



Sustainable Energy and Environment: Technology and Policy Innovations  
Thailand 2006

# Energy system and policy of Vietnam

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# Objectives of Report



- Some information about Energy capacity of Vietnam.
- Overview of current energy system in Vietnam.
- Energy demand of Vietnam period 2005-2020.
- Environmental problems related to energy in Vietnam.



# Energy Capacity of Vietnam



- Fossil energy
- Hydropower
- Nuclear fuel
- Geothermic power
- Solar energy
- Wind energy
- Biomass energy
- Biogas



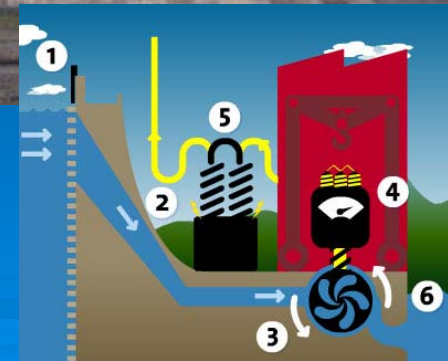
## Fossil Energy

Type of energy	Unit	Total Resources	Potential Capacity	Exploited	Remaining
Oil	mill. m <sup>3</sup>	611.9	2329.8	159.5	2170.3
Gas	mill. m <sup>3</sup>	643.2	1640.4	30	1610.4
Anthracite coal	mill. ton	3600	6600	404	6196
Brown coal	mill. ton	318	3000 - 5000	8.0	-



# Hydropower

- Theoretical capacity of hydropower in Vietnam approximates 70,000 MW capacity and 308 billions KWh power
- Technical capacity is about 17,566 MW capacity and 72 billions KWh output.
- The capacity of small hydropower in total is 2000MW and output of 2 billions KWh/year.





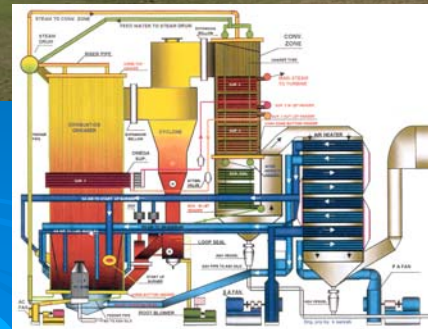
## Some of big hydropower plants

Plant	Theoretical capacity MW	Actual Capacity MW	Status
Hoa Binh hydropower plant	1,920	1,920	Plant woks normaly
Yaly hydropower plant	720	720	Plant woks normaly
Tri An hydropower plant	400	400	Plant woks normaly
Ham Thuan hydropower plant	300	300	Plant woks normaly
Son La hydropower plant	> 3,000	-	New building

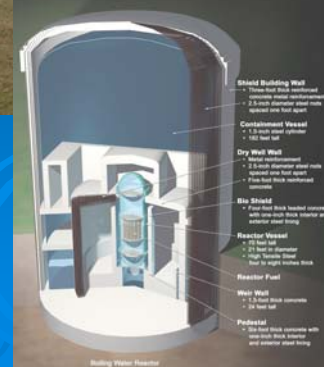


# Nuclear Fuel and Geothermic Power

- **Nuclear fuel:** The primary survey data (grade P1+P2) of ore  $U_3O_8$  is about 106,600 tons.
- **Geothermic power:** Theoretical capacity of geothermic power in Vietnam includes 300 resources with expecting capacity of 472 MW.



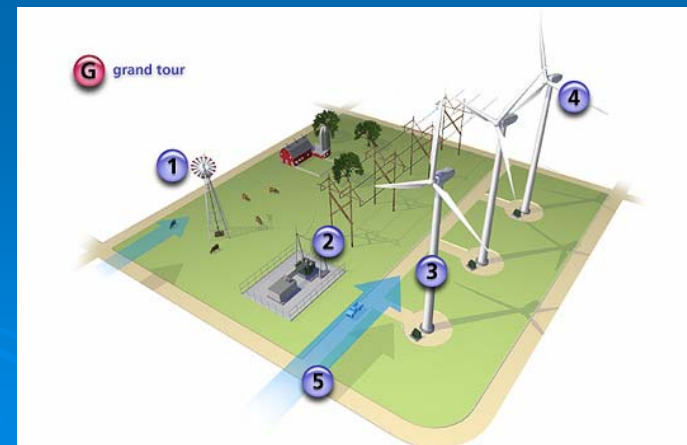
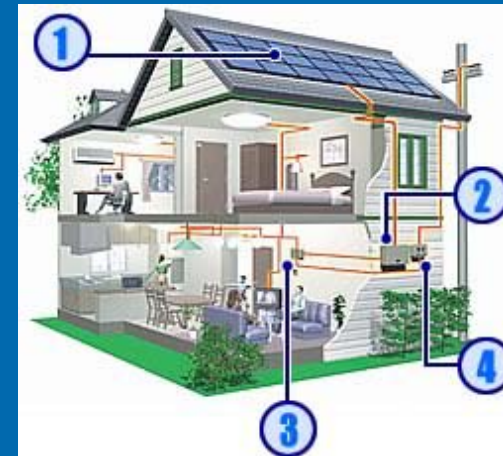
Multiple Layers of Safety at Nuclear Power Plants





## Solar and Wind Energy

- **Solar energy:** The potential of solar energy is abundant in many regions with average sunny hours of 1700-2500 hours/years and illumination power of 100-175 Kcal/cm<sup>2</sup>/day.
- **Wind energy:** The potential of wind power has not been estimated, it concentrates in coastal zones and islands. The project of first wind power plant is being implemented with initial capacity of 70MW in coastal zone of Binh Dinh province, the Middle of Vietnam.







## Some projects of solar and wind energy

### Projects of solar energy :

- Complex solar and small hydropower project in Gialai province : capacity 125 kw, constructed with the Japanese support
- 300 solar electrical unit for house in rural areas

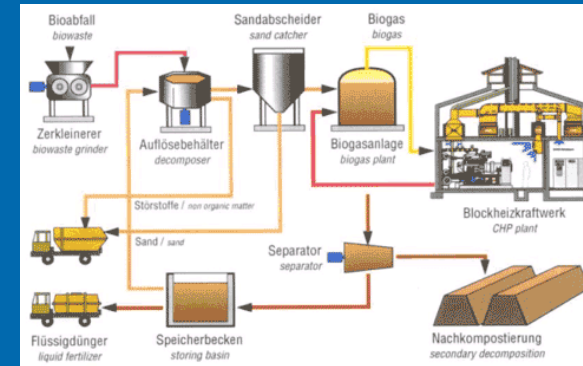
### Projects of wind energy :

- Vietnam has about more than 300 wind electrical units with overage capacity 200 w – 0,5 kw in coastal zones of Hochiminh city and Khanh Hoa province.
- The fist plant of wind energy has capacity 70 MW is in Binh Dinh province



# Biomass Power (or Thermal Utilization of Biomass )

- 45 millions tons of straw,
- 3 millions tons of sugar can residue and leaves of other trees,
- Supplying 60% total primary energy consumption of the country, mainly in rural areas.



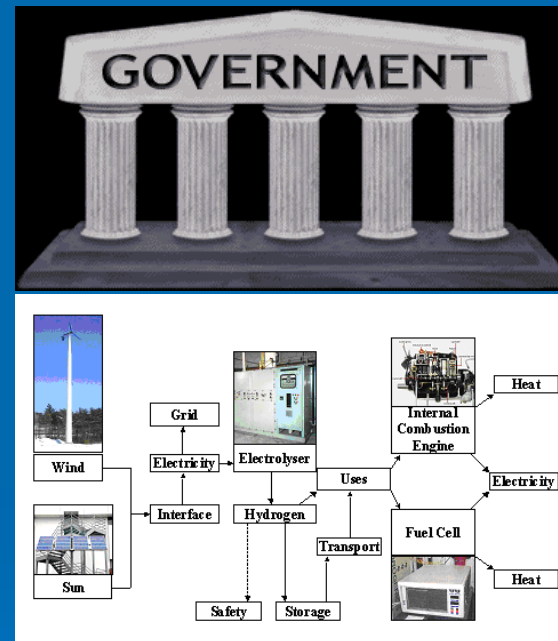
## Biomass Generation

- Biogas from domestic and animal husbandry waste has not been estimated at present time.
- According to 1994 data, about 0,44 millions of conversion fuel [2] is being applied at many scales from household (from rural areas to cities areas )
- At present, there are some CDM project scale returning methane gas of dumping ground in Hanoi, Danang and Ho Chi Minh cities.



# Overview of Current Energy System in Vietnam

- Energy systems in Vietnam includes commercial and non-commercial energy production.
- Most of the consumption and production of commercial energies in Vietnam run under Government control.





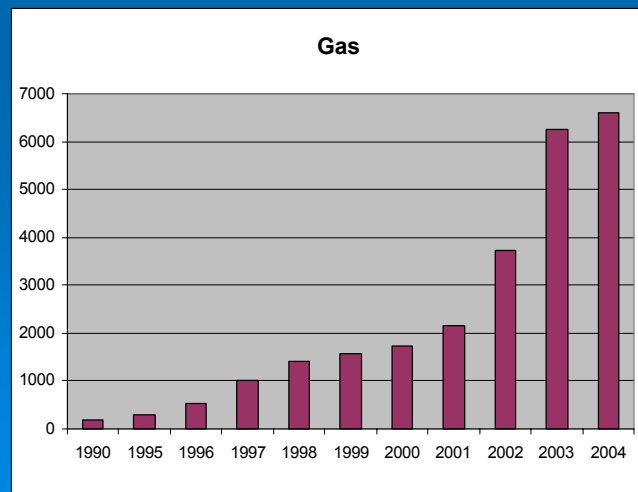
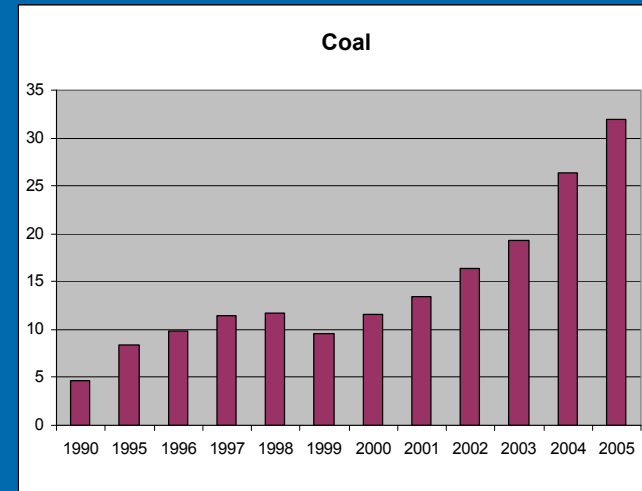
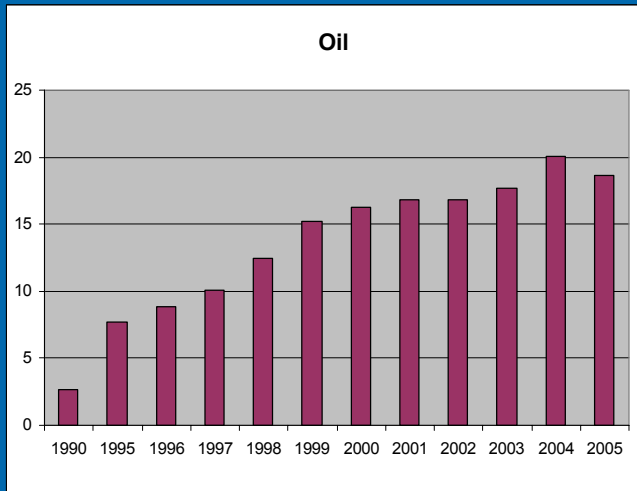
## The Demand of Commercial Energy



- Main kinds of commercial energies for the demand of consumption: coal, oil, gas and hydropower.
- Total exploited energy increased from 7.1 millions TOE (millions tons of equivalent) in 1993 to 29.3 millions TOE in 2000 and 47.36 millions TOE in 2004,
- Average increasing speed in correlative period were 15% (1990-2000) and 12.7% (2000-2004).
- Commercial energy demand structure in 2004: gasoline account for 44%, coal 31%, gas 11.3% and hydropower 12.2% (table 2).



# Production of Commercial Energy





## Capacity of Electricity in Vietnam in the Period 1990-2001

Structure	The year of production (Gwh)											
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total capacity	8678	9152	9654	10665	12284	14636	16945	19151	21665	23739	26594	30603
% growth	11.4	5.5	5.5	10.4	15.2	19.2	15.8	13.0	13.0	9.6	12.0	15.1
KWh /person	131	135	139	150	169	198	225	250	285	309	341	390
% hydro power	61.9	69.0	74.9	74.5	75.2	72.3	70.8	61.0	51.0	58.7	54.7	59.5
% thermal power	32.7	26.9	19.6	16.6	17.2	20.0	19.4	22.6	26.0	22.7	22.3	21.1
% diesel	5.4	4.1	5.5	8.1	7.6	7.7	9.8	16.4	23.0	18.6	23.0	19.4
% household	4.4	3.5	3.5	3.3	2.48	2.31	2.56	2.25	2.59	2.3	2.15	1.11



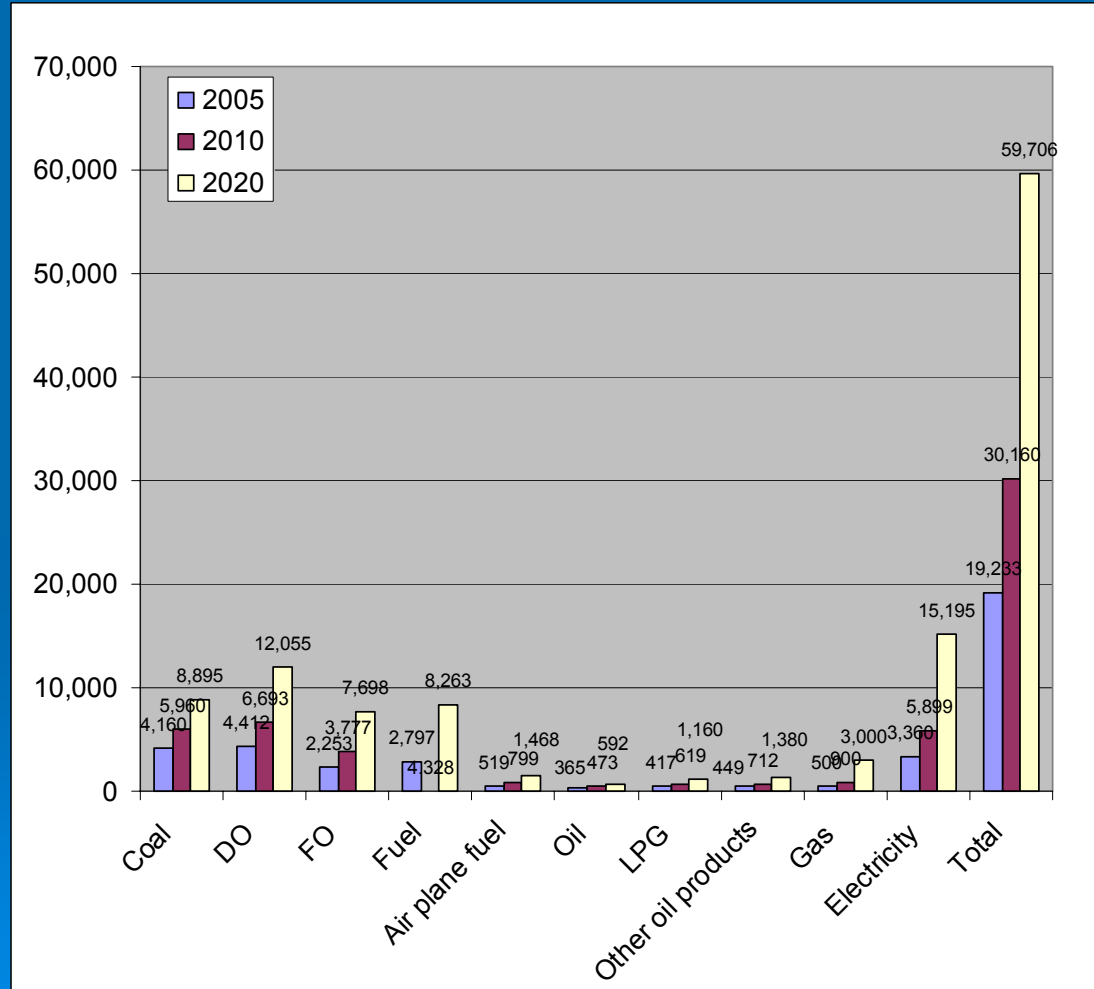
## Non-Commercial Energy

- Firewood and straw are used for domestic and small-scale production of construction materials in the rural areas of Vietnam.
- Total energy consumption increases from 14.19 million TOE in the year 2000 to 14.82 million TOE in 2004.





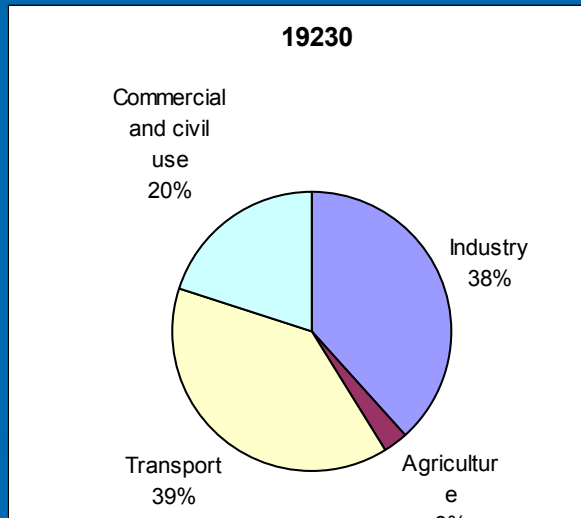
# Energy Demand of Vietnam Period 2005-2020



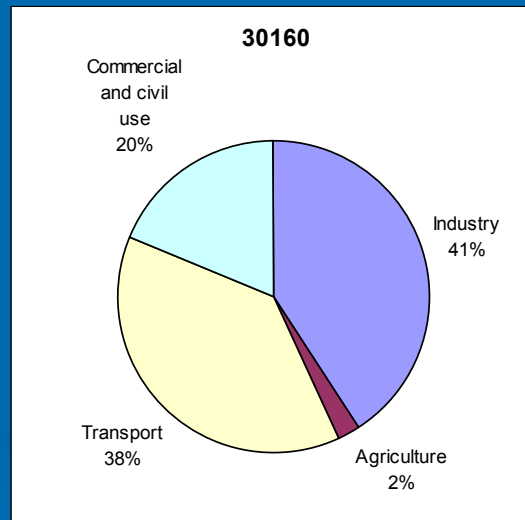




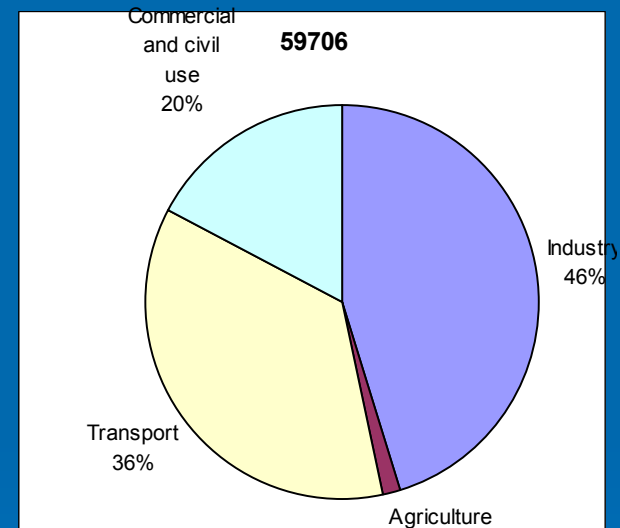
# Energy Demand Period 2005-2020 Divided by Economic Sectors



2005



2010



2020



## Environmental Problems Related to Energy in Vietnam

- Vietnam energy system, especially the commercial energy has been progressed in both scale and capacity
- Diversity of sources (thermal power using coal, gas, oil and different scale hydro power plants)
- Diversity of ownership (state owned, foreign and mixture).
- Nevertheless, the system is still weak





## Vietnam Energy Policy in the Past

- The lack of exploration and synchronous utilization policy: coal is exported to China and electricity is imported from China;
- Energy exploration and utilization in Vietnam is not effective. Loss in coal exploration and transportation
- Energy management system does not adapt to the market mechanism





## Environmental Problems



- Vietnam have a law on Environmental Protection since 1993, but environmental protection is not paid enough attention in the development of energy system.
- There are a large number of people need to be resettled and large areas will be flooded in hydro power projects; coal mining causes many adverse impacts and wastes (dust, gas emissions, wastewater and solid waste);
- The bad planning for thermal power projects and gas treatment systems do not function well, which result in serious pollution in the surrounding residential areas,
- Use of fuel in transport have a serious impact on air environment in big cities, such as Hanoi, Ho Chi Minh.



## Priority Evaluation Based on Natural and Social Environmental Criteria

The environmental and social assessment methods for the world and Vietnam electrical energy sources project :

$$E_I = \sum_{i=1}^m (V_i)_1 W_i$$

$E_I$  : environmental impact

$(V_i)_1$  : quality value of the category  $i$   
environmental parameter with project

$W_i$  : the importance level of the category  $i$  factor

$m$  : sum of factors

- Value  $(V_i)_1$  of natural and social environmental factors is calculated by impact level (a, b, c) identified in individual plants/project checklist. For quantitative calculation, the follow numeral is preliminary assumed:  
 $a = 4, b = 2, c = 1$ .
- Or significant impact, less impact, and no impact of project is corresponding to 4, 2 and 1, respectively.
- For the items which information related is not available (NA – in the Checklist) will be also calculated as 1 (be underlined for distinguish) during priority analysis and final decision making.



# The Priorities of Natural and Social Environmental Aspects (1)

Environmental impact	Impacted aspect	Impact item	Importance level		
			Thermal P P		Hydro power plants
			Coal usage	Gas and DO/FO usage	
<b>Social</b>	<b>Inhabitant</b>	<b>Minority</b>	2	2	3
		<b>Weakness</b>	2	2	2
	<b>Resettlement</b>		–	–	3
	<b>Cultural Heritage/ Asset</b>		3	3	3
	<b>Scenery</b>		2	2	2
	<b>Life</b>	<b>Agriculture</b>	3	3	2
		<b>Fishery</b>	2	2	1
		<b>Water Utilization</b>	3	3	2
		<b>Others</b>	1	2	1



## The Priorities of Natural and Social Environmental Aspects (2)

Impacted aspect	Impact item	Importance level		
		Thermal P P		Hydro power plants
		Coal usage	Gas and DO/FO usage	
<b>Insect / Micro</b>	<b>Fauna</b>	1	1	2
	<b>Flora</b>	2	2	3
	2	2	2	
<b>Aquatic</b>	<b>Fauna</b>	3	2	2
	<b>Flora</b>	2	2	1
	<b>Insect / Micr.</b>	2	2	2
<b>Topography</b>		1	2	2
<b>Reserved/Park Area</b>		3	3	3
<b>Meteorology/Climate Change</b>		1	1	2



## The Priorities of Natural and Social Environmental Aspects (3)

Environmental impact	Impacted aspect	Impact item	Importance level		
			Thermal	P P	Hydro power plants
			Coal usage	Gas and DO/FO usage	
<b>Pollution</b>	<b>Air Quality</b>		3	2	1
	<b>Water Quality</b>		3	3	2
	<b>Soil Contamination</b>		2	1	2
	<b>Noise</b>		2	1	1
	<b>Vibration</b>		2	1	1
	<b>Land Subsidence</b>		1	1	2
	<b>Bad Smell</b>		2	2	1
	<b>Waste</b>		3	1	1





## Total Adverse Impact on Natural and Social Environmental of Power Plants (1)

No.	Plant/project code	Project/Plant	Total adverse impact	
			Construction phase	Operation phase
Thermal power plant				
1	7	O Mon No1 Thermal Power Plant	91	98
2	15	O Mon No 2 Thermal Power Plant	90	95
3	32,35	O Mon No 3 Thermal Power Plant	92	107
4	42	O Mon No 4 Thermal Power Plant	90	102
5	1adf	Phu My No 1 Thermal Power Plant	91	108
6	2adf	Phu My No 2 Thermal Power Plant	91	108
7	3adf	Phu My No 3 Thermal Power Plant	91	108
8	4adf	Phu My No 4 Thermal Power Plant	91	108
9	43	South CCGT Thermal Power Plant	86	91
10	4	Amata Bien Hoa CCGT	82	83
11	17	Nhon Trach No1 Thermal Power Plant	90	97

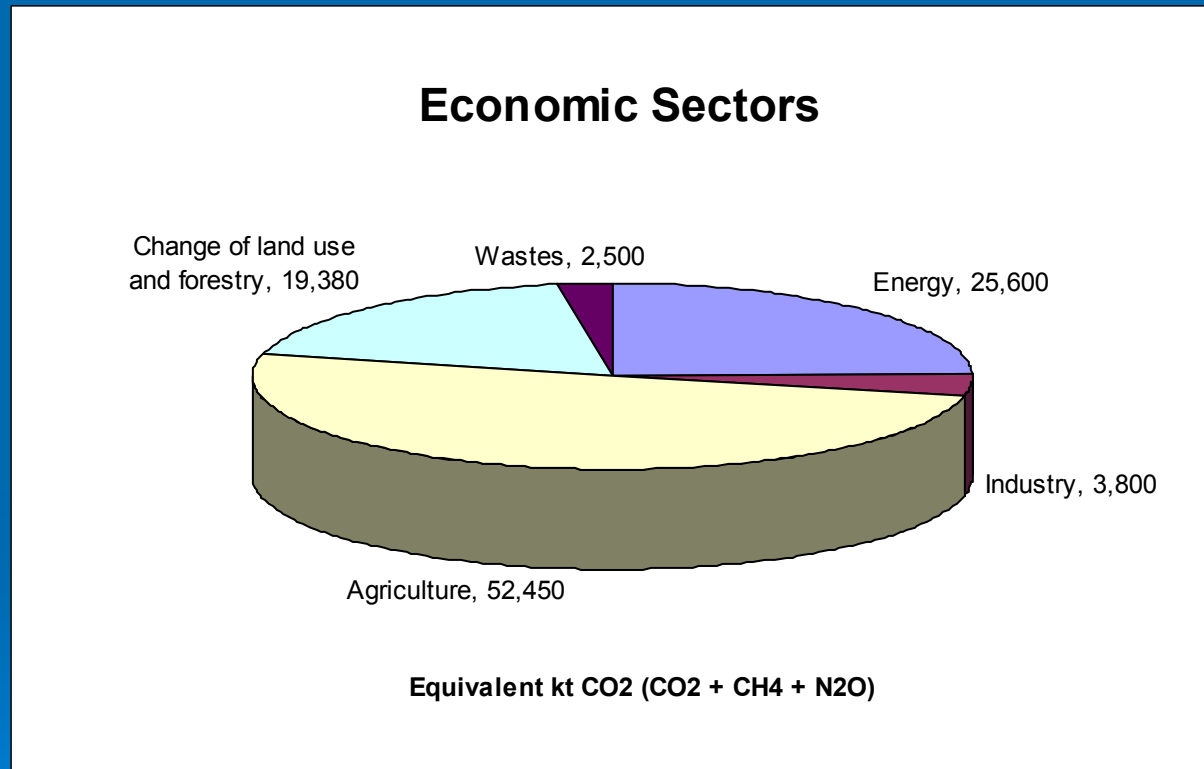


## Total Adverse Impact on Natural and Social Environmental of Power Plants (2)

No.	Plant/project code	Project/Plant	Total adverse impact	
			Construction phase	Operation phase
Hydro power plants				
1	25	Nam Chien Hydropower Station	82	84
2	48	Hydropower Plant Buon Tua Srah	123	75
3	13,49	Dakrtih Hydropower Plant	87	70
4	27	Lai Chau Hydropower Plant	118	82
5	9adf	Pavinh (Son La) Hydropower Plant	117	112
6	23	Ban Uon Hydropower Plant	115	105
Nuclear power plant				
1	22adf	Hoa Tam Nuclear Power Plant	103	120
2	65	Phuoc Dinh Nuclear Power Plant	102	130



# Greenhouse Emissions in Vietnam



Source: Ministry of Natural Resources and Environment, 1994



## Prediction of Green House Emissions CO<sub>2</sub> in Vietnam Energy Period 2000-2020

Economic sector	2000		2005		2010		2020	
	Kt CO <sub>2</sub>	%	Kt CO <sub>2</sub>	%	Kt CO <sub>2</sub>	%	Kt CO <sub>2</sub>	%
Agriculture	413	0.83	496	0.63	588	0.50	713	0.31
Industry	13,291	26.60	20,184	25.60	32,314	27.55	64,954	27.96
Energy	9,469	18.95	19,752	25.06	28,064	23.93	69,049	29.73
Other energy sources	349	0.70	610	0.77	1,113	0.95	1,391	0.60
Services and civil use	12,358	24.72	15,068	19.11	20,133	17.17	30,776	13.25
Transport	14,091	28.20	22,720	28.82	35,068	29.90	65,408	28.15
<b>Total</b>	<b>49,971</b>	<b>100</b>	<b>78,830</b>	<b>100</b>	<b>117,280</b>	<b>100</b>	<b>232,291</b>	<b>100</b>



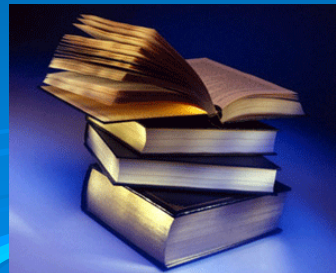
## GHG from agricultural sector from 2000 to 2020

	2000 year		2010 year		2020 year	
	CH4 mil. ton	CO2 Mil. ton	CH4 mil. ton	CO2 Mil. ton	CH4 mil. ton	CO2 mil. ton
Breeding field	0.56	11.8	0.692	14.5	0.927	19.5
-Animal fermentability	0.38		0.486		0.624	
- From animal wastes	0.172		0.206		0.303	
Rice farming land	1.689	35.5	1.875	39.4	1.985	41.7
Total	2.249	47.3	2.567	53.9	2.912	61.2



## Vietnam Energy Development Policy

- **Sustainable energy development policy has been mentioned in Agenda 21 of Vietnam, which was promulgated by the Prime Minister in 2004.**
- **There are 5 priorities in energy sector as follow:**
  - Strengthening of legal base and energy management
  - Selection of appropriate exploration and utilization
  - Research and development of transfer and application of clean energy technology
  - Proposal of technological and management solutions for energy types
  - International co-operation in energy.





## General Orientation for Vietnam Energy Policy



- Ensure national energy security: includes supply and consumption security on, oil, coal, gas, electricity, and other sources.
- Effective utilization of energy sources and conservation of national energy resources
- Environmental protection in energy exploration and utilization : source, supply systems, pollution prevention, implementation of Vietnam's commitment in United Nations Framework Convention on Climate Change and Kyoto Protocol



## Development of New Energy Sources and Renewable Sources

- Wind power to generate electricity for coastal zones and islands, which have strong wind and are far away from the national electricity network.
- Solar energy for heating (water boiling) and small-scale electricity production in remote areas and islands.
- Energy from biogas for cooking in households and farms.
- Develop CDM projects for recycle green house gases (Methane and other gases) from landfills and coal and oil mines for production of commercial energy.
- Utilization of biomass from forest and agricultural wastes (straw, leaves, branches etc.) to generate energy.
- Develop pilot projects of new and renewable energy sources such as geothermal energy.







## Conclusions

- Vietnam has rich and many potential energy sources.
- Energy system in Vietnam has the average growth rate of 15 % for many years in the past, and more than 12% in future.
- In period 2002-2020, exploration and utilization demand for socio-economic development will be expected to increase sharply in scale and change deeply in structure.
- Production and consumption of commercial energy in Vietnam has caused many environmental problems including wastes and partial pollution.
- There is the national strategy orientation for sustainable development of energy but not yet a national policy in development of new and renewable energy sources, despite of the fact that the Government has made efforts to comply United Nations Framework Convention on Climate Change and Kyoto Protocol.



**Thank you for your attention !!**

