

## SECTOR ASSESSMENT (SUMMARY): ENERGY

### Sector Road Map

#### 1. Sector Performance, Problems and Opportunities

1. The Ministry of Industry and Trade (MOIT) has policy and supervisory responsibilities for the energy sector, both as the line ministry and as the ministry with oversight responsibility for the state-owned energy enterprises. Vietnam Electricity (EVN), the main power utility in Viet Nam, is organized as a holding company with a series of wholly owned subsidiaries: three power generation corporations (GENCOs); the National Power Transmission Corporation (NPT), which is responsible for the 500 kilovolt (kV) and 220 kV transmission system; and the five regional power distribution companies. EVN further owns the National Load Dispatch Center, the Electric Power Trading Company, and the strategic power plants, and is a majority shareholder of the partially privatized power plants.

2. **Demand growth and rapid electrification.** Viet Nam's economy grew steadily at an average annual rate of 6.3% during 2005–2012, and gross domestic product (GDP) per capita increased from \$699 to \$1,755 in the same period, while the poverty rate declined from 15.5% in 2006 to 11.1% in 2012.<sup>1</sup> Economic growth was accompanied by average annual growth in electricity demand of 12.6% during 2005–2012, which increased electricity consumption from 53.2 terawatt-hours (TWh) in 2005 to 120.3 TWh in 2012. This rapid growth was also due to the dramatic increase in the household electrification rate from less than 50% in the early 1990s to 97% by 2012.<sup>2</sup> Per capita consumption also increased from 156 kilowatt-hours (kWh) in 1995 to 1,187 kWh in 2012.

3. **Generation.** Installed generation capacity increased from 11,576 megawatts (MW) in 2005 to 26,475 MW in 2012. Hydropower dominated the generation mix until the early 2000s, then thermal power increased rapidly. The current generation mix is 50.2% hydropower, 27.7% gas, 18.3% coal, 3.4% oil, and 0.4% diesel. Renewable energy apart from small hydropower is negligible. EVN owns 49.8% of the installed capacity, EVN joint-stock companies own 13.8%, and domestic and foreign investors own the balance.

4. **Transmission.** As of 2012, transmission assets comprised transformer substation capacities of 16,050 megavolt-amperes (MVA) at 500 kV, 27,901 MVA at 220 kV, and 32,976 MVA at 110 kV. There are 4,670 kilometers (km) of 500 kV transmission lines, 11,449 km of 220 kV lines, and 15,057 km of 110 kV lines. The transmission system's performance has improved over the past decade, and especially system losses declined from 12.2% in 2003 to 9.2% in 2013.

5. **Distribution.** Distribution companies were reorganized into five power corporations in 2010 to strengthen their financial and management capacities. They are primarily responsible for distribution and retail of electricity at 110 kV and below, but are also responsible for developing and operating 220 kV assets in their respective licensed areas. Hanoi Power Corporation (EVN HANOI) and Ho Chi Minh City Power Corporation (EVN HCMC) are the entities responsible for the two 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 population. Their combined peak load of over 6.1 gigawatts (GW) in 2012 represents 23% of the total

<sup>1</sup> General Statistics Office. 2012. *Statistical Yearbook of Vietnam*. Ha Noi.

<sup>2</sup> ADB. 2011. *Energy for All – Viet Nam's Success in Increasing Access to Energy through Rural Electrification*. Manila.

domestic load, and is expected to nearly double to 11.2 GW by 2020.

6. **Tariff.** The retail tariff schedules are set by the government uniformly for the whole country, with progressive tariffs per customer groups. For productive uses, a time-of-use tariff applies. While the average retail tariff has increased by 79% in nominal terms during 2007–2013, it has decreased by 15% in real terms. Moreover, the current average retail tariff of about D1,500/kWh (¢7.14/kWh) is less than the long-run marginal cost, estimated to be in the range of ¢8–9/kWh. A gradual tariff increase is required to ensure the long-term financial sustainability of the power sector, and to attract private investment into the sector, while social safety measures to protect the low-income consumers should stay in place.

## 2. Government's Sector Strategy

7. **Power development plan.** Viet Nam's seventh power development plan (PDP7) is the governing planning document in the power sector.<sup>3</sup> It envisages average annual growth of electricity demand of 10%, reaching 329 TWh in 2020,<sup>4</sup> while the installed capacity is to increase to 70,560 MW by 2020. To accommodate the rapidly increasing power generation volume, more than 40,000 MVA of 500 kV substation capacity and over 70,000 MVA of 220 kV substation capacity will be developed by 2020, and over 8,000 km of 500 kV transmission lines and about 15,000 km of 220 kV transmission lines will also be developed. The investment costs up to 2020 are estimated at \$32.5 billion (generation) and \$16.3 billion (transmission). As for distribution, the investment needs during 2015–2020 are \$1.1 billion each for EVN HANOI and EVN HCMC.<sup>5</sup> The PDP7 also sets an ambitious target to achieve nearly 100% electrification by 2020, which will cost a further \$1.37 billion.<sup>6</sup>

8. **Energy mix.** In generation, the share of hydropower is expected to fall to 24.7% in 2020 and 14.4% in 2030. In contrast, the share of coal thermal power is expected to grow rapidly to 45.9% in 2020 and 52.7% in 2030. Since the economically exploitable domestic coal resource is depleting, it is expected that demand for imported coal for power generation will increase significantly from 2016. As the government and EVN do not have a solid plan to make the use of coal clean, assistance by development partners is deemed necessary.

9. The PDP7 envisages gas thermal power plants to be developed, but their share will decrease steadily to 11.9% in 2030. Although gas is indigenous and relatively clean, negotiations with foreign investors to develop a major offshore gas field have stalled, causing delays in the construction of gas thermal power plants. The PDP7 also envisages the first 1,000 MW of nuclear power to be introduced in 2020, but this is likely to be delayed to at least 2025. The expected increase in baseload generators calls for the introduction of pumped storage hydropower plants (PSHPPs) to efficiently supply power during peak hours. As Viet Nam does not yet have experience in PSHPPs, development partner assistance is being sought.

10. **Sector reform.** Viet Nam's sector reform program began in 1995. The Asian Development Bank (ADB) has supported the process through six technical assistance (TA)

<sup>3</sup> Government of Viet Nam. 2011. *Prime Minister Decision 1208/QD-TTg on Approval of National Power Development Plan between 2010 and 2020, with Orientation Towards 2030*. Ha Noi.

<sup>4</sup> The partially revised PDP7 (Decision 2414/QD-TTg; 11 December 2013) considers the slowing of economic growth, and the revised demand is said to be between 288–307 TWh in 2020.

<sup>5</sup> The two principal documents guiding EVN HANOI's investments are Decision 4351/QD-BCT (29 August 2011) and EVN HANOI report 3643/BC-EVN HANOI (29 August 2013). The two principal documents guiding EVN HCMC's investments are Decision 6468/QD-BCT (09 December 2010) and Decision 850/TTg-KTN (22 June 2012).

<sup>6</sup> Government of Viet Nam. 2013. *Prime Minister Decision No. 2081/QD-TTg on Rural, Mountainous and Island Electrification Program for the Period 2013–2020*. Ha Noi.

projects between 1995 and 2009.<sup>7</sup> The 2001 TA, in particular, was the basis for the 2004 Electricity Law, which is the legal underpinning of the reforms. Electricity Regulatory Authority of Vietnam (ERAV) was established under MOIT in 2005, followed by the unbundling of NPT in 2008. The reform road map (Decision No. 26/2006/QD-TTg; January 2006) envisages establishing an electricity market in three phases: (i) competitive generation market (2005–2014); (ii) competitive wholesale market (2015–2022); and (iii) competitive retail market (beyond 2022).<sup>8</sup> Phase 1 was launched in July 2012 with the legal unbundling of the three GENCOs.<sup>9</sup> ERAV is now preparing for phase 2.

11. **Private sector investment.** Viet Nam classifies power plants funded by domestic investors as independent power producers (IPPs), and those wholly owned by foreign investors take on a build–own–transfer (BOT) modality and are referred to as BOTs. Currently, IPPs own 12.0% and BOTs own 8.6% of the installed capacity. Although the PDP7 slates many projects as BOT schemes, negotiations on the concessional agreement with the government and on the power purchase agreement with EVN are often prolonged.

12. **Renewable energy.** Renewable energy is said to represent 3.7% of power generation, most of which are small hydropower plants (less than 30 MW). The PDP7 envisages the share to increase to 6.0% in 2020 and to 9.3% in 2030. Despite the lack of an approved renewable energy master plan or a renewable energy law, progress has been made on small hydropower development promoted through Decision No. 18/2008/QD-BCT of August 2008, which stipulated the avoided-cost-based tariff schedule and standard power purchase agreements for grid-connected small hydropower projects. Progress is also evident toward grid-connected wind power, where a feed-in-tariff of  $\text{¢}7.8/\text{kWh}$  was approved through Decision No. 37/2011/QD-TTg in June 2011. The target is to commission 1,000 MW of wind power by 2020.

13. **Energy efficiency and smart grid.** Viet Nam's energy intensity as measured by the elasticity ratio of electricity consumption growth to GDP growth has averaged about 2.0. The PDP7 calls for this ratio to fall to 1.5 by 2015 and to 1.0 by 2020. This requires drastic demand-side management, but energy efficiency investments have remained low. In the power system, EVN has steadily reduced transmission and distribution losses from 12.2% in 2003 to 9.2% in 2012. At the distribution level, EVN HANOI's losses increased from 7.3% in 2008 to 8.1% in 2010 as the rural power systems owned by local authorities (e.g., electricity service cooperatives) were transferred to EVN HANOI, but fell to 7.1% in 2012 and are expected to drop to 6.0% by 2020. EVN HCMC's losses continued to drop, from 11.1% in 2000 to 5.6% in 2012, and are targeted at 5.0% in 2020. As for reliability of supply, EVN HANOI expects to reduce the system average interruption duration index (SAIDI) from 6,383 minutes in 2012 to 4,422 minutes in 2015, while EVN HCMC targets a reduction from 2,988 minutes to 1,782 minutes in the same period. Rehabilitation and expansion of transmission and distribution infrastructure is expected to

<sup>7</sup> ADB. 1995. *Technical Assistance to the Socialist Republic of Viet Nam for the Improvement of Financial Management of Power Companies*. Manila (TA 2345); ADB. 1995. *Technical Assistance to the Socialist Republic of Viet Nam for Training in Distribution Planning*. Manila (TA 2346), attached to ADB. 1995. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to the Socialist Republic of Viet Nam for the Power Distribution Rehabilitation Project*. Manila (Loan 1358); ADB. 1997. *Technical Assistance to the Socialist Republic of Viet Nam for Improvement of the Power Sector Regulatory Framework*. Manila (TA 2888); ADB. 1997. *Technical Assistance to the Socialist Republic of Viet Nam for Commercialization of Power Companies*. Manila (TA 2897); ADB. 2001. *Technical Assistance to the Socialist Republic of Viet Nam for a Road Map for Power Sector Reform*. Manila (TA 3763); and ADB. 2006. *Technical Assistance to the Socialist Republic of Viet Nam for the Power Market Design*. Manila (TA 4768).

<sup>8</sup> Phase 2 was initially set for 2015–2022 and phase 3 was to start after 2022 under No. 26/2006/QD-TTg (January 2006), but the recently issued Prime Minister Decision No. 63/2013/QD-TTg (November 2013) has brought the end of phase 2 to 2021 and the start of phase 3 to after 2021.

<sup>9</sup> The Pilot Viet Nam Competitive Generation Market started in July 2011.

contribute to the reduction of losses and to the improvement of the SAIDI.

14. The PDP7 calls for the introduction of modern technologies to improve the quality of electricity supply, minimize power loss, and promote demand-side management. Based on this direction, the smart grid road map,<sup>10</sup> approved on 8 November 2012, stipulates a three-phase plan to introduce smart grid technologies. However, the deployment of smart grid technologies, which entails high investment costs, is delayed because the financial resources are prioritized for the vast task of expanding the generation, transmission, and distribution infrastructure.

15. **Tariff.** The latest decision on tariff increases (Decision 69/2013/AD-TTg, 19 November 2013) allows MOIT to approve increases of up to 10% every 6 months, while increases above 10% will be considered by the Prime Minister.<sup>11</sup> Since the average retail tariff is below the long-run marginal cost of supply, it is important for the retail tariff to be gradually increased, while the power industry must simultaneously reduce its costs. The introduction of an electricity market is hoped to attract private sector investment to shoulder the cost of developing power plants. Since the retail tariff is uniform across the country, transfer tariffs (bulk supply tariffs) for the power corporations are set arbitrarily by EVN to ensure adequate profitability, while taking into consideration their different operating costs and revenues. EVN also sets the transmission charge to NPT. It is deemed necessary for such transfer tariffs to be set more transparently and predictably to enable the subsidiaries to be financially and operationally autonomous.

16. **Environment and social.** Awareness has been growing of the need to safeguard the environment and of the rights of the people affected by power projects. For example, many potential hydropower projects were cancelled in 2013 due to the large envisaged impacts on the environment and people. The expected rapid development of coal-fired power plants deepens environmental concerns because it will add to the emission of greenhouse gases.

### 3. ADB Sector Experience and Assistance Program

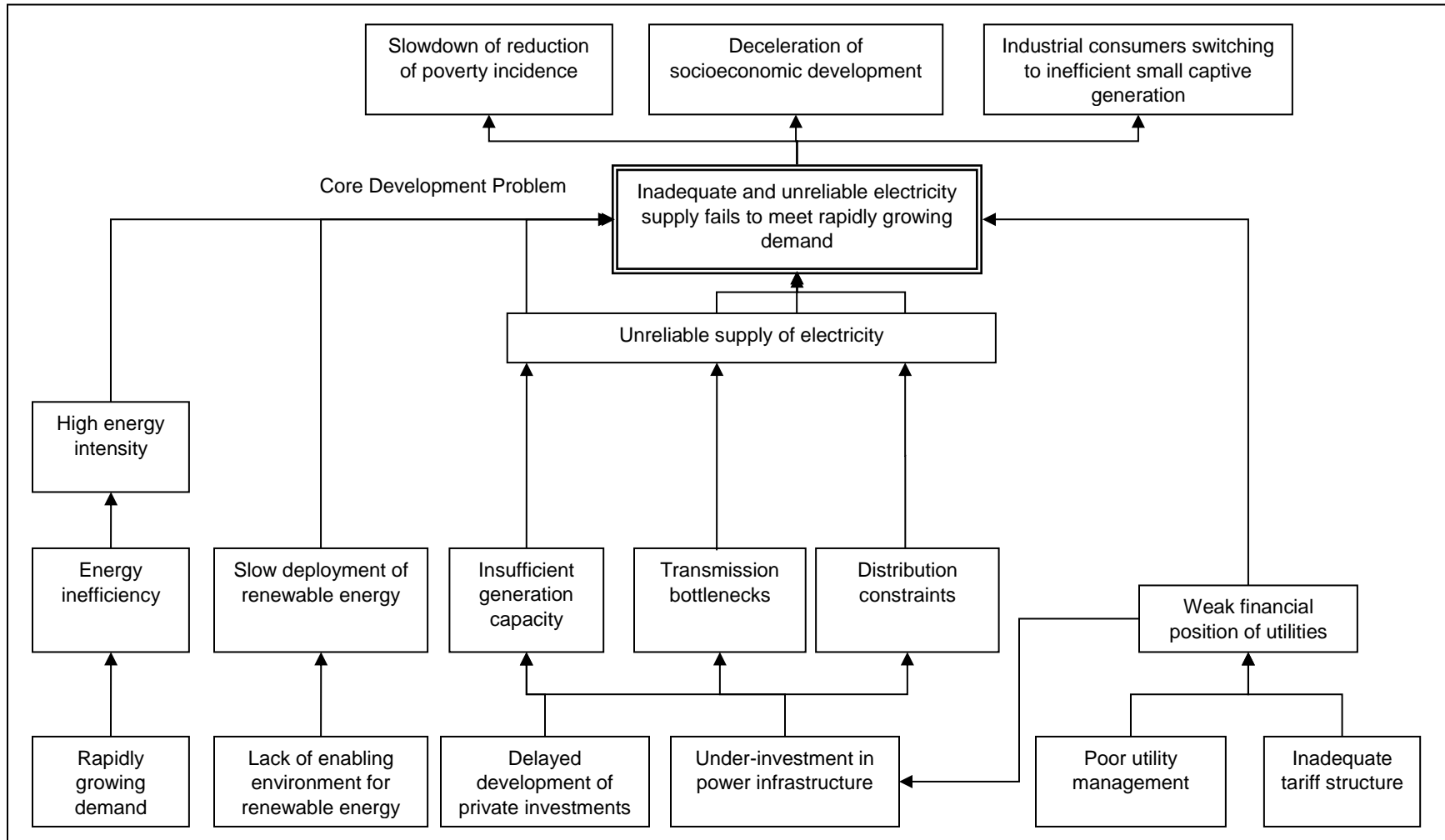
17. The energy sector is one of the priority sectors in ADB's country partnership strategy, 2012–2015 for Viet Nam, which calls for ADB assistance to focus on reforms to meet energy demand with reliable, environmentally sustainable supply; and on investments in energy efficiency, renewable energy, and the expansion of the power transmission network. It also stipulates that the operational and financial viability of state-owned energy enterprises be assessed in consultation with other development partners. ADB's cumulative loan to the energy sector in Viet Nam amounts to \$2.32 billion, and represents about a quarter of the total portfolio in Viet Nam as of December 2013. Ongoing projects are in generation, transmission, distribution, and renewable energy (small hydropower), while TA is being implemented to build the capacities of power utilities and to support the reform program. The energy sector projects disbursed a total of \$572.8 million, or 47% of the total disbursement in Viet Nam in 2013. ADB will continue to support transmission and distribution development, including through the proposed project, which was developed in consultation with, and will complement the efforts of, Japan International Cooperation Agency, KfW, and the World Bank. The project will adopt a sector lending modality, as recommended in project completion reports of past projects, to ensure flexibility against changes in scope and subprojects during implementation.<sup>12</sup>

<sup>10</sup> Government of Viet Nam. 2011. *Prime Minister Decision 1670/QD/TTg on Approval of Proposal for Smart Grid Development in Viet Nam*. Ha Noi.

<sup>11</sup> The earlier Decision 24/2011/QD-TTg (1 June 2011) allowed MOIT to approve tariff increases of up to 5% every quarter. The tariff was increased by 5% each time on 1 July 2012, 22 December 2012, and 1 August 2013.

<sup>12</sup> ADB. 1995. *Loan to the Socialist Republic of Viet Nam for the Power Distribution Rehabilitation Project*. Manila (Loan 1358); ADB. 1997. *Loan to the Socialist Republic of Viet Nam for the Central and Southern Viet Nam Power Distribution Project*. Manila (Loan 1585).

### Problem Tree for Energy Sector



Source: Asian Development Bank.

## Sector Results Framework (Energy, 2014–2016)

Country Sector Outcomes		Country Sector Outputs		ADB Sector Operations	
Outcomes with ADB Contribution	Indicators with Targets and Baselines	Outputs with ADB Contribution	Indicators with Incremental Targets	Planned and Ongoing ADB Interventions	Main Outputs Expected from ADB Interventions
Power is provided to industrial, commercial, and residential consumers in a reliable, economically and environmentally sustainable manner.	<p>Outcome: Industrial, commercial, and residential consumers in Viet Nam use more electricity more efficiently</p> <p>Indicators:</p> <p>Per capita electricity consumption increases to 1,720 kWh by 2015 (2010 baseline: 985 kWh)</p> <p>System losses are reduced to 9% by 2015 (2010 baseline: 10%)</p> <p>Electricity intensity as measured by the elasticity ratio of electricity consumption growth to GDP growth is reduced to 1.5 by 2015 (2010 baseline: 2.0)</p>	Power infrastructure developed and supply made more reliable.	<p>Electricity consumption reaching 329 TWh in 2020 (2012 baseline: 120 TWh)</p> <p>Installed capacity increased to 70,560 MW in 2020 (2012 baseline: 26,475 MW)</p> <p>Additional 40,000 MVA of 500 kV substation capacity and over 70,000 MVA of 220 kV substation capacity developed by 2020 (2011 baseline: 0)</p> <p>Additional 9,000 km of 500 kV transmission lines and 15,000 km of 220 kV transmission lines developed (2011 baseline: 0)</p>	<p><b>Planned and Ongoing ADB Interventions</b></p> <p><b>Planned key activity areas</b></p> <p>Transmission and distribution (80% of funds)</p> <p>Generation including renewables (20% of funds)</p> <p><b>Pipeline projects with estimated amounts</b></p> <ul style="list-style-type: none"> <li>- Ha Noi and Ho Chi Minh City Power Grid Development Sector (\$180 million)</li> <li>- MFF: Power Transmission Investment Program, Tranche 3 (\$250 million)</li> </ul> <p><b>Ongoing projects with approved amounts</b></p> <ul style="list-style-type: none"> <li>- Mong Duong 1 Thermal Power Project (\$902.85 million)</li> <li>- Song Bung 4 Hydropower Project: (\$196.00 million)</li> <li>- MFF: Power Transmission Investment Project, Tranche 1 (\$120.50 million)</li> <li>- MFF: Power Transmission Investment Project, Tranche 2 (\$110.19 million)</li> <li>- Northern Power Transmission Expansion Project (\$360.00 million)</li> <li>- Renewable Energy Development and Network Expansion and Rehabilitation for Remote Communes Sector Project (\$153.50 million)</li> </ul>	<p><b>Planned key activity areas</b></p> <p>About 150 km of transmission lines developed.</p> <p><b>Pipeline projects</b></p> <p>About 300 km of transmission lines developed.</p> <p><b>Ongoing projects</b></p> <p>About 500 km of transmission lines developed.</p> <p>About 1,150 MW of installed capacity added.</p>

ADB = Asian Development Bank, GDP = gross domestic product, km = kilometer, kV = kilovolt, kWh = kilowatt-hour, MFF = multitranche financing facility, MVA = megavolt-ampere, MW = megawatt, TWh = terawatt-hour.

Source: Asian Development Bank estimates.