



SUSTAINABLE DEVELOPMENT STRATEGIES IN ENERGY EFFICIENCY IN VIETNAM



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ABBREVIATIONS

BAU	Business as Usual
CPEE	Clean Production and Energy Efficiency
DEU	Designated Energy Unit
DOIT	Department of Industry and Trade
ECM	Energy Conservation Measure
EE	Energy efficiency
EE&C	Energy efficiency and Conservation
EEP	Energy Efficiency Program
EESP	Energy Efficiency Service Provider
ESCO	Energy Service Company
EVN	Electricity of Vietnam
GDP	Gross Domestic Production
GHG	Greenhouse gas
GVN	Government of Vietnam
IFC	International Finance Corporation
INDC	Intended National Determined Contribution
LCEE	Low Carbon and Energy efficiency
LPG	Liquefied Petroleum Gas
LULUCF	Land use and Land use change and Forestry
MARD	Ministry of Rural Development
MEPS	Minimum Energy Performance Standard
MOC	Ministry of Construction
MOF	Ministry of Finance
MOIT	Ministry of Industry and Trade
MOIT	Ministry of Industry and Trade
MPI	Ministry of Planning and Investment
NTP RCC	National Target Program to respond to climate change
PDP	Power Development Plan
PGGAP	Provincial GreenGrowth Action Plan
SBV	State bank of Vietnam
SME	Small and Medium enterprise
SP RCC	Support Program to Respond to Climate Change
TOE	Ton of Oil equivalent
VEEBC	Vietnam Energy Efficiency Building Code
VEEIE	Vietnam Energy Efficiency for Industrial enterprises
VEPF	Vietnam Environment Protection Fund
VGGAP	Vietnam Green Growth Action Plan
VGGS	Vietnam Green Growth Strategy
VNEEP	Vietnam Energy Efficiency Program

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1 CONTEXT

Energy Background

The country's energy policies have primarily focused on building up power generating capacity through investment in coal, gas and the medium and large-scale hydropower. Vietnam's domestic energy resources have contributed greatly to meet the increasing demand so far, but it is very likely that this will change in the near future. However, sustainable energy policies and development have remained modest. Vietnam is privileged regarding its unexplored potential for renewable energy. Adoption of energy efficiency and demand side management measures are not being fully developed.

Recent released "National Renewable Energy Strategy" set goals for each renewable energy sources and for the first-time solar power was considered. Per this new strategy, GHG emission should be reduced by 5% in 2020; 25% in 2030 and 45% in 2050 compared with BAU scenario. The total electricity generated from renewable sources shall reach 38% in 2020 and 43% in 2050.

According to World Bank database, the quality of power network in Vietnam improves significantly in recent years, however, the loss on transmission and distribution are still high compared to other countries in the region. In 2013, this ratio is 8.93% in Vietnam, 20-30% higher than in China (5.8%), Thailand (6.24%); Malaysia (4.04%).

In terms of efficiency in power production, this figure has been estimated roughly at about 40-45% and is stable during the recent years according to data from Institute of Energy.

Energy Sources and Energy Utilization

Between 2010 and 2015, maximum power capacity experienced an increase of 1.6 times, from 15,400MW to 25,250MW. This led to 3.1 time increase of electricity production from 45.6 billion kWh to 143.3 billion kWh. Generated electricity in 2005 was 159.4 billion kWh (Source: National Master Power Plan (2016) and EVN Annual Report (2015))

Figure 1)

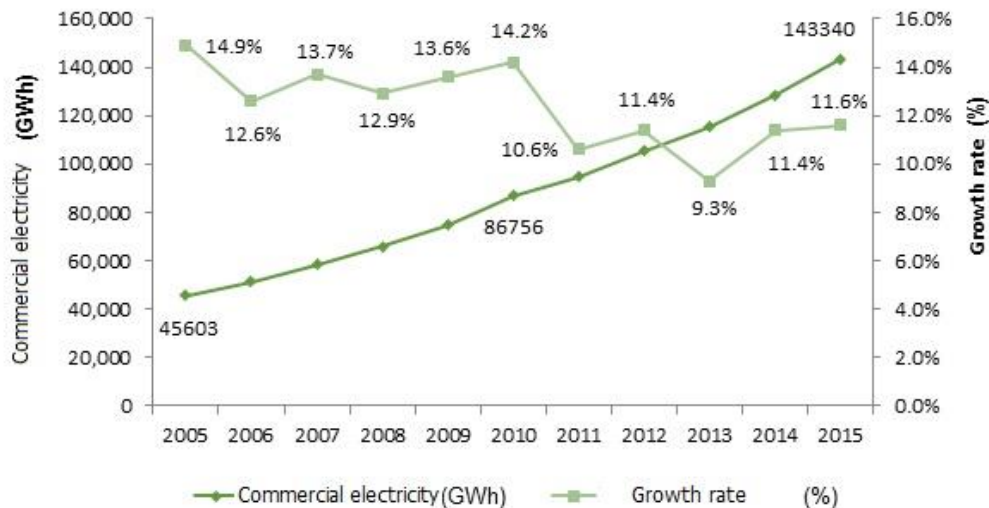
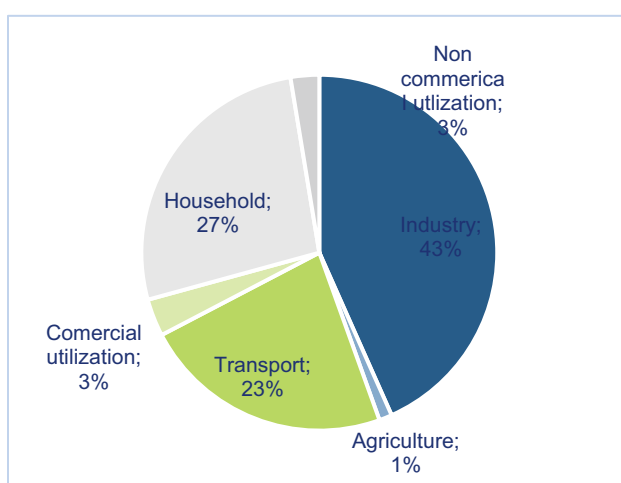
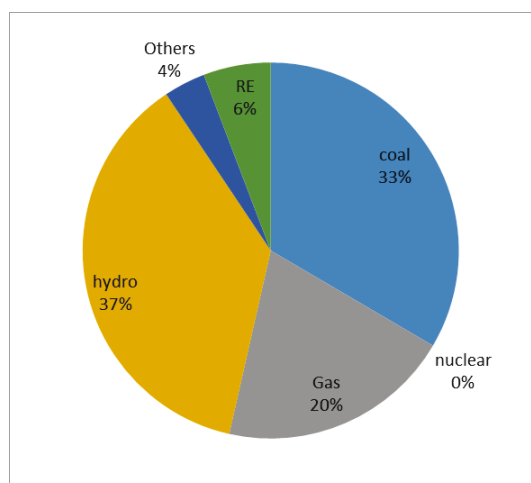


Figure 1: Power demand and growth rate of Vietnam’s power system from 2010 to 2015

Vietnam's power mix was mainly dominated by large hydropower (produced domestically), followed by gas power and coal power. The coal is imported of less than 10% while imported LPG accounts for about 50% of total LPG consumption. However, the power mix started transforming and coal fired power plants surged 3 times since 2010 up to 13.157MW (33.4%) in 2015. According to Power Development Plan VII revised (PDPVII revised) (2011-2020), coal fired power will account for 42.6% and 53.2% in term of capacity and electricity generation respectively. Therefore, Vietnam's future power system will be dominated by coal fired power, whereas the renewable energy potential of the country will be just partly used. PDPVII revised includes a goal of 8,000MW of installed wind capacity by 2030 and 12,000MW of solar capacity by 2030

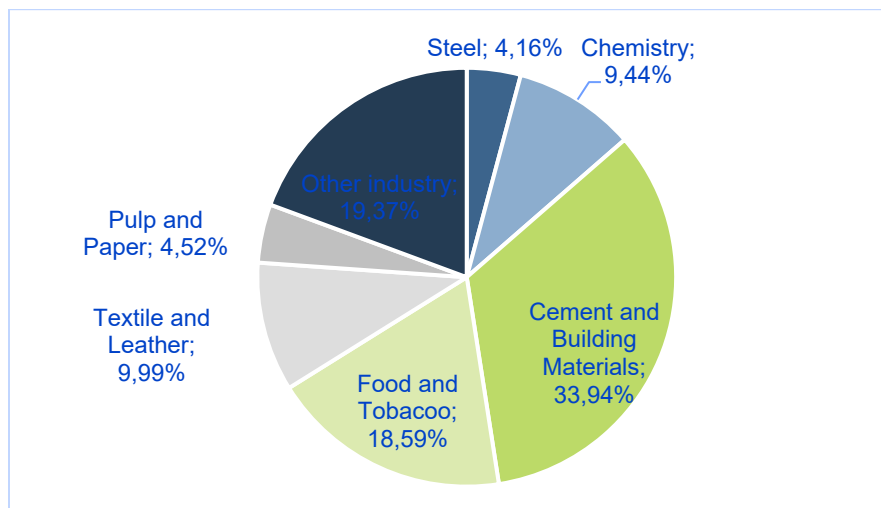


Source: National Load Dispatch Center, EVN (2015) and Institute of Energy (2015)

Figure 2: Installed generation capacity in Vietnam, 2015 **Figure 3: Energy consumption per sector, 2015**

In terms of energy utilization, the industry and residential sectors are the primary consumers accounting for 43% and 27% of the total respectively. The transport sector ranks third at 23%. It has been noticed that the energy consumption in residential sector is increasing with higher growth rate than in other sectors, mainly due to the fast urbanization rate in recent years. Nowadays, electrification in Vietnam reaches nearly 99% with 100% in urban and 96-97% in rural area with about 1000 towns that are still in lack of electricity situation.

In the Industry sector, Cement and Building Materials are the sub-sectors that have highest energy consumption, account for 33.9% of total energy consumption in industry sector following with Food and Tobacco (18.6%); Textile and Leather (10%). Those are the Energy intensive industries in Vietnam and have got much attention from international donors in the last few years for energy efficiency improvement. Some main projects are Nationally Appropriate Mitigation Action in cement sector - NAMA cement (2014); Cleaner Production and Energy Efficiency (2014-2016), etc.



Source: Institute of Energy – Energy balance (2015)

Figure 4: Energy Consumption per sub-sectors in Industry sector

The following sections will provide a description of energy efficiency legal framework, initiatives, potentials and recommendations from the Consultant in the context of current Vietnam Energy efficiency market.

Greenhouse gas emissions sources

According to latest INDC, the main GHG sources in Vietnam (exclude of LULUCF sector) in 2010 are Energy and Agriculture, account for 58% and 36% of total GHG emissions respectively. Projected 2020 and 2030 GHG emissions show that GHG emissions in Energy sector will increase rapidly, more than double from 2010 to 2020, and nearly five times in 2030, contribute to 75% of total emissions of the country in 2020.

Figure below illustrates the GHG emissions per sector in Vietnam (Inventory data in 2010 and projected profile for 2020 and 2030)

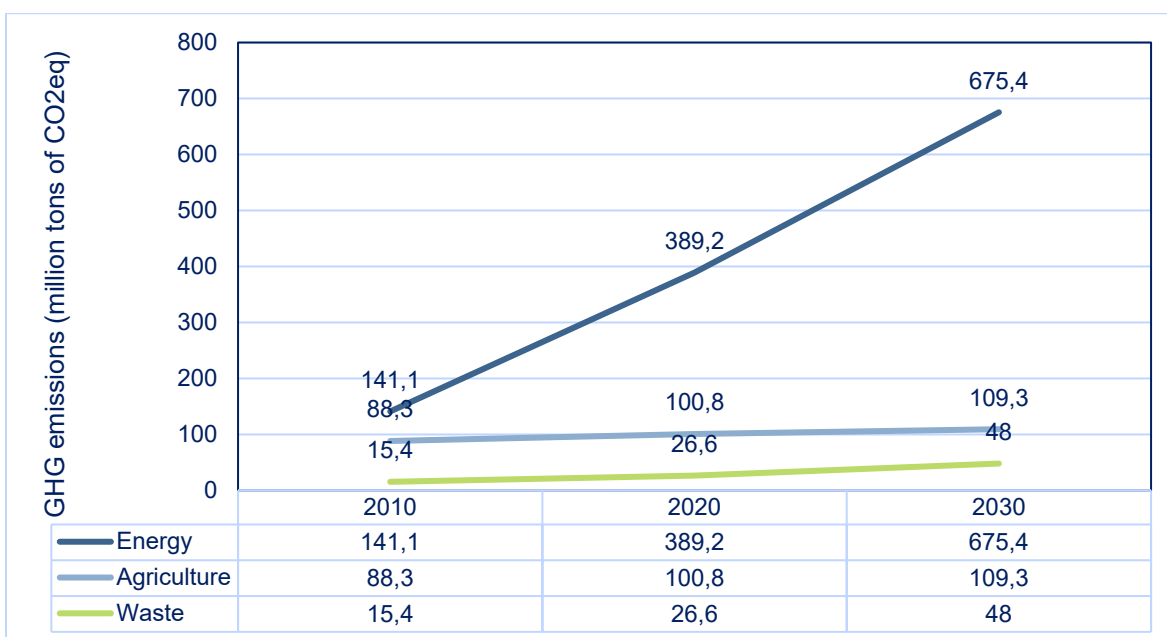


Figure 5: GHG emissions sources in Vietnam (INDC)

In Energy sector, the accounting has been realized by the inventory of fuel consumption in seven sub-sectors, details are provided in Table 1.

Table 1: Breakdown of GHG emissions in energy activities

Unit: Million tons of CO2 equivalents

Sub-sector	2010	2020	2030
Energy production activities	41.1	171.3	404.4
Manufacturing and Construction	38.1	69.3	92.5
Transportation	31.8	87.9	87.9
Commercial/Service	3.3	8.4	12.1
Residential	7.1	16.5	20.4
Agriculture/Forestry/Aquaculture	1.6	2.3	2.9
Leakage (solid fuel, oil and natural gas)	16.9	33.5	55.1
TOTAL	139.9	389.2	675.3

The breakdown of GHG emissions per sub-sector shows that most emissions come from energy production activities (30%), followed by the manufacturing and construction sectors (27%) and transportation sector (23%).

2 POLITICAL FRAMEWORK

2.1 National Energy Efficiency Targets

Vietnamese government has been addressing energy efficiency since 2005 with the first program Vietnam Energy Efficiency Program (VNEEP) initiated in 2006 which has just finished its second phase in 2016. The program has fulfilled its objective to reduce energy intensity in main industrial sectors and more important, to raise awareness about energy efficiency to not only the industry sector but also for other end users.

The last decade also marks an important period for Government efforts in combating Climate Change, especially in the context that Vietnam is one of the countries that is most vulnerable to climate change. Efforts in climate change mitigation have been transformed in target set for GHG emissions reductions, renewable energy development and energy efficiency. The Green Growth Strategy (VGGS) is a sustainable development pathway that the Government has been adopted since 2012.

The next table shows different targets set at national level for GHG emissions reductions and Energy efficiency. Despite lack of harmonization in these targets, it has shown the interest of the GVN in developing a low carbon economy with more efficiency, productivity and less carbon emissions.

Table 2: National Targets in GHG Emissions Reductions and Energy efficiency

Category	Target (% or kWh, period of time, reference year)	Sector	Funds & Investments	Description
GHG reduction target (1)	<p>Reduction of GHG emission intensity by 8 – 10% in the period 2011–2020 compared with 2010;</p> <p>Reduction of 10 – 20% of total GHG emission compared with BAU in all energy activities in the period 2011-2020; of which, 10% is voluntary target and 10% is conditional target with international support.</p> <p>Reduction of GHG emission intensity in the period 2020-2030 of at least 1.5 – 2.0% per year; reduction of 20 – 30% of total GHG emission compared with BAU for the period 2020-2030; of which 20% is voluntary target and 10% is</p>	All sectors	The funding come from different sources including: National budget; private sector and international organization	<p>The National Strategy on Green Growth was approved by the Prime Minister as Decision 1393/2012/QD-TTg on the 25/9/2012.</p> <p>The national target set under VGGS is quite ambitious; a minimum of 10% of total GHG emissions should be reduced to 2020. However, it should note that no baseline for 2010 have been pre-defined under VGGS.</p> <p>Under the framework of this strategy, provincial PGGAPs (Green Growth Action Plan at Provincial Level) have been developed, aiming that all provinces should have their own target to reduce GHG emission reductions. To the knowledge of Consultant, 30 out of 63 provinces have already developed the PGGAP with all detailed mitigation measures in a various sectors.</p> <p>In addition, different Ministries also develop their own GGAPs, for example GGAPs developed by Ministry of Finance, Ministry of Transport, Ministry of Industry and Trade, Ministry of Construction.</p>

Category	Target (% or kWh, period of time, reference year)	Sector	Funds & Investments	Description
	conditional target with international support. Reduction of GHG emission of 1.5 – 2.0% per year in the period 2030-2050.			
GHG reduction target (2)	<p>The GVN committed to reduce 8% of emissions by 2030 compared to the Business-as-usual (BAU), with domestic sources, in details:</p> <p>Emission intensity per unit of GDP will be reduced by 20% compared to the 2010 levels; Forest cover will increase to the level of 45%</p> <p>With international support, GHG emissions will be reduced of 25% by 20230 compared to the BAU, where emission intensity per unit of GDP will be reduced by 30% compared to 2010 levels.</p>	All sectors	National budget, private sector, international support.	<p>Baseline scenario</p> <p>As stated and recorded internationally in the INDC, emissions baseline of Vietnam is calculated based on the Business-as-usual (BAU) scenario, where BAU starts from 2010. The GHG inventory includes energy; agriculture, waste and LULUCF sectors:</p> <p>GHG emission in 2010: 246.8 million tCO₂e</p> <p>Projections for 2020 (not included industrial processes): 474.1 million tCO₂e</p> <p>Projection for 2030 (not included industrial processes): 787.4 million tCO₂e</p> <p>The INDC has clearly identified measures to achieve the GHG emissions mitigation targets such as (1) Strengthen the leading role of the State in responding to Climate Change; (2) Improve effectiveness and efficiency of energy use; reducing energy consumption; (3) Change the fuel structure in industry and transportation; (4) Promote effective exploitation and increase the proportion of new and renewable energy sources in energy production and consumption; (5) Reduce GHG emissions through the development of sustainable agriculture; improve effectiveness and competitiveness of agriculture production; (6) Manage and develop sustainable forest, enhance carbon sequestration and environmental services; conservation of biodiversity associated with livelihood development and income generation for communities and forest dependent people; (7) Waste management; (8) Communication and awareness raising; (9) Enhance international cooperation.</p> <p>In energy sector, INDC put focus on reducing emissions in residential sector by using more energy efficiency equipment, in industrial sector by reducing energy consumption for cement and building material sector, in transport sector by increasing public transport and clean fuel in transportation and last but not least to develop RE such as solar, small hydro, wind and biogas energy sources.</p>

Category	Target (% or kWh, period of time, reference year)	Sector	Funds & Investments	Description																								
EE improvement target	<p>Reduce 5% - 8% of total energy consumption in period 2012 – 2015 compare to BAU as projected in Power development master plan (No. VII).</p> <p>Reduce at least 10% of energy intensity of intensive energy consumers, of which:</p> <ul style="list-style-type: none"> - Cement sector: Reduce from 97kgoe/ton of cement in 2011 to 87 kgoe/ton of cement in 2015. - Steel sector: Reduce from 197kgoe/ton in 2011 to 160 kgoe/ton of steel in 2015. 	Industrial sector/ Cement sector/ Steel Sector	321.8 billion VND from the national budget; 27.5 billion VND from international donors (Danish embassy)	<p>Vietnam National Target Program on energy efficiency and conservation (VNEEP)</p> <p>Under Decision 1427/QĐ-TTg issued by the Prime Minister on 2nd October 2012 approved the National Target Program on Energy efficiency and conservation in period 2012 – 2015.</p> <p>The program has successfully reach its objective with energy intensity have been reduced by 13.9% in cement sector, 20.71% in iron and steel sector and by 11.07% in Textile sector. The overall energy savings for period 2012-2015 is 5.81%, equivalent to 12.61 million TOE.</p> <p>However, the decision to continue VNEEP phase III has not been released yet.</p>																								
Sectorial EE improvement target	The minimum specific energy consumption is set for 2020 and 2025 target according to the production process of steel (Unit MJ/ton)	Steel Sector	Private sector	<p>Circular 20/2016/TT-BCT issued by the MOIT in 2016 has indicated the minimum specific energy consumption that the industry must follow until 2020 and 2025. The Circular mentions about some ECMs that should be carried out for example to develop the EMS according to ISO 50.001; using the high-energy efficiency equipment, etc.</p> <table border="1"> <thead> <tr> <th>Production process</th> <th>2020 target¹</th> <th>2025 target</th> </tr> </thead> <tbody> <tr> <td>Sintering of iron ore</td> <td>2350²</td> <td>1960</td> </tr> <tr> <td>Production of cast iron by blast furnace</td> <td>14000</td> <td>12400</td> </tr> <tr> <td>Production of steel billet by (top-blown) converter</td> <td>150</td> <td>100</td> </tr> <tr> <td>Production of steel billet by electric arc furnace</td> <td>2600</td> <td>2500</td> </tr> <tr> <td>Production of steel billet by induction furnace</td> <td>2600</td> <td>2500</td> </tr> <tr> <td>Hot rolling of long steel products</td> <td>1650</td> <td>1600</td> </tr> <tr> <td>Cold rolling of steel plates</td> <td>1600</td> <td>1500</td> </tr> </tbody> </table>	Production process	2020 target ¹	2025 target	Sintering of iron ore	2350 ²	1960	Production of cast iron by blast furnace	14000	12400	Production of steel billet by (top-blown) converter	150	100	Production of steel billet by electric arc furnace	2600	2500	Production of steel billet by induction furnace	2600	2500	Hot rolling of long steel products	1650	1600	Cold rolling of steel plates	1600	1500
Production process	2020 target ¹	2025 target																										
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¹ There is no M&E of this circular (and other circulars) existing so far, hence we cannot know the progress and the result of this circular unless a new benchmarking study will be carried out.

² 2014 and 2015 data shows that the average energy intensity of the steel sector is 2507 and 2243 MJ/ton of product (for whole sector).

Category	Target (% or kWh, period of time, reference year)	Sector	Funds & Investments	Description																		
	The minimum specific energy consumption is set for 2020 and 2025 target according to the production capacity (Unit MJ/hl)	Beer and Beverage sector	Private sector	<p>Circular 19/2016/TT-BCT issued by the MOIT in 2016 has indicated the minimum specific energy consumption that the industry must follow until 2020 and 2025. The Circular mentions about some ECMs that should be carried out for example to develop the; using the high-energy efficiency equipment, optimizing the production process, etc.</p> <table border="1"> <thead> <tr> <th>Capacity</th> <th>2020 target</th> <th>2025 target</th> </tr> </thead> <tbody> <tr> <td>Beer production – higher than 100 million liters</td> <td>140</td> <td>129</td> </tr> <tr> <td>Beer production – from 20 to 100 million liters</td> <td>215</td> <td>196</td> </tr> <tr> <td>Beer production – less than 20 million liters</td> <td>306</td> <td>286</td> </tr> <tr> <td>Beverage production – non-carbonated</td> <td>111</td> <td>107</td> </tr> <tr> <td>Beverage production – carbonated</td> <td>55</td> <td>52</td> </tr> </tbody> </table>	Capacity	2020 target	2025 target	Beer production – higher than 100 million liters	140	129	Beer production – from 20 to 100 million liters	215	196	Beer production – less than 20 million liters	306	286	Beverage production – non-carbonated	111	107	Beverage production – carbonated	55	52
Capacity	2020 target	2025 target																				
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Beverage production – non-carbonated	111	107																				
Beverage production – carbonated	55	52																				
	The minimum specific energy consumption is set for 2020 and 2025 target according to the product category (kWh/kg)	Plastic sector	Private sector	<p>Circular 38/2016/TT-BCT issued by the MOIT in 2016 has indicated the minimum specific energy consumption that the industry must follow until 2020 and 2025. The Circular mentions about some ECMs that should be carried out for example to develop the; using the high-energy efficiency equipment, optimizing the production process, etc.</p> <table border="1"> <thead> <tr> <th>Product/Purpose</th> <th>2020 target</th> <th>2025 target</th> </tr> </thead> <tbody> <tr> <td>For packaging plastic – plastic bags</td> <td>0.7</td> <td>0.55</td> </tr> <tr> <td>For packaging plastic – plastic bottles</td> <td>1.96</td> <td>1.45</td> </tr> <tr> <td>For packaging plastic – plastic packaging</td> <td>0.79</td> <td>0.62</td> </tr> <tr> <td>For construction plastics</td> <td>0.46</td> <td>0.35</td> </tr> <tr> <td>For household, technical plastics</td> <td>1.27</td> <td>1</td> </tr> </tbody> </table>	Product/Purpose	2020 target	2025 target	For packaging plastic – plastic bags	0.7	0.55	For packaging plastic – plastic bottles	1.96	1.45	For packaging plastic – plastic packaging	0.79	0.62	For construction plastics	0.46	0.35	For household, technical plastics	1.27	1
Product/Purpose	2020 target	2025 target																				
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For packaging plastic – plastic packaging	0.79	0.62																				
For construction plastics	0.46	0.35																				
For household, technical plastics	1.27	1																				
Sectorial EE improvement target	In other sectors such as Pulp and Paper; Food processing; Chemical, the circular on energy performance shall be released soon, in 2017.																					

2.2 Legislative and Regulatory Framework

Since 2003, energy efficiency improvements and rational use of energy have been addressed as key items of Vietnamese energy development policy, initially with the issuance of the Government Decree on Energy Conservation and Energy Efficiency. In 2006, the Prime Minister approved the Vietnam National Energy Efficiency Program (VNEEP) for the period 2005-2015, a first-ever comprehensive plan to institute measures for improving EEC in all sectors of the Vietnamese economy. In 2010, The Law on Energy Efficiency and Conservation is released following with several legal guidance documents, for instance the Decree 21 on detailed requirements and measures to execute the EE &C Law and Decree 134 on the sanctioning of administrative violations in the power sector, dam security and EE&C. Under the Law, circulars have been issued to give concrete direction on key issues such as planning and reporting on implementation of EE&C plans (Circular 08); EE&C measures in industrial sector (Circular 02); energy labelling for energy-consuming devices and equipment (Circular 07).

The following table describes in details the regulatory frameworks in force (building code, standard and labeling, etc.), their status and implementation year.

Table 3: Legislative and Regulatory Framework

Laws & Regulations	Status	Year	Name of Law/Regulation	Description
Law of EE	Adopted	2010	Law No. 50/2010/QH12 on Energy Efficiency and Conservation.	The Law set forth the roles and responsibilities for all actors in government and society with respect to energy efficiency: industry, residential, construction, transport, etc. The Law regulates the duties of key energy consumers to report and conduct energy audit regularly to the Department of Industry and Trade. According to this Law, MOIT shall be responsible to recommend which equipment should be subject to energy labelling and implement the energy labelling procedure. Under the Law, many regulations and guidelines have been established to regulate the energy efficiency issues.
	Adopted	2011	Decree 21/2011/ND-CP on Designated Energy Unit	Define the DEU with annual energy consumption more than 1000TOE for industrial and more than 500TOR for commercial sector
	Adopted	2011	Decision 68/2011/QD-TTG on release list of EE equipment for public procurement	List of equipment with EE label. All purchases using state funding should comply with this regulation. The list targets all public organizations to purchase energy efficient goods and equipment.

Laws & Regulations	Status	Year	Name of Law/Regulation	Description
	Adopted	2012	Circular 09/2012/TT-BCT	Regulate the reporting frameworks for energy consumption, compulsory energy audit of the DEUs and appointment of energy manager
	Adopted	2016	Decision 1357/QD-TTg	Release the list of DEU based on energy consumption 2015
	Adopted	2011	Circular 39/2011/TT-BCT	Regulate training, certification of energy manager and energy auditors
Building Code	Adopted	2013	Vietnam Energy Efficiency Building Code: QCVN 09:2013/BXD	VEEBC is released with the technical support of IFC, USAID, DEA. The code set up standards for building envelop, lighting system, air conditioning system, and other electricity consumer system in building with total floor space larger than 2'500sqm.
Standards and Labelling	Adopted	2011	Decree No. 21/2011/QD-CP on detailing the law on energy efficiency and conservation and measures for its implementation	<p>There are 4 groups of equipment be affixed with an energy efficiency rating label and be applied with minimum energy performance standard (MEPS) as follows:</p> <ul style="list-style-type: none"> › Household appliance group including tube-type fluorescent lamps, compact fluorescent lamps, electronic and electromagnetic ballasts for fluorescent lights, air conditioners, refrigerators, washing machines, electric cookers, electric fans, television, solar water heater. › Office appliance group including photocopy machine, computer monitors, printers, commercial refrigerated cabinets. › Industrial equipment including boilers, distribution transformers and electric motors › Transportation vehicle including cars (7 seats or less).
	Adopted	2014	Circular No. 07/2014/TT-BCT	The Circular defines the procedures for energy labelling, EE product testing, label certification granting and the method of label sticking. Accordingly, an endorsement label is used for products that meet a high efficiency performance standard (HEPS) which is issued by Ministry of Industry and Trade (MoIT) in certain period. Certificate of EE labelling is valid for a maximum period of 03 (three) years. Three months before the expiry of the certificate, the enterprise must apply for re-certification.
	Adopted	2008/2009	Vietnam Quality Standard No. TCVN 7896:2008 and TCVN 8249:2009 and TCVN 7897:2008	These quality standards set out the energy performance standard for compact fluorescent, fluorescent lamps as well as the electronic ballasts and magnetic ballasts in fluorescent lamps.
	Adopted	2010/2013	3 phases distribution transformer (Vietnamese	These quality standards set out the minimum energy performance as well as method to determine the minimum energy performance for the 3 phase distribution transformer, Electrical Motor, Industrial boiler.

Laws & Regulations	Status	Year	Name of Law/Regulation	Description
			Standard TCVN 8525:2010); Electrical Motor (Vietnamese Standard TCVN 7450-1:2013) Industrial boiler (Vietnamese Standard TCVN 8630:2010)	Accordingly, and with respect to the decision No 78/2013/QD-TTg, all equipment that have lower energy efficiency than the minimum energy performance should be phased out.
Agriculture sector	Adopted	2013	Circular 19/2013/BNNPTNT	Regulate EE solution in agriculture sector
Transport sector	Adopted	2014	Transportation vehicle under 7 seats	Regulate the minimum energy performance and EE labelling for car with under 7 seats
	Adopted	2011	Circular 64/2011/TT-BGTVT	Regulate EE solution in transportation sector
	Adopted	2013 2014	Car (Vietnamese standard TCVN 9854:2013) Motorcycle (Vietnamese standards TCVN 7356:2014)	Regulate minimum fuel consumption for car and motorbikes
Regulation to phase-out of old technologies	Adopted	2011	Decision No. 78/2013/QD-TTg	The Decision No. 78/2013/QD-TTg indicates a list of energy consuming vehicles and equipment that needs to be eliminated if the energy efficiency is lower than indicated according to Vietnam Quality Standard.
Regulation to apply advanced technology	Adopted (with weak enforcement)	2011	Decision No 1488/QD-TTg	This is the Master Plan for cement sector and it requires that all cement plants with capacity greater than 2500 ton of clinker per day must install the Waste Heat Recover system before 2015. However, up to now, there are only 06 plants that already implemented this solution. The major barriers are lack of financing sources and difficult economic context.
Other industrial sector	In development	2017	Circulars shall be issued by the MOIT	Under CPEE Program, benchmarking studies have been conducted for intensive energy sectors. Circulars indicate the required-on energy performance of the sectors should be issued for the industry.

Laws & Regulations	Status	Year	Name of Law/Regulation	Description
benchmarking/ specific energy consumption (food processing, pulp and paper).				In 2016, the 3 circulars for steel, beer and beverage, plastic have been issued and in 2017, 3 other circulars for food processing, pulp and paper shall also be issued.
	Adopted	2014	Circular 02/2014/TT-BCT	Regulate the EE measure in Chemical industrial including SEC (See table 1 for EE target)
	Adopted	2016	Circular 19/2016/TT-BCT	Regulate EE in beverage industry including SEC (See table 1 for EE target)
	Adopted	2016	Circular 20/2016/TT-BCT	Regulate EE in beverage industry including SEC (See table 1 for EE target)

2.3 Financial Incentives

Even there are many studies and technical assistance programs existing to promote energy efficiency in the country, it remains to support policy actions to create enabling environment for energy efficiency. Financial incentives including soft loans and EE subsidies are very limited, even absent totally. In the following table, a summary of what existing as financial incentives, status and implementation year for EE is described.

Table 4: Summary of Energy Efficiency Financial Incentives

Financial Incentive	Status	Year	Sector	Description
EE fund VEEIEs	In development	2016-2020	Key industrial sectors (cement, steel, pulp and paper, food, textile and chemical)	The World Bank has allocated \$200M to support the energy efficiency in industrial sector; especially for Intensive energy industrial sectors include cement, steel, textile, pulp and paper, food processing, bricks and ceramics. The fund will give soft and long-term loans for the eligible projects. Energy efficiency and energy saving technologies vary by industrial sub-sectors but potential energy saving measures include (i) energy systems: upgrading boilers and switching fuels, using co-generation facilities and electric-driven systems, including compressed air systems, electric chillers, machinery and lighting; (ii) process technology: upgrading and replacing equipment, machinery and facilities; and (iii) waste heat and waste use: use of waste heat (of hot/warm gases, liquids and solids) and burning combustible waste (gases, liquids, solids). Use of Renewable Energy (RE) sources in order to decrease fuel and/or electricity consumption in IEs may also be considered. Investments may include: a) co-generation facilities, or process furnaces and stoves, and b) solar water heaters for sanitary hot/warm preparation.
EE fund LCEE	Existing	2012-2020	Food (mainly seafood) and brick and ceramic sectors	The Denmark Embassy has initiated a financial mechanism to support energy efficiency investments in the food and building material sectors with total envelope reaches 6.6 Mullion USD. Accordingly, investors in EE will receive either a bank guarantee for the investments, or energy savings awards of up to 30% of the investment cost, depending on the energy savings. Project proponent must be SMEs.
EEP Mekong	Existing	2014-2018	Energy efficiency, waste-to-energy, hybrid, biomass, biofuels, biogas	EEP Mekong phase II is funded by the Ministry for Foreign Affairs of Finland with total budget of 9.1 million €. The program support is provided through Result-based financing mechanism in which financial incentives are provided after pre-agreed milestones/results have been archived and verified. The program aims to improve access of rural population to sustainable and affordable energy services and products in the Mekong countries. The aim is also to increase the climate resilience of local communities through local decentralized renewable energy solutions. The maximum amount allocated for one project is 01 million USD.

Financial Incentive	Status	Year	Sector	Description
Other domestic EE funds	Existing			There are some national funds which can be relevant for EE activities such as Vietnam Environmental Protection Fund; National Technology Fund. However, the operational procedure of these funds remains unclear to most of the investors.
Tax Benefits	Non-existent			<p>Up to present, there is no policy on tax reduction and incentives exist as direct compensation to emission reduction efforts at the plant level in Vietnam. It is expected that a new Decree on environmental protection fee levied on exhaust/flue gases would enter into force soon.</p> <p>However, the Government has introduced several tax incentives for environmental protection activities under Decree 04/2009/ND-CP including:</p> <ul style="list-style-type: none"> › Company income tax: Enterprises using high technology, carrying out scientific research or developing innovative technologies and environmentally friendly enterprises are entitled to reduced tax rate of 10% (commonly tax rate is 25%) for 15 years since the company has a turnover; tax exemption for no more than four years as well as 50% reduction of payable tax amounts for no more than nine subsequent years. › Import tax incentives: Machines, equipment, means, tools and materials for exclusive use in collection, storage, transportation, recycling and treatment of wastes are entitled to Import tax exemption to encourage enterprises to invest in waste treatment sector. › Exemption from or reduction of land use levy and land rents for such activities as prevention and reduction of air pollution; protection of environment; collection and treatment of wastewater, waste gas and solid waste; recycling or reuse of waste; production of relevant equipment. <p>The EE such as Waste-to-Energy can benefit from these incentives.</p>
EE Subsidies	Non-existent			
Energy Subsidies	Existing		Renewable energy	<p>The Government of Vietnam is encouraging power generation from renewable sources through several tariff mechanisms, including:</p> <ul style="list-style-type: none"> › Feed-in-tariff for wind power: EVN has responsibility for buying whole electric output from wind power projects at the price of VND 1,614/kwh or 7.8 US cents/kwh, of which the government supports VND 207/kwh (1.0 Scent/kwh) through VEPF; › Avoided-cost-tariff for small hydropower projects; › Feed-in-tariff for grid-connected biomass power projects: EVN has responsibility for buying whole electric surplus from biomass fired co-generation projects at the price of VND 1,220/kwh (5.8 US cents/kwh);

Financial Incentive	Status	Year	Sector	Description
				› Feed-in-tariff for grid-connected waste to energy: VND 2,114/kwh or 10.05 US cents/kwh for direct waste combustion projects and VND 1,532/kwh or 7.28 US cents/kwh for gas recovery for power generation projects from landfill site.
Relief of Custom Duties				For some sectors, such as cement sector, the GVN wants to protect the domestic producers by imposing a high import tax for these products.

Recently, the **State Bank of Vietnam (SBV)** has issued the **guideline No. 03 dated 24 March 2015 for promoting the green credit and to boost the financial institutions support in green growth, energy efficiency as well as sustainable development**. According to this, financial institutions will provide in priority the credit for EE activities, Renewable energy, and environmentally friendly technology/product, therefore, green credit from local financial institutions in the upcoming period could be a potential financial resource. Moreover, financial institutions must also report periodically to SBV about projects that are financed using green credit lines.

It is expected that this strategy will allow more credits allocated for EE activities in the coming period.

3 OVERVIEW OF ENERGY EFFICIENCY INITIATIVES IMPLEMENTED

The chart in Figure 6 represents the overall programs, both national and international donor supported program related to legal framework and strategy set by the GVN:

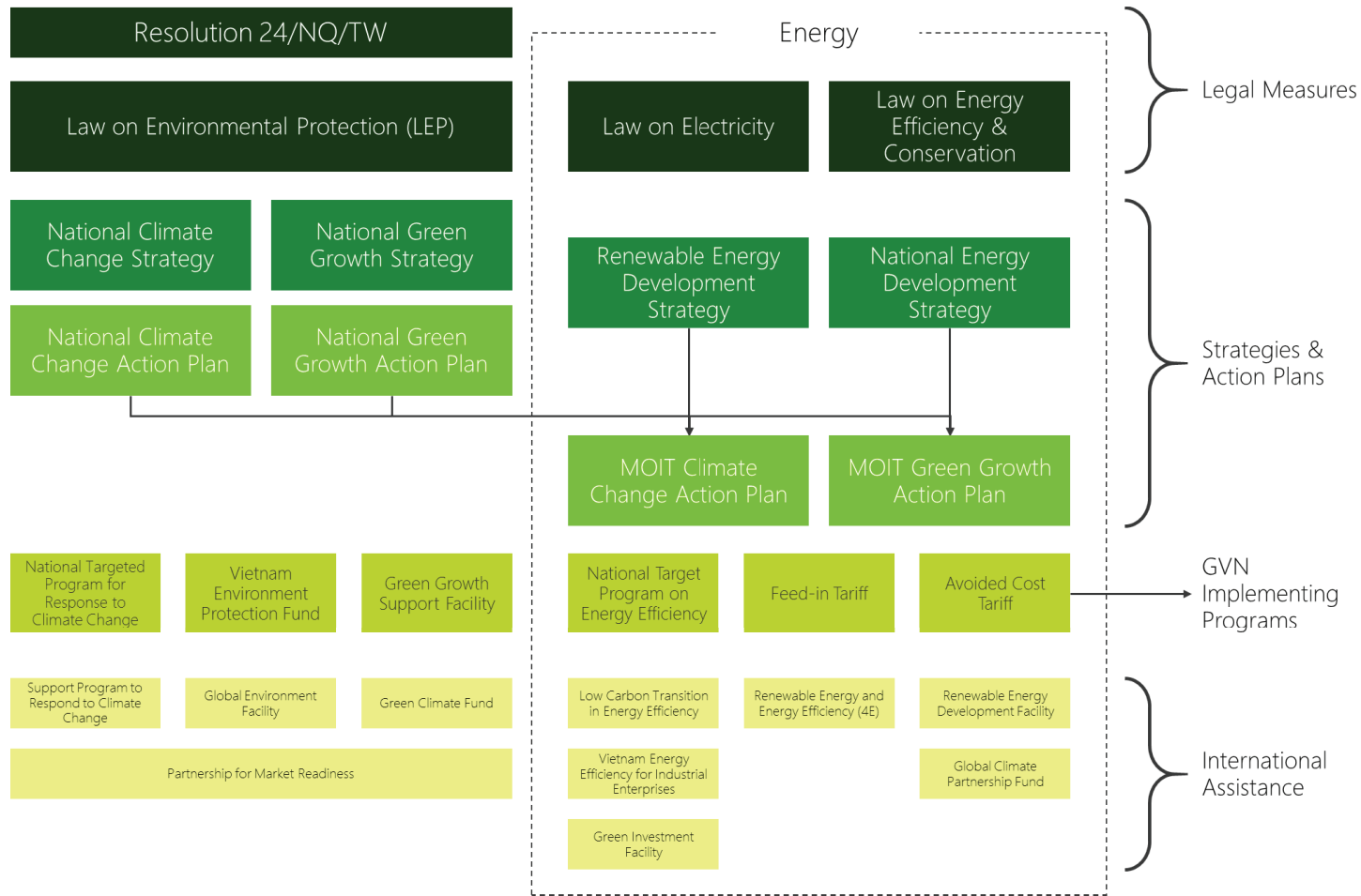


Figure 6: Energy efficiency, Green Growth and Climate Change related projects/programs

In general, there are two main strategies in Vietnam currently relating to Climate Change (The National Climate Change Strategy) and the Green Growth development (National Green Growth strategy). Under the two strategies, the GVN develops two relevant action plans with different funding and programs have been implemented under these actions including: NTP-RCC, SP-RCC, GGSF and some funds such as Vietnam Environment Protection Fund, Global Environment Facility (Funded by WB), Green Climate Fund (UNFCCC).

In Energy sector, the governing documents are Renewable Energy Development Strategy and National Energy Development Strategy. Relating to energy efficiency, the national target program on Energy Efficiency (VNEEP) has been initiated since 2006 and has contributed on the overall EE target of the GVN. Under the framework of VNEEP, international donors have brought their supports, both in TA (Renewable energy and Energy efficiency by GIZ) and funding (VEEIE by WB and LCEE by Danish embassy). Those are the programs that are working actively in Vietnam to support for EE and RE projects.

The next section shall provide a description of each programs relating to energy efficiency.

3.1 Domestic Energy Efficiency Programs

Desk review shows that a limited amount of Climate Change -spending from the Central budget focused on mitigation (i.e. 10% of total spending) including energy efficiency related activities. National Target Program on Energy Efficiency managed by MOIT used to be the main channel for EE in energy field including EE in industrial sector. In the next period, with some relevant actions under VGGS, some EE in industrial sectors can be fit accordingly.

A summary of programs is listed in the following table:

Table 5: Summary of Energy Efficiency Relevant Programs

Program Name	Institution	Sector	Description	Measures/Activities	Year	Budget
Vietnam Green Growth Strategy/Action Plan	Ministries and Provinces State bank of Vietnam	All sector	To move towards low carbon economy and sustainable development. Actions including energy efficiency; GHG reduction; Green growth investment	Improve EE in enterprises in most energy-intensive sectors : Apply advance standards and technical norms to improve EE in production activities in enterprises in most consuming energy sectors (electricity, cement, steel, fabric, transportation, ...)	Until 2020	n.a

Program Name	Institution	Sector	Description	Measures/Activities	Year	Budget
Viet Nam Energy Efficiency Program	MOIT	Industry/Transport and Residential sector	To increase end-use energy efficiency in order to reduce energy consumption, ensuring energy security, environmental protection and sustainable development.	<p>In industry sector, VNEEP aims to promote:</p> <ul style="list-style-type: none"> › Standard and labeling › Equipment manufacture › Production enterprises › Energy management model › Access to financial sources <p>In residential sector, programs have been implemented:</p> <ul style="list-style-type: none"> › Provide incentives to develop solar water heaters in household sectors › Issue building code for new building relating to energy efficiency › Support to develop biogas in household. 	2011-2015	335 billion VND

3.2 Summary of International Support in Energy Efficiency

VNEEP has been successful in creating a platform to receive different funding and Technical assistance from international donors with many programs and projects that have been implemented under VNEEP objective. Even the support are mainly technical assistance without financing sources, they help to increase the capacity relating to energy efficiency significantly. Implementing energy audit, reducing specific energy consumption, optimizing the energy cost are now becoming part of the main regular tasks of the industry thanks to all of the programs. In the coming period, the industry expects to approach more financing sources to implement these measures. World Bank, IFC and other donors are now ready to provide such financial supports to the industry through VEEIE and other envelopes.

The table below provides a brief summary of international support in energy efficiency in the country.

Table 6: Summary of International Energy Efficiency Projects in the Country

Institution	Program	Objective	Activities	Budget	Status
IFC, Techcombank	Vietnam Energy Efficiency and Cleaner Production Financing Program	The EECF Financing Program is an integral part of International Finance Corporation (IFC)'s global Sustainable Energy Finance (SEF) Program.	These projects generally focus on replacement of equipment/ technology in order to modernize and improve the production process, the generation of	25 million USD	In process

Institution	Program	Objective	Activities	Budget	Status
		Under the context of this program, IFC has mostly cooperated with Techcombank in providing EECF loans for SME and IFC is also advising Vietinbank and Sacombank to develop EECF financing products for local SMEs.	renewable energy, and the use of energy in industrial and commercial buildings. Typical project priorities include one or more of the following: Generic energy equipment (lighting, HVAC, pumps, motors, boilers, compressors); Industry-specific process equipment and technology; Co-generation or tri-generation systems, waste heat recovery for heat or electricity generation; Waste minimization and captive renewable energy applications.		
AFD/MOIT	Establishment of an energy saving scheme in steel sector in Vietnam	Review on production process, conduct energy audit, develop benchmark of different types of energy efficiency	Energy audit Identify potential energy savings in the sector Support MOIT to issue a circular on Specific energy consumption in steel sector	Technical Assistance	Completed
UNIDO	Strengthening capacity on climate change initiatives in Industry and Trade in Vietnam		Identify policy and market barriers to commercial viable investments to reduce GHG emissions. Capacity building for policy makers to develop evidence-based policy measures to promote sustainable industrial development. Identify and address the MRV needs to form the basis of future NAMAs in Vietnam. Improve the market for sustainable industrial production.	N/A	Completed
Nordic Development Fund Ministry of Construction	Nordic partnership initiative: Cement sector pilot program in Vietnam	Support MOC to develop NAMA scheme in cement sector	Develop a solid database on the cement sector which is handled by MOC Prepare a Readiness Plan for the Cement sector, developing towards a low carbon pathway	1.6M USD	Completed

Institution	Program	Objective	Activities	Budget	Status
			Identify different measures to reduce carbon emissions including energy efficiency		
UNIDO MOIT	Promoting industrial EE through system optimization and energy management standards, pilot project		Evaluation energy using in cooling, heating, compressed air systems Set up energy management system in pulp and paper facilities	n/a	completed
GEF	Cleaner production and energy efficiency	To develop a benchmark on energy consumption for pulp and paper sector; chemical sector; beer and beverage sector, plastic sector.	Energy audit Identify potential energy savings in the sector Support MOIT to issue a circular on Specific energy consumption in these sectors	n/a	Completed
The World Bank (a TA component of the VEEIE)	Food Processing Industry – Strategic Sector Study and Subproject Pipeline Development for Improving Energy Efficiency with Integrated Ozone and Climate Benefits	Conduct benchmark for energy efficiency in several sub-sectors in food processing, including seafood process. Identify 10 potential energy efficiency investment plans	Energy audit Identify potential energy savings in the sector at investment grade level Support MOIT to issue a circular on Specific energy consumption in steel sector	n/a	Completed
Danish embassy	Low carbon transition in energy efficiency	Promoting energy efficiency in SMEs	Energy audits Energy savings potential identification	n/a	On-going
GIZ	Energy support Program	The Program aims to contribute to Viet Nam's emissions reduction strategy and green growth strategy by improving the existing regulatory framework for Renewable Energy (RE) and Energy Efficiency (EE) and increasing the professional and organizational capacities of key institutions and stakeholders.	Legal and Regulatory Framework conditions Capacity development Technology cooperation		On-going

Institution	Program	Objective	Activities	Budget	Status
EU	Multiannual Indicative Program	<p>Two following sectors will be the main focus of EU support under the Multiannual Indicative Program (MIP Vietnam):</p> <ul style="list-style-type: none"> › Sustainable Energy › Governance and Rule of Law <p>Under Sustainable Energy axe: support for energy access in rural area, increase of share of renewable energy and energy efficiency and infrastructure development.</p>	undefined	undefined	On-going

4 ENERGY EFFICIENCY MARKET

4.1 Key Players in the Energy Efficiency Market

The figure below illustrates the current relationship between stakeholders and facilities in energy efficiency activities in Vietnam. A stakeholder should be any person, agent or organization who can be positively or negatively impacted by, or cause an impact on the actions of an organization, initiative or action.

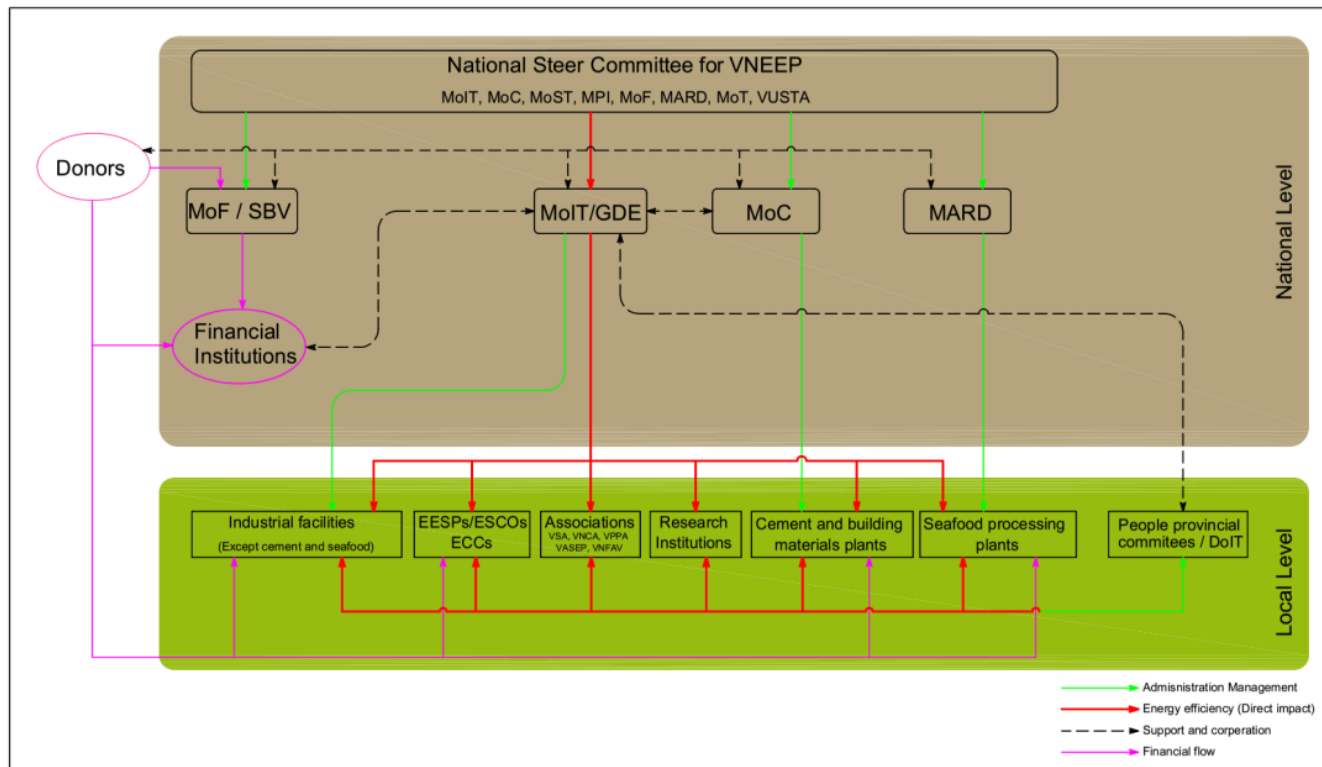


Figure 7: Existing stakeholders mapping for energy efficiency in Vietnam

The diagram shows two different levels: National level and provincial level are distinguished by two different colored frames (grey and light green).

At national level, the National Steering committee for VNEEP is the focal point for coordinating the activities of VNEEP. The committee includes the involvement of several ministries such as MoIT, MoC, MPI, MARD, MoT, MoF and VUSTA. MoIT is assigned as the focal point to conduct implementation. In the targeted sectors (steel, cement, chemicals, pulp and paper, seafood processing, etc.), cement sector is under management of MoC, seafood processing is under management of MARD, and others are belonged to MoIT. Therefore, at the national level, the MoC and MARD are shown alongside MoIT to present administrative relations between these ministries and enterprises (green lines).

Relating to energy efficiency relationship between MoIT (a focal point) and enterprises is shown by the red line. In particular, the National Steering committee dedicates MoIT/GDE the full responsibility to implement VNEEP. Then MOIT/GDE organizes activities to support and promote enterprises implement energy efficiency at local level.

At local level, there are targeted industrial enterprises, service providers (EESPs and ESCOs), associations (Vietnam Cement Association, VASEP, VSA, etc.), research institutions (research centers, universities, etc.). The energy efficiency activities can be deployed directly from MOIT/GDE to industrial enterprises, or through the EESP/ESCO to support industrial enterprises, such as supporting to conduct energy audit.

In addition, the provincial People's Committee (through DoIT) will perform the encouragement and supervision, inspection, particularly intensive energy consumers, implementation of energy saving activities. Besides, DoIT collects energy use reports and energy efficiency plans of the intensive energy consumers (green lines). Annually, DoIT performs synthesis and reports to MOIT/GDE the energy consumption as well as energy saving achievements (black dashed line).

To ensure effective coordination between sectors, MOIT/GDE performs operational coordination with other ministries (MoC, MARD, MoF) through the black dotted line to promote the enterprises.

For the donors, some donors provide technical assistance, or policy development directly to the ministries (shown by the blue dashed line), or direct financial support to enterprises (grant) or through the MoF/SBV (purple line).

Typically, financial assistance through the MoF/SBV would be loans, then through credit institutions to provide to enterprises to implement energy saving measures (purple line), and the enterprises are obliged to return these loans. In fact, due to the credit institutions do not have sufficient capacity to appraise and assess energy saving projects, thus MoIT/GDE usually takes a part to assess technical efficiency and guarantee feasibility of project, as well as recommending support mechanisms for compensation according to the results achieved by the project, for example LCEE project (www.lcee.vn) (black dashed line).

Some EESPs/ESCOs also access these funds and provide to enterprises in term of performance contract.

The relevant stakeholders are listed and described their role, function, political mandate and responsibilities in the context of the energy efficiency in Vietnam. The following table shows the most relevant stakeholders, summarizes its content and limits the related information only to the description and role of the key stakeholders.

Table 7: Summary of Energy Efficiency Market Players

No.	Key stakeholder	Description and role
I	Government agencies	
1	Ministry of Industry and Trade (MOIT)	MOIT is responsible for the state management of industry and trade, including power (electricity, new energy, renewable energy, oil and gas). MOIT is in charge of leading and coordinating relevant ministries, agencies and localities to implement the National Targeted Program for Energy Efficiency, and is involved in relevant mitigation projects financed by ADB, UNDP, AFD, and the WB, etc.
1.2	<i>General Directorate of Energy (GDE)</i>	GDE belongs to MOIT, and it's responsible for assisting the Minister in the State management and oversight of the energy sector (power, nuclear power, oil, coal, new energy, renewable energy, energy efficiency and conservation).
2	Ministry of Construction (MOC)	MOC is the Ministry responsible for public management of the cement industry, including the following tasks ³ : <ul style="list-style-type: none"> - Develop and propose the development master plan of the cement industry to the Prime Minister for approval, and supervise its implementation upon approval; - Propose mechanisms and policies for the sustainable development of the cement industry; - Cooperate with MONRE and MOIT in the assessment of mineral mining use and application for the cement production; - Promulgate technical regulations for the production of cement.
3	Ministry of Planning and Investment (MPI)	MPI performs public sector management over planning and investment, setting the socio-economic development strategies and plans, economic management mechanisms and policies for the national economy, domestic and foreign investments. MPI is in charge of leading and coordinating relevant ministries, agencies and localities to integrate mitigation actions into the green growth strategy to be in line with general emission reduction directions of the economy and the low carbon development scenarios developed by relevant ministries and agencies ⁴ . MPI is also preparing green growth investment guidelines to give instructions to line ministries. MPI is the National Designated Authority (NDA) for GCF.
4	Ministry of Finance (MOF)	MOF performs the public management of financial matters, including but not limited to: management and assignment of the state budget; management, collection and enforcement of tax, fees and other public financial revenues; management of the national reserve; management of public financial funds, financial investment, corporate finance and financial services); customs; accounting; independent auditing; insurance; prices; securities; conducting the ownership rights to the State's investment capital in enterprises.
5	Ministry of Agriculture and Rural Development (MARD)	MARD is a governmental agency performing state management functions in the fields of agriculture, forestry, salt production, fishery, irrigation/water services and rural development nationwide, including state management functions with regard to delivery of public service in accordance with legal documents.

³ According to Decree No.62/2013/ND-CP dated 25/6/2013 of the Government

⁴ Decision 1775/QĐ-TTg of the Prime Minister dated 21 November 2012 on plan for GHG emission management and management of carbon trading to the world market

No.	Key stakeholder	Description and role
6	People provincial committee (Department of industry and trade – DoIT)	DoIT takes a role as government agency to perform state management with all industrial enterprises at provincial levels. In energy efficiency and energy consumption, DoIT promotes, encourages enterprises through supporting projects, and conducts investigations and testing, as well as collect relevant reports from enterprises then summaries and reports to MoIT frequently.
II Facilities		
1	Private consultancy entities (ESCOs/Research institutions)	There are a number of private consultancy entities that are involved in the cement sector, basically providing advisory services. No specific company is relevant enough to be a key stakeholder, but the private consulting “sector” will be featured in the Stakeholder Maps, as it plays a key role in relation to the existing institutional and regulatory set-up of the sector, and similarly will be also a key player in the institutional and regulatory framework.
2	Private service & equipment providers (EESPs)	Similarly as above, there are large numbers of private sector service and equipment providers that are involved in the sector; however, not all are key stakeholders in relation to the institutional & regulatory. While no specific company is relevant enough to be a key stakeholder in itself, however, the private service and equipment providers “sector” is considered of key relevance, and will be featured in the Stakeholder Maps.
3	Associations	There are 5 associations of 5 targeted industrial sectors, Vietnam Steel Association (VSA), Vietnam Cement Association (VNCA), Vietnam Fertilizer Association (VNFAV), Vietnam Pulp and Paper Association, and Vietnam Association of seafood exporters and producers (VASEP). These associations play a key role to promote energy efficiency in member’s enterprises and broadcast the results.
III Financial institutions in Vietnam		
1	State Bank of Vietnam (SBV)	SBV is a ministerial agency of the Government - the Central Bank of the Socialist Republic of Vietnam performing the state management of monetary and banking activities and foreign exchange; performs the issuance of money, acts as the bank of credit institutions and provides monetary services for the Government; and performs the state management of public services under the jurisdiction of the State Bank.
2	Commercial banks (financial institutions)	There are a number of commercial banks that are providing loans in the industrial sectors. While no specific bank is relevant enough to be a key stakeholder in itself, however, the commercial banks “as a whole” is considered of key relevance, and will be featured in the Stakeholder Maps.
IV International development agencies, partnerships and funds (donors)		
1	Nordic Development Fund (NDF)	NDF has been directly or indirectly providing fund for several climate change mitigation efforts in Vietnam. NDF has financed 14.9 million EURO for climate change related projects in Vietnam and in the region (covering Vietnam). This project is part of the Nordic Partnership Initiative on Up-scaled Mitigation Action (NPI) in Peru and Vietnam since 2011.
2	Climate funds (NAMA Facility and GCF)	NAMA facility and GCF are the most potential sources of funding for NAMA proposals at present. USD 10.2 billion has been contributed to the GCF to date and the goal of the Fund is to raise USD 100 billion per year by 2020.

No.	Key stakeholder	Description and role
3	Japan International Cooperation Agency (JICA)	<p>Since 2008, Japan's official development assistance loan provided by Japan bank for international cooperation and the grant aid disbursed by the Ministry of Foreign Affairs are being oversea by JICA. A feasibility study on energy efficiency loans under this program was processed. This was likely to include financing to purchase high efficiency equipment. JICA also has undertaken a study on National energy master plan in Vietnam to (i) develop National Energy Master plan to 2050 including energy security, power sources, emission, energy efficiency, renewable energy, etc.; (b) develop a national database for socio-economic and energy data; (c) build capacity of bodies under MoIT. JICA is now still support Vietnam toward energy efficiency</p>
4	United Nations development program (UNDP)	<p>UNDP has been supporting Vietnam since 1977. Energy and environment is one of the focal areas for the UNDP's work in the country. Key components, focused by UNDP, were composed of six integrated components: (i) policy and institutional support development; (ii) communications and awareness; (iii) technical capacity development; (iv) energy-efficiency services provision support; (v) financing support; and (vi) demonstrations. UNDP also supported for activities under advanced preparation: public lighting efficiency project; national clean production program for Vietnam; appliance labeling and standards program; incandescent lamp phase out program; initiatives on energy-efficiency building codes, capacity building for implementation of the energy conservation law, promotion of Energy Management Standards via the proposed International Organization for Standardization (ISO) 50001 Energy Management Standard, and assistance for the coordination of climate change adaption and mitigation efforts.</p>
5	The World Bank Group (WB)	<p>The International Development Association (IDA) has been supporting energy efficiency efforts in Vietnam since 1997. Its program began with a technical assistance grant provided by the Swedish International Development Agency (SIDA) administered by IDA, for: (i) DSM planning and pilots with EVN; (ii) initiation load management and research functions, also with EVN; (iii) development of initial equipment standards with MOST; and (iv) development of a commercial building code with the MOC.</p> <p>The International Finance Corporation (IFC) has been developing investment projects with Saigon Thuong Tin Commercial Joint Stock Bank (Sacombank) and Technological and Commercial Joint Stock Bank (Techcombank). The investment project with Sacombank is a credit linked guarantee, which will back a local currency loan to Sacombank of up to US\$50 million-equivalent. Funds may be provided through local life insurance companies or directly. Financing to support Techcombank's medium- and long-term lending activities to local SMEs is also being considered.</p> <p>As part of its growing Environmental and Social Sustainability Program, the IFC recently approved Phase 1 of Vietnam Cleaner Production and Energy-Efficiency Program (CPEE). The project will span at least three years. Phase 1 includes US\$1.6 million of financing from the Mekong Private Sector Development Facility, a large multi-donor trust fund managed by IFC. The objective of the CPEE is to promote investment in cleaner production and energy efficiency (CPEE) projects by Vietnamese financial institutions. The program will consists of three aspects: (i) advisory and investment services to selected financial institutions, (ii) technical assistance to develop the consultancy market for CPEE investments, and (iii) promotion activities to increase awareness among local industries.</p>

No.	Key stakeholder	Description and role
6	Agence Française de Développement (AFD)	<p>The support of AFD for Vietnam's development targets is set out in the Partnership Framework Document signed between France and Vietnam in 2006. One of the AFD's support efforts was to develop and modernize financial, banking, and non-banking sectors.</p> <p>The AFD activities support financial sector reforms and small and medium enterprise (SME) development.</p> <p>The AFD cosponsored a symposium on energy-efficiency policies in Vietnam, which was held in Ho Chi Minh City in April 2008 as part of French Week in Vietnam. Other ongoing support from the AFD to the energy sector in Vietnam includes hydropower investments, load management and DSM, CO2 emission mitigation efforts, and provision of modern energy access for all. Early ideas for future activities include development of urban energy-efficiency strategies and perhaps the establishment of credit lines to support energy-efficient construction in the housing sector.</p>
7	Asian Development Bank (ADB)	<p>ADB has launched a technical assistance program to promote energy conservation in industrial sectors in Vietnam. The technical assistance included (i) industrial survey of energy consumption; (ii) energy management training; (iii) energy audit in selected intensive industrial sectors, e.g. steel; (iv) training ESCO and energy conservation service providers; (v) develop a feasible financing mechanisms to promote energy efficiency in Vietnam</p>
8	Danish International Development Agency (DANIDA)	<p>DANIDA's programs in Vietnam are aligned with the government's Socio-Economic Development Plan 2006–2010. The Environment Program is intended to focus on three thematic areas that include (a) urban and industrial environmental management, (b) sustainable energy, and (c) management of natural resources. Danish programs generally aim to build capacity and knowledge in Vietnamese institutions and to target key sectors identified by the Vietnamese government. DANIDA has approved a multiyear technical assistance program to directly support MOIT's energy efficiency program. The program is expected to focus primarily on technical training for energy managers and auditors or consultants, industrial energy audits, and economic incentives for the implementation of audit recommendations</p>
9	Swiss Development Cooperation (SDC)	<p>In some specific energy efficiency areas, the Swiss Development Cooperation (SDC) has been collaborating with UNIDO in the establishment of a national focal point for the promotion and implementation of eco-efficient industrial production through the Vietnam Cleaner Production Center (VNCPC) under the Hanoi University of Technology. Phase 2 (2005–2008) sought to operationalize VNCPC fully and make it financially sustainable. SDC has also implemented an energy efficiency and environmental management project in the brick-making industry. The SDC assisted in the identification and promotion of economic and environmentally viable brick production processes within the framework of the Nam Dinh Urban Development Project. The project included the upgraded design and demonstration of a local tunnel kiln.</p> <p>The Swiss State Secretariat for Economic Affairs (SECO) established a trust fund with the VNCPC that provides partial credit guarantees and incentive grants for cleaner production (such as pollution prevention, energy efficiency, water and material recycling, and so forth). This Green Credit Line works with three commercial banks (Techcombank, Asia Commercial Bank, and Vietnam International Bank). VNCPC reviews applications and, if approved, provides a grant incentive based on the amount of environmental impact reduction (that is, reduced pollution and resource use). Applicants can also request up to a 50 percent guarantee for associated loans, if needed</p>

No.	Key stakeholder	Description and role
10	United Nations of Industrial development organization (UNIDO)	UNIDO is mainly supporting Vietnam to apply and transfer low carbon and climate-friendly technologies toward green growth. In the same way, UNIDO has been funding to conduct advance studies for several sectors, such as benchmarking, energy audit, etc.

5 BARRIERS AND CHALLENGES

Table below describes the barriers and challenges specific to the country's context in implementing and improving EE and the possible solutions.

Table 8: Summary of Barriers to Energy Efficiency Implementation

Barriers	Justification/Description	Potential Solutions
Regulations and legislative framework	Even with the Law on Energy Savings and Conservation, it can be noticed there are lack of enforcement protocols including penalties for non-compliance, except some minor penalties for not conducting energy audit.	Review and revise some term of the Law to facilitate the enforcement of the Law. Enforce other government agencies (MOC, MOT, MPT...) in
	Energy reporting systems ⁵ are weak, usually delay and low accuracy.	Review and redesign a better reporting system for reporting and monitor of the EE in enterprises. The system should enlarge the number of compulsory reporting enterprises. The reporting protocol should include function to evaluate the EE potential.
	Lack of legal regulation for EPC and ESCO model	The authority should release regulation related to ESCO model, energy performance contract
	The next phase of VNEEP is not clear, probably will be phased out, EE activities will be integrated in another GG&CC target program	MOIT proposed to continue VNEEP from 2016 to play as leverage for EE activities.
Finance Mechanism	There are no incentives including tax incentives and other benefits have been identified for energy efficiency. National target program such as VNEEP supports only a part of energy audit fee for certain plant. Enterprises are lacks capital or do not have access to favorable loan to invest in EE measures	MOIT should raise and maintain EE funds to provide financial loan to EE investments. The access to such fund should be easy and encouraging for enterprises to apply. More options are under investigated are ESCO model and Carbon tax.
Knowledge and Capacity	Even the awareness about energy efficiency have been raised significantly in the recent years thanks to VNEEP, however, industry and private sector still need capacity building in some specific areas such as ESCO mechanism, Energy Performance Contract, IMPV, BAT, BATP, how to identify and develop bankable projects, the capacity to evaluate energy efficiency potentials of financial institutions.	Some training programs should be developed and brought to the stakeholders (including financial institutions, industry and energy service providers).

⁵ The high energy consumers need to report their energy consumption to the department of industry and trade (DOIT) at provincial level. DOIT must report this to MOIT annually. Another system is that all enterprises shall respond to General Statistics Office (GSO) all production data including energy consumption.

Barriers	Justification/Description	Potential Solutions
	DEU perform energy audit just to meet the requirement and do not care about the quality	Improve reporting framework to help DEU to evaluate their efficiency
	Lacks quality EE consultant, auditor, ESCO in the market.	Organize internationally certified auditor, more deep technical training for consultant and auditor in international tools/protocols...
Transaction Costs	Some financial supporting packages that have been created but it is not attractive because the size of the loan is small and the approval procedures are too complicated.	Financial institutions should have dedicated division/staff working with EE investment application with different KPI than other loans.
Perceived Risk	Financial institutions usually consider investment in EE as high risk and high transaction costs.	Training and capacity building for FI staffs. GoV should establish a guarantee facility to share risk with FI in EE projects
	Enterprises consider EE as lower priority while putting more effort in investment in solutions to increase production. There also a risk that the installation of EE solution could influence in the production.	Capacity building for energy manager in industrial enterprises. Energy management system should be operating in enterprises.
Energy Cost	Low energy price demotivates stakeholders to invest in ECMs. Power tariff currently being 1'622VND/kWh equivalent to 7'31UScent/kWh is significant lower compare to China 10.04UScent, Thailand 11.81UScent.	A more clear pathway to increase electricity price should be put in place and be accessible to all stakeholders
Incentives to invest in EE	There is lack of incentives for enterprises/ESCO to invest in ECM. Considering the existence of all above mentioned barriers, the financial incentives is the most viable tool to catalyze the EE investment	Design a carbon purchasing facility to provide incentives to EE projects. Subsidy quality energy audits and EE investment report. Tax exemption could be an option for development of ESCO business.
Weak energy database	There are energy database collected and managed by the General Statistic Office and GDE/MOIT, but the quality of data is not verified. The reporting procedures on energy consumption in the industry are still heavy to the industry with both MOIT and GSO involvement.	MOIT is now working with several programs to consolidate the energy data, developing a tool to manage the energy consumption at sectoral data.

6 ENERGY EFFICIENCY POTENTIAL

The VNEEP program (phase 2) has announced officially its results and achievements. The target to reduce energy consumption has achieved 6.18% (10'101 MTOE) in 2012-2015 period compared to BAU. Based on the data provided by VNEEP and from the General Statistic Office (GSO) on economic situation of Vietnam, the Consultant consolidate, compile and analyze energy data in coherent with the economic development context from 2010 to 2020. The final objective is to make a simulation to estimate the energy efficiency potential in each sector (compared to BAU 2016) for the next 05 years' period making a hypothesis that VNEEP will extend its activities in the next period. We enclosed the statistic and the projection of the energy density per GDP in the figure 7: Energy consumption per GDP projection

However, GDE estimates technical potential on energy efficiency is approx. 25-40% for industrial sector (GDE's presentation review on VNEEP phase 2, 13/12/2016). We could not have more details on how the figured are calculated and we assumed that the estimation will not be scope of work for this assignment.

Table 9: Summary of EE Potential per Sector in the Country

Sector	Potential (% or potential kW reduction)	Reference (study)	Description of Possible Activities and Implementation Capacity
Residential	11%	<i>Projection of energy consumption situation in case that VNEEP will continue its activities to 2020.</i>	<p>It's likely that VNEEP will continue in the next period with the following activities:</p> <p>Policies and Institutional Arrangement Institutional set-up: Coordination/integration of EE objectives in national climate changes, GHG emission, green growth program to leverage the resources. Regarding to EE national wide, MOIT/GDE shall focus on the industrial sector where it has dominant role to manage. The sectors which are under other line ministries' management shall be coordinated and target shared with MOIT.</p> <p>Capacity Building Capacity building program for financial private sector (ESCO, EESP) and banks in terms of EE project assessment and evaluation. Capacity building program for provincial stakeholders for energy monitoring of designated energy units and Industrial zones.</p> <p>Technical Assistance Technical assistance for promoting production and commercialization of EE equipment; Development of ESCO model and promotion of ESCO market. MOIT/GDE shall continue supporting training/certification/contract standard/MRV for ESCOs.</p>
Transport Sector	18%		
Commercial	9%		

Sector	Potential (% or potential kW reduction)	Reference (study)	Description of Possible Activities and Implementation Capacity
			<p>Development of official MRV guidelines for energy efficiency activities</p> <p>EE benchmarking for each industrial sector should be developed and updated regularly.</p> <p>Financing</p> <p>Development of EE supporting funds for SME, an option is to extend the DANIDA Green Investment Fund⁶ to cover more sectors and top up with other donors' supports.</p> <p>Development of carbon finance program or Credit Purchasing Facility (CPF) -</p> <p>Development of EE supporting funds (soft loan, guarantees) for large-scale firms and designated energy units. There are multilateral funds such as GCF, WB, etc. or bilateral funds from developed countries. Usually, it requires fund raising skills. MOIT/GDE shall consider hiring international consultant for this job.</p> <p>Promotion</p> <p>Promoting continuously the transformation of energy efficiency market for household, industrial and commercial products and energy efficiency labelling activities. The labelling and MEPS program should continue as it shows effectiveness in recent years.</p> <p>Awareness raising for industry about energy efficiency investment projects, EE technology, and on energy management system and ISO 50001. This can be done by regularly organizing technical workshop for energy managers in facilities in the same sector.</p>
Industrial			
Cement sector	16%	<p>Projection of energy consumption situation in case that VNEEP will continue its activities to 2020.</p> <p>and</p> <p>Nationally Appropriate Mitigation Action for Vietnam Cement Sector</p>	<p>The most potential mitigation measures in cement sector are:</p> <ul style="list-style-type: none"> › Process knowhow, control and management & Diagnostic energy audits › Modern automation and control systems › Clinker cooler modification › Retrofit to modern multi-channel burner › Waste heat recovery (WHR) › BAT for alternative fuels – replacing fossil fuels <p>The following activities should be implemented in the near future by MOC to increase the capacity of sector to implement low carbon options:</p> <ul style="list-style-type: none"> › Prepare application for donor support to the enabling activities

⁶ Green Investment Fund Green Investment Facility (GIF) was launched by Ministry of Industry and Trade of Vietnam (MOIT) and the Danish government in June 2015. The Facility was established as a pilot with US\$ 6M to prove the concept of this new financial design

Sector	Potential (% or potential kW reduction)	Reference (study)	Description of Possible Activities and Implementation Capacity
			<ul style="list-style-type: none"> › Incorporating GHG mitigation targets and measures into the next revision of the Mater Plan and developing policy incentives for EE improvement as part of the Green Growth/ Climate Change Action Plan of MOC; › Introduce legislation on reporting energy consumption › Design and setting up Facility for the carbon credit backed energy saving guarantee mechanism (CESGM); › Capacity building activities.
Food sector (Sugar and Seafood sub-sectors)	20%	Vietnam Energy Efficiency for Industrial Enterprises	<p>The most potential ECMs in seafood sub-sectors are:</p> <ul style="list-style-type: none"> › Switching low efficiency compressors to higher efficiency compressor technologies › Using chilled water instead of mixing ice-water › Waste heat recovery from cooling system to pre-heat hot water › Air cooler defrost system › Freezing store doors › Water pump frequency converters <p>The most potential ECMs in sugar sub-sectors are:</p> <ul style="list-style-type: none"> › Boiler-water tank and pipeline insulation › Installation of VSD for compressor › Investing a bagasse dryer › Installing VSD for secondary fans of the boiler system › Installation of VSD for pump system
Steel	24%	Projection of energy consumption situation in case that VNEEP will continue its activities to 2020. And establishment of an energy saving scheme in steel sector in Vietnam	The most savings potentials are located in sub-sectors such as coke oven, blast furnace, steel sheet, steel pipe sub-sectors.

Sector	Potential (% or potential kW reduction)	Reference (study)	Description of Possible Activities and Implementation Capacity
Pulp and Paper sector	1.5%	Clean Production and Energy Efficiency in Vietnam And Projection of energy consumption situation in case that VNEEP will continue its activities to 2020.	<p>The most potential ECMs are:</p> <ul style="list-style-type: none"> › Energy management › Hood improvement › Product moisture control › VSD installation › Improve steam system › High efficiency vacuum pump › Thermal vapor compressor › Overall control system of air compressor station › Stationary siphons › Wide nip press (shoe press) › Steam-box › Anaerobic WWTP › CHP system
Textile and Leather	7.8%	Clean Production and Energy Efficiency in Vietnam And Projection of energy consumption situation in case that VNEEP will continue its activities to 2020.	<p>Most potential ECMs existing are:</p> <ul style="list-style-type: none"> › Fuel savings from leak detection, preventive, maintenance, improved cleaning › Reuse cooling water › Reuse condensate › Reuse process water › Recover heat from hot water › Improve boiler efficiency; prescreen coal; Insulate boiler and economizer › Maintenance steam traps and system; maintain steam traps; repair steam leaks › Insulate equipment and tanks › Recover heat from hot air › Optimize compressed-air system

Sector	Potential (% or potential kW reduction)	Reference (study)	Description of Possible Activities and Implementation Capacity
Chemical	10%	Clean Production and Energy Efficiency in Vietnam And Projection of energy consumption situation in case that VNEEP will continue its activities to 2020.	<p>The most potential ECMs are:</p> <ul style="list-style-type: none"> › Biomass gasification › Switching existing top air bubbling tank to fine air bubbling tank › Wet drying to dry grinding in SSP-01 › Ore Screening in SSP › Recycle anthracite with bio-char › Integrated gasification and combined cycle (IGCC) › Using rice husk instead of coal for FMP drying › Biogas recovery › Optimization of system at Urea G02 › Optimization of system at Urea G01 › Recycling waste water in FMP › Lighting system improvement › Motor system improvement › Appliance VSD for motor drives › Appliance of high performance motor

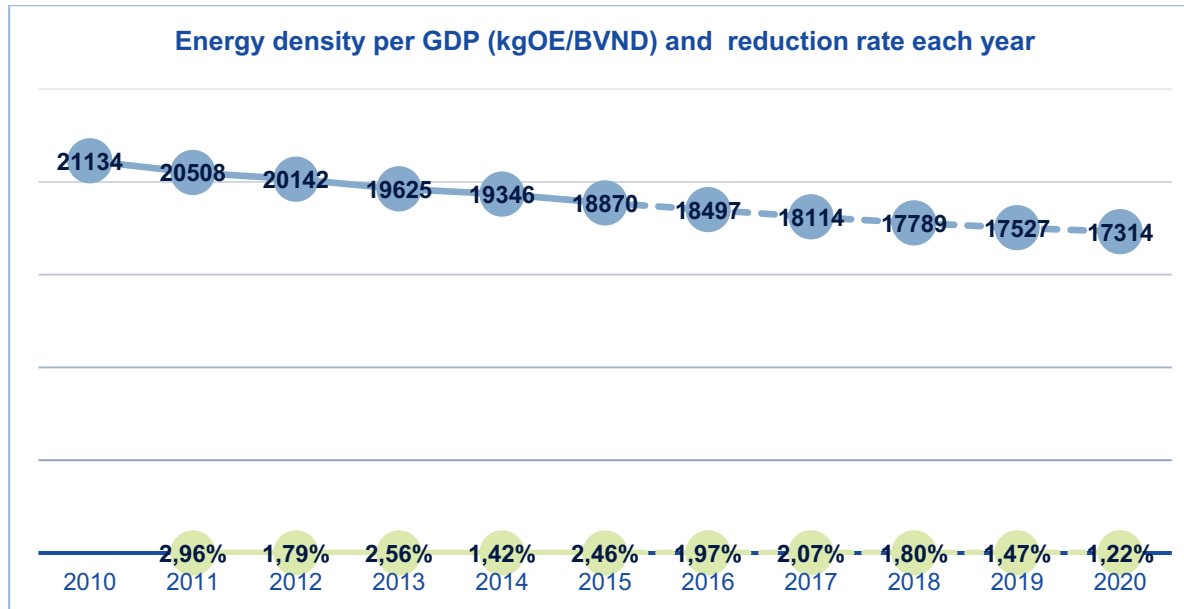


Figure 8: Energy consumption per GDP projection

7 CONCLUSION

Overall, a starting point to improve Energy efficiency is to insert the climate change and green growth related objectives into provincial and ministerial social-economic planning. It has been noted that MPI is starting doing this work in several provinces (Quang Ninh, Ben Tre, Da Lat, Bac Ninh, Quang Nam, Ninh Thuan, Ha Tinh, Binh Thuan, etc.). It is recommended that the relevant energy efficiency measures should be reviewed and integrated with relevant stakeholders into others provincial action plans. This work will help the key industrial sectors to have specific financial sources allocated for realizing the expected results.

The implementation of energy efficiency measures will contribute to archive key objectives of national target programs, especially the Energy Efficiency and Green Growth programs and key industrial sectors' targets:

- › Save energy
- › Reduce in energy consumption
- › Reduce CO2 emissions
- › Encourage the development of more efficiency technology in key industrial sectors and less consumption of natural resources through BAT, BAPT, alternative fuels and material substitutions, etc.
- › Increase the competitiveness of Vietnam products in the regional market through energy efficiency measure such as optimizing the process and making the production more efficiently in terms of energy and raw material consumption that lead to reduction of the production cost.

When integrating energy efficiency actions, especially the contributed targets, specific budget allocation shall be planned for key industrial sectors.

In terms of sectors to favor, the Consultant recommends that energy intensive industry shall be given priority because of its high energy consumption; high energy efficiency potentials and an adequate technical resource already in place. On the other hand, the sectors that open to the export market such as seafood; textile should also be prioritized because they need to increase their competitiveness in the global market. In conclusion, the selected sectors are Cement; Food (seafood and sugar), Steel, Textile, Chemical.

The activities to favor can be:

- › Capacity building to the industries about BAT, BAPT and how to develop bankable projects;
- › Capacity building to the ESCOs about potential ECMs, IMV;
- › Capacity building to financial institutions to evaluate the risk of EE projects;
- › Improving quality of energy audit.

Among many potential ECMs, some can be give more priority to develop and boost the energy efficiency:

- › ECM according to ISO 50.001;
- › Waste Heat recovery in cement sector and other sector;
- › Co-generation technology in sugar and other sectors;
- › Fuel-switching for boiler system (biomass, waste-to-energy);
- › Energy efficiency Refrigeration system in seafood sector;
- › Operation and Maintenance per best practice;
- › High efficiency equipment and motors.