

Overview of Sector

Rapid growth in Vietnam's economy, industry, and consumption has resulted in unprecedented growth in energy demand, and the infrastructure required to extract, generate, and distribute energy is being expanded to try to meet it. Between 2000 and 2005, total primary energy consumption in Vietnam grew 10.6 percent per year. Growth in fossil-fuel consumption is correspondingly high, with coal use increasing 14.9 percent per year, oil use 8.2 percent per year, and natural gas use 37 percent per year.

Vietnam Energy Resources and Electricity Generation At-a-Glance

Resource Potential

Oil:	8 billion tons
Coal:	5.8 billion tons
Natural gas:	2,400–2,700 billion m ³
Hydropower:	18000–20000 MW
Solar:	6–10 MW
Wind:	1,680 MW
Biomass/biogas:	600–800 MW
Geothermal:	200–300 MW

Demand and Growth

Coal:	13.6 m tons/yr (15% / yr)
Oil:	11 m tons/yr (8 % / yr)
Natural gas:	6.6 m m ³ /yr (37% /yr)
Electricity:	9,000 GWh /yr (16%/yr)

Resource Utilization

Oil production:	22 m tons/yr
Natural gas production:	6.8 m m ³ /yr
Coal production:	32.4 m tons/yr
Renewable energy capacity utilized	
Hydropower:	4198 MW
Solar:	0.8 MW
Wind:	1.2 MW
Biomass/biogas:	151 MW
Geothermal:	0 MW

Electricity Grid

Coal and oil:	1,445 MW (13%)
Gas and diesel:	3,282 MW (29%)
Medium-large hydro:	4,092 MW (36%)
Other renewable:	288 MW (2.0%)
Other:	2,287 (21%)

Energy Resources

Vietnam's major indigenous fossil fuel energy resources are coal, natural gas, and oil. Vietnam also possesses large renewable energy resources, including hydropower, solar, wind, geothermal, and biomass, many of which have not been fully explored.

Coal. Coal is the most abundant mineral in Vietnam, and the country's large reserves are being used both to meet growing domestic demand and for export. There are two major coal reserves in the country: Quang Ninh Province, which has been mined for over a 100 years, and the Red River Delta, which is newly discovered and under exploration. Total production for 2009 is projected to be 41 million tons, 22 million tons of which will be exported. Domestic consumption of coal has increased an average of 17.4 percent over the last decade, with the major domestic coal consumers being thermal power plants (31 percent); construction material (brick, tile, lime, and ceramic) producers (25 percent); cement plants (13 percent); households and other consumption (28 percent); and other industries (4 percent).



Oil. Crude oil is produced in Vietnam from ten offshore areas, including one jointly held with another country. Production has grown from 16 million tons in 2000 to 20 million tons in 2004, and average production is



projected to be 25 to 40 million tons per year through to 2020. In 2009 operation at the Dung Quat Refinery began which is the country's first refinery. Before that time, Vietnam imported 11 million tons of

petroleum products annually. In addition to one recently opened refinery, two other refineries are in the planning phase and will be operating from 2015; their combined capacity will be 15 million tons of petroleum products.

Natural gas. Vietnam has abundant natural gas reserves in eight fields. Natural gas production grew from 0.5 billion cubic meters per year in the early 1990s to 6.8 billion cubic meters in 2005. Production is expected to increase to 15 to 20 billion cubic meters by 2012. All natural gas produced currently goes to domestic consumption. More than 80 percent of the consumption for power generation is primarily in three



facilities that use the gas for electricity and

fertilizer production. Gas processing is done the Dinh Co Gas Processing Plant in Ba Ria–Vung Tau Province, which was built in 1998 with a capacity of 13.2 million cubic meters of LPG per day.

Renewable energy. Vietnam has potentially exploitable renewable energy resources amounting to 18,000 to 20,000 MW of hydropower; 6 to 10 MW of solar energy; 1,680 MW of wind power; 600 to 800 MW of biomass; and 200 to 300 MW of geothermal energy. The most explored renewable resource to date has been hydropower, in the form of medium and large hydropower projects, while only a small fraction of the total potential of other forms of renewable energy has been exploited.

Vietnam's Electricity Grid

Vietnam faces a dramatic growth in electricity demand, with projected increases of 16 percent per year from 2006 to 2010 and 11 percent per year from 2011 to 2015. The country's current mix of generation capacity includes renewable energy sources, largely comprised of hydropower (37 percent), and fossil-fuel sources, including gas and diesel turbine (29 percent) and coal and fuel oil (13 percent).

Fossil-fuel-based generation. With the rapid development of natural gas reserves, the proportion of gas-fired generation is expected to grow in the short and medium term and there has been switching of fuels from coal to oil or oil to gas in the industry sector. With its vast coal reserves, Vietnam has plans underway to build eight new coal thermal power plants by 2010. Natural gas plants in the country generally use modern technologies. In coal thermal power generation, however, the most common technology employed is subcritical pulverized coal combustion, a technology with relatively low efficiencies due to the age of the plants and the use of anthracite coal, which is more difficult to combust.

Renewable-energy-based electrical generation. Generation capacity using renewable energy is dominated by medium and large hydropower plants. Hydropower has expanded rapidly and now supplies a large proportion of grid electricity. In 2004, the total capacity of all current hydropower plants reached 4,227 MW: 60 percent from two large hydropower plants and much of the rest from 30 medium plants (capacity at 100 to 350 MW). Fourteen (3,170 MW) new medium plants were under construction in early 2005, and an additional 16 medium plants (2,775 MW) are under consideration. Due to legislative barriers, high investment costs, and higher electricity production costs, development of other renewable energy technologies has been limited, with only 2.1 percent of electricity generation from wind (0.0009 percent), small hydro (0.92 percent), PV solar (0.008 percent), and biomass (1.1 percent). Projects are under development, however, most under the auspices of the CDM.



Greenhouse Gas Emissions

Estimates from the “Vietnam Initial National Communication” indicated that in 1994 greenhouse gas emissions from electricity generation were 4.1 million tCO₂-e (4 percent of national emissions), while methane emissions from coal, gas, and oil exploitation amounted to just under 1 million tCO₂-e (1 percent of national emissions). Total emissions from the energy sector amounted to 26 million tCO₂-e, an amount projected to quadruple by 2010 (to 105 million tCO₂-e) and to double again by 2020 at which time it is projected to account for 84% of national emissions

Potential Mitigation Measures for 2010 to 2015

The main driving factors behind these increases in emissions are rapidly growing energy demand; continued exploitation and reliance on fossil fuels, most importantly coal; lack of control of methane emissions from oil and gas; use of inefficient technologies in industry and in thermal power plants; and limited development of renewable energy technologies other than medium and large hydropower.

Coal mining. Many coal mines contain methane, which is emitted at various points in the process: before mining, when the mines are degasified by removing the methane and releasing it into the atmosphere; through ventilation during mining; through seepage from abandoned mines; and through direct release from coal taken from open-pit mines or from coal after it has been mined. In the major coal producing province, Quang Ninh, 64 percent of the facilities are open-pit mines, and the remainder are underground mines; none undertake any practices to recover and use this methane, which is therefore released as emissions. Introduction of wells to collect methane emissions for use as energy could reduce GHG emissions by up to 1.7 million tCO₂-e per year.

Oil production. The major emissions from oil and gas production result from the release of natural gas, which contains methane. In oil production, the major sources are primarily from the venting or incomplete flaring of the natural gas associated with oil wells and storage tanks or in the production process. Common practice in Vietnam oil production is to dispose of excess gas by flaring, as direct venting is prohibited under Vietnamese law. Vietnam makes some on-site use of the gas for power generation, but these activities are considered to be on a small scale. In the Rang Dong oil field, however, a CDM project is underway to transport and process the gas for use. If this type of project were to be implemented in other oil fields, it could reduce greenhouse gas emissions by up to 2 million tCO₂-e per year.



Electricity generation. Two of the most promising interventions to reduce greenhouse gas emissions from Vietnam's electricity grid are the increased use of renewable energy and improved efficiency in fossil-fuel-based generation.

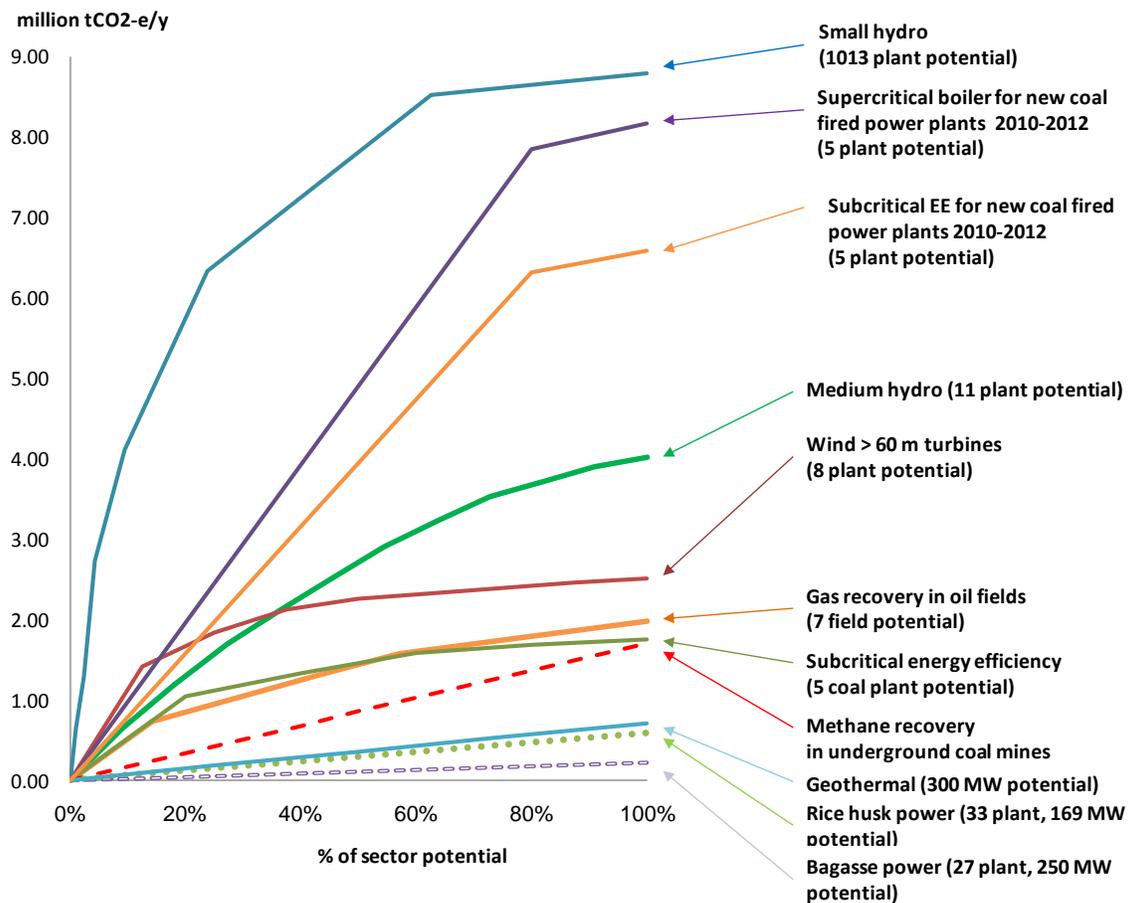
Renewable energy: Considering the likely pace of electricity development based on coal and natural gas, increasing Vietnam's renewable energy generation capacity could reduce emissions substantially. The largest potential is in the development of small hydropower, which is estimated to include

more than 1,000 potential small hydropower plants (less than 30 MW) that could result in emissions reductions of up to 8.5 million tCO₂-e per year. Exploiting the country's undeveloped medium hydropower potential could result in emissions reductions of as much as 4 million tCO₂-e per year, while use of large-scale wind power and biomass generation could result in reductions of 2 million tCO₂-e per year and 800,000 tCO₂-e per year, respectively.



Energy efficiency in thermal power: For coal thermal power generation, the most common technology employed is subcritical pulverized coal combustion, and in Vietnam these plants have relatively low efficiencies due to the age of the plants and the use of anthracite coal, which is more difficult to combust. Modernized process controls and energy-efficient components and technologies, such as circulated fluidized bed combustion, could improve energy efficiency. Supercritical boilers, which produce steam under higher temperature and pressure conditions, resulting in increased overall efficiency, have been considered an option for new coal plants, but no plants with this technology have been developed thus far. Improving energy efficiency using supercritical boilers could result in emissions reductions of up to 1.9 million tCO₂-e per year, while introducing other subcritical energy efficiency improvements and technologies could reduce emissions by up to 1.5 million tCO₂-e per year.

Emission reductions from different interventions in energy sector



Note: Estimates based on annual reductions during 2010-2015.

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