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Hydro Power In Vietnam

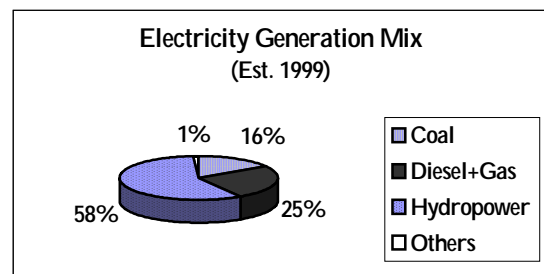
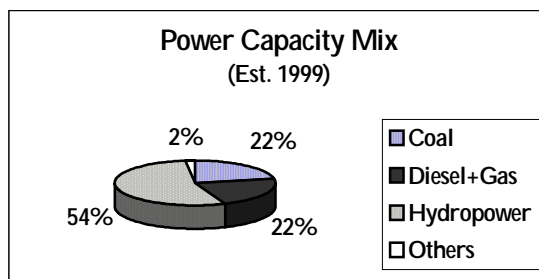
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1. General Geographical Features of Vietnam

Vietnam forms an S-shape on the eastern coast of the Indochina peninsula. It shares the northern border with China and Laos, the Western border with Cambodia. Vietnam's long Eastern, Southeastern and Southern coasts look into the Tonkin Gulf, the South China Sea and the Thailand Gulf. With a total coastline of 3,260 km, the territory of Vietnam spreads over a total area of 331,113.6 km² between 8°30' and 23°22' of the north latitudes and 102°10' and 109°21' of the east longitudes. Its largest portion is the northern part with width of 600km and its narrowest portion is in the central part with only 50-km.

2. Current Situation of Vietnam's Power System

By the end of 1999, total capacity of power plants in Vietnam is estimated at about 5,500 MW, of which the serviceable capacity was about 5300 MW. Hydropower plants contribute the major part accounting for 54% of the total installed capacity, thermal power plants counted for 22%, diesel and gas-based plants counted for another 22%. In 2000, four new hydropower plants (i.e. Yali, Song Chinh, Ham Thuan, Da My) are expected to start commissioning with total installed capacity of 1265 MW and annual electricity generation of 5.4 billion kWh.



Total electricity generation in 1999 was 23,740 billion kWh, of which 58% was hydro-electricity, 16% was produced in thermal power plants, diesel and gas-fired turbines generated about 25% of the total electricity supply. Electricity demand of the country increased very sharply in recent years. In the period 1995-1998, the average annual growth rate of electricity demand was 16.4% for the service sector and about 14% for other productive activities.

3. General Development Plan of the Power Sector

In the General Development Plan of the Power Sector for the period 2000-2010 with outlook for 2020, demand for electricity is projected to continue the rapid increase. In the low scenario, electricity demand is projected at 20 billion kWh in 2000, 65.5 billion kWh in 2010 and 142 billion kWh in 2020. The average annual growth rate will be about 8.6% for the period 2000-2020. In the base scenario, electricity demand increases to 70.5 billion kWh in 2010 and 167 billion kWh in 2020. Correspondingly, the average growth rate will be about 9.75% per annum. In the high scenario, electricity demand is projected to grow

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faster at an annual rate of 10.8% and will be about 78.5 billion kWh in 2010 and 201 billion kWh in 2020.

On basis of the electricity demand projections and availability of domestic primary energy resources, the General Plan also identifies the development scheme for the power generating capacity. In harmony with the projected electricity demand scenarios, the total generating capacity is also projected correspondingly in low, base and high scenarios.

Electricity Power Demand Projections

Year	Unit	2005	2010	2015	2020	Av. growth rate (%/a.)
<u>Low scenario</u>						
+ Electricity demand (GWh)	GWh	42,409	64553	96906	142113	8.86
+ Peak load demand (MW)	MW	7141	10680	22849	22849	
<u>Base scenario</u>						
+ Electricity demand (GWh)	GWh	44230	70437	109439	167022	9.75
+ Peak load demand (MW)	MW	7447	11653	17847	26854	
<u>High scenario</u>						
+ Electricity demand (GWh)	GWh	46554	78466	126949	201367	10.78
+ Peak load demand (MW)	MW	7838	12982	20703	32376	

In the base scenario, there will be a requirement for about 30,000 MW of the newly built capacity by 2020, of which about 9,000 MW are of hydro power plants. At the same time, the total installed power capacity of the country will be more than 33,000 MW, in which hydropower will take a share of about 33%. The share of gas-based plants will be about 30%, while that of coal-fired plants will be just 17%.

In the high scenario, the total new capacity, by 2020, will be nearly 35,000 MW. The total installed power capacity will be around 38,400 MW with the hydropower share of 32%. The share of gas-based and coal-fired plants will be about 26% and 21.3%, respectively.

In both scenarios, the Son La hydro power plant with total installed capacity of 3,600 MW (or 2,400 MW in the low case) will be commissioning with first units, and then will be fully operated by 2016.

4. Hydropower Potential in Vietnam

Vietnam is situated in the tropical region with abundant rainfall evenly distributed over its territory. The national yearly average of rainfall is about 1861 mm. There are more than 2,200 big-to-small rivers and streams with average length of above 10 km. The country, therefore, is rich in hydropower resources. Total theoretical potential of hydroelectric production is estimated to reach about 300 billion kWh/year, of which the Red River

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network can provide 122 billion kWh annually (41%). The similar figures for the Dong Nai and Se San rivers are 27.35 billion kWh (9%) and 16.46 billion kWh (5%), respectively. In terms of potential in power capacity, the major rivers with the highest theoretical potential are the Da in the north with about 7,800 MW, Dong Nai in the south (1800 MW), and Se San in the central highland with 4,000 MW.

The techno-economic hydroelectric power potential of Vietnam, taking into account the geographical conditions, is estimated at more than 360 large and medium schemes (with installed capacity in excess of 10 MW) sum up to 17,500 MW. Total annual production can reach about 72 billion kWh/year. The small schemes (with installed capacity less than 10 MW) is upto 2000 MW. A detailed list of schemes with location and capacity can be found in Appendix.

At present, the total installed capacity of hydropower plants that have been set up in Vietnam is about 3,000 MW, or just 17% of the total techno-economic potential, corresponding to annual production of more than 12 billion kWh in several consecutive years.

The capacity of hydropower stations of Vietnam in the period of 2000-2020 is projected at about 12,000-14,000 MW, which will be expected to produce about 50-60 billion kWh each year.

5. Interconnection of Vietnam's National Grid with Other Countries' in the Region

Currently, Vietnam is taking part in several regional projects to study a possible regional grid interconnection. In the greater regional, the Trans-ASEAN Grid Interconnection project is studying the possibility of having an interconnected grid among the ASEAN member countries, i.e. Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand and Vietnam. Another project under study is the grid interconnection in the Greater Mekong Sub-region (GMS) to connect have a unified grid in this region.

Recently, Vietnam has signed the Agreements on Cooperation in Power with Laos and Cambodia. Following these Agreements, Vietnam will import about 2,000 MW of electricity from Laos, where there abundant hydroelectric power resources under development, and will export electricity to Cambodia. A plan to import electricity from Yunan Province, China is under considerations. In the long-term, these Agreements will be considered as part of the GMS and ASEAN interconnection projects.

Appendix

hydro-power Potential in Vietnam (Taken into account only large river basins and projects with installation capacity of greater than 30MW)

S.N.	Projects	Parameters	
		Installation Capacity (MW)	Production (GWh/year)
I	<u>Đà River</u> (Lai Châu - Sơn La)		
1	Hoà Bình (constructed)	1,920	11,086
2	Sơn La	3,600/2,400	14,124
3	Lai Châu	960	4,630
4	Huội Quảng	600	2,108
	Sub total:	7,080	32,008
II	<u>Mã River and Chu River</u> (Thanh Hoá)		
1	Cửa Đạt	120	426.8
2	Na Hua	270	981.5
3	Bản Uôn	250	937.5
4	Mường Khúc	N/a	
5	Cảnh Dạng	N/a	
	Sub total:	640	2,345.5
III	<u>Chảy river</u> (Yên Bái)		
1	Pa Ke	30	128.7
2	Na Le	90	409.8
3	Thác Bà (constructed)	108	438.0
4	Diên Quang	N/a	N/a
	Sub total:	228	976.5
IV	<u>Lô Gâm</u> (Tuyên Quang)		
1	Bắc Mê	326	1,467.6
2	Đại Thị (Na Hang)	322	1,449.1
3	Tuyên Quang	196	885.8
	Sub total:	844	3,802.5
V	<u>Cả River</u> (Nghệ An)		
1	Bản Mai	N/a	N/a
2	Sop Sok	N/a	N/a
3	Bản Lả	260	926
4	Nà Loét	102	533
5	Sok Ti	60	296
6	Nậm Cang	36	167
7	Thác Muối	32	94
	Sub total:	490	2,016
VI	<u>Vũ Giang Thu Bồn River</u> (Quảng Nam)		
1	Tranh River 2	160	559
2	Đak Mi - 4	200	710.5
3	Bung River - 4	200	693
4	Đak Mi - 1	225	804
5	Bung River - 2	90	400
6	A Vương		
7	Con River 2		

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		Parameters	
8	Bung River - 3		
9	Thu Bồn		
10	Đak Mi - 2		
11	Đak Mi - 3		
12	Cái River		
Sub total:		875	3,166.5
VII	Ba River		
1	Hinh River (under construction)	70	377.7
2	An Khê	140	585.8
3	Đak Srông	40	180.0
4	Yazun Thượng	30	141.0
5	Ea Krông Năng	60	251.7
6	Ba Hạ River	260	805.0
7	Vĩnh Sơn (constructed)	66	229.0
Sub total:		506	2,570.0
VIII	Trà Khúc River (Quảng Ngãi)	(not revised yet)	
1	Dak Re		
2	Dak Rìng		
3	Trà Khúc		
4	Đập Dâng		
Sub total:		490	2.016
IX	Sê San (Gia Lai - Kon Tum)		
1	Thượng Kon tum	212	810
2	Plei Krông	110	442
3	Yaly (under construction)	720	3,600
4	Sê San 3	295	1,224
5	Sê San 4	255	1,087
Sub total:		1,592	7,163
X	Sre Pok (Đac Lắc)		
1	Buôn Kướp	172	931.0
2	Chư Bông Krông	19	89.0
3	Đức Xuyên	89	298.0
4	Sre Pok - 3	102	597.5
5	Buôn Tuosranh	64	216.0
6	Sre Pok - 4	28	118.0
7	Đray Hlìng (constructed)	12	90.0
8	Sre Pok - 1	N/a	N/a
9	Sre Pok - 7	N/a	N/a
10	Buôn Dray	N/a	N/a
Sub total:		480	2,389.5
XI	Đồng Nai		
1	Đa Nhim (constructed)	160	1,025.0
2	Đại Ninh (basic construction)	300	1,178.0
3	Đồng Nai - 3	250	801.8
4	Đồng Nai - 4	286	965.0
5	Đồng Nai - 5	173	805.0
6	Đồng Nai - 6	180	770.0
7	Đồng Nai - 7	No	No
8	Đồng Nai - 8	195	790.0
9	Trị An (constructed)	400	1,726.0
Sub total:		1,944	8,060.8
XII	La Ngà River and Bé River		

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		Parameters	
1	Hàm Thuận (under construction)	300	1,017
2	Đa Mi (under construction)	175	590
3	La Ngà - 3	N/a	N/a
4	Thác Mơ (constructed)	150	589
5	Cần Đơn (under construction)	70	294
	Sub total:	695	2,490
	Total:	15,374	66,988.3
	Other small river basins and hydro-power stations with installation capacity of less than 30MW (estimated to be 10% of the above total)	1,537.4	6,698.83
	Grand Total:	16,911.4	73,687.13

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