

**MINISTRY OF INDUSTRY AND TRADE**

**NATIONAL PROGRAMME**

**VIETNAM - NATIONAL ENERGY EFFICIENCY PROGRAM  
2019 – 2030**

**DRAFTING ENTITY:** Department of Energy Efficiency and Sustainable Development

**Hanoi – December 2018**

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## ACRONYM

<b>Acronym</b>	<b>Description</b>
ADB	The Asian Development Bank
APEC	Asia-Pacific Economic Cooperation
CC	Climate change
EB	Energy balance
GGG	Green Growth Strategy
DB	Database
EP	Energy policy
DANIDA	Danish International Development Agency
DO	Diesel oil
DSM	Demand Side Management
EVN	Electricity of Vietnam
GDP	Gross domestic product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
TP	Transport
HHI	Herfindahl-Hirschman index
ES	Electricity system
IEA	International Energy Agency
INDC	Intended Nationally Determined Contribution
JICA	Japan International Cooperation Agency
IP	Industrial park
GHS	Greenhouse gas
BG	Biogas
LNG	Liquefied natural gas
LPG	Liquefied petroleum gas
PE	Primary energy
RE	Renewable energy
EEE	Efficient energy use
SIDA	Swedish International Development Cooperation Agency
TIMES	Integrated MARKAL-EFOM System
EC	Energy conservation
TOE	Tonne of oil equivalent
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change

UNIDO	United Nations Industrial Development Organization
USD	United States dollar
VND	Vietnamese Dong
VNEEP	Vietnam - National Energy Efficiency Program
WB	World Bank

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## PART I: SIGNIFICANCE OF THE PROGRAMME

Vietnam continues to experience high economic growth compared to regional and global economies. Average gross domestic product (GDP) growth rate reached 7.26% during 2001 - 2010, dropped to around 5.91% during 2011 - 2015 and has gradually recovered at 6.8% from 2016 to present. This economic growth goes hand-in-hand with an increased energy demand to respond to such growth. In 2015, total primary energy (PE) supply in Vietnam was 70,588 KTOE, of which, commercial energy and non-commercial energy respectively accounted for 75.5% and 24.5% of total primary energy consumption. According to forecast in the National Power Development Plan (Revised PDP VII), Vietnam's power demand would increase on average by 8.7% annually in the period of 2016 - 2030. Accordingly, domestic power supply capacity would increase from 38,358 MW in 2015 to 60,000 MW in 2020 and 129,500 MW in 2030, with its yield from 164 billions kWh to 265 - 278 billions and 572 - 632 billions kWh in 2015, 2020, 2025 and 2030, respectively. Hence, power demand would increase by 1.5-fold over each 5-year cycle from this period to 2030. This growth rate is considered to be high comparing to those in the same region and the world.

It is inevitable to develop energy to meet the demand for socio-economic growth however, this development task must be consistent with energy security and environmental protection. Two strategic solutions shall be applied to achieve this goal: (i) Enhance energy efficiency and improve energy performance to reduce energy loss; (ii) Shift the energy mix towards reducing fossil fuel, promoting efficient exploitation and increasing portion of renewable energy in energy production and consumption, and reducing greenhouse gas emission. In implementing the first strategic solution, the Government has issued many policies on energy efficiency and conservation. The “*Vietnam - National Energy Efficiency Programme*” had been implemented during 2006 - 2015 (divided into two phases of 2006-2010 and 2011-2015). The Programme led over 16 tonnes of oil equivalent (TOE) of energy savings; in particular, for period 2011- 2015, the efficiency rate was 5.65 %, which corresponds to a total of 11.8 million TOE of energy savings for this period. Despite some positive results, Vietnam still has a lot of technical opportunities to minimize energy loss and waste in the supply and utilization processes across all sectors, from

industrial production, commerce and service to family consumption. Surveys and calculations show that energy efficiency of coal-fired and oil power plants across the country was only 28% to 36%, which is 8-10% lower than that of developed countries. Industrial boiler's performance reached only 60% in 2010 and increased to approximately 70% in 2014. Nonetheless, this rate is still around 10% lower than the average statistics worldwide and that gap would be even greater if compared to developed countries. In many industries of the country, energy consumption per product unit is much higher than that of developed countries. Energy conservation (EC) potential of some of the country's industries, such as production of cement, steel, ceramic, frozen products, or consumer goods, etc. may reach over 20%; for civil building and transport, this number may be well over 30%; for living and service activities, this saving potential is not inconsiderable. International experiences from highly competitive economies with efficient energy use and successful emission reduction depict that overall energy conservation activities should be constantly maintained, enhanced and perfected in line with the country's industrialization and modernization processes. Therefore, it is important to maintain energy efficiency and conservation activities in Vietnam by adopting long-term plan and strategy with clear a direction in order to eliminate potential barriers and control risks from the increasing demand of energy usage nationwide. At the same time, it is required to address the 5 following core issues in the national sustainable development and competitiveness enhancement targets: *(i) Alleviate the pressure of investing in new power sources; (ii) Preserve national energy resources; (iii) Reduce national energy intensity; (iv) Practice environmental protection and greenhouse gas emission reduction; and (v) Bring about socio-economic benefits and build up a safe, civilized and modern livelihood for people, businesses and communities.* On that basis, the "Vietnam - National Energy Efficiency Programme in the period of 2019 - 2030" (hereinafter called "the Programme") is the implementation step to elaborate the energy development strategy, a critical element in the National Sustainable Development Strategy, aiming at making Vietnam an energy efficient country.

The Programme has been developed upon the following foundations:

## 1.1. Political foundation

- Resolution No. 18-NQ/TW dated 25 October 2007 issued by the 10<sup>th</sup> Politburo providing guidance for Vietnam's national energy development strategy by 2020, with vision to 2050.

- Resolution of the 12<sup>th</sup> National Congress of the Communist Party of Vietnam set out economic indicators for the period of 2016 – 2020: "5-year average economic growth rate shall reach 6.5 - 7%/year. In 2020, average GDP per capita shall reach \$3,200 - \$3,500; the share of industry and services in GDP shall be around 85%; the total social investment capital in 5 years shall averagely account for approximately 32 - 34% of GDP; State budget deficit shall decrease to around 4% of GDP. Total-factor productivity (TFP) contribution to growth shall reach about 30 - 35%; average social labor productivity shall increase by about 5%/year; **energy consumption per GDP shall decrease by around 1.0 - 1.5%/year on average**"

- Resolution No. 23-NQ/TW, dated 22 March 2018 issued by the 12<sup>th</sup> Politburo providing Guidance to formulate national industrial development policy by 2030, with a vision to 2045.

## 1.2. Legislation foundation

- Law on Energy Efficiency and Conservation;

- Decree No. 21/2011/ND-CP dated 29 March 2011 issued by the Government detailing the Energy Efficiency and Conservation Law and its implementation measures;

- Decree No. 134/2013/ND-CP dated 17 October 2013 issued by the Government setting forth administrative fine in electricity, hydroelectric dam safety, and energy efficiency and conservation;

- Intended Nationally Determined Contribution (INDC) – Vietnam's commitment to the international community in combating global climate change where Vietnam commits to reducing 8% greenhouse gas emission against typical development scenario and may further reduce up to 25% with international support;

- Decision No. 04/2017/QD-TTg dated 09 March 2017 issued by the Prime Minister setting forth the List of equipment and appliances to which

mandatory energy labeling and minimum energy efficiency standards are applied, and the roadmap to their implementation;

- Decision No. 24/2018/QD-TTg dated 18 May 2018 issued by the Prime Minister List of energy-consuming vehicles and equipment for disposal and low-efficient power generation units to which construction ban is applied, and the roadmap to implementation thereof;

- Decision No. 2053/QD-TTg dated 28 October 2016 of the Prime Minister promulgating the Plan for implementation of the Paris Agreement on climate change;

- Decision No. 1393/QD-CP dated 25 September 2012 issued by the Prime Minister approving the National Strategy on Green Growth which specifies the indicators for reducing greenhouse gas emission intensity and promoting clean energy and renewable energy use as follows:

- + 2011 – 2020 period: Reduce greenhouse gas emission intensity by 8 - 10% against 2010 index, reduce energy consumption per GDP by 1.0 - 1,5%/year. Reduce greenhouse gas emission from energy-related activities by 10% to 20% against business-as-usual development scenario. Of which, around 10% is from voluntary effort, the remaining is with international aid;

- + Guidance for up to 2030: Reduce annual greenhouse gas emission by at least 1.5 – 2.0%, reduce greenhouse gas emission in energy-related activities by 20% to 30% against business-as-usual development plan. Of which, around 20% is from voluntary effort, the remaining is with international aid;

- + Guidance for up to 2050: Reduce annual greenhouse gas emission by 1.5 – 2.0%.

- Directive No. 34/CT-TTg dated Aug. 07, 2017 by the Prime Minister on promoting power conservation;

- Other relevant documents.

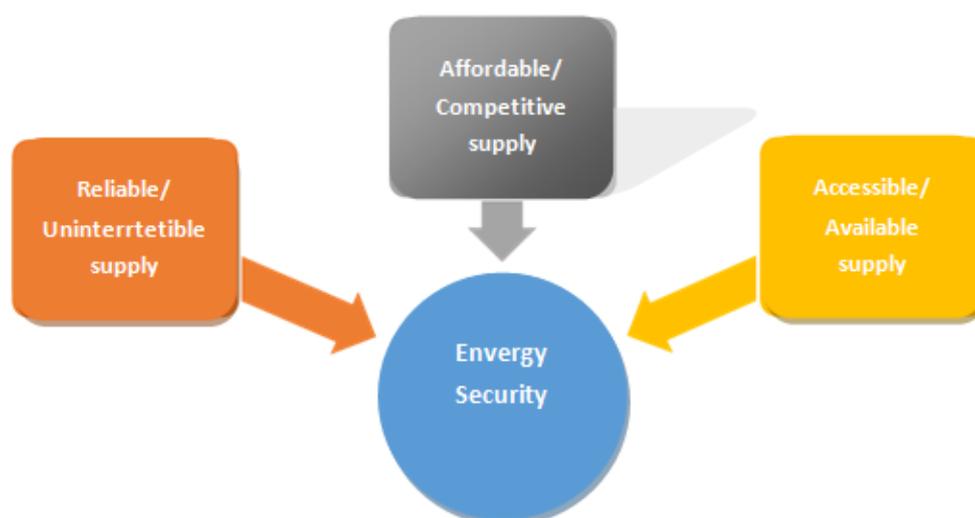
### **1.3. Practical foundation**

#### ***1.3.1. Demand for securing national energy security***

Strengthening energy security is a vital target in national energy policy. The International Energy Agency (IEA) defines energy security as ‘*the uninterrupted availability of energy sources at an affordable price*’. In long-term extend, energy security mainly deals with prompt investment in energy

supply for economic growth and sustainable environment requirement, while, in short-term extend, energy security focuses on the availability of energy systems in responding to unexpected changes in supply and demand balance. Unsecured energy security would lead to negative energy shortage-induced socio-economic impacts and uncompetitive or unstable energy pricing.

**Figure 1. The IEA Model of Energy Security**



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Fundamental challenges against national energy security include<sup>1</sup>:

- Insufficient access to energy;
- Lack of energy source diversity;
- Heavy reliance on traditional energies;
- Increasing shortage of supply and demand in domestic energy;
- Dependence on imported energy; and
- Shortage of adequate energy infrastructure.

Vietnam's energy security indicators for 2010 – 2015 are summarized in **Table 1**.

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<sup>1</sup> ADB, Improving energy security and reducing carbon intensity in Asia and the Pacific, Mandaluyong: Asian Development Bank, 2009

**Table 1. Changes in Energy Security Indicators' during 2010-2015**

Indicator	2010 value	2015 value	Comment/Annotation
Reserves-to-Production (R/P) Ratio of Coal, Oil and Natural Gas	Coal: ~70 years Natural Gas: ~40 years; Raw Oil: ~ 20 years.		Coal mining capacity: 50 million tonnes/year; Gas harvesting capacity: 15 billion m <sup>3</sup> /year; Raw oil drilling capacity: 15 million tonnes/year.
Reliance on coal, oil and natural gas import (% net import)	-14%	5%	Increasing reliance on imported fuel.
Coal/oil/gas import expenditure/total import expenditure (%).		4.90%	The current ratio is not high, however, future upward trend of imported fuel reliance ratio should be noted.
Coal/oil/gas import expenditure/total export revenue (%).		4.78%	
Coal/oil/gas import expenditure/total gross domestic product (%).		4.16%	
Diversification of oil import product (HHI index).	1,879	2,122	Relatively diverse, however, concentration trends are on the rise.
Diversification of fuel structure for power generation (HHI index).	3,107	3,209	Relatively diverse, however, concentration trends are on the rise.
Commercial energy intensity.	0.37	0.38	There is a slight increase due to economy structure changes.

It could be noted that there were signs of a decrease in domestic production capacity and an increase in imported energy reliance during 2010-2015. These changes, despite being not too severe, are warning signs of future energy security for the country. In light of the above-indicated 6 energy security challenges, it could be speculated that Vietnam is facing all these challenges and the trends would become critical unless there were plans and policies for sustainable development in the energy sector.

To overcome energy security challenges, it is recommended that Vietnam implement the following solution sets: (i) *guidance for securing fossil fuel supply* (ii) *development of energy efficiency infrastructure and diversification an energy system based on renewable energy and energy efficiency*. The solution set of energy efficiency and conservation enforcement is considered as one of the key items in Vietnam's national energy security because it leads to:

- Higher socioeconomic and environmental efficiency than utilizing traditional energy sources;
- Reducing imbalance in energy supply and demand;
- Securing long-term stability for national energy resources;

### ***1.3.2. Ensure enhancement of national competitiveness***

In 2015, **Vietnam became a middle-income country** with gross domestic product (GDP) per capita reached \$2,109, 20 times higher than that of 1990 (\$114). Along with economic growth, Vietnam's overall energy situation experienced drastic transformation over the past 30 years. Energy supply quickly shifted from traditional biomass sources for agriculture economy to a diversified model of state-of-the-art energy products. The increase in energy demand driven by economic growth with unmatched extension in energy supply led to energy imbalance. Vietnam has become an energy importer since 2015 and would more and more rely on imported energy sources.

In 2015, total primary energy (PE) supply in Vietnam was 70,588 KTOE, of which, commercial energy and non-commercial energy respectively accounted for 75.5% and 24.5% of total primary energy consumption. The non-commercial biomass energy rate (NCBER)<sup>2</sup> in total primary energy supply decreased drastically from 44.2% in 2000 to 16.9% in 2015. During this period, commercial energy increased by 9.5%/year. This growth rate was greater than the country's GDP growth rate of the same period, resulting in commercial energy - GDP elasticity being greater than 1.0 and reached 1.31. Among

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<sup>2</sup>Non-commercial biomass energy: types of fuels having no commercial exchange or no official market, typically used as burning fuel for civil purposes, which, in this case, are mainly firewood, agriculture by-products, or animal wastes, etc.)

commercial energies, natural gas had the highest growth rate at 13.4%/year, followed by coal, oil products, and hydroelectricity at 12.2%, 6.2%, and 27.6% respectively. Primary energy supply development during 2000 – 2015 is presented in **Table 2**. Industrial growth, energy for civil purposes and traffic mechanization have been the causes for the increase of total energy demand in Vietnam over the past years.

**Table 2. Primary Energy Supply Development during 2000-2015 (MTOE)<sup>3</sup>**

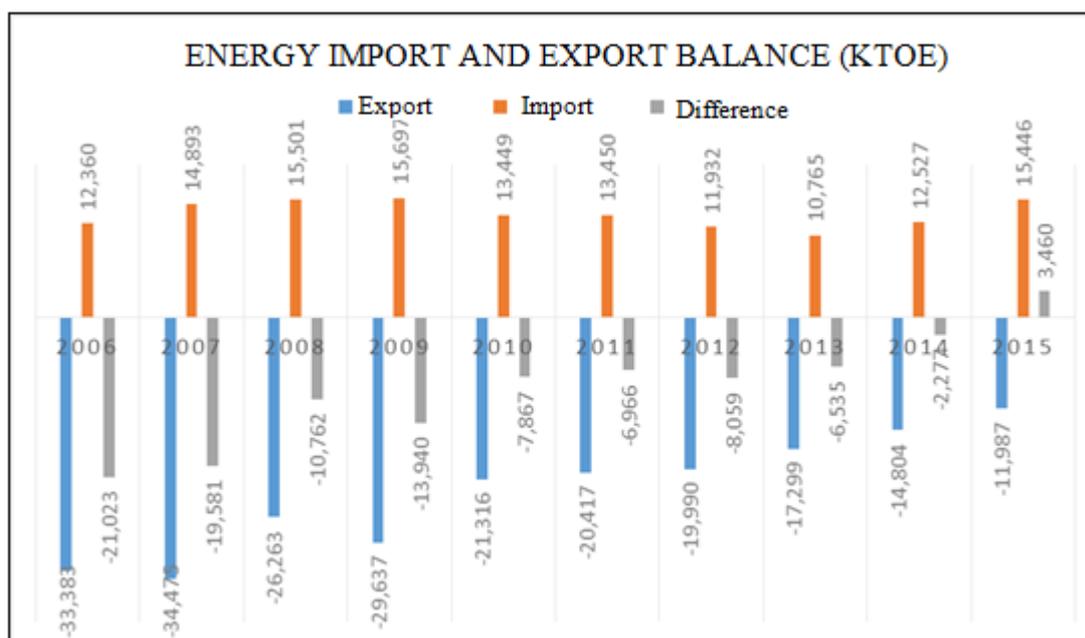
Primary energy	2000	2005	2010	2011	2012	2013	2014	2015
Coal	4.372	8.376	14.730	15.605	15.617	17.239	19.957	24.608
Oil	7.917	12.270	17.321	16.052	15.202	14.698	17.700	19.540
Gas	1.441	4.908	8.316	7.560	8.253	8.522	9.124	9.551
Hydroelectricity	1.250	1.413	2.369	3.519	4.540	4.468	5.146	4.827
Non-Commercial Energy	14.191	14.794	13.890	14.005	14.121	13.673	12.745	11.925
Imported Electricity		33	399	333	125	200	124	136
Total	29.171	41.794	57.025	57.075	57.857	58.801	64.797	70.588

Energy security, reviewed under the light of energy import and export balance is presented in **Figure 2** below.

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<sup>3</sup> Institute of Energy, “Viet Nam Energy Statistics 2014,” IE, 2016

**Figure 2. Energy Import and Export Development during 2006-2015 (KTOE)**



The declining trend of energy export in recent years is noticeable. Export volume in 2015 dwindled to around 12 thousand KTOE, equivalent to 2/5 that of 2009 while energy import volume, after a few years of decrease due to declined domestic demand, drastically increased in 2015. From the gap between energy import and export, it could be concluded that, **in 2015, Vietnam has become a net energy-importing country**<sup>4</sup>.

**Table 3. Development of Key Energy Economic Indexes during 2010-2015**

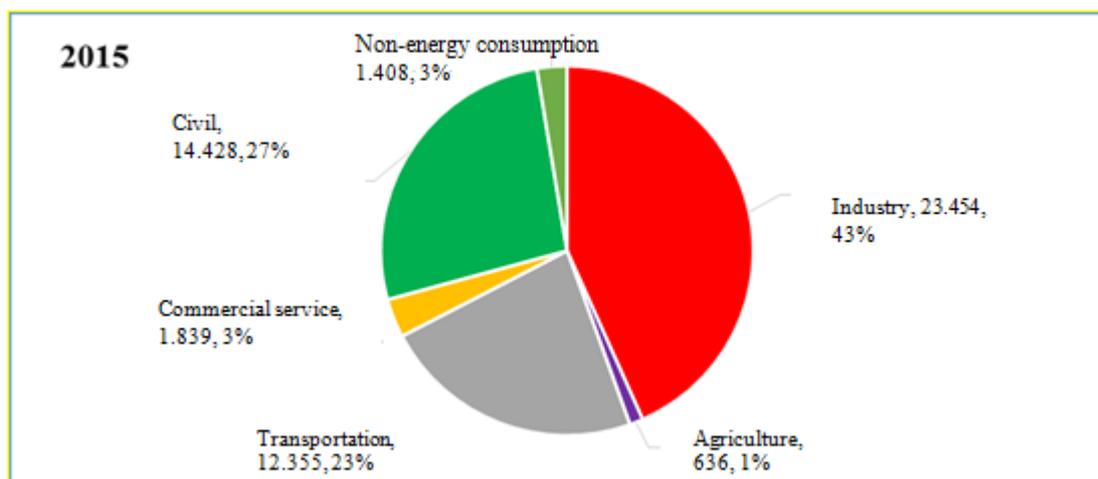
Category	Unit	2010	2012	2013	2014	2015
Total Primary Energy Supply	KTOE	57,023	57,855	59,203	64,797	70,588
Non-Commercial Energy/Total Primary Energy Supply	%	24.4	24.4	23.1	19.7	16.9

<sup>4</sup> Domestic energy supply = Domestic production + Import – Export + Variable reservation; Net imported energy = (Import – Export)/Energy supply (%)

Total Final Energy Consumption	KTOE	47,445	49,134	50,606	52,248	54,080
Final Energy Consumption Per Capita	kgOE/capita	545.7	553.2	563.8	575.9	589.7
Primary Energy Supply/GDP	kgOE/\$1,000	491.9	446.3	433.2	447.4	456.9
Import/Total Supply	%	31.2	27.3	24.6	28.6	35.3
Energy Intensity	kgOE/\$1,000	289.6	270.4	270.6	273.1	270.0
Energy Consumption Per Capita	kWh/capita	998	1,187	1,294	1,416	1,564
Electricity Intensity/GDP	kWh/\$1,000	748	813	850	887	929
Electricity Consumption/Total Energy Consumption	%	22.2	25.9	27.0	27.9	29.2

Energy intensity (energy consumption converted to standard oil kilogram to generate 1 unit of economic value – kgOE/VND or kgOE/USD) of the country fell between 289.6 – 270.0 during 2010 – 2015 (refer to **Table 3**). The energy intensity index in combination with the energy consumption structure in 2015 (the proportion of energy consumption in industrial sector and civil sector respectively accounted for around 43% and 27% of total national energy supply demand in 2015 (see **Figure 2**)) indicate the continuous and industrialization, improving people’s living standards, and rising energy demand, however, when compared to other nations, the country’s energy intensity is currently over 2 times higher than world’s average (see **Figure 3**). In comparison with Thailand and Malaysia, the country’s energy intensity is 1.5 and 1.7 higher, respectively. In certain extent, that means energy efficiency in the country is 1.5-1.7 lower than that of above nations.

**Figure 3. Advanced Energy Consumption Structure in 2015 by Economic Sector (million tonnes, %)**



Consequently, it could be observed that energy efficiency and conservation is a key solution in reducing production costs, ensuring stability and sustainability of the energy supply and making critical contribution to the enhancement of national competitiveness.

### **1.3.3. Demand for sustainable development and green growth**

Vietnam put a lot of efforts into establishing and developing a suitable institutional mechanism for sustainable development. Sustainable development has become the Party's guidance and standpoint, and the State's policies and guidelines; it has been integrated and clearly manifested in ministries, sectors and locals' strategies, schedules, plans, and projects for socio-economic growth and environmental protection. Many relevant policies have been issued to serve the country's sustainable development and execute international commitments which Vietnam has been a partner of.

In the environment sector, pollution prevention and control, greenhouse gas emission reduction and biodiversity preservation have been promoted and achieved favorable results. The State's governance system for environmental protection, from central to local level, has been gradually completed and improved. Vietnam has proactively been practicing international integration and taken part in many international agreements and conventions relating to sustainable development.

In 2010, Vietnam's total greenhouse gas emission was 246.8 million tonnes of CO<sub>2</sub> equivalent inclusive of land use, land-use change and forestry

(LULUCF) and 266 million tonnes of CO<sub>2</sub> equivalent exclusive of LULUCF. Greenhouse gas emission in the energy sector accounted for the highest proportion at 53.05% of non-LULUCF emissions, followed by agriculture at 33.20%. Emission from waste and industrial process sectors were 7.97% and 5.78%, respectively (see **Table 5**).

**Table 4. Greenhouse Gas Inventory Report throughout the years (million tonnes)<sup>5</sup>**

Sector	1994	2000	2010
Energy	25,637.09	52,773.46	141,170.79
Industrial Process	3,807.19	10,005.72	21,172.01
Agriculture	52,450.00	65,090.65	88,354.77
LULUCF	19,380.00	15,104.72	-19,218.59
Waste	2,565.02	7,925.18	15,351.67
Total	103,839.30	150,899.73	246,830.65

During 1994-2010, Vietnam's total greenhouse gas emission (inclusive of LULUCF) rapidly increased from 103.8 tonnes of CO<sub>2</sub> equivalent to 246.8 tonnes of CO<sub>2</sub> equivalent, of which, the energy sector attained the fastest growth rate, from 25.6 tonnes of CO<sub>2</sub> equivalent to 141.1 tonnes of CO<sub>2</sub> equivalent and was also the biggest emission contributor in 2010. Greenhouse gas emission from the four sectors of energy, agriculture, LULUCF and waste are expected to reach 466 tonnes of CO<sub>2</sub> equivalent in 2020 and then rise to 760.5 tonnes of CO<sub>2</sub> equivalent in 2030. Energy would remain as the largest source of greenhouse gas emission (see **Table 6**).

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<sup>5</sup> MONRE, "Viet Nam's Initial Biennial Updated Report to United Nations Framework Convention on Climate Change," MONRE, Hanoi, 2014

**Table 5. Greenhouse Gas Inventory Report by Sectors 2010 (million tonnes)<sup>6</sup>**

Emission Source	Total	Rate (%)
Combustion	124,275.0	88.03
Energy	41,057.9	29.08
Production and Building	38,077.6	26.97
TP	31,817.9	22.54
Commerce/Service	3,314.2	2.35
Civil	7,097.6	5.03
Agriculture, Forestry and Fisheries	1,630.8	1.16
Other Non-Energy Use Sectors	1,279.0	0.91
Dispersion	16,895.8	11.97
Coal Mining	2,243.1	1.59
Oil and Natural Gas	14,652.7	10.38
Total	141,170.8	100

**Table 6. Greenhouse Gas Emission Forecast for 2020 and 2030 (million tonnes)<sup>7</sup>**

Sector	2020	2030
Energy	381.1	648.5
Agriculture	100.8	109.3
LULUCF	-42.5	-45.3
Waste	26.6	48.0
Total	466.0	760.5

<sup>6</sup> MONRE, "Viet Nam's Initial Biennial Updated Report to United Nations Framework Convention on Climate Change," MONRE, Hanoi, 2014

<sup>7</sup> MONRE, "Viet Nam's Initial Biennial Updated Report to United Nations Framework Convention on Climate Change," MONRE, Hanoi, 2014

Estimated GHG emission results for 2020 and 2030 above depict the total GHG emission from the four sectors of energy, agriculture, LULUCF and waste in 2010 was 225.6 tonnes of CO<sub>2</sub> equivalent and would rise to 466 tonnes of CO<sub>2</sub> equivalent in 2020 and 760.5 in 2030. Energy would remain the largest source of GHG emission with 381.1 tonnes of CO<sub>2</sub> equivalent in 2020 and 648.5 tonnes of CO<sub>2</sub> equivalent in 2030. Greenhouse gas emission reduction targets are specifically communicated as follows:

(i) Green Growth Strategy:

- Reduce greenhouse gas emission in energy-related activities by 10% to 20% against business-as-usual development scenario. Of which, around 10% is from voluntary effort, the remaining is with international aid.

- Reduce annual greenhouse gas emission by at least 1.5 – 2.0%, reduce greenhouse gas emission in energy-related activities by 20% to 30% against business-as-usual development scenario.

(ii) Intended Nationally Determined Contribution (INDC): As of 2030, by employing domestic resources, Vietnam commits to reducing 8% greenhouse gas emission against business-as-usual scenario and the figure may be increased to 25% with international aid. At the same time, Vietnam would organize adaptive activities to enhance climate change resistance capability so more contribution would be made towards greenhouse gas emission mitigation.

(iii) Renewable energy development strategy: slightly reduce greenhouse gas emission in energy-related activities against business-as-usual development scenario. About 5.0% in 2020; about 25% in 2030 and about 45% in 2050.

From inventory statistics and greenhouse gas emission forecast in **Table 5 and 6**, it could be deduced that energy efficiency and conservation is the key measure in meeting aforesaid targets. However, recently, the implementation of energy efficiency and conservation solution is faced with the following issues:

- Lack of mechanism and policy to encourage investment, provide subsidies and localize technologies;

- High investment cost;

- Difficulty in accessing funds from commercial banks for projects in innovating and replacing to high energy-efficient equipment and technologies;

- Low level of skill and qualification in utilizing energy-efficient technologies, techniques, equipment and;
- Limited capacity in receiving and applying energy-efficient technologies and techniques;
- Shortage of technical infrastructure and support services for repairing, maintaining and replacing equipment.

*As a result, sustainable development needs for the country in general and for the energy sector in particular require making energy efficiency and conservation a strategic and decisive solution.*

From the above situation and with the urgent needs for sustainable development and national competitiveness enhancement which raise pressing requirements for mechanisms, policies and solutions to further implement energy efficiency and conservation in all aspects of socio-economic life, the “*National Programme for Energy Efficiency and Conservation*” should be developed and implemented.

GIZ Unofficial Translation for Reference Only

## **PART II: ENERGY EFFICIENCY AND CONSERVATION FOR SUSTAINABLE DEVELOPMENT AND NATIONAL COMPETITIVENESS ENHANCEMENT**

### **2.1. Advantages and challenges**

#### **2.1.1. Advantages**

##### *a. Positive outcomes from Vietnam - National Energy Efficiency Programme*

At the beginning of the 21<sup>st</sup> century, when Vietnam was facing the risk of energy shortage due to climbing world oil price and declining hydropower sources due to unfavorable weather conditions and inefficient utilization and exploitation of national primary energy sources, the Vietnam - National Energy Efficiency Programme (The Target Programme) for 2006-2010 was developed and submitted to the Government for approval in order to promote efficient use and conservation of the nation's limited energy sources, aiming at sustainable socioeconomic growth. The Target Programme was also integrated into energy conservation projects funded by international organizations in order to make effective use of ODA funds and international experiences in implementing practical energy conservation activities in Vietnam. The National Energy Efficiency and Conservation Office, which is directly under the Ministry of Industry and Trade, was established and took charge of all nationwide activities within the Target Programme. By 2012, Vietnam - National Energy Efficiency Programme – Phase II was approved in the context Vietnam's Green Growth target is actively promoted. This is the successor of the 2006 – 2010's Programme with a higher target, and higher level of participation of relevant entities and locals nationwide.

In conclusion, we have organized the implementation of energy efficiency and conservation in a systemic, methodical and scientific manner via the National Target Programme since 2006. Results of this Target Programme received the following specific evaluation:

#### **(i) 2006 - 2010**

The Vietnam - National Energy Efficiency Programme for 2006 - 2010 was designed with 6 sets of content and 11 major project proposals across all energy consumption areas, categorized into 7 main themes: (i) Mechanism development; (ii) Awareness raising and capacity building; (iii) High-performance equipment; (iv) Energy audit; (v) Pilot programs; (vi) Energy

management model and (vii) Financial assistance for client. The Programme set its target at 3-5% reduction in total commercial energy consumption for 2006-2010.

*Evaluation shows that the actual saving reached 3.4%, equivalent to 4.9 million TOE.*

## **(ii) 2012-2015**

The Vietnam - National Energy Efficiency Programme for 2012 - 2015 (VNEEP 2) was approved by the Government via the Decision No. 1427/QD-TTg dated Oct. 2, 2012. The Programme set **its target of saving 5-8% of total national energy consumption for 2012-2015 against the energy demand projection specified in the National Power Development Plan for 2011-2020 with consideration to 2030 approved by the Prime Minister**, which is equivalent to around 11 - 17 million TOE for 2012 - 2015. The Programme also designated energy conservation indicators for high energy-consumption sectors, which were:

- Reduce the average energy consumed to produce 01 ton of cement from 97 kgOE in 2011 to 87 kgOE in 2015;

- Reduce the average energy consumed to produce 01 ton of finished steel product from 179 kgOE in 2011 to 160 kgOE in 2015;

- Reduce the average energy consumed to produce 01 ton of fiber from 773 kgOE in 2011 to 695 kgOE in 2015.

*Evaluation shows that the actual saving reached 5.65%, equivalent to 11,2 million TOE.*

Although certain accomplishments have been achieved **the implementation stage of activities for Phase 2 is still faced with some difficulties**, which are:

- Annual funds from the State budget for the target Programme regularly arrived late, affecting execution progress of the objectives; in addition, total annual expenditures were relatively low, for instance: the figure is VND70 billions in 2011, VND82.5 billion in 2012 (VND55 billion from the State budget and VND27.5 billion of grant from the Government of Denmark), VND96.1 billion in 2013, VND58.7 billion in 2014 and VND42 billion in 2015. Total fund

from nation budget granted for the target Programme, as of the end of 2015, was VND349 billion (exclusive of local and corporate budgets) despite the fact that the Programme's intended population was broad and diverse, from central to local level.

- The execution of energy labeling roadmap encountered many challenges, such as limited experiment infrastructure, human resource and implementation expenditure, and lacking and asynchronous energy performance experiment standard and equipment. As of the end of June 2015, 05 domestic laboratories and 02 foreign laboratories, which satisfied experiment requirements for 10 types of products, were designated;

- Asynchronous issue of standard created challenges for product energy labeling;

- Community and corporate awareness were limited as they are not ready to access information on energy conservation technologies and solutions;

- Many businesses have insufficient fund or were unable to access soft credit loans for energy conservation projects. Besides, due to financial difficulties, many companies suspended or were not able to implement energy conservation projects, especially steel and cement production field;

- The support mechanism for companies on replacing outdated production lines with ones applying high-performance and energy efficient technologies encountered many drawbacks. The target Programme's support at 30% of total investment fund for production lines and equipment utilizing high-performance technology with up to VND5 billions for each entity is no longer considered attractive by large enterprises to make investments in production line replacement as this aid is far lower than their total investment.

- A great number of companies have not thoroughly complied with regulatory requirements specified in issued Laws, Decrees, Circulars and Decisions. Energy management model and annual and 5-year energy consumption plan for companies have not been developed; companies' energy consumption have not been properly reported to local authorities (Department of Industry and Trade);

- There were many hindrances in managing local businesses: disconnected management among governing Departments, or confusion in auditing and

inspecting of businesses for compliance of Legal requirement, which were also drawbacks in Law enforcement;

- Corporate projects encountered impediments due to declining economic conditions, rendering them unable to perform as planned, which in turn slow down or halt investment project's execution;

- Energy price increased by over 10% but it was still comparatively lower than that of other countries in the same region, which is also affecting energy conservation measures' execution.

- Although resources for implementing and monitoring the compliance with Energy Efficiency and Conservation Law and legal normative documents, related regulations from Central to local level saw positive development, the documents should be supplemented, and the personnel's capacity should be enhanced.

- Many entities and units in charge of the Programme's execution have not proactively and actively implemented assigned contents and duties; Financial resource, and technical experts, especially Civil Construction, Transport and local ones were limited, hence, energy audit at companies belonged to these sectors for determining energy conservation solutions, consulting in project development, and finding funds for energy conservation projects was lacking and poorly performed.

#### *b. International aid in promoting energy efficiency and conservation*

Beside the executed national target Programme, since 1997, other energy efficiency and conservation-related activities have been organized in Vietnam. These activities were developed and executed with financial and technical assistance from many international organizations: World Bank, ADB, UNIDO, GEF, UNDP, SIDA, JICA, and DANIDA.

##### **(i) World Bank (WB)**

The "Cleaner Production and Energy Efficiency" project funded by GEF via WB was performed in 2011 - 2016. The overall objective of the project is Providing technical assistance for energy conservation market participants, especially manufacturing businesses in the sectors of chemical, food/beverage, paper, plastic, textile, brick/ceramic and energy service providers. In the time

coming, other industrial sectors will be selected to be the next component of this Project.

For capacity building activities within policy planning towards Green Growth, WB set up many supporting activities for Vietnam in the form of technical assistance for domestic partners, with the focal point being the Ministry of Planning and Investment. In 2012, experts from WB, in collaboration with 3 leading domestic research institutes, refined and transferred an emission calculation tool (called “EFFECT”). In addition, those experts, with assistance from the above-mentioned research institutes, developed a technical report which provided recommendation on solution for emission reduction and its costs and possible outcomes by 2040.

#### **(ii) United Nations Development Programme (UNDP)**

UNDP carried out the Promoting Energy Conservation in Small and Medium Scale Enterprises (PESME) Program during 2002 – 2010, via the Ministry of Science and Technology, with funding from UNDP and GEF. The project ended with success and many recognized results. Since July 2009, UNDP also executed another project to promote labeling activities in Asian countries, including Vietnam. The target of this project called BRESL was removing barriers to enable successful conversion of domestic products’ consumption market. A lot of activities within the projects were organized, including (i) standard development, label designing, (ii) policy and personnel capacity enhancement, (iii) information providing and technical support for manufacturers, (iv) information sharing, international partnership, (v) sample project performance. The program ended at the end of 2014 and its effectiveness is currently under review by UNDP.

#### **(iii) The Asian Development Bank (ADB)**

In 2011, ADB started to implement a project in policy planning capacity enhancement, with support to the National Target Program on Climate Change with a Focus on Energy and Transport (TA 7779). The main target of this project is to support the Ministry of Industry and Trade, the Ministry of Transport, and the provinces of Thanh Hoa, Da Nang, and HCMC in devising climate change plan to reduce greenhouse gas emission increase rate in target sectors by 2020. Key activities of this project are awareness and capacity

enhancement for local officers, industry departments and ministries in developing and designing scenario, developing necessary solutions and policies to support the effective performance of climate change mitigation and adaptation solutions.

**(iv) Danish International Development Agency (DANIDA)**

DANIDA's Low Carbon Energy Efficiency (LCEE) Project is a 2012 initiative resulted from the long-term partnership between the Government of Vietnam and the Government of Denmark in green growth in the energy sector in Vietnam. This project aided the Target Programme and was executed on the basis of partnership between the Danish Ministry of Climate, Energy and Building (Denmark), the Embassy of Denmark in Vietnam and the Ministry of Industry and Trade and the Ministry of Construction. The project's target was to contribute to the sustainable development and Vietnam's transition to low-carbon economy via the improvement of energy efficiency at small and medium-sized enterprises and construction sites. The project expected to end in June 2017.

**(v) International Finance Corporation (IFC)**

The overall objective of International Finance Corporation's "Cleaner Production and Energy Efficiency" Project was to improve resource efficiency, which, in turn, would reduce carbon emission in local businesses/entities. By utilizing financial tools serving energy performance and investments for cleaner production, this project supported businesses in upgrading production technology/equipment/infrastructure in order to achieve necessary energy performance, reduce waste, attain cost-effectiveness and practice environmental protection. The project also collaborated with domestic commercial banks in order to support the development of bank's business strategies towards products of energy efficiency improvement and clean production. In addition, the Project supported financial organizations in building partnership with energy service companies (ESCO), conducting corporate training and awareness raising in selected production sectors.

IFC also carried out a cooperation project with the Ministry of Construction in developing and issuing National Standard for energy efficiency and conservation construction projects (Standard QCVN 09:2013/BXD).

#### **(vi) Japan (JICA & METI)**

As part of “National Greenhouse Gas Inventories Capacity Enhancement in Vietnam”, JICA provided support for Vietnam in establishing a national system in greenhouse gas inventories. Short-term experts from JICA collaborated with domestic experts in statistics data collection and approach streamlining activities for inventory tasks.

In addition, Vietnam and Japan is currently in discussion for the early issue of Practice Guideline for Joint Crediting Mechanism - JCM (which is quite similar to CDM with the difference being its bilateral mechanism). Both parties approved a technical guideline for the pilot implementation of JCM projects in Vietnam. There are currently 28 JCM projects (17 of which are energy efficiency and conservation-related projects) in the feasibility study phase with the total emission reduction potential being 10 tonnes of CO<sub>2</sub> equivalent.

#### **(vii) United Nations Industrial Development Organization (UNIDO)**

The project of “Promoting Industrial Energy Performance via system optimization and Energy Management Standards in Vietnam” was funded by UNIDO to provide assistance to industrial manufacturing businesses in energy performance improvement via access to the new ISO 50001 energy demand management standard. By approving Energy Management standard, energy management measures would be integrated into the management cycle and realization of continuous performance improvement measures. This project’s initial priority will be given to capacity building for participants, including manufacturing businesses, equipment distributors and suppliers, energy supply and consultation companies, and policy planners. The project trained 10 domestic experts in energy management and capacity transfer for businesses by introducing ISO 50001 Standard. The project started in 2011 and ended in 2014.

#### **(viii) French Development Agency (AFD)**

As part of the Government of France’s budget support package for Vietnam in responding to climate change, a credit amount of €20 million was granted to Vietnam via AFD. This grant would assist Vietnam in executing a

multi-year program with public policy projects in 8 sectors: Renewable Energy, Energy Conservation, Forestry, Waste Management, Clean Deployment Mechanism, Water, Natural Disaster Prevention and Agriculture.

In addition to budget support, AFD implemented many technical assistance activities for Vietnam, such as defining energy conservation target in the steel sector, preparing a local-scale action plan and analyzing bio-fuel development policy in Vietnam.

General evaluation:

Basically, Vietnam benefited from support activities by international organizations. Funded projects always included financial assistance (ODA and soft loans) and expert experience transfer on the basis of framework activities proposed by the Government of Vietnam. The projects were carried out in close collaboration with Vietnam's departments and ministries as part of energy efficiency and conservation activity: mechanism development (projects of WB, JICA, DANIDA...); human resources training and development, especially personnel with expertise (UNIDO, JICA,...); financial assistance (DANIDA, JICA...); technical assistance (UNIDO, IFC,...). It could be speculated from actual implementation that there were overlaps in support (one project received multiple supports from different institutions) in international funding projects, such as the labeling program received supports from UNDP and AUSAID and the Project of developing Standard QCVN 09/2013 for Construction Sites received supports from 3 organizations: DANIDA, IFC, and USAID.

Consequently, to effectively optimize all resources, there should be a **national monitoring program for energy efficiency and conservation activities on the basis of defining core points causing the nation's energy waste and inefficiency, establishing a hierarchy of tasks for each participating entities: the State's governance authorities, businesses, the public and international organization's support.**

*c. Institutionalize energy efficiency and conservation*

**(i) Energy Efficiency and Conservation Law 2010<sup>8</sup>**

Energy Efficiency and Conservation Law stipulates energy efficiency and conservation issues; policy and measures for promoting energy efficiency and conservation; right, obligation and responsibility of organization, household and individual in energy efficiency and conservation. This law created a legal framework to promote efficient energy use activities in all aspects of the economy via regulations, standards, incentives, and encouragements. The main contents of this Law include:

- Obligation for key energy consumption facilities: develop annual and 5-year energy plans; appoint energy managers, develop energy management model; conduct mandatory energy audit every 3 years;

- Develop standards and equipment labeling activities;

- Incentives: tax exemption and reduction, land use incentive, soft loan from Vietnam Development Bank, National Foundation for Science and Technology Development, National Technology Innovation Fund, Environmental Protection Fund, and Vietnam - National Energy Efficiency Programme (VNEEP);

The Ministry of Industry and Trade is responsible for governance in energy efficiency and conservation.

**(ii) Vietnam - National Energy Efficiency Program<sup>9</sup>**

The target Programme aims to: (i) implement in synchronization the activities under the Programme in depth, remove barriers and create breakthroughs in improving end-use efficiency, focus on the sectors of Industrial Manufacturing; High Energy-Consumption Buildings; Transportation; Services; Household; Popularization of Energy Saving, High Performance Equipment and Facility; (ii) achieve the goal of aggregated total energy conservation for the whole country and in high energy-consumption individual sectors, bring about

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<sup>8</sup>Law No. 50/2010/QH12

<sup>9</sup>Decision No. 1427/QĐ-TTg approving the Vietnam - National Energy Efficiency Program for 2012 - 2015

socio-economic benefits; contribute to reduce investment in energy supply system development, secure energy security, environmental protection; rational exploitation of energy resources, and practice sustainable socio-economic development. The Programme set its target at 5.0 - 8.0% saving from total national energy consumption for 2012 - 2015 against the energy demand forecast in the National Power Development Plan for 2011 - 2020 with consideration to 2030 approved by the Prime Minister, which is equivalent to 11 - 17 million TOE (tonnes of oil equivalent) for 2012 - 2015.

### **(iii) Sustainable development strategy<sup>10</sup>**

The overall objective of the Sustainable Development Strategy is “Sustainable and efficient growth coupled with progress, social justice, protection of natural resources and environment, maintaining social and political stability, securely protecting the independence, sovereignty, unity and territorial integrity of the country.” The strategy also mentions some energy - economic indicators that should be noted in the course of sustainable development:

- Reduce energy intensity/GDP ratio;
- Increase the share of renewable energy in energy consumption.

### **(iv) National green growth action plan<sup>11</sup>**

The aim of green growth action plan is to realize Green Growth Strategy’s goals, including 04 main themes, 12 activity sets, and 66 specific action targets. All energy efficiency and conservation-related activities are included in Theme 02 with 20 actions. Some of the important actions are:

- Action No. 9: Develop implementation plan for National energy strategy for 2014-2020 and policies under the guidance of synchronous development of energy sources; practice efficient use and exploitation of domestic energy sources; reduce reliance on imported oil products; gradually decrease exported

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<sup>10</sup>Decision No. 432/QĐ-TTg dated Apr. 12, 2012 approving Viet Nam’s Sustainable Development Strategy

<sup>11</sup>Decision No. 403/QĐ-TTg dated Mar 20, 2014 approving National Action Plan for Green Growth for 2014 - 2020

coal and adjust imported coal to an appropriate volume; establish connection with adjacent countries' energy systems.

- Action No. 14: Adopt advanced technical norms and standards in order to improve energy performance in business and manufacturing activities of companies in high energy-consumption sectors (electricity, cement, steel, textile).

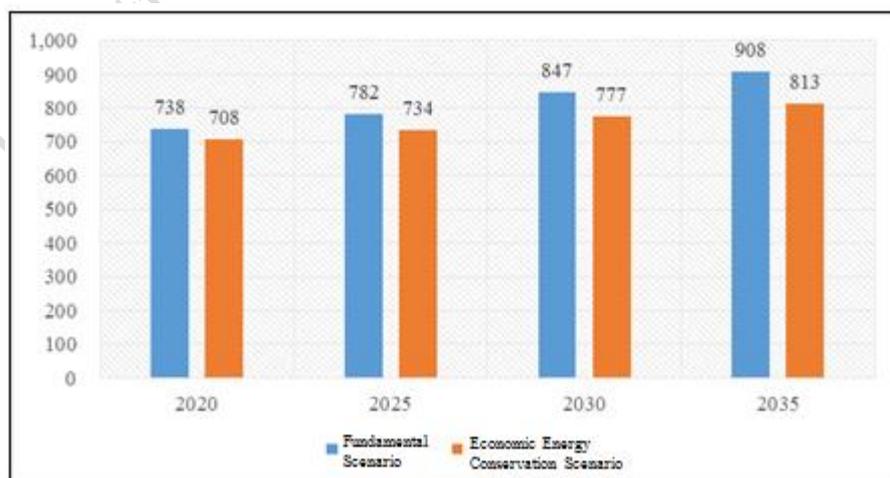
*d. Energy conservation potential of the economy*

Energy conservation potential of the economy was identified by the Institute of Energy via energy conservation scenario developed on the basis of Economic Growth Scenario.

**(i) For agriculture sector**

Basically, due to the low rate of mechanization in Vietnam's agriculture, unpopulated large-scale livestock model, and popular near-shore fishery, the industry's energy consumption is still very low. According to statistics, Vietnam's agriculture contributed only 16.1% to total GDP in 2015 but consumed 1.2% of total energy consumption, which is equivalent to 636 KTOE. Data from two fishery and irrigation sub-sectors among other agriculture sub-sectors was used to calculate energy conservation potential for the agriculture sector. Against Fundamental Scenario, the resulting rate of energy conservation would be 4.2%, 6.2%, 8.2% and 10.4% in 2020, 2025, 2030 and 2035, respectively.

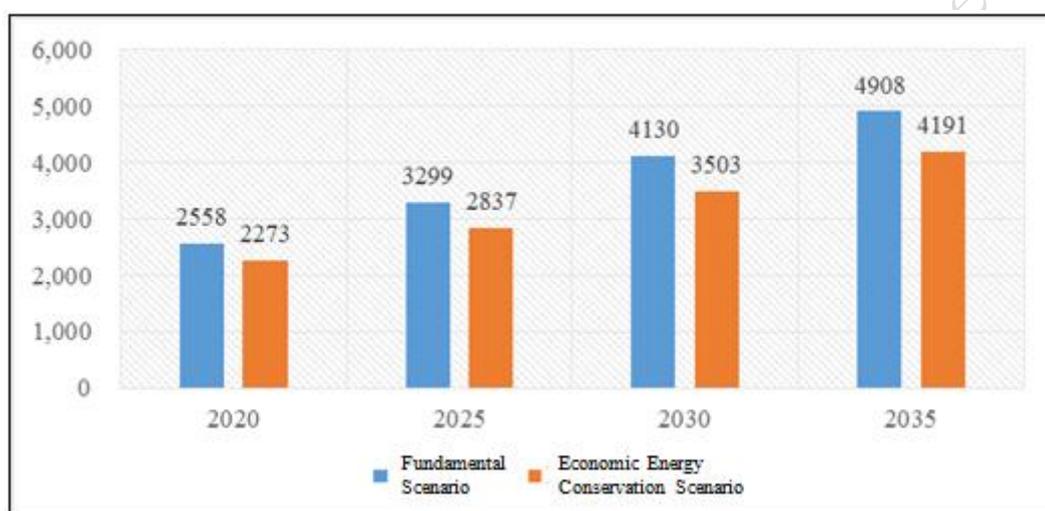
**Figure 4. Energy Consumption - Conservation Demand Forecast for Agriculture Sector (unit: KTOE)**



## (ii) Service sector

Service sector has a high contribution rate to GDP but low total final energy consumption, just 3.4% over the total final energy consumption in 2015. However, according to the forecast, this would be the sector with a high energy consumption growth rate in the next period. Energy conservation scenario assumes that this sector' energy intensity would gradually decrease, reaching 15% by 2035, with high fuel conversion rate, and near vanish of DO in 2035.

**Figure 5. Energy Consumption - Conservation Demand Forecast for Service Sector (unit: KTOE)**

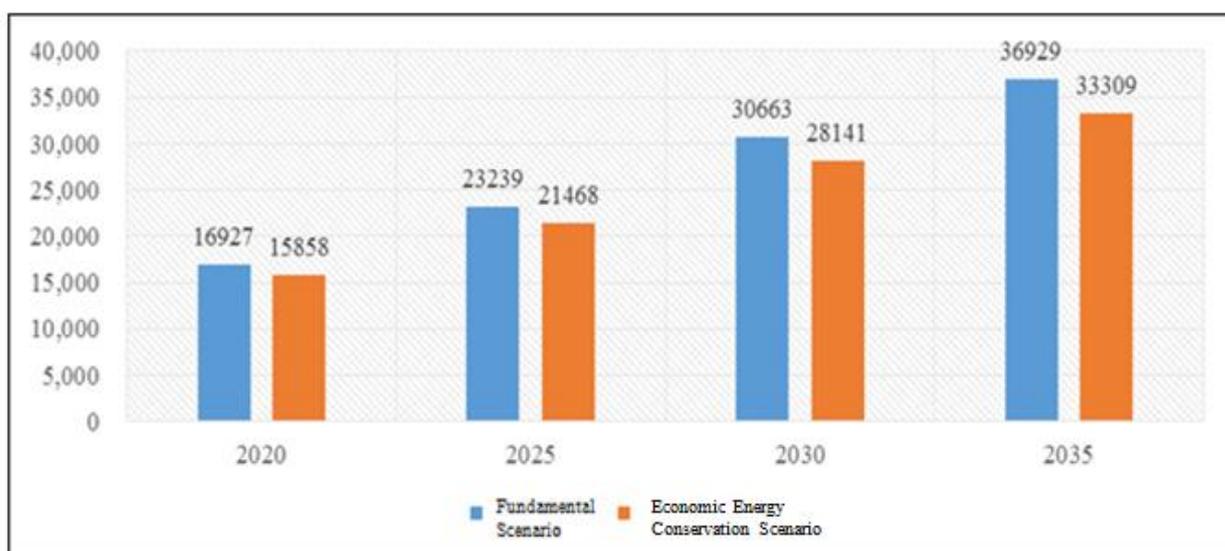


Calculation shows that the reduced energy rate against energy consumption in Fundamental Scenario would be 11.1%, 14.0%, 14.6% and 15.0% in 2020, 2025, 2030 and 2035, respectively.

## (iii) Transport

Transport is a complex sector, with various forms of transport and technology. With the assumption that air fuel consumption remained unchanged, calculation shows that the reduced energy rate against energy consumption in Fundamental Scenario would be 6.3%, 7.6%, 8.2% and 9.8% in 2020, 2025, 2030 and 2035, respectively.

**Figure 6. Energy Consumption - Conservation Demand Forecast for Transport Sector (unit: KTOE)**



**(iv) Household sector**

Each household has 4 main needs for energy/fuel consumption listed below, with relevant technology and equipment in use.

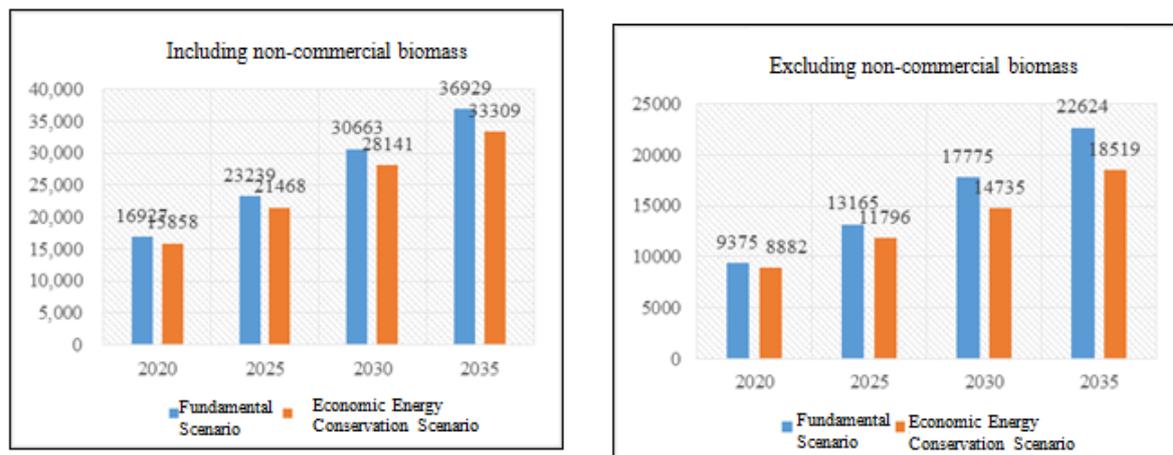
- Need for cooking: consume electricity, coal, biomass, kerosene, LPG and biogas. Associated equipment includes stove;

- Need for hot water: consume electricity, LPG and solar energy. Associated equipment includes electricity, gas or solar energy container-powered hot water dispenser;

- Need for lighting: mainly consume electricity. Associated equipment includes different types of electrical lights;

- Other needs: consume electricity and a small amount of DO for power generator. Associated equipment includes air conditioner, TV, refrigerator, washing machine, fan, DVD player, power generator, ...

**Figure 7. Energy Consumption - Conservation Demand Forecast for Household Sector (unit: KTOE)**



Calculation shows that the reduced energy rate against energy consumption in Fundamental Scenario, including non-commercial biomass, would be 4.0%, 7.2%, 12.9% and 14.3% in 2020, 2025, 2030 and 2035, respectively. If only commercial energies are taken into account, the energy rate would achieve further reduction at 5.3%, 10.4%, 17.1% and 18.1% in 2020, 2025, 2030 and 2035, respectively.

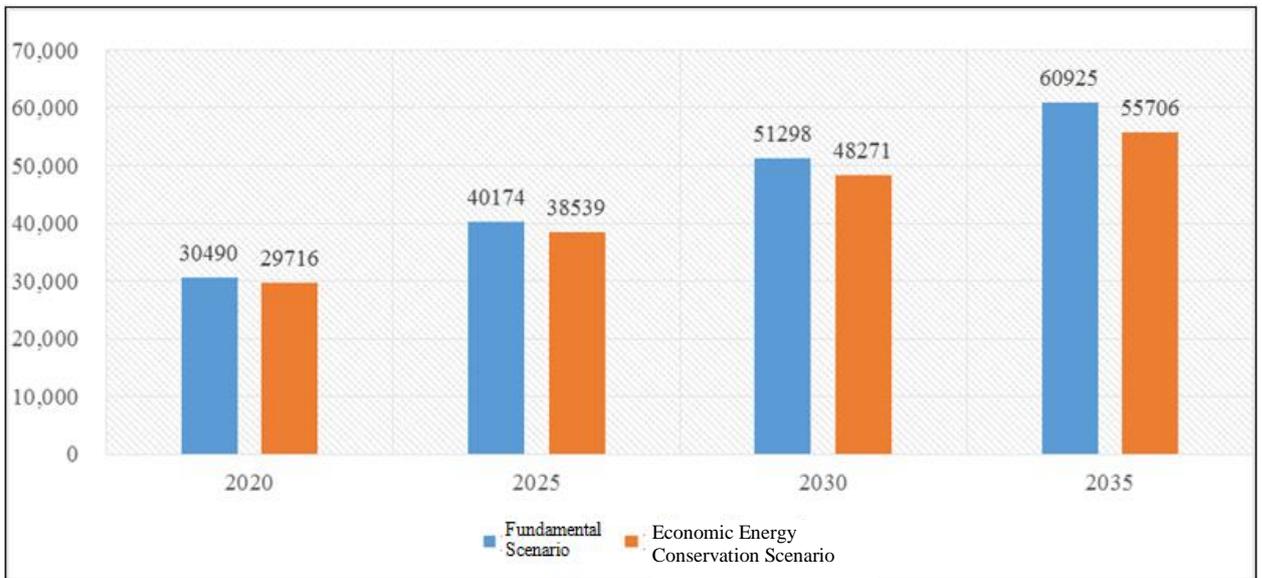
**(v) Industrial sector**

Industry is currently the biggest energy consumption sector, accounting for 43.4% of total energy consumption in 2015. There were a lot of past researches having pointed out that the energy intensity of Vietnam's industry sub-sector and fuel expenditure per product unit are higher than the advanced rate of the world. With that judgment, the Fundamental Scenario's calculation determined Industry sector's energy conservation potential down to Sub-sector level. Calculation shows that the reduced energy rate against energy consumption, including non-commercial energies, in Fundamental Scenario would be 2.3%, 4.1%, 5.9% and 8.6% in 2020, 2025, 2030 and 2035, respectively.

**Table 7. Calculated Energy Expenditure and Conservation Potential Norms**

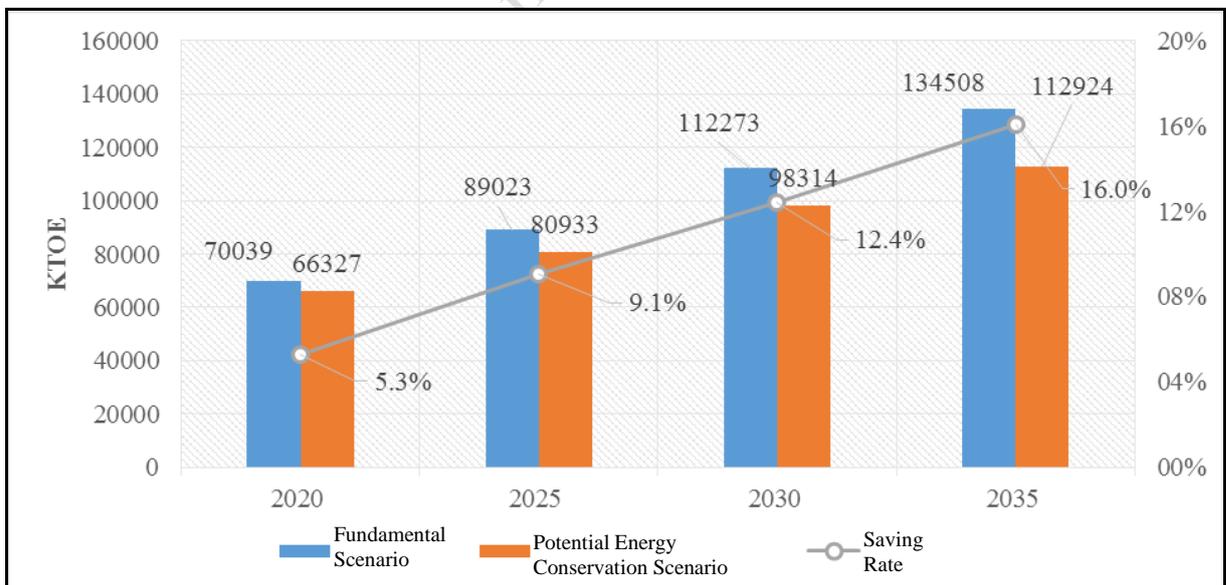
Industry	Product	Specific Consumption		Saving Potential (%)
		Total	Unit	
Beverage	Beer	255	MJ/ 100 liters	9 - 12
	Non-alcohol beverage	78	MJ/ 100 liters	4 - 9
Plastic	Home appliance plastic	1.32	kWh/kg	9 - 13
	Construction plastic	0.41	kWh/kg	5 - 14
	Packaging	0.49	kWh/kg	4 - 12
	Plastic bottle	1.52	kWh/kg	5 - 14.5
	Plastic bag	0.66	kWh/kg	11 - 17
Paper	Paper powder	3,990	MJ/ton	6.8
	Packaging	7,166	MJ/ton	3.8
	Printing paper	9,804	MJ/ton	4.4
	Toilet paper	11,443	MJ/ton	3.8
Chemical	Rubber SVR 10CV, 20 CV	37	KGOE/ton	9.4 - 32.7
	Rubber SSVR 10, 20	55	KGOE/ton	9.8 - 32.7
	Fertilizer	25	KGOE/ton	1.4 - 5.4
	Water-based paint	6.0	KGOE/ton	20 - 30
Heavy industrial product	Finished steel product	179	KGOE/ton	13
	Cement	97	KGOE/ton	14
	Textile	177	KGOE/ton	14

**Figure 8. Energy Consumption - Conservation Demand Forecast for Industrial Sector (unit: KTOE)**



Evaluation shows that energy conservation potential is quite high with energy conservation rates over total final energy consumption against Fundamental Scenario are 5.3%, 9.1%, 12.4% and 16.0% in 2020, 2025, 2030 and 2035, respectively.

**Figure 9. Summary of Energy Conservation Forecast Result (unit: KTOE)**



### 2.1.2. Challenges

- Community and corporate awareness were limited as they are not yet ready to access information on energy conservation technologies and solutions;

- Many businesses have insufficient fund or were not able to access soft credit loans for energy conservation projects. Besides, due to financial difficulty, many companies halted the implementation of energy conservation projects, especially heavy-energy consumption sectors such as steel and cement;

- The support mechanism on replacing outdated production lines by ones with high-performance energy conservation technology encountered many drawbacks. At the moment, the target Program's offering of 30% of total investment fund for production lines and equipment utilizing high-performance technology and less than VND5 billion for a single entity is no longer considered attractive by large enterprises looking to invest in production line replacement as this aid are lower than their total investment;

- A great number of companies who have not thoroughly complied with regulatory requirements from the Law; energy management model and annual and 5-year energy consumption plan for companies have not been developed; companies' energy consumption have not been properly reported to local authorities (Department of Industry and Trade);

- There were many hindrances in managing local businesses: disconnected management among local governing Department, or confusion in auditing and inspecting of businesses for compliance of Legal requirement, which were also drawbacks in the enforcement of Energy Efficiency and Conservation Law;

- Energy price in 2013 increased by over 10% but it was still comparatively lower than that of other countries in the same region, which also affecting energy conservation measures' execution;

- Although resources for implementing and monitoring the compliance with Energy Conservation Law and legal normative documents, related regulations from Central to local level saw positive development, the texts should be supplemented, and the personnel's capacity should be enhanced. Energy management personnel have insufficient knowledge of energy efficiency, and are unsure about solution priority and extends that require assistance. Service-providing businesses only focus on energy audit, not execution plan and solution.

- Financial resource and technical experts at many locals were limited, hence, energy audit at companies for determining energy conservation solutions,

consulting in project development, and finding funds for energy conservation projects was lacking and poorly performed.

## **2.2. Standpoint**

Efficient and effective use of energy makes significant contributions to the national energy security and reliability, and to the accomplishment of Vietnam's commitment to the international community on reducing greenhouse gas emission in the NDC within the framework of the Paris Agreement on Climate Change as well.

The Vietnam National Energy Efficiency Program for the period of 2019 - 2030 is a synchronous programme to support the execution of the Law on Economical and Efficient Use of Energy as well as demonstrate the commitment of authorities and government agencies at all levels from central to local level, associations, enterprises, organisations, individuals and communities on energy saving in particular, on responses to climate change and environmental protection in general;

The Vietnam National Energy Efficiency Program for the period of 2019-2030 was developed based on inheritances from and promotions of positive results, overcoming of limitations of its preceding periods, coordination and mainstreaming with other on-going programmes.

## **2.3. Principle**

The Vietnam - National Energy Efficiency Programme is established on the basis of following specific principles:

- Mobilize all social resources to cope with energy efficiency and conservation demands;
- Conduct institutional capacity enhancement in the implementation of energy efficiency and conservation policy;
- Make the most of international commitment to human resource development, financial capability, and advanced technique and technology as the foundation for the development of national capacity in energy efficiency and conservation;
- Advance technology and technical potential in energy efficiency and conservation field; and

- Become a critical element in the national energy policy.

## **2.4. Objectives**

### **2.4.1. Overall objectives**

- Mobilize all domestic and international resources for the promotion of energy efficiency and conservation via the synchronous assignments and solutions in governance of government; technical assistance, scientific and technological research and products development; market transformations, training and development of human resources; access to international expertise and support in energy efficiency and conservation;

- Establish the habit of energy efficiency and conservation in all aspects of social activities; decrease energy intensity in various industries and economic sectors; make energy conservation a regular activity for key energy users and key energy-intensive economic sectors with guidance towards green growth and sustainable development.

### **2.4.2. Specific objectives**

(i) By 2025:

+ Achieve the efficiency rate of 5.0 – 7.0% per total national commercial energy consumption for the period of 2019 - 2025;

+ Finalize mechanisms, policies and legal regulations on energy conservation, including: Study, amend and supplement the Law on Economical and Efficient Use of Energy and bylaws; complete and supplement regulations on energy consumption norms for 10 to 15 sectors/ subsectors of key energy-intensive economic fields; develop and disseminate 15 to 20 technical guidelines for economic sectors and subsectors;

- Reduce power loss to less than 6.5%;

+ Lower the average energy consumption for industrial sectors/ subsectors compared to that in the period of 2015-2018, namely: (i) For steel industry: from 3.00 – 10.00% depending on product type and production technology; (ii) For chemical industry: minimum 7.00%; (iii) For plastic manufacturing industry: from 18.00 – 22.46%; (iv) For cement industry: minimum 7.50%; (v) For textile and garment industry: minimum 5.00%; (vi) For alcohol, beer and beverage industry: from 3.00 – 6.88% depending on product type and production scale; (vii) For paper industry: from 8.00 – 15.80% depending on product type and production scale;

- + Ensure 100% key transport enterprises to have program on training vehicle control/ technical solution skills in operation and using of motorized vehicles towards energy saving;
- + Reach 70% of industrial parks and 50% of industrial clusters to have access to and apply energy efficiency solutions;
- + Ensure 100% of key energy consumption facilities to apply energy management system as regulated;
- + Ensure the compliance and implementation of requirements in the National Technical Regulation on Energy Efficiency Buildings for construction works under the scope of application of this Regulation;
- + Have 80 construction works certified green buildings, and energy efficiency;
- + Develop and implement a market transformation program on energy efficiency for at least 5 popular products on the market;
- + Provide training and grant certificates for 3,000 energy management/energy audit experts;
- + Reach 60% of schools with communication and teaching activities on efficient use of energy;
- + Reach 90% of provinces and centrally-affiliated cities to develop and approve plans/ programmes on efficient use of energy in their localities;
- + Maintain and develop a network of energy-saving and clean production facilities in at least 50 provinces and centrally-affiliated cities; Establish and keep national energy management network active;
- + Build one (1) Vietnam Energy Data Center and at least (i) two (2) national training centers on efficient energy use, (ii) one (1) energy-efficiency urban model, (iii) five (5) demonstration models on investment loans for energy efficiency projects, and two (2) energy efficiency laboratories;
- + Pilot establishment of a Foundation for promoting energy saving and efficiency through socialization, sponsorship and cooperation of foreign and local individuals and organizations.(ii) In the period towards 2030:
  - + Achieve savings of 8-10% of the total national energy consumption in the period from 2019 to 2030.
  - + Reduce electricity loss to less than 6.0%;

+ Lower the average energy consumption for industrial sectors/ subsectors compared to that in the period of 2015-2018, namely: (i) For steel industry: from 5.00 – 16.50% depending on product type and production technology; (ii) For chemical industry: minimum 10.00%; (iii) For plastic manufacturing industry: from 21.55 – 24.81%; (iv) For cement industry: minimum 10.89%; (v) For textile and garment industry: minimum 6.80%; (vi) For alcohol, beer and beverage industry: from 4.60 – 8.44% depending on product type and production scale; (vii) For paper industry: from 9.90 – 18.48% depending on product type and production scale;

+ Decrease 5% of fuel and oil consumption in transportation against the forecast of fuel consumption demand by 2030; Formulate regulations on fuel consumption for newly produced, assembled and imported 2-wheel motorbikes and automobiles of 09 seats or less;

+ Reach 90% of industrial parks and 70% of industrial clusters to access and apply energy efficiency solutions;

+ Carry out energy labeling for 50% of all kinds of construction materials and products requiring thermal insulation to be used in construction works;

+ Reach 100% of provinces and centrally-affiliated cities to develop and approve plans and programmes on efficient use of energy in their localities;

+ Have 150 construction works certified green buildings, and energy efficiency;

+ Provide training and grant certificates for 5,000 energy management/ energy audit experts;

+ Reach 100% of schools with communication and teaching activities on efficient use of energy.

## **2.5. Applicable subject, scope, and duration of the Programme**

The Vietnam - National Energy Efficiency Programme's focus lies on the following subjects:

### **- Subject:**

+ The programme is applied to all subjects including agencies, entities and individuals involving in energy consumption and/ management activities in Vietnam;

+ Equipment, devices, machines, energy distribution and conversion system allowed to be in use and circulation in nationwide;

+ Other specific subjects.

- **Scope:** The Vietnam - National Energy Efficiency Programme is implemented and applicable across the whole country.

- **Duration:** The Programme shall be implemented from 2019 to 2030 within two phases with the first phase for the period towards 2025, and the second phase for the period of 2026 to 2030.

## 2.6. Key objectives of the Programme

1. Review, develop and complete energy efficiency and conservation policy and institution;

- Review, amend, supplement and streamline the legal normative documents system for energy efficiency and conservation; Study to develop guidelines for energy use management applicable for industrial parks and industrial clusters.

- Study and formulate an energy efficient certification system for energy efficiency solutions.

- Review and finalize a system of technical economic norms on energy efficiency buildings; establish an energy efficiency buildings assessment and certification system; form energy standards, evaluation and labelling for construction materials/ products requiring thermal insulation to be used in construction works;

- Study, develop and issue policies, mechanisms and regulations for energy saving service companies (ESCO) model.

- Review, amend, supplement and complete technical standards and norms for energy efficiency and conservation;

- Develop a capacity evaluation system, recognize and announce energy audit entities meeting regulatory standards

- Review, prepare, formulate and issue energy and energy consumption norms for some sectors/ sub-sectors of industrial field, agricultural field, transportation, construction and services, industrial parks and clusters.

- Establish mechanisms and policies on promoting effective and efficient use of energy for small- and medium-scaled enterprises; incentive mechanisms and policies to encourage and promote public-private partnership in implementing energy saving solutions and integrating renewable energies;

- Develop mechanisms, policies and measures to promote the use of new energies, effective and efficient use of energy for transportation vehicles and equipment. .

2. Provide technical assistance, promote investment projects on energy saving and energy efficiency in manufacturing, transform and transform vehicle market, import equipment, machine, production line with given priorities to the following activities:

- Conduct energy audits and apply advanced energy management systems for energy consumption facilities;

- Improve eco-friendly technological procedures for energy transition, energy efficiency and conservation, and mitigate climate changes;

- Apply new high-efficiency technologies in producing and manufacturing machines, equipment, production line, telecommunication, irrigation, and aquaculture and fishing, etc.

- Apply new energies, use energy effectively and efficiently; apply solutions to improve fuel efficiency of vehicles and equipment; transform modals of passengers and goods transportation.

- Install, improve, and replace vehicles, devices and machinery components by energy-efficiency ones; integrate energy saving solutions and renewable energy for public utilities, buildings, industrial parks, industrial clusters, urban lighting systems, roads, traffic signals, and industrial production facilities, etc.;

- Produce equipment and vehicles with high energy efficiency, and new materials for energy saving solutions;

- Enable advertisement and distribution system of environmentally friendly and energy-saving products;

- Instruct, apply energy saving solutions, high energy-efficiency equipment and renewable energies (solar energy, wind energy, biogas, biomass energy, etc.) in households;

- Provide technical assistance, training, investment in construction and improvement of energy efficiency laboratories;

- Develop demonstration models of investment loans for energy saving and energy efficiency projects;

- Evaluate and deploy application of effective and efficient energy use solutions for industrial parks and industrial clusters;

- Other activities related to effective and efficient use of energy.

3. Build an energy data center of Vietnam and databases, apply information and technology in energy sector, energy saving and efficiency:

- Collect and compile energy statistics information, establish national and sectoral databases on energy and energy efficiency, develop mechanism of cooperation and information exchange on energy and energy efficiency database with other databases;

- Strengthen application and integration of smart technologies and equipment in operation and management of energy-consumed systems and transportation system;

- Develop software and provide guidance on its utilization in managing and updating data about effective and efficient use of energy that is suitable for energy users and energy management units from central to local level.

4. Capacity building for energy efficiency and conservation

- Provide trainings and capacity building for key agencies and officials from central to local level on effective and efficient use of energy in managing the execution of legal regulations on energy saving and energy efficiency practices; provide specialized and technical trainings on effective and efficient use of energy.

- Organize training and capacity building for research institutes, education facilities, consulting companies specializing in energy saving, and energy service companies (ESCOs);

- Update and compile new training materials, technical documents, and guidelines for capacity enhancement on effective and efficient use of energy for various subjects;

- Review and supplement, update contents related to energy saving and efficiency into energy training programs of training institutions throughout the education system;

- Strengthen and improve the network of consulting and service organizations on energy saving and cleaner production from central to local level in nationwide;

- Invest in and put into operation 02 national education centers on energy management;

- For energy consumption facilities:

- + Develop training plan, conduct capacity enhancement for internal officers and workers about energy efficiency and conservation.

- + Organize workshops and seminars, and exchange and share experiences in effective and efficient energy practices.

- + Cooperate, share experience, make plan and practice energy efficiency and conservation between entities.

- For credit institutions: Provide training and enhance capacity on validation of financing projects in the field of energy saving and efficiency;

- For socio-political organizations, civil societies and professional associations: Provide training, disseminate initiatives, experience and solutions on effective and efficient use of energy;

## 5. Inspection, monitoring and evaluation of energy efficiency and conservation practice results

- Organize training and guide inspection and monitoring, urge and evaluate results of fulfilling legal regulations on energy saving and efficiency for stakeholders;

- Strengthen inspection, monitoring and evaluation of the compliance with legal regulations on energy saving and efficiency for individuals and organizations subjected to amendments under the Law on Energy Efficiency and Conservation and bylaws;

- Develop a manual for inspection, monitoring and evaluation of compliance with legislations on effective and efficient use of energy.

## 6. Communication for community's awareness raising

- Develop and implement communication plans on energy efficiency and conservation through different forms in order to raise enterprises' and public community's awareness and responsibility towards energy efficiency and conservation.

- Make communication plans on energy-efficient products including educational programs to provide information for corporates and communities, organization of contests and recurring awards, movements/ campaigns on promoting energy saving and environmental protection, fairs and exhibitions promoting energy conservation products and technologies.

## 7. Enhancement of international partnership on energy saving and energy efficiency

- Enhance international collaboration, improve sharing of policies and experiences, and intensify technical cooperation with other countries, international and non-government organizations in energy efficiency and conservation;

- Further receive technical support, technology transfer and human resource training in energy efficiency and conservation activities;

- Seek, mobilize and conduct technical assistance and investment support projects relating to energy efficiency and conservation towards targets of climate change response and national Green Growth.

- Cooperate in establishing bilateral and multilateral financing mechanisms to promote implementation of energy saving solutions.

## 8. Conduction of scientific research and technology development in energy efficiency and conservation

- Mobilize human resource, research equipment, fund from the State's budget, and domestic and foreign individuals and organizations to develop national science and technology capacity in energy efficiency and conservation;

- Build and conduct researches and key scientific & technological programmes to develop and adopt source/core energy-efficiency science and technologies to practices;

## 9. Establishment of the Foundation for Promoting Energy Efficiency and Conservation

Study to develop, suggest and establish the Foundation for Promoting Energy Efficiency and Conservation on the basis of mobilizing all domestic and foreign resources for the implementation of energy efficiency and conservation in Vietnam.

### **2.7. Programme Operational Fund**

The expenditure source for the Program's implementation includes:

a) Funding from the State Budget: estimated VND 4,400 billion comprising:

- Non-business economic expenditure from the central budget reserved for energy saving and effective use activities managed and organized by Ministries/ departments is VND 600 billion;

- Non-refundable aid: expected about VND 1,600 billion from bilateral and multilateral support programs, in which the capital for development investment is VND 500 billion, and the remaining VND 1,100 VND is from non-business expenditure/ technical assistance;

- Based on the Program and proposals of the Ministry of Industry and Trade, the Ministry of Finance will, on yearly basis, balance budget to fund for implementation of energy saving and efficiency activities (for the funding to promote effective and efficient use of energy in ministries / sectors; People's Committees of provinces and centrally-affiliated cities shall work out plans and cost estimation for implementation in order to allocate from the state budget estimates (for funding to implement effective and efficient energy use activities in localities);

- Expenditure from the central budget for development investment covers construction investment, procurement of equipment for national training centers, demonstration projects, central and local data centers and laboratories on energy saving and energy efficiency. Based on construction investment and equipment procurement projects formulated by agencies, the Ministry of Industry and Trade compiles and submits to the Ministry of Planning and Investment for consideration and appropriate financial arrangement according to the budget balancing, then submit to competent authorities for final decision;

- ODA and concessional loans from international governments, international organizations, development partners, and international credit institutions: estimated VND 2,200 billion.

b) Funding from domestic sources, energy-utilizing individuals and entities and energy service companies (ESCO):

- Capital for investment in the field of energy saving from domestic credit institutions: estimated around VND 5,000 billion.

- Energy-utilizing individuals and entities and energy service companies make use of their funding to fulfill objectives of securing energy efficiency and conservation.

c) Other legal mobilization sources:

Other funds could be raised for implementation of energy efficiency and conservation activities.

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## **PART III: EVALUATION OF THE PROGRAMME'S EFFECTIVENESS**

### **3.1. Evaluation of the Programme's feasibility**

- The Programme closely sticks to energy efficiency and conservation standpoint and guidance;
- The standpoints, principles, goals, and objectives are consistent with the necessity and scientific foundation of energy efficiency and conservation;
- Objectives and implementation solutions.

### **3.2. Forecast possible challenges causing negative impact and remedies**

#### **3.2.1. Challenges**

- Implementation time of the Programme, especially in 2019, is not much left;
- Energy price structure does not promote the urgent need of energy efficiency and conservation;
- Expenditure for the implementation of the Programme (scale and budget distribution).

#### **3.2.2. Remedies**

- Determination of the political system;
- Support from domestic and foreign experts, international funding for promoting energy efficiency and conservation in Vietnam.

### **3.3. Specific impact of the Programme**

#### **3.3.1. Social impact**

- There are a lot of subjects benefiting from the Programme: All energy-utilizing and energy-providing entities and individuals, and the State's governance authorities that benefit from the Programme's result
- The Programme is the measure for primary energy supply reservation and national development towards sustainability, green growth and national competitiveness enhancement.
- Establish a society with awareness of energy efficiency and conservation.

### **3.3.2. Socio-economic impact**

#### **a. Economic impact**

- Contribute to the implementation of National Energy Policy:
- + Reduce the increase in commercial energy supply by average 0.8%/year for 2020 - 2030;
- + Reduce greenhouse gas emission by 10 – 15 million tonnes of CO<sub>2</sub> equivalent per year;
- + Achieve energy saving of 55 – 60 million TOE.

#### **b. Social impact**

- Improve national competitiveness index;
- Establish a society of energy efficiency and conservation.

### **3.3.3. Sustainability of the Program**

- Enhanced national competitiveness;
- Is an important solution for the implementation of National Policy on Energy, Sustainable Development Policy and Green Growth Policy.

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## PART IV. IMPLEMENTING ENTITIES

### 4.1. Organizing inter-sector collaboration

#### a) *The Steering Board of the Vietnam National Energy Efficiency Programme:*

- Establish National Steering Committee for Vietnam National Energy Efficiency Programme (hereinafter called the “Program Steering Committee”) with the Deputy Prime Minister acting as the Head, Minister of Industry and Trade acting as Standing Deputy Head, and representatives from other Ministries: Construction, Transport, Agriculture and Rural Development, Training and Education, Labour, Invalids and Social Affairs, Information and Communication, Planning and Investment, Finance, Natural Resource and Environment, Vietnam Union of Science and Technology Associations acting as the members of the Steering Committee;

- The Steering Committee shall have its operational regulation for the Vietnam - National Energy Efficiency Programme approved and establish office at MoIT with establishment decision by MoIT;

#### b) Local Standing Agencies:

- The mission of the *Programme* in localities shall be fulfilled by DoITs with focal official assigned to monitor the Programme implementation at their localities.

### 4.2. Responsibility of Ministries and Departments

#### a) Ministry of Industry and Trade:

Ministry of Industry and Trade is the permanent agency of the Programme Steering Committee which take responsibility for assisting the Steering Committee to organize and oversee effective implementation of the Programmes;

MoIT shall be liable to lead and coordinate with ministries and departments to make annual plans, organize selection and collection of duty suggestions for related ministries/ departments, collaborate with the Ministry of Finance and Ministry of Planning and Investment in identifying and consolidating list of responsibilities and projects to implement the Programme;

On basis of annual final report and annual implementation schedule of ministries, departments and localities, MoIT shall review, assess, draw lessons

learnt and make plans for the following years to further deploy the Programmes; review and evaluate implementation results of the period 2019-2025 and propose adjustments and supplementation of objectives and tasks of the Programme in the period 2025-2030 in line with socio-economic development conditions of the country, and report to the Steering Committee for consideration and final decision in 2025.

MoIT shall be responsible for instructing, organizing and accomplishing the Programme's tasks that are under control and management of MoIT:

- Direct and collaborate with related ministries and departments to validate, amend, supplement, develop, submit to issuance-competent level or issue mechanisms and policies for energy efficiency and conservation;

- Direct and collaborate with relevant Ministries/ divisions in reviewing, amending, supplementing and formulating energy efficiency policies and mechanisms, financial management mechanism for the Foundation for promoting energy efficiency and conservation, and financial mechanism to promote energy service market;

- Direct and collaborate with related ministries and departments to study to develop certification regulation for energy efficiency and conservation;

- Direct and collaborate with related ministries and departments to study to develop regulations for energy efficiency and conservation certification for energy-utilizing facilities, including evaluation criteria, organization of evaluation, monitoring, qualification, certification and certification procedure;

- Direct implementation of technical assistance, promotion of projects on investment, installation, improvement and manufacture of fuel-conversion equipment and technological processes, and encouragement of energy saving and efficiency for production facilities, service companies and households;

- Guide localities in developing, approving and implementing action plan for energy efficiency and conservation;

- Organize the inspection, supervise and speed up the implementation of energy efficiency and conservation;

- Organize and manage training activities, prepare and compile training coursebooks, provide implementation guideline for energy efficiency and conservation;

- Direct the organizing of communication, education and capacity enhancement activities on energy efficiency and conservation; routinely hold contests, awards, trade promotion programmes and technology introduction, and promote market of energy-efficiency products;

- Expand international partnership, intensify exchanges of experiences, scientific technologies, finance, human resource trainings and information to execute the national Programme. Implement international partnership Projects on energy efficiency to tackle the targets specified in Vietnam's Nationally Determined Contributions (NDCs) and Green Growth strategy in the field of energy, industry and trade;

- Perfect the legal framework, build and establish Vietnam energy, energy saving and energy efficiency data center, mechanism of coordination and information sharing on energy use database with other databases;

- Implement annual targets and five-year targets on energy saving and energy efficiency for industry and trade sectors;

- Perform other tasks on energy saving and energy efficiency as assigned.

b) Ministry of Construction:

The Ministry of Construction is responsible for the directing and organizing of implementation energy efficiency and conservation activities within its governmental governance, namely:

- Make annual plans and reports on the implementation of energy saving and energy efficiency tasks as assigned and send to the Ministry of Industry and Trade for sum-up and report to the Programme Steering Committee;

- Guide, urge, inspect and oversee the compliance with requirements of the National Technical Regulation on Energy Efficiency Buildings.

- Review, amend and supplement standards, technical and economic norms on energy saving and energy efficiency in construction works, industrial facilities, development of green buildings and urban areas; establish an energy efficiency buildings assessment and certification system; form energy standards,

enhance capacity of laboratories, evaluate and do energy labelling for construction materials/ products requiring thermal insulation to be used in construction works;

- Review, study and build regulations on energy consumption limits for sectors/ sub-sectors and construction products to meet management requirements and suit to socio-economic conditions;

- Carry out activities about technical assistance, promotion of new construction investment projects, projects on improvement, installation and replacement of equipment in construction works, public lighting systems; projects on investment, improvement and renewal of equipment and technology in production facilities under construction sector for energy saving and energy efficiency.

- Perform other duties on effective and efficient use of energy under the functions and tasks assigned.

c) Ministry of Agriculture and Rural Development:

The Ministry of Agriculture and Rural Development is responsible for the directing and organizing of energy efficiency and conservation implementation effort within its governmental governance, namely:

- Make annual plans and reports on the implementation of energy saving and energy efficiency tasks as assigned and send to the Ministry of Industry and Trade for sum-up and report to the Programme Steering Committee;;

- Lead and coordinate with relevant ministries to review and perfect policies, mechanisms, standards and technical regulations on energy saving and energy efficiency in the field of irrigation, aquaculture, fishing and seafood exploitation, and instruct the implementation;

- Lead and coordinate with relevant ministries to review, study, develop and issue energy use norms for irrigation, aquaculture, fishing and seafood exploitation to satisfy management requirements and suit to socio-economic conditions;

- Lead the implementation of technical assistance, promotion of projects on investment, installation and improvement of energy-efficiency equipment and vehicles in agriculture; on production and diversification of renewable energy sources from agricultural by-products;

- Perform other duties on effective and efficient use of energy under the functions and tasks assigned.

#### d) Ministry of Transport

The Ministry of Transport is responsible for the directing and organizing of energy efficiency and conservation implementation effort within its governmental governance, namely:

- Make annual plans and reports on the implementation of energy saving and energy efficiency tasks as assigned and send to the Ministry of Industry and Trade for sum-up and report to the Programme Steering Committee;

- Lead and coordinate with relevant ministries to review and perfect policies, mechanisms, standards and technical regulations on energy saving and energy efficiency in the field of transportation, and instruct the implementation;

- Lead and coordinate with relevant ministries to review, study, develop and issue energy level and energy use norms for some kinds of transport vehicles and equipment, lighting for national traffic system and traffic signals to satisfy management requirements and suit to socio-economic conditions;

- Lead building and implementation of solutions to promote development and increase of share of urban public transportation; share of freight transport by waterways, coastal transport and rail transport to reduce fuel consumption in transportation; apply new technologies and new energies in replacement of conventional fuels, and change fuels to be used in transportation sector;

- Lead the implementation of technical assistance, promotion of projects on investment, installation, improvement and production of energy-efficiency equipment for transportation works, equipment and vehicles;

- Implement energy labeling for newly produced, assembled and imported transportation vehicles; Develop and disseminate vehicle controlling skills/technical solutions in exploitation and utilization of motorized vehicles towards energy saving and energy efficiency;

- Lead the implementation of regulations on effective and efficient use of energy in maritime and civil aviation in accordance with International Treaties that Vietnam is a member of;

- Perform other duties on effective and efficient use of energy under the functions and tasks assigned.

#### e) Ministry of Science and Technology

The Ministry of Science and Technology is responsible for the directing and organizing of energy efficiency and conservation implementation effort within its governmental governance, namely:

- Make annual plans and reports on the implementation of energy saving and energy efficiency tasks as assigned and send to the Ministry of Industry and Trade for sum-up and report to the Programme Steering Committee;

- Lead and coordinate with relevant ministries and departments to review, supplement and develop national standards on energy efficiency for energy-based vehicles and equipment;

- Lead and collaborate with the Ministry of Industry and Trade in developing and conducting key national scientific research and technology programmes in the aspect of energy efficiency and conservation;

- Collaborate with other Ministries: Ministry of Industry and Trade, Ministry of Finance, Ministry of Planning and Investment, and other relevant ministries/ departments in allocating fund, organizing the management, implementation and application of scientific research and technology development results in the Priority List;

- Perform other duties on effective and efficient use of energy under the functions and tasks assigned.

#### f) Ministry of Planning and Investment

- The Ministry of Planning and Investment, on the basis of the Programme's content and suggestions from the Ministry of Industry and Trade, ministries, departments and locals, is responsible for balancing and distributing development fund annually in order to implement the Programme under applicable budget hierarchy;

- Lead the review, study, amendment, supplement, and promulgation of standards on energy saving and energy efficiency requirements in planning industrial parks.

- Guide other ministries and local authorities in making mid-term budget plan for implementation of the Programme's activities;

- Perform other duties on effective and efficient use of energy under the functions and tasks assigned.

g) Ministry of Finance

- The Ministry of Finance, on the basis of the Programme's content and suggestions from the Ministry of Industry and Trade, ministries, departments and locals, is responsible for balancing and distributing development fund annually in order to implement the Programme in accordance with prevailing laws and regulations;

- Lead and work with the Ministry of Planning and Investment and the Ministry of Industry and Trade in studying, developing and promulgating regulations on the Programme's expenditure management and use to ensure full financial mechanisms for the Programme's activities

- Cooperate with the Ministry of Industry and Trade and relevant authorities to set up financial mechanisms of the Foundation for promoting energy efficiency and conservation;

- Work with the Ministry of Industry and Trade to build financial mechanisms to promote energy service market;

- Perform other duties on effective and efficient use of energy under the functions and tasks assigned.

h) Ministry of Natural Resources and Environment

- Lead and work with the Ministry of Industry and Trade, and other ministries, departments and local authorities to guide implementation and compilation of information on attempted mitigation of greenhouse gas emission through energy saving and energy efficiency in the NDC of Vietnam; Instruct implementation of national monitoring and coordination in international surveillance in conformity to the Paris Agreement;

- Perform other duties on effective and efficient use of energy under the functions and tasks assigned.

i) Ministry of Education and Training; Ministry of Labor, War Invalids and Social Affairs

- The Ministries of Education and Training and Labor, War Invalids and Social Affairs is responsible for leading the implementation of technical assistance projects on building integrated training programs, executing training activities, organizing knowledge training in energy efficiency and conservation within the national education system;

- Report the review and prepare annual planning on energy efficiency and conservation in education sector then submit it to the Ministry of Industry and Trade for compilation and report to the Programme Steering Committee.

- Perform other duties on effective and efficient use of energy under the functions and tasks assigned.

k) Ministry of Information and Communication

- Instruct and work with central-to-local radio and television broadcasters and news agencies to promote and communicate policies, legal regulations, knowledge and information on energy saving and energy efficiency;

- Perform other duties on effective and efficient use of energy under the functions and tasks assigned.

l) Vietnam Energy Efficiency and Energy Conservation Association and relevant societies:

- Participate in collaboration with the Ministry of Industry and Trade and other relevant agencies in the task of training, popularizing of knowledge, organizing experience-sharing workshop and conference on energy efficiency and conservation for energy-utilizing individuals and entities;

- Collaborate with the State's governance authorities in developing indexes for the inspection, monitoring and evaluation of securing energy efficiency and conservation implementation outcome.

- Strengthen international partnership for experience, science, technology, finance, human resource training, information exchange for the implementation of National Programme.

m) Groups and Corporations: Electricity of Vietnam, Vietnam National Petroleum Group, Vietnam National Coal & Mineral Industries Holding Corporation Limited:

Assume the responsibility for executing, monitoring, evaluating the deployment of contents within its sector management authority; periodically report to the Programme Steering Committee the followings:

- Develop plans, set out targets and implementation schedule, arrange and mobilize funds for the implementation energy saving and energy efficiency activities;

- Involve in or lead activities of communication and information dissemination on energy saving, electricity saving, use of new energies and renewable energies towards enterprises and society;

- Build training and capacity building plans for officials and workers inside the Corporations on energy saving and energy efficiency;

- Organize workshops and conferences for guiding, exchange of information and experience, and communication on energy saving and energy efficiency inside the Corporations;

- The Electricity of Vietnam: To organize communications activities on energy saving, adopt solutions on energy saving and reduce power loss during the generation, transmission and distribution on annual basis and five-year basis, periodically report the Programme Steering Committee, and carry out pilot ESCO projects;

- Annually report achievements and work plan of the following year to the Programme Steering Committee;

### **3. Responsibility of Committees of provinces and municipalities**

- Establish and approve the local-level Programme implementation plan which clearly indicates road map and targets of energy saving and energy efficiency under their authority; allocate fund for accomplishing, inspecting, monitoring and evaluating quality, progress and performance of the tasks on energy efficiency and conservation at localities;

- Study and promulgate incentive mechanisms and policies, encourage and grant special rewards for organizations and individuals with achievements in energy saving and energy efficiency at localities;

- Organize and collaborate in the implementation of popularization of energy efficiency and conservation at localities;

- Instruct authorities to further examine, inspect and urge fulfilment of legal regulations on energy saving and energy efficiency;.

- Mobilize lawful funds for the implementation of the Programme's contents within local governance authority.

- Annually report achievements and work plan of the following year to the Programme Steering Committee;

#### **4. Responsibility of energy-utilizing entity**

- Establish and implement energy efficiency and conservation plan for energy-consuming vehicle and equipment under the entity's management in accordance with approved roadmap; organize the task of monitoring and evaluating energy efficiency and conservation implementation outcomes; update and supplement the plan for later phase;

- Collaborate with related agencies in performing auditing, validating and assessing impacts associated with energy use; study to suggest source management measure to energy loss and waste;

- Invest and recondition energy-utilizing vehicle, equipment and work; study to apply energy efficiency and conservation technology; adopt information technology in management and monitoring of energy use within the entity;

- Develop risk management, respond and remedy procedure; promptly allocate human resource and equipment in the event of issues in energy use within the entity;

- Develop training plan, conduct capacity enhancement for internal officers and workers about energy efficiency and conservation;

- Organize workshop, guidance conference for experience exchange and sharing, and popularizing the practice of efficient and effective energy use within the entity;

- Form partnership and share experience in making plans and practicing energy efficiency and conservation between entities;

- Periodically report the achievements of energy saving and energy efficiency to the local Departments of Industry and Trade.

## **5. Public responsibilities**

Residential communities, households, individuals and entities bear the responsibility of taking energy saving and energy efficiency measures, monitor, inspect, detect, report, and request competent authorities to handle legal violations on energy efficiency and conservation.

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## ANNEXES

### **Annex 1. Review of the implementation of the Vietnam - National Energy Efficiency Programme**

#### ***1. Performance against the Programme goals:***

- The goals of reducing the total energy consumption nationwide by 5.0-8.0% in the 2011-2015 period were met against the energy demand forecast for the 2011-2020 period with an outlook to 2030, equivalent to an 11-17 million TOE reduction in the 2011-2015 period;

- Energy efficiency and conservation (EEC) targets were met in the most energy-consuming industries; the implementation of EEC Building Code was strengthened among large-scale energy consuming buildings; EEC solutions and technologies were promoted in the transportation sector; additional specific goals and targets were also introduced.

#### ***2. Achievements in the 2011-2015 period***

594 tasks and projects under the target Programme were implemented in the 2011-2015 period. The target Programme's activities are divided into different project groups as follows:

**Project group 1:** Strengthening education, dissemination and communication, public advocacy, awareness raising, promoting EEC and environmental protection.

The key activities of Project group 1 aim to:

- i) Promote and raise public and community awareness of EEC.
- ii) Introduce EEC education into the National Education System.
- iii) Develop and pilot the use of alternative energy sources and models of energy saving households.

The activities under Project group 1, led by MOIT in coordination with MOET and other stakeholders, have led to the following achievements:

- Coordinated with Vietnam Television and other local media channels in developing and releasing video clips, reportages and newspapers articles to disseminate and advocate EEC. Maintained and regularly updated the contents and articles, performed data management, and improved the quality of the Programme's website at (<http://www.tietkiemnangluong.com.vn> and

<http://www.vneec.gov.vn>), disseminating useful EEC know-how and solutions, promoting EEC efforts in production, business and daily living among enterprises and communities;

- Organized annual competitions such as “Energy efficient building” and “Energy conservation in the industrial sector” nationwide in the 2011-2015 period; organize energy-saving homes advocacy campaigns and emulation movements; organize Earth Hour campaign, promoting the Law on EEC and under-law documents to municipal sectoral departments and agencies as well as enterprises across the country, etc. These activities were well received and participated in by organizations and enterprises nationwide;

- Formulated and promulgated in a synchronous manner directive and guiding documents which guide DOET, intermediate schools, colleges and universities to mainstream EEC education into all levels of education. Five years of implementation saw positive results. EEC contents were incorporated into a number of subjects at preschool, primary school, lower secondary school, upper secondary school, professional intermediate school, college and university level. School-based EEC models were developed by a number of educational establishments.

- Developed, disseminated and replicated successful demonstrations of the use of new energy sources (e.g. solar, biogas, etc.) at production and business facilities and households across many cities and provinces nationwide.

**2.2 Project group 2:** Developing and popularizing high efficiency and energy saving equipment and devices, eliminating low-efficiency ones step by step

The key activities of Project group 2 aim to:

- i) Develop EE standards and introduce required energy labeling;
- ii) Provide manufacturers, assemblers, importers and retailers of high-efficiency products as well as local EE testing laboratories with technical support;
- iii) Support enterprises in applying technical standards and norms, in improving efficiency towards EEC;

iv) Promote the deployment of energy management models at industrial establishments;

v) Develop technical and financial services for the implementation of EEC investment projects;

The activities under Project group 2, led by MOIT in coordination with MOST, have led to the following achievements:

- Strengthened the system of legal normative documents with 30 documents of all types: Circular, Technical Guideline, Code, National standard (TCVN) for EEC state management purpose, i.e. management of activities under EEC standard implementation program and energy labelling of energy powered vehicles and devices, as well as development of a specific implementation roadmap;

- As of the end of 2015, MOIT had approved energy labeling for over 8,000 types of products, impacting tens of millions of energy powered devices. Over the past years, energy labeling has been successfully performed by MOIT, shifting the market of energy powered devices and vehicles from low efficiency to high EE;

- Delivered over 50 policy dissemination and training workshops on energy labeling to relevant stakeholders such as DOIT, market surveillance and quality management agencies, importers and exporters, supermarkets, retailers of energy powered devices across the country;

- Provided technical support to 05 local EE testing laboratories, improving the capacity of testing personnel. Cross-checked between different testing laboratories to ensure the accuracy across EE testing laboratories;

- Developed energy consumption quotas for steel, plastics, paper, cement, beverages, textile and garment, fibre manufacturing and agricultural produce processing industries. 05 circulars on energy consumption quotas of key industries and energy consuming industries were promulgated by MOIT to strengthen management and monitoring of energy consumption at industrial establishment level;

- Supported 585 enterprises in energy audit; surveyed and analyze energy-saving possibilities and potentials of production enterprises, in order to optimize

production processes, improve the current state of energy consumption, and save power;

- Facilitated investment in the replacement and EE improvement of outdated devices as part of energy saving plan; improved the efficiency of new devices by providing technical support to introduce optimal operating parameters to new device assembly lines. As of the end of 2015, 11 projects had received support to replace their outdated lines with high EE ones;

- Supported key energy consuming establishments develop ISO:50001 energy management system. As of the end of 2016, the Programme had supported over 150 enterprises develop their energy management system, among which 20 enterprises had successfully applied for ISO:50001;

- Provided training and certification to 2,200 energy managers and issued 250 energy auditor certificates. Developed and promulgated 02 standardized training materials on energy auditing and management; 03 training materials on advanced energy auditing in textile, beer and paper industries;

- Introduced and implemented the model of energy service companies (ESCO), and provided consulting service and financial support to EEC investment projects. So far 6 ESCOs have been established and registered.

### **2.3 Project group 3: Promoting efficient use of energy in buildings**

The key activities of Project group 3 aim to:

- i) Strengthen the implementation of energy efficiency building code in large-scale buildings.

- ii) Promote the use of energy saving solutions, technologies, devices and materials; organize green and energy saving building competitions.

- iii) Promote efficient and saving use of energy in public lighting

The activities under Project group 3, led by MOC, have led to the following achievements:

- Promulgated the National technical standard QVCN 09/2013/BXD on EE buildings. Reviewed, supplemented and amended regulations on public lighting to meet what is required by QCVN 07:2014/BXD;

- Set up and updated energy consumption database of key buildings and large-scale buildings, i.e. over 200 high-rises, commercial buildings and hotels nationwide;

- Piloted green building assessment criteria and green building certification of buildings which meet EE standards. Organized national EE building competitions annually, building energy saving solution design and application competitions;

- Piloted the development and upscaling of public lighting command and control centers using GSM/GPRS to improve Hanoi's public lighting EE;

- Surveyed the state of energy consumption across the provinces; provided support to pilot solar-powered public lighting in public spaces such as parks, squares, and streets; Developed EE and energy-saving lighting models across cities and provinces nationwide.

#### **2.4 Project group 4: Promoting energy saving in the transportation sector**

The key activities of Project group 4 aim to:

- i) Promote energy saving in the planning and construction of transportation infrastructures.

- ii) Improve EE in the organization and exploitation of transportation systems.

- iii) Promote the use of new technologies and renewable energy in the transportation sector

The activities under Project group 4, led by MOT, have led to the following achievements:

- Surveyed, developed and deployed EE solutions applicable to passenger transportation buses in major cities; surveyed and developed codes, standards and fuel consumption quotas applicable to a number of means of road transportation.

- Developed an EE improvement handbook for planning and formulation of road transportation works, a fuel efficiency improvement handbook for marine propulsion system, a fuel improvement handbook for key enterprises in

the road transportation sector; developed and promulgated energy labeling standards and procedures for under 7 seater vehicles.

- Optimized flight routes in the aviation sector to reduce the fuel consumption of certain flight routes.

- Designed and manufactured 12-15 seater mini-bus to be rolled out in certain cities and tourist areas; designed and manufactured test electric cars for use in airports.

- Piloted the use of biodiesel in certain types of locomotives; introduced natural gas-powered technologies in passenger car manufacturing and assembly, and proposed solutions rolled out in cities in order for EE improvement, environmental protection, and accessible transportation.

- Developed technical and management solutions to reduce fuel cost in maritime transportation and aviation; developed technical and management EEC solutions to port exploitation.

### ***3. Evaluation of energy conservation results within the Programme for the 2011-2015 period***

The accumulated energy conservation rate in the 2011-2015 period was **5.96%**, equivalent to 11.880 TOE, according to the calculation done by the Institute of Energy.

**Table 8. Energy conservation results for the 2011-2015 period<sup>12</sup>**

Item	Unit	2010	2011	2012	2013	2014	2015	2011-2013	2011-2015
Assumed energy intensity	kgOE/10 <sup>3</sup> USD	428.8	428.8	428.8	428.8	428.8	428.8	428.8	428.8
Total GDP (2005 fixed price)	million USD	78,282	83,167	87,531	92,277	97,795	103,858		
Total assumed energy consumption	KTOE	33,570	35,662	37,533	39,568	41,934	44,534	112,764	199,233
Total actual energy consumption	KTOE	33,570	34,502	35,216	36,987	39,169	41,480	106,705	187,353
Energy conserved	KTOE	-	1,160	2,317	2,582	2,766	3,055	6,059	11,880
Conservation rate (%)		0.0%	3.3%	6.2%	6.5%	6.6%	6.9%	5.37%	5.96%

<sup>12</sup> The 2011-2015 National Target Program review report, the Institute of Energy

#### ***4. Existing issues***

Compared to the identified energy consumption potential, despite having the set goals met, the target Programme encountered a number of challenges during implementation, which reduced its sustainability, as follows:

- The Law on EEC was not strictly obeyed. Many organizations and enterprises did not fulfill all of what is stated in the promulgated Law, Decree and guiding documents, e.g. development of establishment-based energy management model, formulation of annual and five-year energy consumption plan, energy statistics, periodic reporting to local authorities, procurement of high efficiency devices using their budget, sanctions imposed on violators, etc.;

- Local management of energy consuming establishments remained limited. There was a lack of coordination among state management authorities at local level (DOIT, DOC and DOT), leading to certain struggles in inspection and examination of establishments which had not observed the Law;

- The implementation of energy labeling roadmap encountered certain difficulties in terms of testing infrastructures, inadequate and inconsistent standards, shortage of EE testing devices, weak human and financial resources. As of the end of June 2015, only 05 local laboratories and 02 laboratories overseas had been appointed to conduct EE testing, meeting the need for testing only 10 types of products. Preparation and investment in testing equipment and devices are being made for the testing of other products such as television receivers, electric motors, washing machines, office equipment and devices, etc;

- The community and enterprises have limited awareness and readiness to access information on energy conservation technologies and solutions. Many government agencies and units were not really proactive and active in implementing their assigned contents and tasks in the target Programme; EE technical experts, especially in civil construction and transportation sectors and at local level fell short in number and weak in capacity;

- Annual funding allocated from the State budget to the target Programme often came late, affecting the implementation progress of Program tasks. Moreover, the annual amount of funding remained small, e.g. VND70 billion in 2011, VND82.5 billion in 2012 (VND55 billion from the State budget and VND27.5 billion funded by the Government of Denmark), VND96.1 billion in

2013, VND58.7 billion in 2014, and VND42 billion in 2015. The total accumulated funding the target Programme had received as of the end of 2015 was VND349 billion (not inclusive of the funding from local budget and enterprises), while the target Programme covered a wide variety of beneficiaries from central to local level.

- The outcome of EEC activities in civil construction and transportation sectors was below their potential. Owners of buildings and transportation facilities had limited awareness of EEC. There lacked a focus in the implementation of solutions, and specific results achieved in the assigned areas were not yet quantified.

- Enterprises were short of funding or unable to access preferential loans applicable to energy conservation projects. Due to financial difficulties, many enterprises, especially in the steel, cement, chemicals... industries, had not had a plan to implement energy conservation projects, despite having the largest energy saving potential.

- There were many limitations in the mechanism of support provided to enterprises to invest in the replacement of outdated technological lines with high efficiency, energy saving ones. So far, the target Programme has funded enterprises with 30% of the total investment capital in technological lines and high-efficiency devices, and funding per enterprise does not exceed VND5 billion. Such incentive no longer attracts large enterprises to invest in transforming their technological line, because the amount of funding is far smaller than the total investment capital that they have to make.

- The energy service market has not been formed yet to promote investment in energy conservation solutions. There is a small number of energy conservation service providers and ESCOs (so far only 6 ESCOs established) with limited technical, technological and financial capacity. The existing legal framework is inadequate to execute EE contracts between ESCO and enterprises.

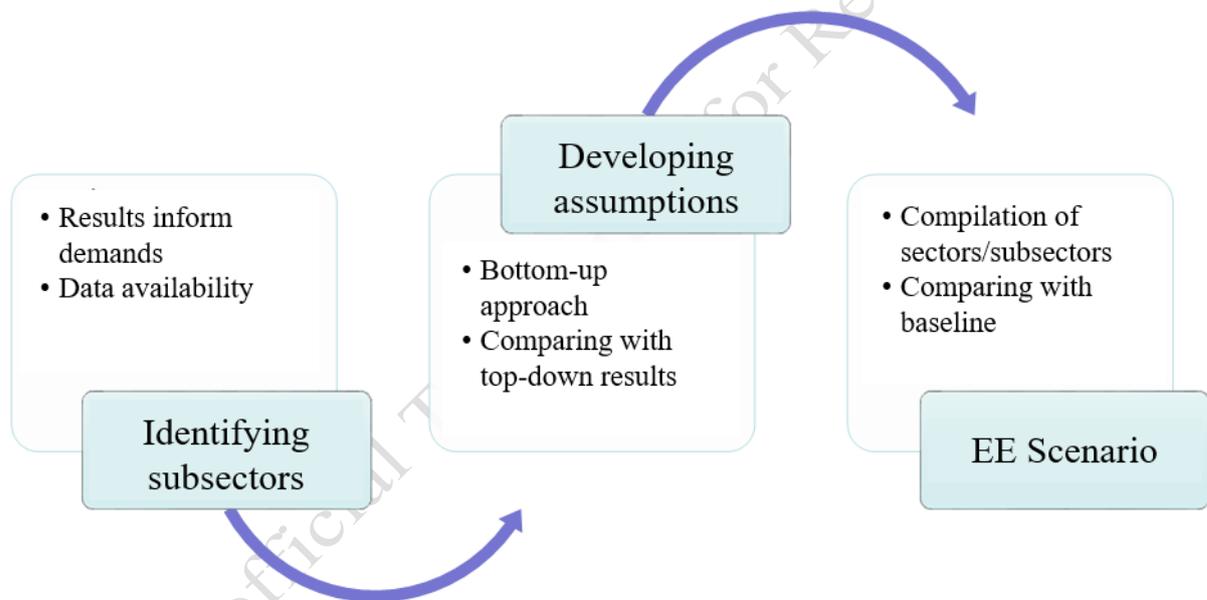
- Vietnam's energy price, especially electricity price, was lower than that of other countries resulting in negative impacts on the adoption of energy conservation solutions among the people and enterprises.

## Annex 2. Methodology of assessing energy conservation potential

An EE scenario was developed, calculating the amount of energy conserved per type of fuel and subsector against the baseline scenario (also known as BAU) and estimating added costs against BAU.

Future energy consumption was forecasted using Simple\_E regression model, which is a top-down approach. However, it was required to adopt a bottom-up approach to develop a complete EE scenario per type of fuel and subsector. The level of detail provided by the bottom-up approach depended on data availability and ability to develop calculation assumptions. The figure below describes the approach which the Institute of Energy adopted to develop the EE scenario.

**Figure 10. Approach to EE scenario development**



In the EE scenario, each sector/subsector or type of fuel was taken into account separately.

**Figure 11. Non-industrial subsectors**

Agriculture	Service	Transportation	Domestic use
<ul style="list-style-type: none"> <li>• Fishing</li> <li>• Irrigation and drainage, and other agricultural uses</li> </ul>	<ul style="list-style-type: none"> <li>• Lighting</li> <li>• Air conditioning</li> <li>• Water heating</li> <li>• Other devices</li> </ul>	<ul style="list-style-type: none"> <li>• Road</li> <li>• Railway</li> <li>• Maritime and waterway</li> <li>• Aviation</li> </ul>	<ul style="list-style-type: none"> <li>• Lighting</li> <li>• Cooking</li> <li>• Water heating</li> <li>• Others</li> </ul>

**Figure 12. Industrial subsectors**

- 1 Mining and exploitation
- 2 Food processing and tobacco
  - 2.1 Beverages
  - 2.2 Food processing (dried) and tobacco
- 3 Textile & Garment and Leather & Footwear
  - 3.1 Textile
  - 3.2 Garment, Leather & Footwear
- 4 Timber and timber products
- 5 Paper and pulp
  - 5.1 Pulp
  - 5.2 Finished paper manufacturing
  - 5.3 Printing
- 6 Chemicals and chemical products
  - 6.1 Nitrogenous fertilizer
  - 6.2 Other chemicals
- 7 Rubber and plastic products
  - 7.1 Rubber
  - 7.2 Plastics
- 8 Non-metallic mineral products
  - 8.1 Cement
  - 8.2 Other non-metallic minerals
- 9 Steel
- 10 Generation and distribution of electricity, gas, heated water, steam, and air conditioning
- 11 Construction
- 12 Other subsectors

### **Annex 3. Analysis of energy conservation solutions**

#### ***1. Domestic use***

The demand for electricity in domestic use has increased because of improved standard of living and growing population. The past few years have also witnessed the increasing use of electricity partly due to the shift away from other sources of energy such as coal, oil or biomass, mainly in heating and cooking. To save electricity, an instantly recognized solution is the replacement of low-efficiency devices with high-efficiency ones.

Electricity also competes with solar energy in meeting the need for heated water. However, the number of solar powered water heating tank will soon reach a saturation point since it is restricted by installation space (e.g. there is a large number of households living in one high residential building, but a fairly small number of solar-powered tanks may be installed at maximum) and by regional climatic conditions. Nevertheless, installation of solar-powered tanks is a highly effective solution to reducing electricity consumption. According to a recent survey conducted by the Institute of Energy, a four-member family consumes approximately 1.8-2.5kWh/day on average for water heating, which accounts for around 16-21% daily electricity consumption.

Therefore, two basic solutions to reduce domestic electricity consumption are identified as follows:

- Replacing electricity (or gas) powered water heating with solar powered water heating tanks;
- Promoting the replacement of low-efficiency devices with high-efficiency ones. In addition, it is important to gradually raise the Minimum energy performance standard (MEPS) based on a roadmap in order to drive technological advancement research and development activities. It means that allegedly high-efficiency devices today may fail to enter the market tomorrow.

There is also a tendency of replacing biomass with other sources of fuel in cooking and heating with biomass losing its popularity. However, within the context of domestic animal husbandry, biogas is an effective practice of capitalizing on existing inputs, requires little investment or brings about immediate reduction in the amount of CO<sub>2</sub> released into the environment.

## **2. Building use**

Similar to domestic use, there is a significant increase in the demand for electricity and gas in buildings, and electricity takes a dominant share in the energy consumption structure. Therefore, an immediate solution is to promote the use of high-efficiency devices. The design and materials of walls and ceiling also influence electricity consumption, mainly in ventilation and lighting. Therefore, two basic solutions to reduce building electricity consumption are identified as follows:

- Promoting the replacement of low-efficiency devices with high-efficiency ones;
- Applying new construction design standards (e.g. QCVN 09:2013/BXD on energy efficiency building) with an aim to conserve the energy of buildings right from when they have not gone into operation.

## **3. Agriculture**

Agricultural production in Vietnam consumes relatively little energy. In fact, not many significant EEC activities are recorded in the agricultural sector.

Nevertheless, MARD promulgated Circular 19/2013/TT-BNNPTNT dated March 15, 2013 guiding the implementation of EEC measures in agricultural production. The Circular mentions a number of EEC measures in the agricultural sector, e.g. cultivation, plant protection, animal husbandry, vet medicine, irrigation and drainage, aquaculture, forestry, salt making, and fishing. Among all of the measures stated by the Circular, this Report only identified two following ones which mainly focus on two agricultural areas with the largest energy consumption and are possible to develop calculation assumptions:

- Fishing: using high-efficiency lighting and solar batteries to reducing the amount of electricity generated (from diesel oil) on seafaring vessels.
- Irrigation and drainage: using high-efficiency pumps to reduce electricity consumption.

## **4. Transportation**

Energy consumption structure is complex in the transportation sector due to its various types of transportation and stakeholders involves. Based on the

purpose of transportation, there are two categories: passenger transportation and freight transportation. Based on the type of transportation, there are five categories: road transportation, railway, inland waterway, maritime transportation and aviation.

Even road transportation itself involves various means of transport. However, there are two types of means of transportation involved in road transportation: personal vehicles and public vehicles.

For each aforementioned type/means of transportation, it is possible to develop different solutions to reducing fuel consumption. MOT also promulgated Circular 64/2011/TT-BGTVT dated December 26, 2011 providing EEC measures in the transportation sector.

Recent studies conducted by World Bank (EFFECT), ADB (technical support) and the UK Energy Agency (Vietnam Calculator2050) have identified certain integrated solutions applicable to Vietnam, including

- Promoting the use of biofuels (e.g. E5 petrol);
- Promoting the use of high-efficiency vehicles or clean fuel powered vehicles (e.g. hybrid cars);
- Promoting the use of public transportation (e.g. buses and metro) and reducing the circulation of personal vehicles;
- Shifting from road to railway and waterway in freight transportation.

## ***5. Industrial production***

Industry is currently the economic sector with the highest level of energy consumption. This will continue to be the case in the next several years, as Vietnam is still in the Industrialization process. It can be said that the increase in energy consumption in industrial production over the past years was a topic of concern for Vietnamese policymakers. Therefore, there have been numerous programs and projects concerning industrial energy efficiency implemented over a long period of time, with strong support from several international organizations.

In almost every industry sub-sector, it is possible to determine dozens of solutions to improve efficiency and operation. This is because the results of the aforementioned projects in energy efficiency are highly shareable. It is quite

easy for the mass public to learn from success stories. In addition, the Ministry of Industry and Trade has issued guiding circulars and provided energy conservation solutions applicable in industrial production in general and some specific sub-sectors in particular, such as:

- Circular 02/2014/TT-BCT dated 16 January 2014 on solutions for economical and efficient use of energy in industries;

- Circular 19/2016/TT-BCT dated 14 September 2016 regulating the energy consumption norms in the beer and beverage production industry;

- Circular 38/2016/TT-BCT dated 28 December 2016 regulating the quota on energy consumption of the plastic industry.

Based on typical success stories in Vietnam and in comparison with other countries, Vietnam industries can be considered to have a “wealth” of solutions. However, many other challenges still remain.

As mentioned above, there are many solutions for energy conservation applicable to each industry sub-sector. If the solutions for all industries are to be listed, the number can reach the hundreds. However, they can be classified into six solution groups as follows:

- Promoting the development of energy management systems (for example the ISO 50001 certificate system). This solution group is mainly directed at the upper levels of the business, at investment decision makers. In addition, a management system will directly affect the operation of equipment and improve the ability to monitor as well as seek opportunities to improve the internal efficiency of the enterprise;

- Optimizing auxiliary systems (such as air compressor system, steam or chiller system): this solution group is aimed at conventional auxiliary systems with great potential. A recent survey of a research group of the Institute of Energy evaluating some audit reports shows that the number of solutions under this solution group usually accounts for nearly half of the solutions proposed to enterprises;

- Increasing engine efficiency (for example switching to more efficient engines/pumps or installing additional frequency converters): this is one of the common solutions, often proposed in audit reports;

- Utilizing waste heat: in cement production, waste heat can be utilized for electricity production, but the costs are relatively high. In some other low-cost applications, the waste heat retrieved can be used to provide more heat for other processes, such as fuel drying;

- Substituting fuels: mainly in steam systems, for example using cashew nut husk instead of coal, CNG instead of DO, or coal gasification instead of DO (this application, in particular, can help to decrease operation costs of the business, but it leaves more negative impacts on the environment);

- Replacing technologies (new technologies to replace old technologies, for example, cement shaft kilns are replaced by rotary kilns, traditional brick kilns are replaced by vertical shaft brick kilns, etc.). In some sense, “demolition to make way for new construction” is not entirely a solution for energy efficiency improvement. However, choosing new technologies certainly leads to higher competitiveness for products, through the reduction of fuel costs and fulfillment of increasingly strict environmental requirements.

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#### **Appendix 4. Targets on energy efficiency and conservation for some industries.**

- Cement production: Reduce the average energy consumption to produce 1 tonne of cement from 87 kgOE in 2015 to 81 kgOE;
- Textile: Reduce the average energy consumption to produce 1 tonne of fiber from 773 kgOE in 2015 to 734 kgOE;
- Electric power industry: Reduce power loss across the entire power network to 6.0%;
- Chemical industry: the chemical sector sets the target of reducing the level of energy consumption by a minimum of 10%;
- Plastic industry: By 2025, reduce the average energy consumption to produce one unit (kg) of product as follows:
  - + Household plastic/Engineering plastic: reduce the energy consumption level from 1.27 kWh in 2020 to 1.00 kWh;
  - + Plastic as construction materials: reduce the energy consumption level from 0.46 kWh in 2020 to 0.35 kWh;
  - + Packaging plastic: reduce the energy consumption level from 0.79 kWh in 2020 to 0.62;
  - + Packaging plastic (bags, bottles): reduce the energy consumption level from 0.7-1.96 kWh in 2020 to 0.55-1.45 kWh.
- The beer and beverage production industry: By 2025, reduce the average energy consumption level (MJ/hl) to produce one unit of product as follows:
  - + Beer production: reduce the energy consumption level from 140 MJ in 2020 to 129 MJ (for production scale of over 100 million liters); from 215 MJ in 2020 to 196 MJ (for production scale of 20 to 100 million liters); from 306 MJ in 2020 to 286 MJ (for production scale of less than 20 million liters);
  - + Beverage production: reduce the energy consumption level from 55 MJ in 2020 to 52MJ (for carbonated beverages); from 111 MJ in 2020 to 107 MJ (for non-carbonated beverages).
- Paper industry: reduce the energy consumption level to produce one unit tonne of product until the end of the Programme as follows:

+ Packaging paper: reduce the energy consumption level for one unit (tonne) of product: from 7,809 MJ/T in 2020 to 6,713 MJ/T (for production capacity of over 50,000 tonnes/year); from 7,872 MJ/T in 2020 to 6,744 MJ/T (for production capacity of 10,000 – 50,000 tonnes/year); from 6,728 MJ/T in 2020 to 5,484 MJ/T in 2025 (for production capacity of less than 10,000 tonnes/year).

+ Tissue paper: reduce the energy consumption level on one unit (tonne) of product: from 16,503 MJ in 2020 to 14,572 MJ (for production capacity of 10,000 to 50,000 tonnes/year); from 14,914 MJ in 2020 to 13,169 MJ in 2025 (for production capacity of less than 10,000 tonnes/year).

+ Printing paper, writing paper and photocopying paper: reduce the energy consumption level on one unit (tonne) of product: from 15,138 MJ in 2020 to 13,639 MJ (for production capacity of over 50,000 tonnes/year); from 10,459 MJ in 2020 to 9,455 MJ (for production line using pulp as raw material with production capacity of 10,000 to 50,000 tonnes/year, excluding systems for recycled paper treatment).

- Steel industry: reduce the average energy consumption level to produce a tonne of product in production processes until the end of the Programme as follows:

+ Sintering of iron ore: reduce the energy consumption level on one unit (tonne) of product from 2,530 MJ in 2020 to 1,960 MJ;

+ Cast iron production by blast-furnace: reduce the energy consumption level on one unit (tonne) of product from 14,000 MJ in 2020 to 12,400 MJ;

+ Steel ingot production by basic oxygen furnace (oxygen converter): reduce the energy consumption level on one unit (tonne) of product from 150 MJ in 2020 to 100 MJ;

+ Steel ingot production by electric arc furnace: reduce the energy consumption level on one unit (tonne) of product from 2,600 MJ in 2020 to 2,500;

+ Steel ingot production by induction furnace: reduce energy consumption on one unit (tonne) of product from 2,600 MJ in 2020 to 2,500 MJ;

+ Long hot-rolled steel: reduce the energy consumption level on one unit (tonne) of product from 1,650 MJ in 2020 to 1,600 MJ;

+ Cold-rolled steel sheet: reduce the energy consumption level on one unit (tonne) of product from 1,600 MJ in 2020 to 1,500 MJ;

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## Appendix 5. List of prioritized duties performed in the Programme

<b>1. Perfect legal documents, policies and mechanisms on energy saving and energy efficiency, support the implementation from central to local level</b>	
Implementing agency:	Led by: MoIT  Coordinating with: Ministry of Construction (MOC); Ministry of Agriculture and Rural Development (MOARD); Ministry of Transport (MOT); Ministry of Science and Technology (MOST); Ministry of Planning and Investment (MPI); Ministry of Finance (MOF); Ministry of Natural Resources and Environment (MONRE); People’s Committees of provinces and centrally-affiliated cities
Time frame:	2019-2025
<b>2. Technical and financial support to promote projects on investment, production and business on energy saving and energy efficiency for activities of producing, improving and transforming equipment, vehicle, machines and production line market</b>	
Implementing agency:	Led by: MoIT  Coordinating with: Ministries, departments, People’s Committees of provinces and centrally-affiliated cities, relevant organizations and individuals
Time frame:	2019-2030
<b>3. Development of Vietnam Energy Data Center and databases, adoption of information technology in energy saving and energy efficiency</b>	
Implementing agency:	Led by: MoIT  Coordinating with: Ministries, departments, People’s Committees of provinces and centrally-affiliated cities, relevant organizations and individuals

Time frame:	2019-2030
<b>4. Assistance in inspecting, monitoring and evaluating implementation of energy saving and energy efficiency</b>	
Implementing agency:	Led by: MoIT Coordinating with: MONRE, People's Committees of provinces and centrally-affiliated cities, organizations and individuals using energy
Time frame:	2019-2030
<b>5. Enhancement of communication activities on energy saving and energy efficiency</b>	
Implementing agency:	Led by: MoIT Coordinating with: Ministry of Communication, local and central Radio and Television Broadcasters, and relevant communication agencies
Time frame:	2019-2030
<b>6. Establishment and implementation of key national scientific researches in the field of energy saving and energy efficiency</b>	
Implementing agency:	Led by: MOST Coordinating with: Ministries, departments, People's Committees of provinces and centrally-affiliated cities, relevant organizations and individuals
Time frame:	2019-2030
<b>7. Study on proposal of establishing the Foundation for promoting energy saving and energy efficiency</b>	
Implementing agency:	Led by: MoIT Coordinating with: MOF, State Bank of Vietnam, credit

	institutions, sponsors, relevant individuals and organizations
Time frame:	2019-2025
<b>8. Further effective and efficient use of energy for transportation vehicles</b>	
Implementing agency:	Led by: Ministry of Transport (MOT) Coordinating with: Ministries, departments, People's Committees of provinces and centrally-affiliated cities, relevant organizations and individuals
Time frame:	2019-2025
<b>9. Further effective and efficient use of energy in civil works and production facilities in the construction sector</b>	
Implementing agency:	Led by: Ministry of Construction (MOC) Coordinating with: Ministries, departments, People's Committees of provinces and centrally-affiliated cities, relevant organizations and individuals
Time frame:	2019-2030
<b>10. Further effective and efficient use of energy in agricultural production</b>	
Implementing agency:	Led by: Ministry of Agriculture and Rural Development (MOARD) Coordinating with: Ministries, departments, People's Committees of provinces and centrally-affiliated cities, relevant organizations and individuals
Time frame:	2019-2025
<b>11. Further education and training on energy saving and energy efficiency throughout the national education system</b>	
Implementing agency:	Led by: Ministry of Education and Training; Ministry of

	<p>Labour, Invalids and Social Affairs</p> <p>Coordinating with: Ministries, departments, People's Committees of provinces and centrally-affiliated cities, relevant organizations and individuals</p>
Time frame:	2019-2030
<p><b>12. Development and strengthening of capacity for organizations and individuals on energy saving and energy efficiency from central to local level</b></p>	
Implementing agency:	<p>Led by: MoIT</p> <p>Coordinating with: People's Committees of provinces and centrally-affiliated cities, relevant organizations and individuals</p>
Time frame:	2019-2030

**Appendix 6: Basis for estimation of expenditure for the Programme implementation**

#	Item	Specific tasks	Expenditure (VND billion)					
			Central-level state budget	Non-refundable aid	ODA and other concessional loans	Funds from society	Other sources	Total
			600	1,306	4,150	5,450	-	11,506
1	Review, development and perfection of mechanisms and policies on energy saving and energy efficiency	Review, amend, supplement and systemize legal documents (Laws, Decrees, Circulars, etc.)	110	250				360
		Study and develop an energy saving certification system for energy saving and energy efficiency solutions						
		Review and perfect the technical economic norms system on construction of energy efficiency buildings; Establish an energy efficiency evaluation and						

	certification system for construction works; Set up standards, evaluation and energy labelling system for construction materials/ products requiring thermal insulation to be used in construction works.						
	Study, develop and promulgate mechanisms, policies and legal regulations on energy service companies (ESCO) model;						
	Review, modify, supplement and perfect technical regulations and standards on energy saving and energy efficiency						
	Build capacity assessment system, acknowledge and announce qualified energy auditors satisfying legal requirements						
	Review, draft, develop and issue energy consumption limits and norms for some						

		sectors/ subsectors of industry, agriculture, transportation, construction and service; industrial parks and industrial clusters						
		Develop mechanisms and policies on promoting energy saving and energy efficiency for small and medium-sized enterprises; incentive mechanisms and policies to promote public-private partnership in implementation of energy saving solutions and integration of renewable energies						
		Build mechanisms, policies and measures to promote use of new energy, effective and efficient use of energy for transportation vehicles and equipment						
2	Technical assistance and promotion of	Improve fuel transition processes and technologies, use energy effectively, efficiently and environmentally friendly,	35	160	3,700	5,200		<b>9,095</b>

investment on energy saving and energy efficiency for production, manufacturing, market transformation of equipment, vehicles, machines, production lines, public lighting, and energy saving in households	and mitigate climate change						
	Adopt new technologies with high energy efficiency in production and manufacture of machines and equipment, production lines, telecommunications, irrigation, aquaculture and fishing, etc.						
	Use new energy, and use energy effectively and efficiently; apply solutions to improve fuel efficiency of vehicles and equipment; change passenger and freight transportation modals in transportation sector						
	Install, upgrade and replace energy-saving and energy-efficiency vehicles, equipment, components and machines; integrate energy saving solutions and renewable energies for public utilities, buildings, industrial parks, industrial						

		clusters, urban street lighting system, roads, traffic signals, and industrial production facilities						
		Produce equipment, vehicles and materials with high energy efficiency						
		Support to carry out promotion and distribution of energy-efficiency and environmentally friendly products						
		Guide and support implementation of energy saving solutions, change to use high energy-efficiency equipment, and apply renewable energy solutions in households						
3	Building of databases and adoption of information	Collect and compile energy statistics information, establish national and sectoral databases on energy and energy efficiency, develop mechanism of	45	146				<b>191</b>

technology in energy saving and energy efficiency	cooperation and information exchange on energy and energy efficiency database with other databases						
	Strengthen application and integration of smart technologies and equipment in operation and management of energy-consumed systems and transportation system;						
	Develop software and provide guidance on its utilization in managing and updating data about effective and efficient use of energy that is suitable for energy users and energy management units from central to local level						

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4	Capacity enhancement on energy saving and energy efficiency	Provide trainings and capacity building for key agencies and officials from central to local level on effective and efficient use of energy in managing the execution of legal regulations on energy saving and energy efficiency practices; provide specialized and technical trainings on effective and efficient use of energy	100	350				450
		Update and compile new training materials, technical documents, and guidelines for capacity enhancement on effective and efficient use of energy for various subjects						
		Review and supplement, update contents related to energy saving and efficiency into energy training programs of training institutions throughout the education system						

		Develop training plan, conduct capacity enhancement for internal officers and workers about energy efficiency and conservation						
		Organize workshops and seminars, and exchange and share experiences in effective and efficient energy practices						
		Establish a national education center on energy saving and energy efficiency						
		Provide training, disseminate initiatives, experience and solutions on effective and efficient use of energy						
5	Checking, monitoring, pushing and guiding to implement and	Organize training and guide inspection and monitoring, urge and evaluate results of fulfilling legal regulations on energy saving and efficiency for stakeholders	50	250				<b>300</b>

	evaluate results of implementing legal regulations on energy saving and energy efficiency	<p>Strengthen inspection, monitoring and evaluation of the compliance with legal regulations on energy saving and efficiency for individuals and organizations subjected to amendments under the Law on Energy Efficiency and Conservation and bylaws</p> <p>Develop a manual for inspection, monitoring and evaluation of compliance with legislations on effective and efficient use of energy</p>						
6	Communication to raise public awareness	Develop and implement communication plans on energy efficiency and conservation through different forms in order to raise enterprises' and public community's awareness and responsibility towards energy efficiency and conservation	80	150				<b>230</b>

		Make communication plans on energy-efficient products including educational programs to provide information for corporates and communities, organization of contests and recurring awards, movements/ campaigns on promoting energy saving and environmental protection, fairs and exhibitions promoting energy conservation products and technologies						
7	Scientific research and technological development on energy saving and energy efficiency	Build and conduct researches and key scientific & technological programmes to develop and adopt source/core energy-efficiency science and technologies to practices	180			250		<b>430</b>

8	Establishment of the Foundation for promoting energy saving and energy efficiency				450			<b>450</b>
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