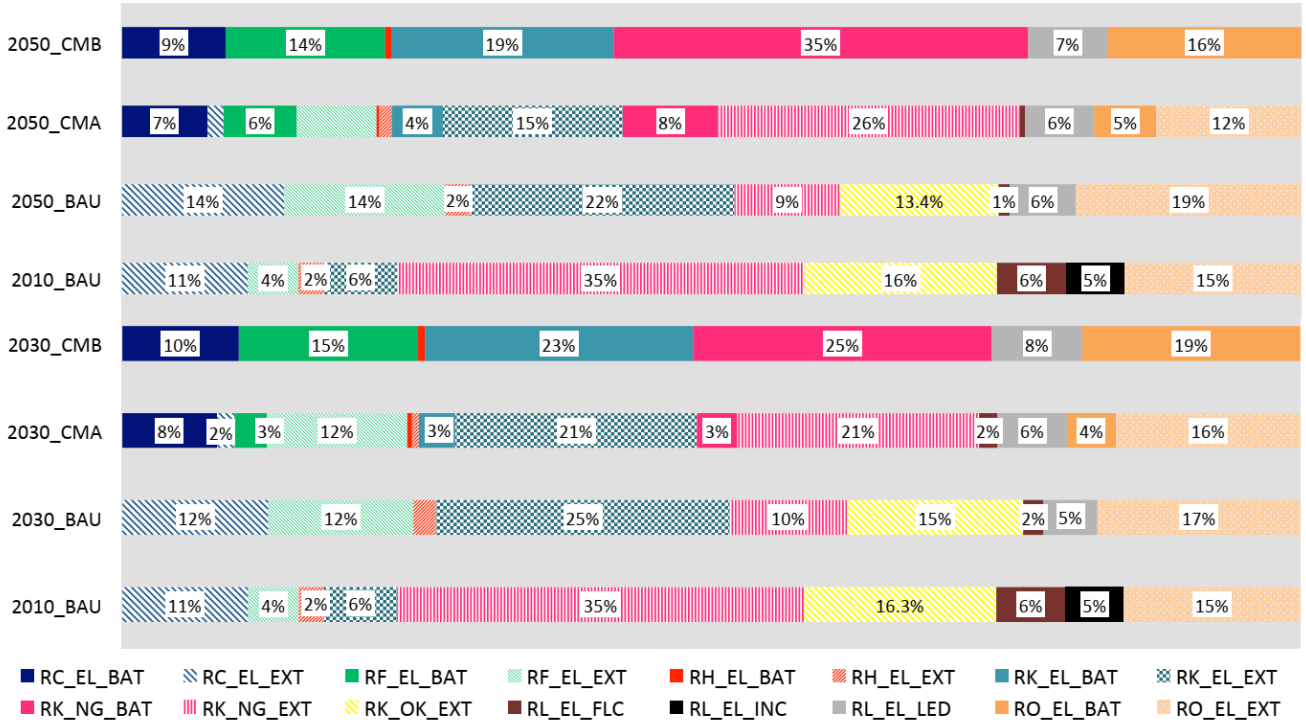


The Structure electricity sector in the AIM -EndUse



Selection of technology and estimation of power generation capacity need to be done to meet service demand (Hibino et al., 1996) and estimate the energy demands and the associated GHG emissions released from the operation of the selected technology (Mikiko et al., 2000).

Improving Energy Performance Potential and Addressing Growing Demand in Buildings Sectors



RF_EL_EXT	Refrigerant (conventional)
RF_EL_BAT	Refrigerant (advanced)
RC_EL_EXT	Air Conditioner for Space Cool (Conventional)
RC_EL_BAT	Air Conditioner for Space Cool (Advanced)
RH_OK_EXT	Kerosene Water Heater (Conventional)
RH_OK_BAT	Kerosene Water Heater (Advanced)
RH_NG_EXT	Gas Water Heater (Conventional)
RH_NG_BAT	Gas Water Heater (Advanced)
RH_EL_EXT	Electric Water Heater (Conventional)
RH_EL_BAT	Heat Pump Water Heater (Advanced)
RH_SL_EXT	Solar Water Heater (conventional)
RH_SL_BAT	Solar Water Heater (advanced)
RK_OK_EXT	Kerosene Cooking Range (Conventional)
RK_OK_BAT	Kerosene Cooking Range (Advanced)
RK_NG_EXT	Gas Cooking Range (Conventional)
RK_NG_BAT	Gas Cooking Range (Advanced)
RK_EL_EXT	Electric Cooking Range (Conventional)
RK_EL_BAT	Electric Cooking Range (Advanced)
RK_BM_EXT	Biomass Cooking Range (Conventional)
RK_BM_BAT	Biomass Cooking Range (Advanced)
RL_EL_INC	Incandescent Lamp
RL_EL_FLC	Fluorescent Lamp (CFL, swaballast)
RL_EL_LED	LED Lamp
RO_EL_EXT	Other Equipment (Conventional)
RO_EL_BAT	Other Equipment (Advanced)

FINDINGS

- Opportunity exists in conserving energy for cooking services, as the highest share in residential energy consumption. BAT penetration in this appliances range needs to be promoted. Cooking services have wide fuels option: biomass and LPG/city gas can be substituted to each other, also possible shifting to biogas; while electric cooking range is more preferred and broadly used with remain opportunity in efficiency.
- Scenario CMA shows that shifting to efficient technology can reduce energy demand by 5% in 2030 and 7% in 2050. AC and lamps contribute to 10,000 GWh and 308 GWh reduction in 2030. Achievement from energy sector stated that efficient AC and lamps saved respectively 2,220 GWh (2.6 $MtCO_2e$) and 191 GWh (5.3 $MtCO_2e$) in 2017. Improvement can be done and higher reduction seems achievable through proposing new MEPS.

EE measures in the demand side could be implemented when the following conditions prevail:

- The needed energy efficient equipment/appliances is available and relatively easy to access
- Equipment producers have technical and financial capability to produce efficient appliances
- Equipment producers have the needed drives to produce efficient appliances (if there is a market demand of their product)
- Energy end users have the driver to safe energy, it can only happen if consumers perceive that the energy cost is high.
- Energy consumers have financial capacity to acquire efficient appliances (usually more expensive than less efficient ones)

The energy efficiency measures in the supply side could be implemented when the following conditions prevail:

- There is an economic drive or stimulant for the power generators (PLN or IPP) to improve generation efficiency. Under current subsidy system such drive may not exist
- Strict regulation that prevent construction of less efficient power plant. The GOI should set minimum thermal efficiency for new power plants or implement the CAP for power generations

The required policies for the above issues are:

- Financial support and incentives to end user to acquire efficient appliances (promotion grant, loan scheme etc.)
- Financial support and incentives to producer to produce and market efficient appliances (low interest loan scheme etc.)
- Award and penalty policies for large scale energy consumers
- Regulations that prevent the production of less efficient appliances
- Gradual increase of electricity price (removal of subsidy)

The existing policies related to the efficiency measures are as follows:

- Ministerial Regulation No.14 Tahun 2012 concerning Energy Management
- Presidential Instruction No 13/ 2011 concerning Energy and Water Conservation
- Ministerial Regulation No 06 2011 concerning Labeling of Efficient Lamp
- Ministerial Regulation No. 7/2010 concerning Electricity Tariff
- Ministerial Regulation No 14 Tahun 2010 concerning Competency Standard for Energy Manager in Building
- Ministerial Regulation No 13 Tahun 2010 concerning Competency Standard for Energy Manager in Industry
- Government Regulation No. 70/2009 concerning Energy Conservation, which is the derivatives of Law No. 30/2007
- Presidential Instruction No.2/2008 concerning Energy and Water Conservation
- Law No 30/2007 concerning Energy
- Presidential Regulation No. 5/2006 concerning National Energy Policy
- Presidential Decree No. 43/1991 concerning Energy Conservation

EE Implementations in Buildings

- Governor Regulation No. 38/2012 Green Buildings and Standards
- Ministerial Regulation MEMR No. 57/2017 regarding Minimum Energy Performance Standards and Energy Saving Label Inclusion for Air Conditioners and Setting standards and labeling of energy efficient air conditioners

Comparing the required and existing policies, to close the gap of the policy to implement energy efficiency measures, in the demand side (buildings), the following policy/regulations are recommended:

- Introduce regulations (fiscal or award approach) that promote the production more efficient equipment and penalize the production of less efficient product.
- To ensure the use of efficient energy appliances, introduce incentive packages for energy consumer such as help for financing of expensive but efficient appliances.
- Introduce building codes that promote energy efficiency: make the use of efficient appliances and energy efficient design as requirement for construction approval.
- Introduce energy efficiency as major criteria in the rating of industrial environmental compliance (PROPER award, Green Buildings, Eco Label, etc.)
- Strengthen the capacity of government officials in energy efficiency arena such as in evaluating and inspecting the efficiency of energy systems and energy audit document reported by building sector; the government officials that need to be strengthen is not limited to energy ministry but also for officers at other ministry that deals with energy related issues such as ministry of environment, ministry of public works, ministry of finance etc.
- Introduce energy pricing policy that promotes energy efficiency undertaking: gradual removal electricity and oil subsidies

1. To ensure that energy efficient building codes (incld. standards) and government regulations on EE in building as well as Green Building, are widely implemented;
2. Prepare human resources needed to design and operate energy efficient building and to develop energy efficient appliances;
3. To introduce carbon label to building energy performance
4. To include energy efficiency measures in building sector in achieving National GHG emission target including de-carbonization beyond 2020;
5. To develop information for data on mitigation activities and emissions reduction potential at the level of end use appliances.

We welcome new ideas/initiatives in this research

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Thank You
Terimakasih

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- In your experience, what form of policy (prescriptive, market-based, information-based) have been most effective at achieving change in energy efficiency within the building sector market, and why?
- What technologies do you see offering the most potential at improving energy performance and addressing growing demand in buildings in ASEAN?
- Where do you think more research and development efforts are needed to achieve a transition to a whole life cycle carbon buildings and construction sector?
- In your experience, what are some effective ways of building coalitions of partners to creating successful diagonal partnerships (i.e. between government, industry, advocacy) for prioritizing energy efficiency?
- Can you give an example of an effective communications or public engagement strategies that have resonated with public or industry and why?