



# **VIET NAM**

## **ENERGY SECTOR ASSESSMENT, STRATEGY, AND ROAD MAP**

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December 2015



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# Weight and Measures

bcm	billion cubic meter
GW	gigawatt
GWh	gigawatt-hour
km	kilometer
kV	kilovolt
kWh	kilowatt-hour
m <sup>3</sup>	cubic meter
MT	million tons
Mtoe	million tons of oil equivalent
MVA	megavolt-ampere
MW	megawatt
TWh	terawatt-hour

# Currency Equivalents

(as of 15 October 2015)

Currency Unit	-	dong (D)
D1.00	=	\$0.00004465
\$1.00	=	D22,395

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# Abbreviations

ADB	Asian Development Bank
ADF	Asian Development Fund
AFD	<i>Agence Française de Développement</i> (French Development Agency)
BOT	build–operate–transfer
CAPE	country assistance program evaluation
CPS	country partnership strategy
Danida	Danish International Development Agency
DFAT	Australian Department of Foreign Affairs and Trade
EEAS	European External Action Service
EIB	European Investment Bank
EPTC	Electric Power Trading Company
ERAV	Electricity Regulatory Authority of Vietnam
EVN	Viet Nam Electricity
EVNCPC	Central Power Corporation
EVNHANOI	Hanoi Power Corporation
EVNHCMC	Ho Chi Minh City Power Corporation
EVNNPC	Northern Power Corporation
EVNSPC	Southern Power Corporation
FIT	feed-in-tariffs
GDE	General Directorate of Energy
GDP	gross domestic product
GENCO	power generation corporation
GGs	green growth strategy
GHG	greenhouse gas
GMS	Greater Mekong Subregion
HPP	hydropower plant
IPP	independent power producer
JICA	Japan International Cooperation Agency
Lao PDR	Lao People’s Democratic Republic
LNG	liquefied natural gas
MAIFI	momentary average interruption frequency
MFF	multitranches financing facility
MOIT	Ministry of Industry and Trade
NLDC	National Load Dispatch Center
NPT	National Power Transmission Corporation
OCR	ordinary capital resources
PDP	power development plan
PPP	public–private partnership
PPTA	project preparatory technical assistance
PRC	People’s Republic of China
PSPP	pumped storage power plant
RETA	regional technical assistance
RPTCC	Regional Power Trade Coordination Committee
SAIDI	system average interruption duration

SAIFI	system average interruption frequency
SEA	strategic environmental assessment
SECO	Swiss Secretariat for Economic Affairs
SEDP	socio-economic development plan
SEDS	socio-economic development strategy
SHPP	small hydropower plant
Sida	Swedish International Development Cooperation Agency
SMO	system and market operator
TA	technical assistance
TASF	Technical Assistance Special Fund
UNDP	United Nations Development Programme
VCGM	Vietnam Competitive Generation Market
VNEEP	Viet Nam Energy Efficiency Program

# I Sector Assessment: Context and Strategic Issues

## A. Introduction

1. This energy sector assessment, strategy, and road map for Viet Nam documents the current assessment of the Asian Development Bank (ADB), and the strategic investment priorities of the Government of Socialist Republic of Viet Nam and ADB in the energy sector of Viet Nam. It highlights sector performance, major development constraints, government development plans and strategy, past ADB support and experience, other development partners' support, and future ADB support strategy. The assessment, strategy, and road map will be linked to and informs ADB's next country partnership strategy (2016–2020) for Viet Nam. It will be updated as appropriate when changes occur in sector development strategies and program, and will help provide sector background information for investment and technical assistance operations.<sup>1</sup>

## B. Overall Sector Context

2. Viet Nam is a lower-middle-income country<sup>2</sup> with a population of over 90 million and a territory of more than 330,000 square kilometers. Almost 65% of the population is rural based. Numerous ethnic groups live in remote, mountainous regions with limited access to markets and basic services. It has already attained 5 of its 10 Millennium Development Goals and is likely to attain two more by 2015. Viet Nam is considered as one of the most dynamic and stable countries in Southeast Asia, both in terms of political system and economic development. Its economy grew steadily at an average rate of 6.2% per annum, and during 2005–2014 its gross domestic product (GDP) per capita increased from \$699 to \$2,052, while its poverty rate dropped from 15.5% to 8.4%.<sup>3</sup> Viet Nam's GDP in 2014 was \$186.2 billion.<sup>4</sup>

3. Viet Nam achieved remarkable economic development because of its economic reforms (Doi Moi) introduced in 1986.<sup>5</sup> At the beginning of the reforms, there was a rapid agricultural growth, and in 1988, the agriculture sector accounted for 46.3% of the GDP. However, during the past 15 years, the strong growth in the industrial and service sectors has majorly contributed to the country's economy. The growth was particularly strong in the service sector, which recorded an average annual growth of 7.0%, followed by 6.3% in the industrial sector and 3.4% in the agricultural sector during 2005–2014. Thus, in 2014, the agriculture sector's contribution to GDP was only 17%, while contribution of service sector was 44% and industrial sector was 39%.

<sup>1</sup> New country partnership strategy is being prepared in 2015 for the period of 2016–2020.

<sup>2</sup> The country became a lower-middle-income country in 2009.

<sup>3</sup> Government of Viet Nam, Ministry of Planning and Investment. 2014. *Statistics Year Book of Vietnam*. Hanoi.

<sup>4</sup> The World Bank. Country at a Glance: Viet Nam. <http://www.worldbank.org/en/country/vietnam>

<sup>5</sup> Doi Moi is the name given to the economic reforms initiated in Viet Nam in 1986 with the goal of creating a “socialist-oriented market economy.”

4. The hierarchy of planning and policy in Viet Nam proceeds from the overall socio-economic development strategy (SEDS). The current version, SEDS 2011–2020, was approved by the National Assembly in November 2011. The overall objective of SEDS 2011–2020 is to lay the foundation for Viet Nam to become a modern, industrialized society well integrated into the international economy through policies that maximize long-term welfare through rapid and sustainable development by 2020. The strategy recognizes the need for social equity and macroeconomic stability, broad-based growth, and environmental sustainability for sustainable development, with emphasis on improving efficiency of resource utilization and technological progress. It identifies three breakthrough areas: (i) promoting human resources development, (ii) improving market institutions, and (iii) infrastructure development.

5. The SEDS 2011–2020 guides the formulation of two 5-year socioeconomic development plans (SEDP), SEDP 2011–2015 and SEDP 2016–2020,<sup>6</sup> which provide a policy framework and direction for the government ministries to develop their own action plans. The SEDP 2011–2015 focused on the broad range of policies required to achieve high-quality and sustainable economic growth. These include the need to restructure the economy to increase the share of economic activities of high value, improve the living standards of ethnic minority populations, strengthen environmental protection, and mitigate and prevent the adverse impacts of climate change.

6. The increasing population, a rising appetite for goods and services, rapid urbanization, and rapidly growing economic activities in industrial and service sectors are exerting increased pressure on energy supplies in Viet Nam. Therefore, availability of adequate and reliable energy supply is an essential prerequisite for maintaining Viet Nam's enviable record of socially inclusive economic growth and achieving the government's socioeconomic development goals.

### 1. Primary Energy Supply and Final Consumption

7. Viet Nam has large reserves of primary energy resources, such as coal, oil, natural gas, and water for hydropower generation. It also has a high potential for renewable energy resources, such as biomass, solar, and wind. In 2012, the total national primary energy supply was around 58.0 million tons of oil equivalent (Mtoe), of which noncommercial energy accounted for 14.0 Mtoe. The share of total national primary energy by fuel type was coal (26%), crude oil and petroleum products (27%), gas (14%), hydropower generation (8%), and noncommercial energy (25%). In addition, 10.7 Mtoe of petroleum fuels and 0.2 Mtoe of electricity were imported in 2012. Figure 1 shows the primary energy supply mix in 2012.<sup>7</sup>

8. In 2012, the total final energy consumption in Viet Nam was 49.3 Mtoe, including 14.0 Mtoe of noncommercial energy,<sup>8</sup> where share by sector was as follows: residential (33%), transport (24%), service (3%), industrial (39%), and agriculture (1%). Figure 2 shows the final energy consumption by sector in 2012.

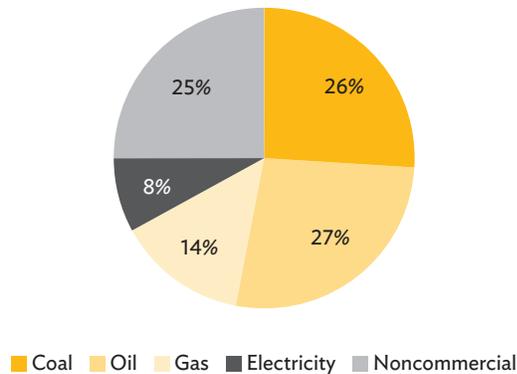
9. Overall, Viet Nam has been a net exporter of energy, with exports growing on average at about 9% annually. Net energy exports grew from 0.2 Mtoe in 1990 to a peak of 22.0 Mtoe in 2006 and then started to decline because of increased local demand. In 2012, 18.0 Mtoe of energy was exported (9.4 Mtoe of crude oil and 8.6 Mtoe of coal).

<sup>6</sup> The government is currently preparing SEDP 2016–2020, and it is expected to be passed by the National Assembly by the end of 2015.

<sup>7</sup> Government of Viet Nam, Ministry of Industry and Trade. 2012. *Vietnam Energy Statistics*. Ha Noi.

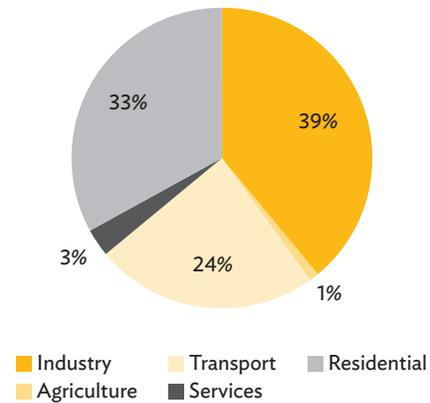
<sup>8</sup> Noncommercial energy consumed in domestic sector, food processing, and building material industries.

**Figure 1: Primary Energy Supply 2012**



Source: Government of Viet Nam, Ministry of Industry and Trade. 2012. *Vietnam Energy Statistics*. Ha Noi.

**Figure 2: Final Energy Consumption by Sector in 2012**



Source: Government of Viet Nam, Ministry of Industry and Trade. 2012. *Vietnam Energy Statistics*. Ha Noi.

10. Viet Nam national energy development strategy 2020, approved in 2007, with an outlook to 2050<sup>9</sup> has the following objectives: ensure national energy security; supply sufficiently high-quality energy for socioeconomic development; exploit and manage domestic primary energy resources efficiently; diversify energy investments and business models; establish and develop a competitive energy market; promote new and renewable energy sources; and develop energy resources effectively and sustainably with consideration for environmental protection.

## 2. Energy Sector Institutions

11. The organizational structure of Viet Nam energy sector is given in Figure 3.

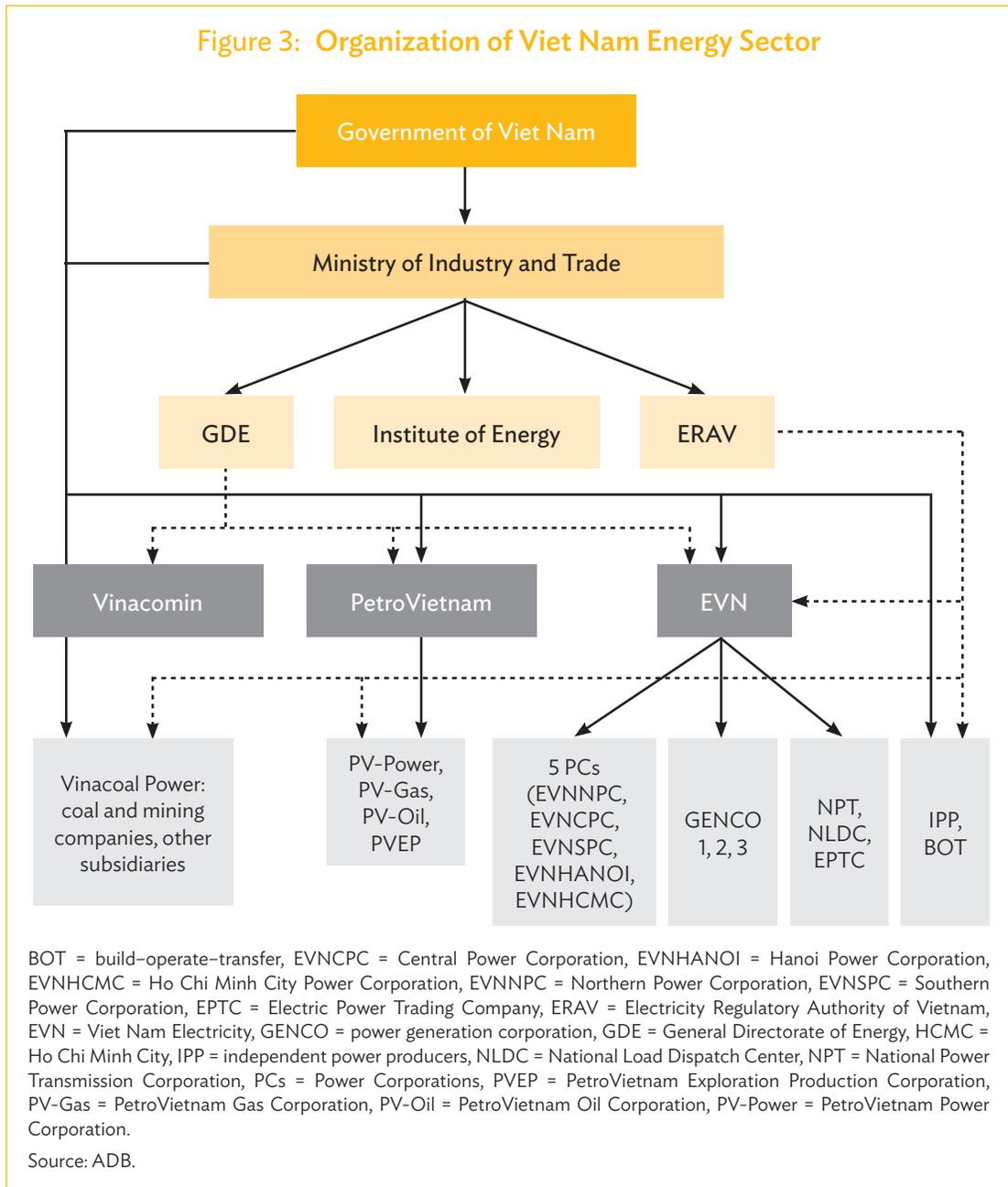
12. **Ministry of Industry and Trade (MOIT).** The management of the energy sector in Viet Nam is mainly the responsibility of the MOIT, both as line ministry and as ministry with oversight responsibility of state-owned energy enterprises.<sup>10</sup> In 2012, the MOIT established General Directorate of Energy (GDE) to better align the MOIT's departmental responsibilities in the energy sector.<sup>11</sup> Its responsibilities include overall energy planning and policy formulation; appraisal of power and energy

<sup>9</sup> Government of Viet Nam. 2007. *Prime Minister's Decision No. 1855/QD-TTg*. Ha Noi.

<sup>10</sup> The prime minister of Viet Nam is responsible for approving policies and regulations. MOIT's key responsibilities are to (i) develop policies, oversee planning, and implement strategies; (ii) prepare technical standards and monitor compliance; (iii) prepare technical and economic indicators; (iv) manage and regulate energy sector activities and use of energy; (v) set retail electricity prices, and mechanisms and policies on electricity prices; (vi) formulate legal and regulatory reforms to establish a competitive sector market; (vii) identify schemes to mobilize funds for the sector investments; and (viii) prepare programs to adopt modern technologies and strengthen domestic industry.

<sup>11</sup> The departments under GDE are (i) Department of international cooperation; (ii) Department of master planning; (iii) Department of thermal and hydropower; (iv) department of nuclear power; (v) Department of new and renewable energy; (vi) Department of power grid and rural electrification; (vii) Department of science, technology, and energy efficiency; (viii) Department of petroleum exploration and exploitation; (ix) Department of petroleum transportation and processing; (x) Department of coal industry; (xi) Department of build-operate-transfer (BOT) power, training, and management; (xii) Department of energy information center; and (xiii) Department of center for energy training and consultancy.

Figure 3: Organization of Viet Nam Energy Sector



development plans, and local and regional development plans; and management of build-operate-transfer (BOT) power projects.

13. The Electricity Regulatory Authority of Vietnam (ERAV) was set up in 2005 under the MOIT. The responsibilities of the ERAV include: developing regulations and directions to implement and regulate competitive power markets; developing technical codes and performance standards for power distribution and transmission, and for monitoring/certifying compliance; monitoring electricity tariff review and tariff setting; issuing reliability criteria for power supply, guiding and monitoring

compliance; reviewing power demand forecast, conducting system studies, and recommending measures to achieve supply–demand balance; and monitoring implementation of power projects.

14. The Institute of Energy is an energy research and planning institute set up under the MOIT 20 years ago. It conducts research on national energy strategies, policies, and development plans; forecasts future demand for energy; prepares project feasibility studies; and identifies new technologies to improve energy efficiency and supply. It is also active in developing and promoting renewable energy and it established the Center for Renewable Energy and Clean Development Mechanisms in 2007. While the Ministry of Natural Resources and Environment is the lead agency for research and development in environmental protection, Institute of Energy serves as a research organization and think tank for the government.

15. The Energy Efficiency and Conservation Office is a dedicated unit in the MOIT leading the implementation of Viet Nam Energy Efficiency Program and the energy efficiency and conservation laws, decrees, and regulations.

16. The three main state-owned energy enterprises that directly operate and manage the energy sector are the Viet Nam Electricity (EVN), the Vietnam Oil and Gas Group (PetroVietnam), and the Vietnam National Coal and Mineral Industries Group (Vinacomin).

17. **Viet Nam Electricity.** EVN was formed in 1995 as a vertically integrated, state-owned corporation responsible for Viet Nam’s power subsector. In mid-2006, EVN was transformed into a holding group. EVN is still the main actor in the power subsector with wholly owned subsidiaries: three power generation corporations (GENCOs); the National Power Transmission Corporation (NPT)<sup>12</sup> responsible for power transmission; and the five power corporations<sup>13</sup> (Hanoi Power Corporation, Northern Power Corporation, Central Power Corporation, Southern Power Corporation, and Ho Chi Minh City Power Corporation) responsible for power distribution. EVN owns National Load Dispatch Center, which serves as the system and market operator (SMO); strategic power plants, including multipurpose hydropower plants (HPPs); the Electric Power Trading Company (EPTC); and it is the majority shareholder of partially privatized power plants in the Vietnam Competitive Generation Market (VCGM).

18. **PetroVietnam.** PetroVietnam implements petroleum and hydrocarbon exploration and production activities, and also manages and supervises petroleum and hydrocarbon exploration and production activities by other private- and public-sector entities. In 2007, PetroVietnam established a holding company, PV-Power, with 100% share for investing in independent power projects, for operation and maintenance of power plants of PetroVietnam, and for providing engineering services. In 2014, the share of PetroVietnam in power generation was 11.4%.

19. **Vinacomin.** Vinacomin, a state-owned limited liability holding corporation, is one of the 11 largest economic group companies in Viet Nam. As a group, it comprises 100 companies, of which 54 subsidiaries are wholly owned by Vinacomin and 46 are joint-stock companies. Its main functions are to (i) explore and survey, exploit, process, and sell coal products and other minerals<sup>14</sup> in the domestic and international markets; (ii) construct and operate power plants (mainly coal fired); (iii) manufacture industrial explosive materials, construction materials, and mining equipment; and (iv) provide technical services in the above areas. In September 2009, Vinacomin established

<sup>12</sup> NPT was established in 2008 as a company wholly owned by EVN.

<sup>13</sup> The power corporations were created in early 2010 out of the existing 11 power companies.

<sup>14</sup> Other minerals include bauxite, iron ore, copper, lead, zinc, tin, titanium, manganese, gemstones, and gold.

Vinacomin-Power Holding Corporation Limited for the development of power plants. In 2014, the share of Vinacomin in power generation was 4.4%.

## C. Overview of the Energy Sector

### 1. Power Subsector

20. Economic growth meant high demand for electricity and other forms of end-use energies in Viet Nam. In particular, a growth process driven by industrialization implies a strong growth in the demand for electricity and therefore the power subsector is a key sector in a rapidly growing economy. The power subsector is also critical to the energy sector, because it consumes the major portion of the country's indigenous fossil fuel, such as gas, coal, and oil, and has a determinant impact on their relative prices. The national power development plan (PDP) is the governing planning document in the power subsector. PDP VII was prepared in 2011 for the period from 2011 to 2020, with long-term vision up to 2030.<sup>15</sup> minor revisions were incorporated in 2013<sup>16</sup> and major revisions are being carried out in 2015.<sup>17</sup>

#### a. Power Subsector Features

21. **Demand Growth.** During 2005–2014, average annual growth in electricity demand was 12.1%, electricity consumption increased from 45.6 terawatt-hours (TWh) to 128.4 TWh,<sup>18</sup> and peak demand grew from 9.5 gigawatts (GW) to 22.2 GW. Per capita electricity consumption increased from 156 kilowatt-hours (kWh) in 1995 to 983 kWh in 2010 and to 1,415 kWh in 2014. The total installed and operating generation capacity in Viet Nam was 11.6 GW in 2005 and 34.1 GW in 2014, an average annual growth of 12.6% in generation additions.

22. In 2014, power consumption by sector was as follows: industrial (53.9%), residential (35.6%), commercial (4.8%), agriculture (1.5%), and other sectors (4.3%). The industrial sector is the largest consumer of electricity and also the most important sector economically, projected by 2015 to account for 41% of GDP, 29% of the workforce, and 87% of export revenues (footnote 17).

23. **Demand Forecast.** Based on the revised PDP VII, demand for electricity is expected to grow at an average of 10.5% per annum during 2016–2020, and 8.0% per annum during 2021–2030. Electricity consumption is projected to reach 234.6 TWh in 2020 and 506.0 TWh by 2030, representing a fourfold increase by 2030 compared with the consumption in 2014. The peak demand is estimated to reach 42.1 GW by 2020 and 90.7 GW by 2030 to supply the projected power consumption. Table 1 shows key indicators with respect to power demand, production, and consumption for the period 2005–2014 (actual) and also shows projections up to 2030.

24. **Access to Electricity.** Viet Nam has made remarkable progress in expanding access to electricity, with percentage of households without electricity decreasing from 50% in 1995 to 2% in

<sup>15</sup> Government of Viet Nam. 2011. *Decision No. 1208/QĐ-TTg: Approval of the National Power Development Plan for the 2011–2020 Period with the Vision to 2030 (PDP VII)*. Ha Noi.

<sup>16</sup> Government of Viet Nam. 2013. *Decision No. 2414/QĐ-TTg: Updated Schedule of Power Projects and Special Regulations and Policies for Investment in Urgent Power Generation Projects from 2013 to 2020*. Ha Noi.

<sup>17</sup> Government of Viet Nam, Ministry of Industry and Trade. 2015. *Revised Power Development Plan for the 2011–2020 Period with the Vision to 2030 (Revised PDP VII)*. Ha Noi.

<sup>18</sup> Government of Viet Nam, Viet Nam Electricity. 2014. *Annual Report*. Ha Noi.

**Table 1: Electricity Demand: Actual (2005–2014) and Projected (2015–2030)**

Item	2005	2009	2014	2015	2020	2025	2030
Annual demand (TWh)	45.6	76.0	128.4	141.8	234.6	352.3	506.0
Annual generation (TWh)	53.6	86.9	145.5	161.3	265.4	400.3	571.8
Maximum demand (GW)	9.5	13.9	22.2	25.3	42.1	63.5	90.7
Per capita consumption (kWh)	549.0	873.0	1,415.0	1,560.0	2,545.0	3,610.0	4,950.0

GW = gigawatt, kWh = kilowatt-hour, TWh = terawatt-hour.

Source: Government of Viet Nam. 2015. *Revised Power Development Plan 2011–2020*. Ha Noi.

2014.<sup>19</sup> This has also been one of the drivers for rapid growth in the demand for electricity in the past. The communities that are not yet connected to the grid are mainly in the less developed and sparsely populated mountainous areas of the northwest and isolated islands. Providing universal access to electricity is a top priority of the government's power subsector development agenda.

### b. Power Generation

25. The total installed and operating generation capacity in Viet Nam was 34.1 GW in 2014. In 2014 power generation mix, shown in Table 2, was constituted by hydropower (46.07%), gas (21.58%), coal (28.64%), oil (3.39%), and renewable energy (0.32%).<sup>20</sup> EVN and its joint-stock companies own 61% of the installed capacity, while the rest is owned by domestic independent power producers (IPP) and foreign investors on BOT arrangement.<sup>21</sup>

26. Hydropower still dominates and accounts for a significant proportion of the power generation mix. However, its share is expected to reduce to 28.7% in 2020 and to 17.8% in 2030. Instead, the share of coal-fired power plants is expected to grow rapidly to 48.8% in 2020 and to 50.2% in 2030. Since

**Table 2: Viet Nam Power Generation Capacity Mix by Fuel in 2014 (MW)**

Power plants	EVN	BOT and IPP	Total
Coal fired	6,119	3,640	9,759
Oil fired	528	627	1,155
Gas fired	3,113	4,241	7,354
Hydropower plants <sup>a</sup>	10,780	4,923	15,703
Wind power and biogas		109	109
<b>Total</b>	<b>20,540</b>	<b>13,540</b>	<b>34,080</b>

BOT = build–operate–transfer, EVN = Viet Nam Electricity, IPP = independent power producer, MW = megawatt.

<sup>a</sup> Includes small hydropower plants less than 30 MW capacity.

Source: Government of Viet Nam, Viet Nam Electricity. 2014. Annual Report. Ha Noi.

<sup>19</sup> The Government of Viet Nam, Ministry of Industry and Trade. 2014. *Report on Rural Electrification*. Ha Noi.

<sup>20</sup> Renewable energy includes small hydropower plants below 30 megawatts (MW) of capacity.

<sup>21</sup> Viet Nam classifies power plants funded by domestic investors as independent power producers and those wholly owned and operate by foreign investors as build–operate–transfer (BOT) power plants.

the economically exploitable domestic coal resources is depleting, it is expected that the demand for imported coal for power generation will increase significantly from 2016. Because of limited availability of gas, revised PDP VII proposes only limited new gas-fired power plants. Consequently, share of gas-fired power plants will decrease to 17.5% by 2030. The government also envisages building nuclear power plants to ensure long-term energy security. EVN plans to build the first nuclear power plant in Ninh Thuan district for which its staff are being trained (footnote 18); however, the final schedule for commencing construction has not yet been approved by the government. Figure 4 shows planned power generation capacity mix for the years 2015, 2020, 2025, and 2030.

**Figure 4: Planned Power Generation Capacity Mix in 2015, 2020, 2025, and 2030**



HPP = hydropower plant, PSPP = pumped storage power plant, SHPP = small hydropower plant, RE = renewable energy.  
Source: Asian Development Bank based on the statistics of Government of Viet Nam. 2015. *Revised Power Development Plan 2011–2020*.

### c. Renewable Energy for Power Generation

27. Viet Nam has substantial potential for renewable energy, especially solar photovoltaic, wind, biomass, and small hydropower. However, the current renewable energy generation apart from small hydropower generation is negligible. The total potential for small hydropower generation exceeds 7,200 megawatt (MW).<sup>22</sup> In 2014, there were small hydropower plants, with investments by local private enterprises, located in north and central Viet Nam with total installed capacity of 1,984 MW.

28. A wind atlas prepared in 2011 for Viet Nam recorded the total wind energy potential at about 27,750 MW.<sup>23</sup> However, there are only three grid-connected wind power plants in operation with a total capacity of 52 MW.<sup>24</sup> The total technical potential for solar power generation in Viet Nam is

<sup>22</sup> In Viet Nam large hydropower generation is not considered as renewable energy and only small hydropower plants less than 30 MW capacity are considered as renewable energy.

<sup>23</sup> About 24,350 MW at average wind speeds of 6–7 meters per second and about 2,400 MW with average wind speed of 7–9 meters per second at mean height of 80 meters above ground.

<sup>24</sup> Tuy Phong (30 MW), Phu Quy (6 MW), and Bac Lieu (16 MW).

estimated at around 13,000 MW.<sup>25</sup> At present, the total installed solar capacity for power generation is about 4 MW, used mainly for research purposes and rural electrification. The potential for power generation from municipal solid waste is estimated to exceed 320 MW, of which only 2.4 MW is being exploited. The theoretical potential of biomass energy in Viet Nam from the combustion of rice husk, rice straw, corn cob, cassava stalk, bagasse, and sugar cane trash is estimated at more than 2,500 MW. Furthermore, geothermal potential is 340 MW.

29. Responsibility for renewable energy development lies with the New and Renewable Energy Department under the GDE of the MOIT. The obstacles to more active utilization of renewable energies are the lack of (i) a strong institutional and regulatory framework to support renewable energies and effectively facilitate the development of a renewable energy market and industry, (ii) a strong supporting mechanism and fund for upfront investment, and (iii) technical capacity.<sup>26</sup> The government is presently considering a draft strategy for renewable energy development in Viet Nam up to 2020, with outlook up to 2030. A renewable energy master plan and a renewable energy law also are being prepared.

#### *d. Power Transmission and Distribution*

30. **Power Transmission.** The power transmission is at 500 kilovolts (kV) and 220 kV levels, and is the responsibility of NPT. As of 2014, transmission assets comprised more than 21,900 megavolt-amperes (MVA) of capacity at 500 kV substations and more than 30,726 MVA of capacity at 220 kV substations, with more than 6,755 kilometers (km) of 500 kV and 12,513 km of 220 kV transmission lines. The NPT also operates and maintains 43 km of 110 kV lines and 110 kV substations of the total capacity of 3,175 MVA. The transmission system performance has improved over the past decade, and transmission losses have reduced from 8.2% in 2004 to 2.5% in 2014 (footnote 18).

31. **Power Distribution.** Five power corporations under EVN were responsible for power distribution and retail supply to about 22.1 million electricity users as of the end of 2014. The distribution system consists of 110, 35, 22, 15, 10, and 6 kV networks and some 220 kV lines. In 2014, distribution assets comprised more than 16,700 km transmission lines and 35,000 MVA transformer capacity at 110 kV, and 435,000 km of transmission lines and 53,200 MVA transformer capacity at 6–35 kV. Power corporations also operate and maintain 55 km of transmission lines and 1,875 MVA transformer capacity at 220 kV. EVNHANOI and Ho Chi Minh City Power Corporations are the entities responsible for distributing electricity in two of the largest cities in Viet Nam. The capital city of Ha Noi is home to 6.5 million people and Ho Chi Minh City has a population of 7.4 million, together accounting for 16% of the total national population. Their combined peak load was over 5.8 GW in 2014, accounting for 26% of the peak load. Distribution system losses have been gradually reduced to about 6% in 2014 (footnote 18).

32. **Transmission and Distribution System Losses.** Power system losses from 2008 to 2014 are detailed in Table 3.

#### *e. Cross-Border Power Trade*

33. Currently, Viet Nam has some cross-border power transmission connections with neighboring countries, such as the People's Republic of China (PRC), the Lao People's Democratic Republic (Lao PDR), and Cambodia. Viet Nam started importing electricity from the PRC in 2004,

<sup>25</sup> ADB. 2014. *Renewable Energy Developments and Potential for the Greater Mekong Subregion*. Manila

<sup>26</sup> MOIT staff capacity should be strengthened to (i) conduct renewable energy resource assessments, mapping, and planning; (ii) identify appropriate technologies for on-grid and off-grid renewable energy generation and for pricing; and (iii) establish procedures for streamlined private investments.

**Table 3: Power Transmission and Distribution Losses from 2008 to 2014**

Losses (%)	Year						
	2008	2009	2010	2011	2012	2013	2014
Transmission losses	2.70	2.86	3.13	2.56	2.33	2.69	2.49
Distribution losses	6.65	6.71	7.02	6.67	6.22	6.18	6.11
<b>Total</b>	<b>9.35</b>	<b>9.57</b>	<b>10.15</b>	<b>9.23</b>	<b>8.85</b>	<b>8.87</b>	<b>8.60</b>

Source: Government of Viet Nam, Viet Nam Electricity. 2014. *Annual Report*. Ha Noi.

increasing the imports from 383 gigawatt-hours (GWh) in 2005 to 2,025 GWh in 2014 through two 220 kV lines and three 110 kV lines. The import from Lao PDR started in 2013, with 450 GWh imported through two 220 kV transmission lines from Xekaman 3 HPP. The export to Cambodia through 220 kV transmission lines started in 2009, reaching 885 GWh in 2014, contributing to nearly 25% of the power consumption in Cambodia.

#### *f. Power Subsector Reform and Market Development*

34. Since the enactment of the Electricity Law in December 2004<sup>27</sup> and Prime Minister's Decision No. 26/2006/QĐ-TTg in January 2006, Viet Nam has demonstrated a strong commitment to creating a competitive transparent power market and broadening the ownership of the power subsector. In December 2008, the ERAV put forward a master plan for restructuring the power subsector by separating generation, load dispatch, transmission, and distribution; and for the establishment of a competitive electricity market.

35. For restructuring, the following actions have been implemented: (i) separation of transmission functions from EVN by establishing NPT in December 2008; (ii) establishment of five power corporations responsible for power distribution in February 2010; and (iii) establishment of three independent GENCOs in July 2012. The EPTC was also established in December 2007 under EVN and plays the role of a single buyer in the generation market.<sup>28</sup> However, separation of the National Load Dispatch Center from EVN and establishment of an independent SMO has not yet been implemented, although they are generally viewed as essential for effective competition and private sector investment.

36. Regarding competitive electricity market, Prime Minister's Decision No. 63/2013/QĐ-TTg in November 2013 provides an updated road map to establish competitive power market in three phases—Phase I: competitive generation market by 2014–2017; Phase II: competitive wholesale market from 2015 to 2021; and Phase III: competitive retail market from 2021 to 2024. Phase I was launched in July 2012 with the legal unbundling of the three GENCOs and the introduction of the VCGM. The current plan is to equitize all the GENCOs by 2017 with each GENCO's ownership restricted to 25% of the total installed generation capacity.<sup>29</sup> The ERAV is currently in the process of preparing for Phase II and Phase III, which will be more challenging in the reform process. Further

<sup>27</sup> Government of Viet Nam, Electricity Law 28/2004/QH11. Dated 3 December 2004.

<sup>28</sup> The EPTC acts as a wholesale single buyer within the VCGM and transfers power to regional distribution corporations at regulated bulk supply tariffs. The EPTC buys power from the competitive power generation spot market and is also responsible for import and export of power at 220 kV and above.

<sup>29</sup> Currently, EVN owns 22% of the total installed generation capacity; the three generation companies own 39%; state-owned companies, PetroVietnam and Vinacomin, own 16%; and the rest is owned by the private sector. The three GENCOs will be fully separated from EVN when the competitive wholesale market commences; however, EVN retains the ownership and operating control of three strategic multipurpose hydropower projects whose operations have implications for irrigation and flood control.

details on the progress of power subsector reforms and key areas that remain to be addressed are provided in ADB's assessment of power subsector reforms in Viet Nam.<sup>30</sup>

### g. Electricity Tariff

37. The government has embarked on tariff reforms in 2009 through Prime Minister's Decision No. 21/2009/QD-TTg. The ultimate goal of the tariff framework is to have market-based retail tariffs with separate performance-based tariffs for transmission and distribution. However, the tariffs have not yet reached a cost-recovery level, and revenue is not sufficient for financial autonomy of the power subsector entities.

38. The government is currently developing a market-based tariff mechanism. The prime minister's recent decisions stipulate the following actions: (i) Decision No. 24/2011/QD-TTg dated 15 April 2011 requires electricity retail tariffs be revised reflecting fuel cost, exchange rate fluctuation, and generation capacity charge; (ii) Decision No. 2165/QD-TTg dated 11 November 2013 sets the average electricity retail tariffs for 2013–2015 at a minimum of D1,437/kWh and a maximum of D1,835/kWh, any adjustment of the given average electricity retail tariff bracket because of cost fluctuations will be decided by the MOIT and the Ministry of Finance; and (iii) Decision No. 69/2013/QD-TTg dated 19 December 2013 stipulates that cost increases less than 7% can be recovered by EVN in the next tariff adjustment; cost increases from 7% to 10%, and within the approved ceiling, can be approved by the MOIT; and cost increases over 10% and/or beyond the set ceiling require the prime minister's approval. In addition, there is a mandatory 1-year wait for cost recovery of any increase over 7%. At present, retail tariffs are being reviewed and adjusted every 6 months based on the above directions.

39. The average electricity retail tariff was D1,622/kWh<sup>31</sup> as of March 2015 without value-added tax, which is only 73% of the long-run marginal cost estimated at D2,100/kWh (footnote 17). While the average retail tariff has increased by 85% in nominal terms during 2007–2014, it has decreased by 15% in real terms due to the weakening of the dong.

40. Transmission tariffs are calculated and charged separately. Criteria for performance-based transmission tariffs have not yet been established. Transmission tariffs are under major review to establish new regulation that will allow full cost recovery for NPT through multiyear tariff regulation and charging structure. This is expected to be approved by 2016.

## 2. Coal

41. Coal is Viet Nam's largest indigenous resource, with proven reserves estimated to be of the order of 6 billion tons. The bulk of this coal is anthracite, concentrated in the northern part of the country. The country exports its high-quality coal, and lower-quality coal is used in domestic power generation and industries. Coal mining, export, and domestic distribution are solely owned by Vinacomin.

42. The government's target is to rapidly increase coal production. The production in 2013 was 42.6 million tons (MT), which is expected to rise to 56.0 MT in 2020 and over 65.0 MT in 2030.<sup>32</sup> During 2000–2013, domestic coal consumption increased from 4.4 to 27.4 MT, representing an

<sup>30</sup> ADB. 2015. *Assessment of Power Sector Reforms in Viet Nam*. Manila.

<sup>31</sup> \$0.072/kWh at exchange rate D22,395/\$ on 15 October 2015.

<sup>32</sup> Government of Viet Nam. 2012. *Coal Development Master Plan 2012–2020, with Outlook to 2030*. Ha Noi.

annual increase of 15%. According to the coal industry development master plan 2012–2020, the demand for coal is expected to increase to 145.5 MT by the year 2025, and to more than 220 MT in 2030, whereas estimated coal demand for power generation is 112.7 MT in 2025 and 181.3 MT in 2030 (footnote 32). Power generation has been the most significant consumer of coal, accounting for 44% of total coal consumed in 2012. The other major user of coal is the industrial sector, where coal is used primarily in the steel, cement, paper, and fertilizer production industries.

43. Viet Nam has been a net exporter of coal, exporting a peak volume of 31 MT of coal in 2007, but a reduced volume of 15.2 MT in 2012. More than 60% of the coal exported was to the PRC and the rest to Japan. However, because of the rapidly increasing domestic demand for coal, lack of available areas suitable for open pit mining, dearth of capital, and a lack of local expertise for undertaking deep underground mining, Viet Nam has become a net importer of coal in 2015. It is projected that 1.3 MT of coal will be imported in 2015, which will gradually increase to about 64 MT in 2020. Total investment required for the development of the coal subsector is estimated at D109,156 billion during 2016–2020 and D373,237 billion during 2021–2030 (footnote 32).

### 3. Oil and Petroleum

44. Viet Nam has substantial oil reserves and the current discovered oil reserves stand at 600 MT of crude oil, the second largest oil reserves in East Asia, exceeded only by the PRC.<sup>33</sup> Much of these reserves are located offshore.

45. In 1990, Viet Nam produced 2.6 MT of oil. The production peaked at 20.0 MT in 2004, and reduced to 16.7 MT in 2013, primarily because of the maturing of the largest oil field (Bach Ho field) in Viet Nam. The oil production is however expected to increase modestly to 18.0 MT by 2025. In the past, as Viet Nam had no refinery, almost all of the crude oil produced in the country was exported mainly to refineries in Japan, the Republic of Korea, and Singapore, making crude oil one of Viet Nam's main exports. However, the share of crude oil export earnings has fallen in the recent years.<sup>34</sup>

46. In 2009, Viet Nam commissioned its first refinery (Dung Quat) at Quang Ngai province in central Viet Nam, which has an annual refining capacity of 6.5 MT. It refines domestic crude oil and is slated to meet up to 30% of total domestic demand for petroleum products. Another refinery at Nghi Son in Thanh Hoa province is under construction and is expected to be operational in 2017. This will have an annual capacity of 8.4 MT, and it will use crude oil imported from Kuwait. A third refinery with an annual capacity of 10.0 MT is proposed to be built in Long Son at Ba Ria-Vung Tau province in southern Viet Nam, and it will use crude oil from Venezuela. The government objective is to develop the oil refinery plants gradually in line with the domestic demand. A total refinery capacity of 25.0–30.0 MT is expected to be achieved by 2020.

47. Domestic demand for petroleum products was 14.4 MT in 2013, which was catered to by 7.5 MT of imports and 6.6 MT domestic supply from the Dung Quat refinery. Of the total petroleum consumption, the major consumers were the transport (approximately 70%) and service (approximately 10%) sectors. During 2013–2025, the demand is expected to grow at an average of 7.1% annually.<sup>35</sup> Much of this demand can be mapped to the transport sector, which will account for more than 50% of the total demand for petroleum products in 2025.

<sup>33</sup> BP (British Petroleum). 2014. *BP-Statistical Review of World Energy*. London.

<sup>34</sup> Government of Viet Nam. 2013. *General Department of Customs Report*. Ha Noi.

<sup>35</sup> Asia Pacific Energy Research Centre. 2013. *APEC Energy Overview*. Tokyo.

## 4. Natural Gas

48. The proven natural gas reserves of Viet Nam are estimated at 600 billion cubic meters (bcm). Reserves are almost exclusively offshore. Production in 2013 was 10 bcm, representing a reserves-to-production ratio of about 63 years. Natural gas production has grown rapidly over the past decade and has leveled off in recent years at about 10 bcm (footnote 33).

49. Since most of the gas fields in Viet Nam are located offshore, an extensive pipeline system is in place to bring gas onshore. The Oil and Gas Master Plan 2007–2015 with outlook to 2025 envisages gas use for generation in southern Viet Nam to increase from 8 bcm in 2010 to 21–24 bcm in 2025. Gas production during 2020–2025 is expected to increase at a much lower rate, approximately 4% annually, reaching 11–15 bcm/year by 2025 unless there are major new discoveries. The government foresees import of gas in the future. The forecasted gas shortage in southern Viet Nam is 3 bcm/year in 2015, 6 bcm/year in 2020, and over 15 bcm/year by 2025.

50. The government is also preparing to invest in infrastructure for liquefied natural gas (LNG) imports to ensure domestic gas supply–demand balance. The priority is for LNG imports in the southern Viet Nam to ensure adequate supply, maintenance, and development of the gas market in the southern Viet Nam, while continuing to explore possibilities to import LNG for use in northern and central Viet Nam. Consequently, PetroVietnam’s subsidiary, PV-Gas is developing two receiving and regasification terminals in southern Viet Nam.<sup>36</sup> A terminal is also proposed at Son My in Binh Thuan province where PetroVietnam is engaged in a feasibility study and is seeking foreign investors.<sup>37</sup>

## D. Core Sector Issues, Causes, and Effects

51. The core energy sector issues include (i) poor energy resources management, (ii) inadequate infrastructure, (iii) insufficient revenue for financial autonomy of the power and coal subsectors, (iv) lapses in environmental management in the sector, (v) enhancing energy efficiency, and (v) institutional gaps.

52. **Poor Energy Resource Management.** Viet Nam does not have a holistic energy sectorwide policy that sets out a systematic and long-term approach to integrated energy planning, policy formulation, and sector development. In addition, an integrated energy master plan is yet to be prepared. As a consequence, energy resource management is inefficient and there is a serious lack of infrastructure. The current development planning approach is largely focused on the development of the power subsector in isolation from coal, oil, and gas development planning, whereas the power subsector consumes major portion of these scarce resources. Because of much reliance on energy based on coal, gas, and oil, Viet Nam will have a greater dependence on imported coal, natural gas, and oil, leading to more vulnerability and fluctuations in energy costs, thereby affecting its energy security. A common drawback in many of the planning documents is a lack of detailed economic and financial analysis necessary to provide robust evidence as to how to utilize scarce resources most effectively. With a firm national energy policy as a framework, the MOIT will be better placed to undertake its responsibilities for energy planning and strategic guidance, particularly to enforce their implementation. Hence, formulation of a long-term national energy sectorwide policy and energy

<sup>36</sup> PetroVietnam. 2013. *Gas Importation*. <http://pvgas.com.vn/product-and-service/services/gas-import>

<sup>37</sup> Platts. 2013. *Vietnam’s PV Gas Offers Foreign Investors 49% Stake in 2nd LNG Terminal Project*. <http://www.platts.com/latest-news/natural-gas/hanoi/vietnams-pv-gas-offers-foreign-investors-49-stake-27671797>

master plan is the need of the hour. The MOIT has prepared the content of the energy master plan and is waiting for government approval to initiate the study.<sup>38</sup>

53. **Inadequate Infrastructure.** Huge investments are required to develop infrastructure to meet the rapidly increasing energy demand. In the oil and gas subsectors, there is a big involvement of international companies. However, the regulatory environment in Viet Nam still has several aspects that are disconcerting to private sector investors: the dual role of PetroVietnam, as a commercial entity and an instrument of state policy, is confusing and private partners face difficulties in distinguishing between the two roles. The same difficulty is likely to arise in the coal subsector, as Vinacomin depends substantially on joint ventures with private partners. In the power subsector, mobilization of private sector financing is still a challenge.

54. **Insufficient revenue in the power and coal subsectors.** Because of inadequate tariffs, the revenue is not sufficient for financial autonomy of the power and coal subsectors. The government has committed to gradually orient price setting toward a market-based approach, and legal frameworks are in place for increasing the pricing of coal, oil, gas, and electricity. However, the recent increases in coal price and retail electricity tariff were just to catch up with the inflation rate, but in constant value, they are still considered to be priced below the cost of production.

55. In the power subsector, the electricity tariff has been set at a low level for many years, thereby seriously undermining EVN's financial position and private sector investments in the power subsector. ADB and the World Bank advisory consultations have prompted the government to decide appropriate electricity tariffs to cover production, transmission, and distribution costs, and also to facilitate the financial recovery of EVN. It is expected that electricity prices will be increased at an appropriate rate for all tariff categories to ensure cost-reflective pricing in the medium term. In the long term, the government aims to have prices that would reflect changes in the international prices of fossil fuels. Implementation of competitive wholesale and retail markets and price liberalization in the long term will address this issue. Currently, ADB is providing technical assistance for drafting a new circular on transmission tariff, which will allow NPT to fully recover its costs and capital investment through revenue. It is expected that regulations will be in place by 2016 allowing NPT to implement a full cost-recovery tariff and charging structure. Furthermore, Tariff reforms are included in the tranches 4, 5, and 6 of the development policy operations program led by the World Bank in Viet Nam for which the World Bank and ADB are jointly developing policy-based loans using parallel financing.

56. **Environmental Impacts.** The rapid expansion of Viet Nam's energy sector is accompanied by significant environmental impacts. Increased coal-fired power generation worsens the environmental concerns. Without investments in efficient and clean thermal technologies, there will be huge environmental impacts. It is necessary to reinforce environmental management at project and strategic levels, and to strengthen regulatory compliance for environmentally sustainable management of natural resources. The coal development plan 2012–2020 indicates that the development of the coal industry must be closely aligned with ecological–environmental protection and conservation, harmonization between food security and energy security, safety in production, and strengthened security in the coal mining areas. The most recent government initiative, National Green Growth Strategy,<sup>39</sup> also identifies energy and transport sectors as priorities for reduction of greenhouse gas emissions and sets out clear goals for (i) reducing greenhouse gas emission intensity and promoting the use of clean and renewable energy and (ii) enhancing green lifestyle and sustainable consumption.

<sup>38</sup> ADB is currently preparing a regional technical assistance for strengthening power subsector planning in the Greater Mekong Subregion countries using integrated resource planning and sustainable strategic environmental assessment. The regional technical assistance will primarily focus on Viet Nam power development process by applying integrated resource planning principles.

<sup>39</sup> Government of Viet Nam. 2012. *Decision No. 1393/QĐ-TTg: National Green Growth Strategy*. Ha Noi.

However, the progress has been slow in achieving the set targets both in coal development plan and green growth strategy.

57. **Energy Efficiency.** There is continued government commitment to enhance energy efficiency on both supply and demand side. However, energy efficiency in the industrial sector is still poor. The main constraints in the implementation of more rigorous energy efficiency measures are (i) lack of policy framework and its enforcement, (ii) lack of viable financial mechanism allowing upfront investments in new technology and a fund to support energy conservation projects, and (iii) low electricity tariff.

58. **Institutional Gaps.** The main institutional capacity gap is the persistent mixing of political, regulatory, and commercial functions. The largest extent of separation has been achieved in the power subsector, but the ERAV is still under the MOIT and hardly independent, with the state-owned EVN still the dominant player in the power market. Therefore, the cozy relationship between EVN and the government leads to the regulatory oversight of EVN's practices in the power markets. There is a need to have an independent SMO. In the coal and oil subsectors, there is no formal independent regulator. In the other cases, regulatory institutions do exist but are weak, for example, there are government departments for renewable energy and energy efficiency, but they seem unable to impose firm and effective policies. Enhancement of the policy-making and regulatory skills of the institutions, as well as setting up of a strong and independent regulator, extending over coal, oil, and gas subsectors, is crucial to limiting the potential for monopolistic practices in the process and transition to more open and competitive energy markets.

59. Overall, the energy sector in the next stage of development will face the following challenges in meeting the rapidly rising demand: (i) coping with the rapid change in energy supply structure; (ii) maximizing the use of domestic energy resources efficiently and lowering imports, adopting new technologies; (iii) mitigating environmental impacts and achieving the set targets in sustainable green development; (iv) enhancing energy efficiency; (v) strengthening institutional capacities; (vi) diversifying energy supply, including that of renewable energies; and (vii) increasing energy prices to its socially and environmentally acceptable level to cover full costs.

60. All subsectors face significant constraints in their development, but the most susceptible of these energy subsectors to remedy through ADB assistance is the power subsector, including renewable energy and energy efficiency, which is the focus of discussions in the subsequent chapters.

## 1. Power Subsector

### a. Development Challenges

61. Viet Nam has achieved excellent progress in its power subsector, as the subsector has been restructured, a competitive market is being implemented, private sector is active in generation, system losses are low, and tariff reforms are in progress. Notwithstanding considerable development, the power subsector still needs to continue the reforms process, which is in the most crucial stage, and reach cost-reflective tariffs.

62. The key development challenge of EVN and its holding companies is the rapid expansion of power infrastructure to cope with increasing power demand. Furthermore, during 2014–2024, the power subsector also needs investments for upgrading and revamping of aging and overloaded transmission and distribution networks. In turn, the financial requirements needed are huge and beyond the financing capabilities of EVN and its holding companies.

63. **Development Priorities.** In the next phase of development, the power subsector needs to focus on (i) ensuring sustainable use of domestic natural resources and finding secure imports of “clean coal” technologies and gas for power generation; (ii) mobilizing sufficient financial resources to meet investment needs in power generation, transmission, distribution, and services; (iii) coping with the reform and market development; (iv) increasing the generation of renewable energy and implementing energy efficiency measures; (v) promoting environmental management because of ongoing and proposed power projects; (vi) adopting new technologies; (vii) providing access to electricity for the remaining remote populations; and (viii) strengthening capacities of EVN and its holding companies both in technical and managerial skills.

#### *b. Key Constraints*

64. Key constraints to the development of the power subsector are (i) sourcing huge financial requirements for the development of the subsector and (ii) capacity gaps in fostering modern technologies and efficient management of the subsector.

65. **Financial Resources Constraints.** Huge capital investments are needed to support the development of the power subsector. The revised PDP VII estimates that, from 2014 to 2030, the subsector will need \$94.12 billion for generation expansion (including expected financing by private sector) and \$36.52 billion for the expansion of transmission and distribution systems. Although private sector investors are gradually being attracted to power generation, the environment is not conducive for private sector investments in the expansion of power transmission and distribution networks. Hence, the NPT and power corporations remain solely responsible for meeting investment requirements either using own resources or borrowing from export credit agencies, multilateral and bilateral banks, and commercial banks.

66. **Capacity/Skills Gaps.** Although the technical capacity of EVN and its subsidiaries has improved quite remarkably over the past two decades, the improved capacity is still not adequate to cope with the anticipated expansion. Adopting new technologies, enhancing energy efficiency, ensuring clean energy development, and introducing a retail power market in the future are four important areas requiring human resource development. EVN and its subsidiaries have a huge workforce, but most of them are semiskilled and there is a dearth of skilled managerial staff. The NPT and the five power corporations being fairly new entities, human resource capacity in the key operational areas of corporate strategic business planning, accounting, financial management, and system planning need to be strengthened, and appropriate processes and procedures need to be further developed for efficient and effective operation.

#### *c. Development Plans and Investment Requirements*

67. Based on the revised PDP VII, the total installed power generation capacity in 2020 will be 57.7 GW. The projected power generation additions during 2014–2020 are close to 23.6 GW. To commensurate with the new power generation capacity, over 23,000 MVA of 500 kV and 39,000 MVA of 220 kV substations, 3,000 km of 500 kV and 7,000 km of 220 kV transmission lines, and appropriate distribution networks need to be developed in parallel to generation expansion. The total investment requirement in the power subsector during 2014–2030 is \$130.64 billion (\$55.46 billion for 2014–2020, \$35.86 billion for 2021–2025, and \$39.32 billion for 2026–2030). Table 4 provides investment requirements for three time slices from 2014 to 2030.

##### *i. Power Generation Expansion*

68. EVN will not be able to fully meet the forecasted investments for new generation plants on its own. Hence, the IPP and BOT arrangement with the government guarantee for buying electricity are encouraged to invest in power generation. For the proposed generation projects from 2014 to

**Table 4: Investment Requirements in the Power Subsector, 2014–2030**  
(\$ billion)

Investment Activity	2014–2020	2021–2025	2026–2030	Total
Power generation	42.10	25.63	26.39	94.12
Power transmission and distribution <sup>a</sup>	13.36	10.23	12.93	36.52
<b>Total</b>	<b>55.46</b>	<b>35.86</b>	<b>39.32</b>	<b>130.64</b>

<sup>a</sup> Share of distribution is \$6.60 billion for 2014–2020, \$4.72 billion for 2021–2025, and \$5.33 billion for 2026–2030.

Source: Government of Viet Nam. 2015. *Revised Power Development Plan 2011–2020*.

2020, total expected investments under IPP is \$8.0 billion and BOT is \$16.4 billion. EVN needs to source the balance amount of \$17.7 billion. Table A1.1 lists the proposed generating plants from 2014 to 2020 by fuel type and investment.

## ii. Power Transmission System Development

69. The estimated investment for the development of 500 and 220 kV power transmission system from 2014 to 2020 is estimated at \$6.7 billion.

70. **Power Transmission interconnections.** In the future, regional power trade will continue to play an important role. In the northern Viet Nam, import from the PRC will continue. The Lao PDR will also become an important source of power imports. Table 5 provides information on the proposed transmission lines connecting Viet Nam with the PRC, the Lao PDR, and Cambodia from 2014 to 2020.

**Table 5: Planned Power Transmission Interconnections**

Lao PDR	PRC	Cambodia	Viet Nam	Voltage (kV)
Ban Hatsan			Pleiku	220
Nam Mo			Ban Ve	220
Luong Prabang			Nho Quan	500
Nam Xam 1,3			Thanh Hoa	220
	Yunnan		Hiep Hoa	500
		Stung Treng	Tay Ninh	220

kV = kilovolt, Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.

Source: Asian Development Bank based on the discussions with Institute of Energy of Ministry of Industry and Trade.

## iii. Power Distribution System Development

71. The estimated investment in the distribution system during 2014–2020 is \$6.6 billion. In addition to expansion, the distribution networks also require upgrading and rehabilitation as most of the existing distribution networks are aging, overloaded, and of substandard construction. Although power supply has been improving continually, the reliability is still poor, necessitating urgent upgrading/

**Table 6: Reliability Indicators for Five Distribution Corporations in 2013 and 2014**

Power distribution corporations	MAIFI (frequency)		SAIDI (minutes)		SAIFI (frequency)	
	2013	2014	2013	2014	2013	2014
EVNNPC	5.06	3.55	4,883	4,212	33.69	28.43
EVNSPC	7.20	0.76	4,700	2,630	30.00	9.22
EVNCPC	1.33	6.4	3,500	3,276	14.07	20.52
EVNHANOI	1.77	1.89	4,218	2,027	11.10	8.30
EVNHCMC	0.62	0.15	2,163	1,300	18.45	10.97

MAIFI = momentary average interruption frequency, SAIDI = system average interruption duration, SAIFI = system average interruption frequency, EVNNPC = Northern Power Corporation, EVNSPC = Southern Power Corporation, EVNCPC = Central Power Corporation, EVNHANOI = Hanoi Power Corporation, EVNHCMC = Ho Chi Minh City Power Corporation.

Source: Government of Viet Nam, Viet Nam Electricity, 2013 and 2014. *Annual Reports*. Ha Noi.

rehabilitation and development of networks. The power supply reliability indicators<sup>40</sup> are provided in Table 6.

#### iv. Access to Electricity for All

72. The government's rural electrification program is targeting provision of electricity services by 2020 to the remaining 2% of the population, comprising rural households. Both the MOIT and EVN have approached development partners to support in rural electrification; however, most of the remaining areas without electricity are very far from the existing networks and further expansions are not feasible unless the existing rural networks are augmented. For providing electricity to the remaining areas where grid extension is not feasible, studies on feasible off-grid renewable energy generation are currently lacking. The estimated investment requirement for increasing access to electricity during 2014–2020 is around \$1.5 billion.<sup>41</sup>

#### v. Renewable Energy for Power Generation

73. The revised PDP VII envisages increasing the share of renewables in the energy mix to 6.6% in 2020 and 10.2% in 2030. The bulk of this renewable capacity will come from small hydropower and wind power generation. In particular, the total wind power capacity will be increased from the current level, which is negligible, to around 1,000 MW by 2020 and 6,200 MW by 2030; biomass power generation in sugar mills is estimated at around 500 MW by 2020 and 2,000 MW by 2030. Table A1.2 provides the proposed renewable energy projects.

#### vi. Energy Efficiency

74. Viet Nam's energy intensity in terms of elasticity of growth in demand for electricity against GDP growth had been very high (1.74 during 2010–2014) according to the revised PDP VII, reflecting a high consumption of electricity per output of GDP. The revised PDP VII calls for this ratio to be reduced

<sup>40</sup> System average interruption duration index measures the annual average outage duration in minutes per customer and EVN records outages that last over 5 minutes; System average interruption frequency index measures the annual average number of interruptions per customer and EVN records interruptions that last more than 5 minutes; Momentary average interruption frequency index measures the annual average number of momentary interruptions per customer and the EVN records interruptions that last less than 5 minutes.

<sup>41</sup> The prime minister approved the rural electrification program by Decision No. 2018/QĐ-TTg on 8 November 2013, which was updated by the MOIT in May 2015.

to 1.53 by 2020. This requires drastic demand-side management and energy efficiency, especially in energy-intensive industries, such as steel mills and cement factories. In the power system, EVN has made good progress and has achieved steady reduction in transmission and distribution losses, from 12.2% in 2003 to 8.6% in 2014, and is continuing the reduction of losses by upgrading the networks.

75. **Smart Grid.** The revised PDP VII calls for the introduction of modern technologies to improve the quality of electricity supply, minimize power loss, ensure renewable energy integration, and promote demand-side management. Based on this direction, the smart grid road map<sup>42</sup> was approved in November 2012 stipulating completion of high-voltage supervisory control and data acquisition, introduction of advanced metering infrastructure and other smart grid technologies at the distribution level, integration of distributed renewable energy, and development of the necessary regulatory frameworks.

76. **Pumped Storage Hydropower Plants.** The expected increase in base-load generators and larger integration of renewable energy calls for the introduction of pumped storage HPP to store energy and efficiently supply power during peak hours. The World Bank and the Japan International Cooperation Agency are currently conducting a study to identify the requirement of pumped storage in Viet Nam and the requisite long-term strategy.

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<sup>42</sup> Government of Viet Nam. 2011. *Prime Minister's Decision No. 1670/QD/TT on Smart Grid Development*. Ha Noi.

## A. Government Strategy, Policy, and Plans for Power Subsector

77. The socio-economic development plan (SEDP) 2011–2015 acknowledges the importance of large infrastructure investments for socioeconomic development. Recognizing the need to overcome current constraints in the power subsector, the development of power infrastructure in an inclusive and economically and environmentally sustainable manner to meet the rapidly growing demand for electricity is a key priority of the government. In accordance with the revised power development plan (PDP) VII, the government has approved multiple power generation and transmission projects to be implemented during 2014–2020 and has laid out a detailed road map for power market development as well as for strengthening operational and financial performance of power subsector entities. The government also aims to sustainably develop and modernize the power subsector by enhancing human resource capacity, technological optimization, and modernization of power infrastructure; by increasing renewable energy generation and enhancing energy efficiency in generation and consumption (supply-side and demand-side management).

78. In the context of road map for power market reform, good progress has been made since 2004 to address financial difficulties and to embrace the benefits of the market system and private participation. The government has unbundled Viet Nam Electricity (EVN) in the process of establishing necessary institutions and regulations required for a competitive power market. A competitive generation market was established in 2012, and a pilot competitive wholesale power market is expected to commence in 2015, fully operational in 2017, allowing retailers and large consumers to buy electricity directly from generators at the wholesale market. It is expected to introduce retail competition on a pilot basis in 2021, and make the initiative fully operational in 2024. While developing the power market, the government has also enabled foreign and domestic private sector investment in generation through build–operate–transfer and independent power producer contracts, which comprised around 16% of the generation capacity in 2014. As such, the approach of the power subsector is transitioning from a centrally planned and government-operated approach to a market-driven approach.

79. **Environmental Management and Climate Change Mitigation.** Cutting greenhouse gas (GHG) emissions while supplying the energy needs for a rapidly developing country such as Viet Nam is challenging. The SEDP 2011–2015 focused on the broad range of policies required to achieve high-quality and sustainable economic growth, which include environmental protection, and mitigation and prevention of adverse climate change impacts. Furthermore, green growth strategy (GGS) reaffirms the commitment of Viet Nam to sustainable development of energy necessary for the well-being of the people and for the country’s contribution to international initiatives in combatting climate change. Another initiative is Government Decision No. 432/QĐ-TTg, dated 12/4/2012, which lays out the strategic direction for sustainable development in Viet Nam for the period 2011–2020, which includes increasing the share of clean and renewable energy use in total energy consumption in Viet Nam. However, these policies are of recent origin and implementation is rather slow. For example, preparation of a green growth action plan is still under discussion. The Ministry of Planning and Investment is nominated as the focal point for green growth. The Ministry of Finance and the Ministry of National Resources and Environment are also assigned significant roles, and the Ministry

of Industry and Trade (MOIT) is in the process of establishing important policies, such as demand-side management, renewable energy development, capacity development, and environmental management.

80. **Energy Efficiency.** In 2006, the prime minister issued Decision No. 79/2006/QĐ-TTg ratifying the Viet Nam Energy Efficiency Program (VNEEP) for the period 2005–2015, which was the first comprehensive plan to improve energy efficiency across the energy sector. Targets stipulated in VNEEP were revised subsequently in the national energy development strategy and the GGS. After several years of continued efforts, energy efficiency gradually took roots and a dedicated energy efficiency office was set up within the MOIT for coordinating energy efficiency across all subsectors. According to the latest MOIT reports, energy savings in the power subsector were 5,969 gigawatt-hours (GWh) in 2011, 9,942 GWh in 2012, and 18,089 GWh in 2013 (percentage savings of total power consumption are 5.9% in 2011, 8.6% in 2012, and 12.3% in 2013). By June 2014, the MOIT granted energy efficiency labeling for more than 6,215 models of 13 equipment types. In addition, 12 energy efficiency centers and 40 promotion, consulting, and technology transfer centers have been set up across the country.

81. **Renewable Energy Development.** The main instrument currently used for the promotion of renewables is the standardized (no negotiations) Special Power Purchase Agreement for power plants less than 30 megawatts (MW) and a standard tariff for small generators based on the avoided costs of EVN.<sup>43</sup> In addition, three feed-in-tariffs (FITs) for grid-connected renewable energy projects are in place, for wind power promulgated in 2011,<sup>44</sup> and biomass cogeneration and solid waste to energy promulgated in 2014. The FIT for solar energy is under consideration. Though these FITs are still relatively modest to attract private sector investors, it shows the commitment of the government on the clean energy development road map. The FIT for wind power generation offers a fixed purchase price and a variable additional subsidy from the environment protection fund paid through EVN. Some wind power projects are being implemented, and regulations for wind power integration are currently being revised to attract more private sector investments.

82. Various modes of assistance have been provided by development partners to promote renewable energy however progress is very slow and the share of renewable energy generation in the energy mix is minimal.

## B. ADB's Sector Support and Experience

83. The energy sector has been a priority sector in ADB operations in Viet Nam. In accordance with the country partnership strategy (CPS) 2012–2015, completed and ongoing projects in the energy sector focused primarily on the power subsector, as it is vital to sustain socioeconomic development. ADB's Energy Policy 2009 aims to help developing member countries to provide reliable, adequate, and affordable energy for inclusive growth in a socially, economically, and environmentally sustainable way. To this end, ADB's Energy Policy has three pillars: (i) promoting energy efficiency and renewable energy; (ii) maximizing access to energy for all; and (iii) promoting energy sector reform, capacity building, and good governance. Consistent with the above pillars and the priorities, ADB has provided long-term, consistent, and coordinated support for the power subsector focusing on (i) subsector reforms to ensure sustainability; (ii) develop power generation expansion, transmission, and

<sup>43</sup> Government of Viet Nam, Ministry of Industry and Trade. 2008. *Decision No. 18/2008/QĐ-BCT: Promulgation of Regulation on Avoided Cost Tariff and Standardized Power Purchase Agreement for Small Renewable Energy Power*. Ha Noi.

<sup>44</sup> Government of Viet Nam. 2011. *Decision on Mechanisms for Support and Development of Wind Power Projects in Vietnam*. Ha Noi.

distribution; (iii) improve efficiency and reliability; (iv) provide access to electricity for the poor and the remote populations; (v) develop renewable energy; and (vi) enable an environment for improved regional power trade.

84. Since 1994, ADB has provided 13 loans (worth \$2.5 billion) and 46 technical assistances (TAs) (worth \$32.9 million) to the energy sector. The loans include \$1.4 billion for the development of transmission and distribution systems, including rural electrification and renewable energy generation, and the remainder is for power generation. Tables A1.3 and A1.4 list ADB loans, grants, and TAs provided from 1994 to 2015. Ongoing loans are meant to support infrastructure development for power generation, transmission, distribution, and generation of renewable energy (small hydropower), whereas TAs are provided to build the capacities of power subsector entities, to support the reform process, and to project feasibility studies.

## 1. Lending Program

85. In power generation, ADB has financed for the preparation and construction of large power plants: Mong Duong 1 coal-fired power plant (1,000 MW) and Song Bung 4 hydropower plant (156 MW). ADB has been attentive to environmental and social impacts mitigation plans and their monitoring through project-specific TAs.

86. In power transmission, ADB has provided sustained assistance to the expansion of the high-voltage transmission system through two completed projects, Loan 2128<sup>45</sup> and Loan 2225,<sup>46</sup> transmitting power to load centers from remote generation facilities, thereby drastically improving system reliability and efficiency. Continuing the assistance in 2011, ADB approved a multitranche financing facility (MFF) for a countrywide transmission system development program, including a TA to improve the operational effectiveness and efficiency of the National Power Transmission Corporation and to support the implementation of the program.

87. In power distribution, ADB provided three Asian Development Fund loans and one ordinary capital resources loan. Two loan projects that are ongoing include Loan 2517<sup>47</sup> approved in 2009 for three power corporations (Northern Power Corporation, Southern Power Corporation, and Central Power Corporation) and Loan 3161<sup>48</sup> approved in 2014 for Hanoi Power Corporation and Ho Chi Minh City Power Corporation, which has been cofinanced by the Association of Southeast Asian Nations Infrastructure Fund. ADB also mobilized \$3 million additional financing under Loan 2517 from ADB-administered Clean Energy Fund for providing electricity service connections to the poor households in the project areas.

88. All the power subsector programs approved after 2009 have adopted sector lending and MFF modalities, as recommended in project completion reports, to provide for flexibility in changes in scope and subprojects during implementation.

<sup>45</sup> ADB. 2011. *Report and Recommendation of the President to the Board of Directors: Proposed Northern Power Transmission (Sector) Project*. Loan 2128-VIE. Manila.

<sup>46</sup> ADB. 2004. *Report and Recommendation of the President to the Board of Directors: Proposed Northern Power Transmission Expansion (Sector) Project*. Loan 2225-VIE. Manila.

<sup>47</sup> ADB. 2009. *Report and Recommendation of the President to the Board of Directors: Proposed Renewable Energy Development and Network Expansion and Rehabilitation for Remote Communes Sector Project*. Loan 2517-VIE. Manila.

<sup>48</sup> ADB. 2014. *Report and Recommendation of the President to the Board of Directors: Ha Noi and Ho Cho Minh Power Grid Development Sector Project*. Loan 3161-VIE. Manila.

## 2. Nonlending Program

89. Viet Nam's power subsector reform process dates back to 1995, and ADB has supported the reform through eight TAs between 1995 and 2012. ADB supported the establishment of the 2004 Electricity Law, which provided the legal basis for the reform, resulting in the establishment of the Electricity Regulatory Authority of Vietnam and the unbundling of EVN. Following the enactment of the Electricity Law, ADB provided a TA in 2006 to support the establishment of the competitive generation market. ADB in coordination with the World Bank has continued to support the development of the competitive generation market by providing successive TAs: in 2008 and 2010 to strengthen the human resource capacity of the National Power Transmission Corporation in a competitive power market environment; and in 2012 and 2015 to support electricity transmission pricing review.

90. ADB has also assisted the government in developing public-private partnership (PPP) framework for build-operate-transfers and independent power producers. In 2006, ADB provided support for the project design and feasibility study of a PPP pertaining to the development of the O Mon Thermal Power Complex in southern Viet Nam and the associated gas pipeline required to transport offshore gas to the power plants. This initial work was followed by supplementary TAs in 2008, 2010, and 2011.

91. From 2005 to 2006, ADB has approved a series of advisory TAs to improve the crosscutting social and environmental issues of the power subsector together with two project preparatory technical assistance (PPTAs) to prepare Song Bung 4 Hydro Power Project. In 2014, a PPTA was provided to review and finalize the project documents prepared by the implementing agencies, Hanoi Power Corporation and Ho Chi Minh City Power Corporation for Loan 3161.

92. ADB has been actively assisting Viet Nam by providing TAs for policy development for energy efficiency and renewable energy: in 2009, it provided a TA to develop biogas plants by small livestock farmers, and in the same year, it provided a TA for capacity building to support the development of small hydropower plants under Loan 2517. In 2007, ADB provided a TA, cofinanced by the government of France and the Spanish Cooperation Fund, to implement the following actions identified in the VNEEP: (i) design a training program for energy managers in industrial enterprises, (ii) conduct a survey on energy consumption in industrial enterprises, (iii) establish energy service companies that can provide auditing services and advise industrial enterprises on energy conservation measures, (iv) pilot energy audits in selected industrial enterprises, and (v) prepare appropriate investment plans applicable for the audited enterprises to implement as well as advising them on financing so as to realize the energy-saving potential in a profitable manner. In addition, ADB assisted the MOIT to draft the Energy Conservation Law, focusing on potential energy conservation in the industrial sector, water supply and sanitation, household energy use, public lighting, and retrofitting of power plants.

93. Other aspects of climate change have been addressed by TAs that go beyond the immediate scope of the energy sector, where a TA approved in January 2011 provides support for the National Target Program on Climate Change Action by strengthening the capacity to design and implement climate change response measures in selected ministries, provinces, and cities. Another TA approved in 2013 has been supporting the GGS in developing a market readiness proposal for a domestic carbon market comprising a road map for the deployment of market-based instruments that will achieve cost-effective reduction of GHG emissions and foster the channeling of mitigation finance.

94. ADB has been providing a regional technical assistance (RETA) for the six Greater Mekong Subregion (GMS) countries, Cambodia, the People's Republic of China, the Lao People's Democratic Republic, Myanmar, Thailand, and Viet Nam, to share a common vision of an integrated power system and the development of the regional power market. As a key milestone, the GMS Regional

Power Trade Coordination Committee (RPTCC) was established in 2002, and the intergovernmental memorandum of understanding to establish the Regional Power Coordination Center was signed in 2012. Viet Nam being one of the GMS countries is a signatory to the various agreements for establishing guidelines for the implementation of regional power trade, and it actively participates in the discussions on the regional power trade initiatives under ADB RETA.

95. ADB has also assisted the GMS countries in enhancing their capacity in integrating environmental and social considerations into the regional power development planning through the RPTCC using the Strategic Environmental Assessment (SEA), whereby Viet Nam was able to apply the SEA in its PDP VII. ADB is now processing a RETA to strengthen power subsector planning in GMS countries by considering environmental and social impacts at the more upstream stage through SEA and examining all supply-side and demand-side options using integrated resource planning. The RETA will primarily focus on Viet Nam's PDP process by applying integrated resource planning with SEA which will include renewable energy and energy efficiency. Lessons learned and good practices from Viet Nam will be published as a knowledge product for sharing with other countries to enhance their power subsector planning process.

### C. Other Development Partners Support

96. The other major development partners engaged in the development of the energy sector in Viet Nam are the World Bank, Japan International Cooperation Agency, the European External Action Service, European Investment Bank French Development Agency, KfW and GIZ (implementing agencies for projects funded by the Government of Germany), Swedish International Development Cooperation Agency, Danish International Development Agency, Australian Department of Foreign Affairs and Trade, United States Agency for International Development, Swiss Secretariat for Economic Affairs, and the United Nations Development Programme. Support by development partners is summarized in Table 7 and details are provided in Appendix 2.

**Table 7: Development Partners Support in Viet Nam Power Subsector**

Areas of Assistance	Development Agencies
Power development plan	ADB, WB, JICA
Sector reform and market development	ADB, WB, AFD, UNDP
Energy efficiency and renewable energy	ADB, WB, JICA, AFD, KfW, GIZ, EIB, Danida, Sida, DFAT, SECO, UNDP
Generation	ADB, WB, JICA, AFD
Transmission	ADB, WB, JICA, AFD, KfW, GIZ
Distribution and rural electrification	ADB, WB, AFD, KfW, GTZ, JICA, Sida
Environmental impacts and climate change mitigation	ADB, WB, JICA, AFD, KfW, GIZ, Danida, EIB, Sida, DFAT
Regional interconnections	ADB, WB, AFD, Sida
Public-private partnerships	ADB, AFD, EEAS

ADB = Asian Development Bank, AFD = *Agence Française de Développement* (French Development Agency), Danida = Danish International Development Agency, DFAT = Australian Department of Foreign Affairs and Trade, EEAS = European External Action Service, EIB = European Investment Bank, JICA = Japan International Cooperation Agency, SECO = Swiss Secretariat for Economic Affairs, Sida = Swedish International Development Cooperation Agency, UNDP = United Nations Development Programme, WB = World Bank.

Source: Asian Development Bank.

## D. Lessons Learned in ADB Operations

97. ADB's country assistance program evaluation (CAPE) for Viet Nam conducted in 2009 for the period from 1999 to 2008<sup>49</sup> and ADB's CPS Final Review for Viet Nam conducted in 2015 rated the energy sector assistance strategy and program for Viet Nam as highly relevant, successful, effective, likely sustainable, and substantial in impact and contribution to development results and value addition. The evaluation also identified the following strengths in ADB assistance: (i) alignment with the government's development plans, (ii) replication of past successful practices in the subsequent projects, and (iii) coordination with other development partners.

98. After the CAPE, three projects were completed from 2009 to 2014 (Loan 2128 and Loan 2225 in transmission system development, and Loan 2429<sup>50</sup> for the construction of the Song Bung 4 hydropower plant). Project completion report for Loan 2128 was completed in 2014, and project completion reports for the other loans are being prepared. The results of the assessment of projects completed from 2009 to 2014 confirmed the 2009 CAPE results. However, the assessments based on the completed projects show efficiency issues related to implementation delays and high transaction costs, in particular (i) lengthy government administrative and approval procedures involving several ministries taking long intervals between feasibility studies and loan approvals; (ii) delays in finalizing technical designs; (iii) delays in preparation and implementation of procurement, land acquisition, and social safeguards; and (iv) minimal number of trained human resources to implement environmental and social safeguard measures in an effective and timely manner. Furthermore, capacity for monitoring and evaluation is considered weak among the executing agencies. Although there are some improvements, more sustainable approaches are required for improving the capacities in the respective areas.

99. **Power Subsector Reforms.** The sustainability of Viet Nam's power subsector will depend in large part on successful sector reforms. Although unbundling of EVN has progressed, the National Load Dispatch Center is still owned by EVN. It is essential that the National Load Dispatch Center becomes independent, separated from EVN, at the commencement of the competitive wholesale market. Independence of the system and market operator is generally viewed as essential for effective competition and for attracting private sector investment, which exercises complete control over the short-term operations of a generating plant and its interface with the transmission system. With respect to competitive generation market, although progress has been made by establishing three power generation corporations, and marked improvement has been recorded in transparency in generation scheduling and energy wholesaling activities, the competitive generation market is still in its infancy. Development partners' continued support is very important in the reform process together with investments.

100. **Environmental Issues.** While energy efficiency and renewable energy generation, and smart grid technologies to reduce GHG emissions are taking root, efforts toward enhancing the capacity within the executing agencies from the design stage to implementation and monitoring of environmental impacts of projects will help strengthen environmental safeguard practices. ADB together with other development partners need to continue to promote capacity building to achieve environmental sustainability of the power subsector.

101. **Procurement.** Based on the assessment of completed power projects, EVN and its holding companies have improved the capacity in open competitive bidding procedures and are familiar with

<sup>49</sup> ADB. 2009. *Country Assistance Program Evaluation: Viet Nam*. Manila.

<sup>50</sup> ADB. 2008. *Report and Recommendation of the President to the Board of Directors: Proposed Song Bung 4 Hydropower*. Loan 2429-VIE. Manila.

harmonized procurement procedures of multilateral development banks. However, one of the key reasons for project delays is still the delays in preparation of bidding documents, evaluations, and review because of limited staff working across several projects/programs financed by the government and its development partners. To mitigate the risk, ADB approves advance contracting actions during loan processing as part of its project readiness filters. It is expected that streamlined procurement process under ADB Strategy 2020 Medium-Term Review action plan will help to minimize project implementation delays.

102. **Financial Performance.** EVN suffered financial losses in 2010 and 2011. Although it made profits in 2012, its investments were around 50% of the annual need in 2012 (investment need is around \$5–\$6 billion per annum). Based on ADB’s assessment of EVN’s audited financial statements, EVN was in breach of the debt service coverage ratio and the self-financing ratio for fiscal years ending December 2013 and 2014. A TA funded by the World Bank is currently being implemented to identify strategic options to enhance the financial performance of EVN.

103. **Operational Capacity.** The technical capacity of EVN and its holding companies as well as the MOIT energy departments has improved along with the growth in their activities. Continued efforts in institutional strengthening and capacity building of the staff of the above entities are required, in particular to cope with the ongoing power market development, better system planning, and modern technologies.

## E. ADB Sector Forward Strategy

### 2. Rationale and Objectives

104. ADB Strategy 2020 calls for socially inclusive and environmentally sustainable economic growth, a key pillar in ADB’s CPS for Viet Nam. The key strategic principle and operating priorities of ADB’s CPS 2012–2015 for Viet Nam are strengthened support to the following three pillars of inclusive growth: (i) enhancing economic efficiency and environmental sustainability, (ii) focused sector and subsector engagement, and (iii) consideration of thematic issues (environment, gender, governance, regional cooperation and integration, and private sector development). Indicative key themes of the SEDP 2016–2020 which is under review by the government include instituting institutional reforms toward a market economy that enhances the role of the private sector, mitigating social risks because of structural reforms and transformation, strengthening fiscal systems and decentralization, and managing environmental and climate change risks. Coupled with sustained economic growth and the aforementioned socioeconomic development goals of the government, development partners’ continued engagement and long-term commitment in the energy sector will be required. The power subsector will continue to be a key priority in ADB operations in Viet Nam, where ADB has a proven track record and a comparative advantage.

105. ADB’s energy sector strategy in Viet Nam from 2016 to 2020 will be to support (i) power subsector reform and competitive market development; (ii) infrastructure development (generation, transmission, and distribution); (iii) access to electricity; (iv) energy efficiency and renewable energy generation; (v) an enabling environment for cross-border power trading; and (vi) skills development. Current partnerships and close coordination with key development agencies supporting the energy sector in Viet Nam will be enhanced. In coordination with other development partners, ADB will guide the MOIT in systematic sectorwide planning, which would lead to efficient and economic utilization and development of energy resources.

106. The period 2015–2025 is the time when the power subsector needs investment not only for power system expansion but also to rehabilitate and upgrade aging and overloaded infrastructure

covering power generation, transmission, and distribution. ADB will continue its support to the development of transmission and distribution network, focusing on the use of modern technologies, energy efficiency solutions, and renewable energy integration.

107. In power generation expansion, ADB in line with its Energy Policy 2009 will support highly efficient, environment-friendly generation technologies, as well as renewable energy.

108. The government aims to provide access to electricity for the entire population by 2020. Ensuring access to modern energy in remote communities requires dedicated policies of grid extension and rehabilitation together with off-grid investment, particularly in renewable energy. Microgrids (both on-grid and off-grid) comprising distributed energy resources is a good solution. Renewable energy generation is the best way to provide electricity to remote areas and isolated islands beyond the reach of the national grid. ADB continues its support to the government's rural electrification program.

109. In supporting power subsector reforms, ADB will place particular focus on the evolution of a competent and independent regulatory body that enforces cost-recovery principles to ensure financial sustainability of the power subsector. A policy-based loan is being prepared to further support power subsector reforms.

110. ADB will continue to provide TA to establish environmental management guidelines/mitigation measures, and measuring reporting and verification systems for mainstreaming climate change mitigation into energy sector infrastructure projects.

111. Participation of GMS countries, including Viet Nam, in GMS power trade program as well as in other fora of the Association of Southeast Asian Nations will continue to be supported by ADB. Particularly under the RPTCC umbrella, cross-border interconnections will be further pursued. The GMS countries are in the process of establishing the Regional Power Coordination Center.

## 2. Financing Instruments

112. ADB Strategy 2020 Medium-Term Review action plan approved the merger of the Asian Development Fund and ordinary capital resources enabling increased lending capacity to its developing member countries. Hence, from 2017, ADB's lending volume for Viet Nam energy sector development is expected to be scaled up based on the country needs and absorption capacity. In the next phase of development support, ADB shall employ instruments that confer scale and flexibility. Therefore, ADB will follow a programmatic approach using its MFF, results-based lending, and policy-based lending instruments to match with the government investment programs, and strategic projects as set out in the national development plans.

113. To address delays and because of the minimal resources and time required for processing TAs, Project Preparation and Start-up Support Facility for project preparation will be used wherever feasible. Larger regional PPTA facilities to support preparation of several loans will also be considered to lower transaction costs.

114. ADB will deploy innovative financing instruments, such as sovereign and nonsovereign guarantees, for commercial private sector lending to meet the investment needs of the energy sector. ADB's Private Sector Operations Department and Office of Public-Private Partnership will seek out the possibilities to promote PPP opportunities in the energy sector. ADB will also draw on its financial instruments, including partial risk and other forms of guarantees, to help improve the availability and terms of financing for power generation projects led by the private sector.

### 3. Risks and Assumptions

115. The proposed ADB strategy in support of Viet Nam's energy sector is based on the socioeconomic development needs of the country, as identified by the government. The fundamental assumption for ADB's proposed strategy of support for the energy sector is that the government will implement the socioeconomic development strategy and the SEDP which include targets for the provision of reliable and sustainable energy. Since a comprehensive national energy strategy is still under preparation, the revised PDP VII serves as the basis for ADB's energy sector development strategy for Viet Nam.

116. Key risks to the implementation of the road map are (i) project delays because of lengthy and complex government procedures in loan processing and (ii) institutional gaps and lack of readiness of power subsector entities to adopt power subsector reforms and market development actions in a timely manner.

117. The proposed ADB strategy in support of Viet Nam's energy sector integrates risk mitigation through continued assistance to power subsector reforms and by incorporating institutional strengthening and capacity development in program/project design. As part of implementation of ADB Strategy 2020 Medium-Term Review action plan, project administration is being decentralized to ADB's Viet Nam Resident Mission in a phased manner. Procurement, loan disbursement, and project administration functions of Viet Nam Resident Mission have already been strengthened and will have sufficient in-house capacity to mitigate risks, if any.



# Energy Sector Results Framework (2016–2020)

118. This results framework will be revised based on Viet Nam country partnership strategy 2016–2020 final results framework.

Country Sector Outcomes		Country Sector Outputs		ADB Sector Operations	
Outcomes with ADB Contribution	Outcome Indicators with Targets and Baselines	Outputs with ADB Contribution	Output Indicators with Incremental Targets	Planned and Ongoing ADB Interventions	Main Outputs Expected from ADB Interventions
National electricity demand met in a reliable, efficient, and sustainable manner	(i) Per capita consumption of power increased to 3,610 kWh by 2025 (2014 baseline: 1,415 kWh)	Transmission and distribution grid strengthened, operated, and managed efficiently	Installed capacity increased by 23.6 GW	(i) Pipeline projects with estimated amounts	(i) Pipeline projects
Financial viability of power subsector	(ii) Projected peak demand of 63.5 GW is met by 2025 (2014 baseline: 22.2 GW)	Rural distribution networks rehabilitated and expanded to increase access to electricity	Additional renewable generation: 3.2 GW by 2020	- Power Transmission Investment MFF Program: Tranche 3 (\$230 million) and Tranche 4 (\$330 million)	Over 600 km of transmission lines developed and 3,000 MVA of high-voltage substation capacities expanded <sup>a</sup>
Access to energy for all	(iii) Electrification rate increased to 100% by 2020 (2015 baseline: 98%)	Enhanced enabling environment for private sector investment into power subsector	Minimum additional 23,000 MVA of 500/220 kV and 39,000 MVA of 220/110 kV substation capacities developed by 2020 (2014 baseline: 21,900 MVA of 500 kV and 30,726 MVA of 220 kV)	- Electricity Distribution System Development Program 1 (\$350 million, including AIF cofinancing)	Over 3,000 km of medium-voltage networks rehabilitated and expanded along with associated substations of total capacity of more than 600 MVA <sup>a</sup>
	(iv) Fully operational competitive wholesale power market in 2017, retail market in 2024 (2014 baseline: generation of competitive market)		Additional 3,000 km of 500 kV and 7,000 km of 220 kV transmission lines developed (2014 baseline: 6,755 km of 500 kV and 12,513 km of 220 kV)	- Electricity Distribution System Development Program 2 (\$350 million, including AIF cofinancing)	Over 6,000 km of low-voltage networks extended/rehabilitated providing electricity access to more than 150,000 rural households <sup>a</sup>
			Additional 2% of the households in remote communes to be provided with access to electricity by 2020	- Development Policy Operations Support (policy-based loan: 1 \$200 million)	Institutional arrangements of the power corporations involved in distribution network development, operation, and

continued on next page

Energy Sector Results Framework (2016–2020) *continued*

Country Sector Outcomes		Country Sector Outputs		ADB Sector Operations	
Outcomes with ADB Contribution	Outcome Indicators with Targets and Baselines	Outputs with ADB Contribution	Output Indicators with Incremental Targets	Planned and Ongoing ADB Interventions	Main Outputs Expected from ADB Interventions
				Support (policy-based loan: \$2 million–\$200 million)	maintenance strengthened
				- Rural Electrification loan 1 (\$300 million, including cofinancing)	Viet Nam competitive wholesale power market developed
				- Rural Electrification loan 2 (\$300 million, including cofinancing)	(ii) Ongoing projects
				- Power Transmission Grid Reinforcement Loan 1 (\$350 million)	About 500 km of 500 kV, 100 km of 220 kV transmission lines expanded, and 600 MVA of 500/220 kV and 1,000 MVA of 220 kV substation transformer capacity added
				(ii) Ongoing projects with approved amounts	About 1,150 MW of installed generation capacity added
				- Mong Duong 1 Thermal Power MFF, Tranche 2 (\$902 million) and cofinancing from Korea Eximbank (\$510 million)	Over 2,250 km of medium-voltage network and 8,000 km of low-voltage network extended/rehabilitated, providing electricity access to about 128,000 households
				- Song Bung 4 Hydropower Project (\$196 million)	Grid connection provided to minimum 48,000 poor households
				- Power Transmission Investment Program: MFF, Tranche 1 (\$120.5 million)	About 35 MW small hydropower generation capacity added
				- Power Transmission Investment Program: MFF, Tranche 2 (\$110.9 million)	The NPT's operating efficiency in procurement, financial systems, and setting of transmission charges improved
				- Renewable Energy Development and Network Expansion and	

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Energy Sector Results Framework (2016–2020) *continued*

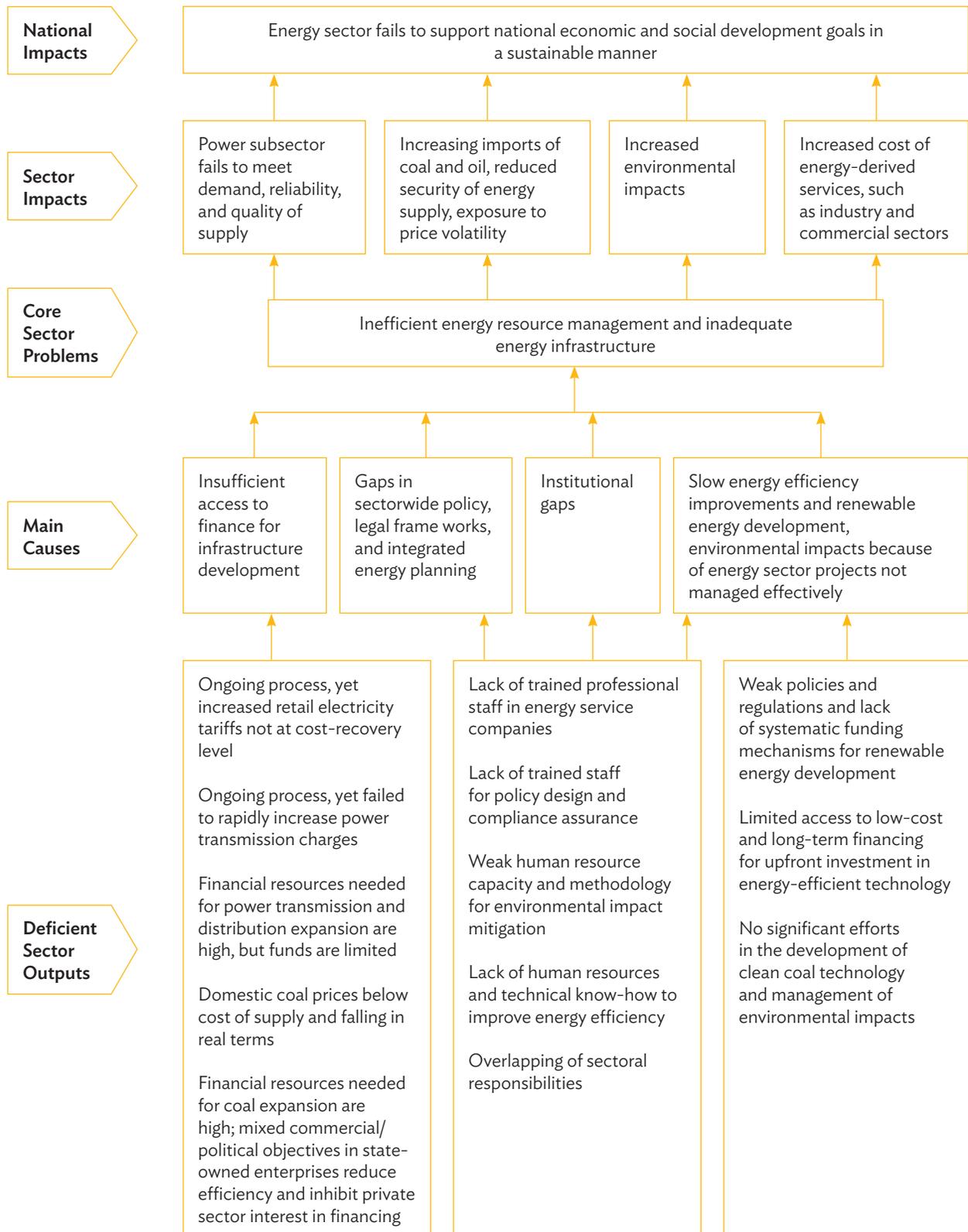
Country Sector Outcomes		Country Sector Outputs		ADB Sector Operations	
Outcomes with ADB Contribution	Outcome Indicators with Targets and Baselines	Outputs with ADB Contribution	Output Indicators with Incremental Targets	Planned and Ongoing ADB Interventions	Main Outputs Expected from ADB Interventions
				Rehabilitation for Remote Communes Sector Project (\$153 million) - Ha Noi and Ho Chi Minh City Power Grid Development Sector (\$180 million)	Capacity to design and implement climate change response measures improved

<sup>a</sup> ADB staff estimates. Exact outputs will be known during the project feasibility studies.

ADB = Asian Development Bank, AIF = ASEAN Infrastructure Fund, GW = gigawatt, km = kilometer, kV = kilovolt, kWh = kilowatt-hour, MFF = multitranche financing facility, MVA = megavolt-ampere, MW = megawatt, NPT = National Power Transmission Corporation.

Source: Asian Development Bank.

### Sector Problem Analysis



# Appendix 1

## Data Tables

**Table A1.1: Planned Power Generation Plants from 2014 to 2020**

No.	Year Installed	Investor	Total Capacity	Name of Power Station and Capacity
<b>1</b>	<b>Hydropower Plants</b>			
	2014–2015	IPP	680 MW	Ngòi Phát (72 MW), Nậm Toóng (34 MW), Nho Quế 1 (32 MW), Nhạc Hạn (45 MW), Ngòi Hút 2 (48 MW), Nậm Múc (44 MW), Nậm Na 2 (66 MW), Nậm Phan 5 (36 MW), Nậm Cùn (40 MW), Sông Bạc (42 MW), Sông Giang 2 (937 MW), Sông Tranh 3 (62 MW), Sông Tranh 4 (48 MW), Đồng Nai 2 (74 MW)
	2014–15	EVN	125 MW	Đăk Drinh 1
	2015	IPP	567 MW	Nho Quế 2 (48 MW), Nậm Na 3 (84 MW), Bắc Mê (45 MW), Sê Ka Man 3—Lao PDR (250 MW), Đồng Nai 5 (140 MW)
	2016	IPP	817 MW	Bá Thước 1 (60 MW), Lông Tào (42 MW), Chi Khê (41 MW), Sông Lô 6 (44 MW), La Ngâu (36 MW), Sông Nam Sông Bắc (49 MW), Sêkaman 1 (232 MW), Sông Bung 2 (108 MW), A Lin (62 MW), Đăk Mi 2 (98 MW), Đăk Mi 3 (45 MW)
	2015–2016	EVN	776 MW	Lai Châu Unit 1 (400 MW), Thượng Kon Tum Unit 1 (110 MW), Thượng Kon Tum Unit 2 (110 MW), Sông Bung 4 (156 MW)
	2017	IPP	220 MW	Yên Sơn (70 MW), Thành Sơn (42 MW), Bảo Lâm 3 (46 MW), Trà Khúc 1 (36 MW), Sekaman sanxay (26 MW),
	2017	EVN	1,215 MW	Trung Sơn (260 MW), Lai Châu Unit 2 (400 MW), Lai Châu Unit 3 (400 MW), Đa Nhim Extension (80 MW), Thác Mơ Extension (75 MW)
	2018	IPP	414 MW	Hồi Xuân (102 MW), Bảo Lâm 2 (930 MW), Đăk Mi 1 (54 MW), Sêkaman 4 (64 MW), Sêkong 3 Upstream and Downstream (9,164 MW)
	2018	EVN	900 MW	Huội Quảng Unit 1 (260 MW), Huội Quảng Unit 2 (260 MW), Thái Bình I Unit 2 (300 MW), Vĩnh Sơn II
	2019	IPP	182 MW	Sông Hiếu (42 MW), Bảo Lâm 1 (40 MW), Phú Tân 2 (60 MW), Thanh Sơn (40 MW)
	2019	EVN	360 MW	Yaly MR
<b>2</b>	<b>Coal-Fired Power Plants</b>			
	2014–2015	EVN	1,800 MW	Hải Phòng II Unit 1 (300 MW), Nghi Sơn I Unit 1 (300 MW), Hải Phòng II Unit 2 (300 MW), Nghi Sơn I Unit2 (300 MW), Vĩnh Tân II Unit 1 (600 MW)

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Table A1.1 *continued*

No.	Year Installed	Investor	Total Capacity	Name of Power Station and Capacity
	2014–2015	IPP	680 MW	An Khánh I Unit 1 (50 MW), Vũng Áng I Unit 1 (600 MW), Nông Sơn (30 MW)
	2014–2015	BOT	600 MW	Mông Dương II Unit 1
	2015	IPP	1,360 MW	An Khánh I Unit 2 (50 MW), Vũng Áng I Unit2 (600 MW), Formusa Hà Tĩnh Units 1 and 2 (300 MW), Formusa Hà Tĩnh Units 3 and 4 (200 MW), Formusa Hà Tĩnh Unit 5 (150 MW), Vê Đan (Cogeneration) (60 MW)
	2016	BOT	600 MW	Mông Dương II Unit 2
	2015	EVN	930 MW	Vĩnh Tân II Unit 2 (600 MW), Ô Môn I Unit 2—FO (330 MW)
	2016	IPP	627 MW	Thái Bình II Unit 1 (600 MW), Dung Quất (927 MW)
	2016	EVN	1,000 MW	Mông Dương I Unit 1 (500 MW), Mông Dương I Unit 2 (500 MW)
	2017	IPP	600 MW	Thái Bình II Unit 2
	2017	EVN	1,200 MW	Thái Bình I Unit 1 (300 MW), Duyên Hải I Unit 1 (600 MW), Vĩnh Tân IV Unit 1 (9,600 MW)
	2018	IPP	150 MW	Formosa Unit3
	2018	EVN	1,200 MW	Duyên Hải I Unit 2 (600 MW), Vĩnh Tân IV Unit 2 (600 MW)
	2019	IPP	1,300 MW	Na Dương II Units1 and 2 (100 MW), Long Phú I Units 1 and 2 (1,200 MW)
	2019	BOT	1,200 MW	Nghi Sơn II Units 1 and 2
	2019	EVN	600 MW	Duyên Hải III Unit 3
	2020	IPP	3,250 MW	Quảng Trạch I Unit 1 (600 MW), Hà Tĩnh Units 6 and 7 (600 MW), Formosa (300 MW), Formosa Hà Tĩnh Unit10 (150 MW), Sông Hậu I Units1 and 2 (1,200 MW)
	2020	BOT	1,320 MW	Vân Phong Units 1 and 2
<b>3</b>	<b>Gas-Fired Power Plants</b>			
	2018	IPP		Hiệp Phước 1
	2019	IPP	390 MW	Hiệp Phước 2
	2020	IPP	200 MW	Formosa Hà Tĩnh Units 8 and9

BOT = build–operate–transfer, EVN = Viet Nam Electricity, IPP = independent power producer, Lao PDR = Lao People’s Democratic Republic, MW = megawatt.

Source: Government of Viet Nam. 2015. *Revised Power Development Plan 2011–2020*. Ha Noi

**Table A1.2: Renewable Energy Projects for the Period 2015–2025**

No.	Name	Capacity (MW)
<b>2015</b>		
1	SHPP north	Total 100
2	SHPP south	Total 100
3	Wind	60
<b>2016</b>		
4	Bagasse Tuy Hòa Unit 1	30
5	SHPP north	Total 100
6	Wind	30
<b>2017</b>		
7	SHPP north	Total 100
8	SHPP center	Total 100
9	Wind center	90
10	Wind south	30
11	Solar	5
12	Biomass	30
<b>2018</b>		
13	Bagasse Tuy Hòa Unit 2	30
14	North SHPP	Total 100
15	Center SHPP	Total 100
16	South SHPP	Total 100
17	Wind center	90
18	Wind south	30
19	Solar	10
20	Biomass south	50
<b>2019</b>		
21	North SHPP	Total 100
22	Center SHPP	Total 100
23	Wind center	90
24	Solar center	10
25	SHPP south	100
26	Wind south	30
27	Solar south	5
28	Biomass south	50
<b>2020</b>		
29	SHPP north	Total 100
30	Wind north	30
31	Solar north	5
32	Biomass north	50
33	SHPP center	Total 100
34	Solar south	10
35	Biomass center	50
36	SHPP south	Total 100
37	Wind south	30
38	Solar south	5
39	Biomass south	100

MW = megawatt, SHPP = small hydropower plant.

Source: Government of Viet Nam. 2015. *Revised Power Development Plan 2011–2020*. Ha Noi

**Table A1.3: ADB-Approved Loans and Grants for Energy Sector  
in Viet Nam, 1994–2015**

No.	Loan No.	Project Name	Fund Type	Date Approved	Amount Approved (\$ million)
<b>I. Loans</b>					
<b>A. Generation</b>					
1	2353	Mong Duong 1 Thermal Power Plant—Tranche 1	OCR	2-Oct-2007	27.86
2	2429	Song Bung 4 Hydropower Plant	OCR	26-June-2008	196.00
3	2610	Mong Duong 1 Thermal Power Plant—Tranche 2	OCR	21-Dec-2009	902.85
<b>Subtotal</b>					<b>1,126.71</b>
<b>B. Transmission and Distribution</b>					
4	1358	Power Distribution Rehabilitation	ADF	8-Jun-1995	79.98
5	1585	Central and Southern Viet Nam Power Distribution	ADF	27-Nov-1997	100.00
6	2128	Northern Power Transmission Sector	OCR	13-Dec-2004	120.00
7	2225	Northern Power Transmission Expansion Sector	OCR	21-Dec-2005	360.00
8	2517	Renewable Energy Development and Network Expansion and Rehabilitation for Remote Communes	ADF	30-Mar-2009	151.00
9	2848	Power Transmission Investment Program—Tranche 1	OCR	29-Dec-2011	120.50
10	2959	Power Transmission Investment Program—Tranche 2	OCR	29-Dec-2012	110.19
11	3161	Hanoi and Ho Chi Minh City Power Grid Development	OCR	23-Sep-2014	172.70
12	NA	Power Transmission Investment Program—Tranche 3	OCR	Dec-2015	231.31
<b>Subtotal</b>					<b>1,445.68</b>
<b>Total Loans</b>					<b>2,572.31</b>
<b>II. Grants</b>					
13	0384	Renewable Energy Development and Network Expansion and Rehabilitation for Remote Communes Sector Project—Additional Financing	CEF	9-April-2014	3.00
<b>Subtotal</b>					<b>3.00</b>
<b>Total Loans and Grants</b>					<b>2,575.31</b>

ADB = Asian Development Bank, ADF = Asian Development Fund, CEF = clean energy fund, NA = loan number not available at the time of publication, OCR = ordinary capital resources.

Source: Asian Development Bank.

**Table A1.4: ADB-Approved Technical Assistance for Energy Sector in Viet Nam, 1994–2015**

No.	TA No.	TA Name	Fund Source	Date Approved	Amount Approved (\$'000)
<b>Energy Sector Development</b>					
1	2239	Institutional Strengthening of the State Planning Committee in Energy Planning	TASF	14-Dec-1994	580.00
2	2345	Improvement of Financial and Accounting Systems of the Power Companies	JSF	8-June-1995	1,200.00
3	2346	Training in Distribution Planning	JSF	8-Jun-1995	247.00
4	2392	Review of Hydrocarbon Sector Policy	TASF	5-Sep-1995	290.00
5	2470	Central and Southern Viet Nam Power Distribution	JSF	12-Dec-1995	508.00
6	2888	Improvement of the Power Sector Regulatory Framework	JSF	7-Oct-1997	800.00
7	2897	Commercialization of Power Companies	JSF	20-Oct-1997	900.00
8	3140	Energy Sector Profile Study	TASF	23-Dec-1998	60.00
9	3222	Se San 3 Hydropower	JSF	14-July-1999	998.00
10	3763	Road Map for Power Sector Reform	Other	6-Nov-2001	400.00
11	4051	Northern Power Transmission	TASF	18-Dec-2002	700.00
12	4470	Northern Power Transmission and Expansion	JSF	10-Dec-2004	500.00
13	4475	Preparation of Song Bung 4 Hydropower: Phase I	TASF	12-Dec-2004	150.00
14	4625	Song Bung 4 Hydropower Phase II	JSF	2-Aug-2005	1,575.00
15	4670	Muong Duong Thermal Power Generation	TASF	17-Oct-2005	150.00
16	4689	Developing Benefit Sharing Mechanisms for People Adversely Affected by Power Generation Projects	Other	14-Nov-2005	150.00
17	4690	Strengthening Institutional Capacity of Local Stakeholders for Implementation of Son La Livelihood and Resettlement Plan	Other	14-Nov-2005	1,000.00
18	4670	Mong Duong Thermal Power Generation (Supplementary)	TASF	1-Dec-2005	400.00
19	4711	Implementation of the Environmental Management Plan for the Son La Hydropower	Other	2-Dec-2005	800.00
20	4713	Capacity Building in the Strategic Environmental Assessment of the Hydropower Sector	Other	5-Dec-2005	475.00
21	4768	Power Market Design	TASF	1-Mar-2006	500.00
22	4845	Support for Public-Private Development of the O Mon Thermal Power Complex	JSF	29-Sep-2006	1,700.00
23	4923	Support for the Public-Private Development of the O Mon Gas Pipeline	Other	19-Mar-2007	975.00

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Table A1.4 *continued*

No.	TA No.	TA Name	Fund Source	Date Approved	Amount Approved (\$'000)
24	4966	Capacity Building on Environmental Management to the Power Sector	JSF	10-Sep-2007	600.00
25	4996	Vinh Tan 3 Thermal Power Generation	JSF	3-Dec-2007	1,000.00
26	7024	Supporting Implementation of the National Energy Efficiency Program	Other	12-Dec-2007	925.00
27	4845	Support for Public-Private Development of the O Mon Thermal Power Complex (Supplementary)	TASF	10-Jan-2008	740.00
28	4689	Developing Benefit Sharing Mechanisms for People Adversely Affected by Power Generation Project (Supplementary)	Other	22-May-2008	240.00
29	7222	Capacity Building of the National Power Transmission Corporation in a Competitive Power Market Environment	TASF	22-Dec-2008	225.00
30	7251	Strengthening Project Management and Developing Strategies and Options for Biogas Development Program Expansion	TASF	18-Mar-2009	1,500.00
31	7262	Capacity Building of Renewable Energy Development	TASF/CEF	11-Dec-2009	2,500.00
32	7461	Capacity Building for Investment Support Program for Viet Nam Electricity		12-Jan-2010	
33	4845	Support for Public-Private Development of the O Mon Thermal Power Complex (Supplementary)	TASF	12-Nov-2010	260.00
34	7668	Increasing the Efficiency of the National Power Transmission Corporation through Targeted Capacity Building	TASF	12-Nov-2010	600.00
35	7742	Power Transmission Investment Program (MFF)	TASF	3-Dec-2010	1,500.00
36	7779	Support for the National Target Program on Climate Change with a Focus on Energy and Transport	Other	31-Jan-2011	2,500.00
37	7861	Implementation and Monitoring of Song Bung 4 Hydropower Project Resettlement and Ethnic Minority Development Plan	TASF	9-Sep-2011	225.00
38	7942	Energy Efficiency in the Industry	TASF	2-Dec-2011	800.00
39	4845	Support for Public-Private Development of the O Mon Thermal Power Complex (Supplementary)	TASF	6-Dec-2011	200.00
40	8205	Ha Noi and Ho Chi Minh City Power Transmission Development Sector	TASF	2-Nov-2012	500.00
41	8302	Electricity Transmission Pricing Review in the Context of Power Sector Restructuring	TASF	11-Dec-2012	800.00

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Table A1.4 *continued*

No.	TA No.	TA Name	Fund Source	Date Approved	Amount Approved (\$'000)
42	8341	Developing the Market Readiness Proposal for a Domestic Carbon Market	Other	21-Mar-2013	315.00
43	7861	Implementation and Monitoring of Song Bung 4 Hydropower Project Resettlement and Ethnic Minority Development Plan	TASF	13-Dec-2013	500.00
44	8205	Ha Noi and Ho Chi Minh City Power Grid Development Sector (Supplementary)	TASF	16-Apr-2014	200.00
45	9012	Power Sector Reform Program	TASF	Dec-2015	500.00
46	9008	Rural Electrification Project	TASF	Dec-2015	1,000.00
47	8302	Electricity Transmission Pricing Review in the Context of Power Sector Restructuring (additional financing)	TASF	Nov-2015	225.00
<b>Subtotal</b>					<b>32,913.00</b>

ADB = Asian Development Bank, CEF = Clean Energy Fund, JSF = Japan Special Fund, MFF = multitranches financing facility, TA = technical assistance, TASF = Technical Assistance Special Fund.

Source: Asian Development Bank.

## Appendix 2

# Development Partners' Support

1. **The World Bank.** The World Bank has five ongoing investment projects in the energy sector, totaling nearly \$1.5 billion, for renewable energy development, and clean production and energy efficiency; construction of Trung Son hydropower project; distribution efficiency project; and transmission efficiency project. Further, the World Bank has also provided a policy-based loan for development policy operations program with three tranches totaling \$750 million. The World Bank's planned projects from 2016 to 2017 totals \$1.1 billion, which include (i) energy efficiency for industrial enterprises (\$200 million); Renewable Energy Development (\$100 million); (iii) the first tranche of new development policy operations program for wholesale electricity market with three tranches (totaling \$600 million) for which the World Bank and the Asian Development Bank (ADB) are jointly developing policy-based loans using parallel financing; and (iv) the second distribution efficiency project (\$400 million).
2. Ongoing analytical and advisory technical assistance executed by the World Bank for strategic policy development until 2017 is over \$5 million, and they cover (i) renewable energy resource mapping, (ii) development of capacity adequacy mechanism for power market operation, (iii) divestiture strategy for Viet Nam Electricity generation assets, (iv) pumped storage development strategy for Viet Nam, and (v) support to develop wholesale electricity market. Future technical assistances include (i) energy subsidy reform, (ii) Viet Nam–Lao People's Democratic Republic power trade strategy, (iii) communication strategy for financial recovery plan, and (iv) implementation of sustainable hydropower protocol.
3. **The European External Action Service (EEAS).** Indicative program of EEAS in Viet Nam energy sector is €340 million grant for the period 2014–2020 to support: (i) energy efficiency; (ii) renewable energy; and (iii) access to energy services.
4. **European Investment Bank.** The European Investment Bank has provided a €150 million loan for climate change mitigation. The loan will make long-term financing available for investments that contribute to climate change mitigation through the avoidance, reduction, or sequestration of greenhouse gas emissions; and enable the use of renewable energy sources and energy efficiency. The loan is provided via the Ministry of Finance to four state-owned banks for on-lending to small-scale climate change projects. This is the second loan of its kind in Viet Nam, the first being the €100 million Viet Nam Climate Change Framework loan signed in May 2009.
5. **French Development Agency (AFD).** AFD has an €310 million program in energy sector. It has provided a loan of €60 million with cofinancing from Japan International Cooperation Agency for the Support Program to Respond to Climate Change. It aims to ensure that climate change mitigation is included in programs and policies as part of the government's overall action plan. Ongoing projects in power subsector include (i) €82 million nonsovereign direct loan to Viet Nam Electricity for the Huoi Quang hydropower plant, which is expected to be commissioned in 2016; (ii) €75 million cofinancing with ADB for the construction of 500 kilovolt power transmission line from Pleiku in

central Viet Nam to Cau Bong in the south; (iii) €40 million cofinancing with ADB for the Northern Power Transmission Project; (iv) €17.14 million loan for rural electrification project in the Mekong Delta; (v) €200,000 grant for development of detailed design for Viet Nam wholesale electricity market ; (vi) €500,000 for capacity building of the National Power Transmission Corporation staff; (vii) €668,000 for capacity building of the Northern Power Corporation and the Hanoi Power Corporation staff; and (viii) \$3.5 million loan cofinanced by AFD and ADB to advise Ministry of Planning and Investment on the development of the public-private partnership program.

6. **KfW and GIZ.** German development cooperation through KfW has been engaged in the Viet Nam energy sector since 2009. KfW has nearly €1 billion portfolio in the power subsector efficiency improvements (rehabilitation and development of transmission and distribution networks) and renewable energy (wind power) development. KfW cofinanced ADB's ongoing transmission expansion multitranches financing facility with about €80 million. KfW is currently focusing on formulating similar projects in medium cities. German development cooperation through GIZ is supporting capacity development and establishing legal and regulatory frameworks required in renewable energy and energy efficiency. In the renewable energy sector, GIZ is currently conducting a wind resource assessment and expects to expand its support to biomass assessment and capacity building in renewable energy.

7. **Japan International Cooperation Agency (JICA).** In the power sector, the JICA has provided ¥504 trillion in the past for the development of power generation, transmission, and distribution networks. JICA's planned projects for the period of 2016-2017 include development of a coal-fired thermal power plant and associated transmission line in the north and a pumped storage hydro power plant in the south of Viet Nam.

8. **Danish International Development Agency (Danida).** The Government of Denmark has provided \$12 million to support energy efficiency efforts, including a fund for projects in small and medium-sized enterprises, and the development of an energy building code.

9. **Swedish International Development Cooperation Agency (Sida).** Sida has been supporting electrification in the country's rural and mountainous areas through the use of off-grid renewable energy systems, and has established the future framework for a broader implementation of off-grid renewable energy projects.

10. **Australian Department of Foreign Affairs and Trade (DFAT).** Climate change is a key focus of AusAid, which concentrates on two strategic outcomes: building community resilience and promoting low carbon growth. In the latter case, DFAT has identified energy efficiency as an area for collaboration under a strategic partnership with the World Bank. DFAT will fund complementary technical assistance to the World Bank's distribution efficiency project to build the capacity of Viet Nam's power corporations and the Electricity Regulatory Authority of Vietnam to augment the quality and sustainability of the investment. DFAT is supporting the Ministry of Industry and Trade to develop and implement energy efficiency standards, registration, labeling, testing, compliance, and monitoring mechanisms.

11. **United States Agency for International Development (USAID).** USAID is providing assistance in the energy sector, focusing on policy areas of renewable energy, energy planning, clean energy investment, and energy efficiency. Currently, it is providing assistance for the improvement of energy efficiency in buildings to the Ministry of Construction, and a technical assistance to the National Power Transmission Corporation for upgrading its telecommunication infrastructure. It also lends support to the energy sector to adapt to climate change.

12. **United Nations Development Programme (UNDP).** UNDP has been supporting reforms in the energy sector and a study on fossil fuel subsidy. Currently, it is supporting capacity building in the industry sector on energy efficiency.
13. **Swiss Secretariat for Economic Affairs (SECO).** SECO is supporting in the areas of energy efficiency and renewable energies, clean and sustainable production and consumption, and climate protection measures.

## **Viet Nam: Energy Sector Assessment, Strategy, and Road Map**

The latest energy sector assessment, strategy, and road map for Viet Nam of the Southeast Asia Energy Division of the Asian Development Bank (ADB) highlights energy sector performance, major development constraints, government development plans and strategy, previous support from ADB and other development partners, and ADB's future support strategy in Viet Nam's energy sector. The assessment, strategy, and road map will add on to ADB's 2016–2020 country partnership strategy for Viet Nam. The report also provides energy sector background information for ADB investment and technical assistance operations.

### **About the Asian Development Bank**

ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to the majority of the world's poor. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

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