



# **STATUS OF WIND POWER DEVELOPMENT AND FINANCING OF THESE PROJECTS IN VIETNAM**

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**GIZ Wind Energy Project**

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## Abbreviations

ACB	Asia Commercial Bank, Vietnam
ADB	Asian Development Bank
AGL	Above the Ground Level
BIDV	Bank for Investment and Development of Vietnam
BOT	Build Operate Transfer
CDM	Clean Development Mechanism
DO	Diesel Oil
DOIT	Department of Industry and Trade
EVN	Electricity of Vietnam
FO	Fuel Oil
GDP	Gross Domestic Product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
IEC	International Electrotechnical Commission
IKLU	Initiative für Klima und Umweltschutz (Initiative for Climate and Environmental Protection)
JBIC	Japan Bank for International Cooperation
KfW	Kreditanstalt für Wiederaufbau
LNG	Liquefied Natural Gas
MoIT	Ministry of Industry and Trade, Vietnam
PPC	Provincial People Committee
REDP	Renewable Energy Development Project
REVN	Vietnam Renewable Energy Joint Stock Company
Sacombank	Sai Gon Thuong Tin Bank, Vietnam
Techcombank	Vietnam Technological and Commercial Joint-stock Bank
TMCP	Stock Commercial
VDB	Vietnam Development Bank
Vietcombank	Stock Commercial Bank for Foreign Trade of Vietnam
WB	World Bank

Exchange rate: US\$ 1 = VND 21,015 (Dec. 16, 2011, Stock Commercial Bank for Foreign Trade of Vietnam - Vietcombank)

## 1. Overview of the Vietnamese Power Industry

### 1.1. Status of Power Generation

Between 10 years from 2001 to 2010, Vietnam posted robust economic growth, averaging 7.2% a year. The economic and residential demand for power energy grew 14.5%. The commercial power output more than tripled from 31.1 billion kWh in 2001 to 99.1 billion kWh in 2010 over a span of 10 years. In 2010, it was a 14.3% rise from the 2009 level, a growth rate 2.5 times as high as that of the Gross Domestic Product (GDP). The total installed capacity of all power producers in Vietnam in 2010 was 21,542 MW, of which the Electricity of Vietnam (EVN) accounted for 11,848 MW (or 55%) and the others, including the companies where the EVN has equity, 9,694 MW (45%). By the type of power generation (as shown in Figure 1), hydropower represented the largest share of 7,633 MW (38% of the total installed capacity), followed by gas turbines with 3,197 MW (~32%), coal-fired power with 2,745 MW (~18%), imported power with 1,000 MW (~5%), oil-fired power with 537 MW (~3%), gas-fired power with 500 MW (~2%) and power from renewable energy sources (~2%).<sup>1</sup>

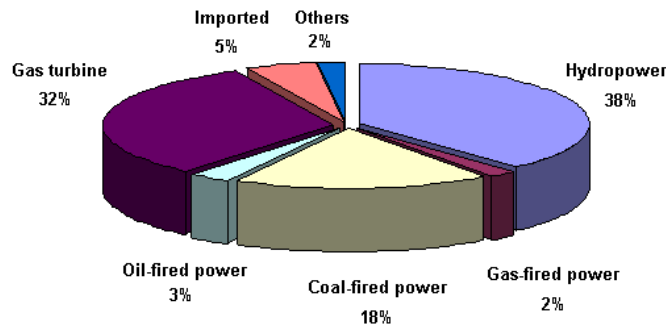


Figure 1: Classification by type of power production

The national grid can generally meet the power producers in terms of loads, providing sufficient power supply for socio-economic development and playing a significant role in power loss reduction. Still, there is no contingency supply. Key information on the Vietnamese high-voltage transmission grids, including the North-South 500 kV and 200 kV lines are shown in Table A1 (Appendixes).

### 1.2. Targets for Power Generation to 2020

To have sufficient power supply for socio-economic development, the Vietnamese Government has set targets for power generation in the National Power Development Plan (Power Masterplan VII) for the period 2011 – 2020 with a vision to 2030 as follows<sup>2</sup>:

- To fully meet the national need of power with the homemade and imported supplies in the range of 194 – 210 billion kWh by 2015; 330 – 362 billion kWh by 2020; and 695 – 834 billion kWh by 2030.

<sup>1</sup> GIZ (2011) Exploring biogas market opportunities in Vietnam. Prepared by Cuong ND et al., Vietnam Institute of Energy.

<sup>2</sup> Decision No. 1208/2011/QĐ-TTg issued on July 21<sup>st</sup>, 2011, approving the National Power Development Plan for the 2011 – 2020 period with a vision to 2030. (in Vietnamese)

- To prioritize the development of renewable energy sources for power generation and increase the share of renewable energy power from 3.5% in 2010 to 4.5% by 2020 and to 6.0% by 2030 of the total power supply.

The planned supply of homemade and imported power by 2020 is 330 billion kWh, of which hydropower accounts for 19.6%; coal-fired power, 46.8%; gas-fired power (Liquefied Natural Gas - LNG, 4.0%), 24.0%; renewable energy power, 4.5%; nuclear power, 2.1%; and imported power, 3.0%.

### 1.3. Roadmap to Competitive Power Markets and Current Power Prices

#### *Competitive power markets*

According to Decision No. 26/2006/QĐ-TTg<sup>3</sup> of the Prime Minister issued on January 26<sup>th</sup>, 2006, approving the roadmap and conditions for the establishment and development of national power markets, the Vietnamese power markets will open up one by one as follows:

- 1) Phase 1 (2005 - 2014): competitive power generation market
- 2) Phase 2 (2015 – 2022): competitive power wholesale market
- 3) Phase 3 (after 2022): competitive power retail market

For the competitive power generation market to start officially in 2012 (originally scheduled for January 1<sup>st</sup>, 2012, then delayed), the Ministry of Industry and Trade (MoIT) has issued a regulation on the operation of this competitive market, whereby all power plants with the designed capacity larger than 30 MW and connected with the national grid must participate in the competitive power generation market, except for BOT plants, **wind power plants**, and geothermal power plants. Power plants located inside industrial parks are required to sell only part of their power output and need not to have long-term power sale plans.<sup>4</sup>

#### *Current power prices*

In April 2011, the Prime Minister issued Decision No. 24/2011/QĐ-TTg<sup>5</sup> to revise the sale prices of power under the open market policy, whereby the sale prices will be revised only when the input costs change from those used for calculating the current rates and revision is considered only after the completion of reconciliation and audit reports as legally regulated. The interval between the two consecutive price revisions is 3 months at least.

Since the issuance of Decision No. 26/2006/QĐ-TTg, Vietnam has revised the power price 6 times, the first on January 1<sup>st</sup>, 2007 sending the price up to 842 VND /kWh, which was 7.6% higher than the averaged price of 2006. The second and third revisions were made consecutively in the following 2 years with the price rise in the range of 5-10%. A significant revision was made on March 1<sup>st</sup>, 2011 with the price climbing to 1,242 VND /kWh or 15.28%. The latest revision is a rise of 5%, effective on December 20<sup>th</sup>, 2011, bringing the price up to the current 1,304 VND /kWh (a surge of 62 VND /kWh). It is reported that the Minister of Finance Vuong Dinh Hue has announced a scheme to revise the power rates for 2012

<sup>3</sup> Decision No. 26/2006/QĐ-TTg approving the roadmap and conditions for the establishment and development of competitive power markets in Vietnam. (in Vietnamese)

<sup>4</sup> Lan N (2011), Power plants larger than 30 MW must participate in the competitive power generation market. Website: <http://www.thesaigontimes.vn>, accessed: Nov. 2011. (in Vietnamese)

<sup>5</sup> Decision No.24/2011/QĐ-TTg regulating the power sales price in an open market. (in Vietnamese)

by adding to the 2011 price increases in the input costs of coal, FO, DO or gas, to help re-gain the financial balance for the EVN and a balanced foreign exchange rate. Under this scheme, the power price increase will be capped at 15.38% of the current price.<sup>6</sup> Under Circular No. 31/2011/TT-BCT<sup>7</sup> issued by the MoIT on August 19<sup>th</sup>, 2011, regulating the pricing of power based on input costs, whereby the setting of power prices will be based on Decision No. 24/2011/QD-TTg of the Prime Minister. The current price is set on the basis of: 1) the USD/VND exchange rate and 2) fuel price.

## 2. Status of Wind Power Development in Vietnam

In light of the existing power shortage and in response to climate change in the years to come, “green power” from renewable energy is a feasible solution to ensure power security and contribute to environmental protection. The Vietnamese Government has recently made clear their intension to develop this “green power”. Accordingly, wind power is designed for focal development and this is also an energy source, of which Vietnam has the largest potential in Southeast Asia. This paper is aimed to generate a view of the current status of wind power development and the financing ability of national and international institutions in developing wind power in Vietnam.

### 2.1. Wind Energy Resources

Findings of several researches have shown Vietnam’s great wind resources for the development of large wind projects.

The World Bank (WB)’s Wind Resource Atlas<sup>8</sup> (Worldbank, 2001) prepared for the 4 Southeast Asian countries of Vietnam, Cambodia, Laos and Thailand, based on the simulative method of atmospheric numerical model indicate that at the altitude of 65 m (above the ground level - AGL), Vietnam has the greatest wind resources of all regional countries with the theoretical wind energy capacity reaching 513,360 MW. The potential areas of large resources in Vietnam are the coast, the Central Highland and the South. However, these simulative results are told to be greatly different from the EVN’s observative data and this can be caused by the errors in simulative calculation.

In 2007, the EVN conducted a research on wind resources and identified potential areas for wind power development on national scale and found the technical capacity at 1,785 MW<sup>9</sup>. The Central Coast is considered as having the largest wind resources of 880 MW, concentrating in Quang Binh and Binh Dinh provinces, followed by the south Central Coast with 855 MW, mainly in Ninh Thuan and Binh Thuan provinces.<sup>10</sup>

<sup>6</sup> L H (2011), The power price may be revised at 15.38% at most, not 4.6%. Website: <http://dantri.com.vn>, accessed: Nov. 2011. (in Vietnamese)

<sup>7</sup> Circular No. 31/2011/TT-BCT by the MoIT, regulating the pricing of power rates based on input costs. (in Vietnamese)

<sup>8</sup> Worldbank (2001) Wind Energy Resource Atlas of Southeast Asia. Prepared by TrueWind Solutions, LLC, New York.

<sup>9</sup> Electricity of Viet Nam (2007) Wind Resource Assessment for Power Generation.

<sup>10</sup> GIZ/MoIT (2011) Information on wind energy in Vietnam. Prepared by Khanh NQ. Website: [www.windenergy.org.vn](http://www.windenergy.org.vn).

Additionally, the MoIT and WB in 2010<sup>11</sup> together conducted a survey at 3 sites for observative data to be included in Vietnam's wind resource atlas at the altitude of 80 m (AGL). Results show that the wind power potential at the altitude of 80 m is 2,400 MW and that the annual average wind speed is 7 m/s.

**Table 1: Vietnam's wind resources at the elevation of 80 m above the ground**

Average wind speed	< 4 m/s	4-5 m/s	5-6 m/s	6-7 m/s	7-8 m/s	8-9 m/s	> 9 m/s
Area (km <sup>2</sup> )	95,916	70,868	40,473	2,435	220	20	1
Area percentage (%)	45.7	33.8	19.3	1.2	0.1	0.01	< 0.01
Potentiality (MW)	956,161	708,678	404,732	24,351	2,202	200	10

To date, a broad research of Vietnam's wind resources has been absent due to the missing observative data. Recently, a joint research conducted by the MoIT and the GIZ Wind Energy Project (hereinafter referred to as the GIZ/MoIT Wind Energy Project, has measured wind at 10 sites in the Central Highland and Central Coastal provinces at altitudes of 80 m, 60 m and 40 m (AGL). Using the standards of the International Electrotechnical Commission (IEC) No. 61400-12 during the wind measurement, the project is designed to produce wind data representative of Vietnam's areas that have wind resources for the development of wind power in the future. When completed, the project's reports on its procedure and standards for the installation of wind measuring poles will serve as helpful reference for wind power developers.

## 2.2. Existing Wind Power Projects

There have been 48 projects on wind power development registered in the whole of Vietnam so far (see Table A2, Appendixes), concentrating in the Central and Southern provinces with the total registered capacity of 5,000 MW, each having capacity in the range of 6 – 250 MW. However, wind power is still not attractive to national and international investors as investment is high but the sale price, regulated by Prime Minister Decision 37/2011/QD-TTg<sup>12</sup>, is as low as 1,614 VND/ kWh (equivalent to 7.8 UScents/ kWh), although it is 310 VND/ kWh higher than the average power price of 1,304 VND/ kWh. So far, a single project, located in Binh Thanh commune, Tuy Phong district, Binh Thuan province, has completed the first phase of building to be operational with the installed capacity of 30 MW, including 20 wind turbines, each 1.5 MW. In the second phase from 2011 to 2015, the project plans to increase its capacity to 120 MW. The investor of this project is the Vietnam Renewable Energy Joint Stock Company - REVN<sup>13</sup>. The project has the price tag of 1,500 billion VND, equivalent to 75 million USD. Wind turbines are supplied by the German Fuhrlaender company. The wind mill was connected to the national grid in March 2011. Internal sources say that its wind power output in 2011 reached 79,000 MWh.

Also in this province, on the Phu Quy island offshore is located a hybrid project of wind power and diesel generator power. This project, carried out by the PetroVietnam Power Corporation, a subsidiary of the PetroVietnam Group, has capacity of 9 MW, with 3 wind turbines, each 2 MW and 6 diesel generators each 0.5 MW. The installation has been completed and the connection of the wind project to the national

<sup>11</sup> Vietnam Ministry of Industry and Trade (2010) Wind resource atlas of Viet Nam. Sponsored by World Bank. Prepared by AWS Truepower. 463 New Karner Road, Albany, New York 12205.

<sup>12</sup> Decision No. 37/2011/QD-TTg on incentives for the development of wind power in Vietnam. (in Vietnamese)

<sup>13</sup> Vietnam Renewable Energy Joint Stock Company (2009) <http://www.revn.vn>, accessed: Jan. 2012.



grid is underway. The wind turbines are supplied by Vestas of Denmark. The sale price is proposed around 13 US cents/ kWh, which is considered competitive given the project's particular conditions on the island offshore. Another project of similar conditions is located on the Con Dao island, offshore Ba Ria – Vung Tau province. The project, owned by the German company EAB, has obtained the negotiated sale price of 25 UScents/ kWh and its building is under preparation.

In the Mekong delta province of Bac Lieu, there is a wind power project implemented by the Vietnamese company Cong Ly Trade and Service Company Ltd. The wind power plant is installing wind turbines (1<sup>st</sup> wind turbine has been installed). Its capacity in the first phase is 16 MW (10 turbines x 1.6 MW each, turbines supplied by the GE in the US). The second phase (from 2012 to 2014) will bring its capacity up to 120 MW.

Other projects are at different phases of a project life. See Table A2 in the Appendixes for the list of wind power projects operational and registered in Vietnam.

### **2.3. Wind Power Equipment Suppliers**

Contested on the Vietnamese wind turbine supplier market, beside the mentioned Fuhrlaender (Germany), Vestas (Denmark) and GE (USA), are other international companies such as Gamesa (Spain), Nordex (Germany), IMPSA (Argentina), and Sany, Shanghai Electric and Gold Wind (China).

What is heartening for the Vietnamese wind power market is the presence of wind turbine and wind pole manufacturers such as:

- The GE (USA) that has a wind turbine generator plant located at the Nomura Industrial Park in Hai Phong City with the investment of US\$ 61 million;
- The Fuhrlaender (Germany) that intends to build a wind turbine plant in Binh Thuan province with the investment of US\$ 25 million;
- The CS Wind Tower<sup>14</sup> (100% owned by South Korea) located at the Phu My 1 Industrial Park in Tan Thanh district, Ba Ria – Vung Tau province, which is making and exporting wind towers;
- The VINA HALLA Heavy Industries<sup>15</sup> (100% owned by South Korea) located at the My Xuan B1 Industrial Park, Tan Thanh district, Ba Ria – Vung Tau province, which makes and exports 400 wind towers a year to South Korea, Japan, Italy, Belgium, Brazil and the USA and selling products to projects in South Korea, Saudi Arabia, Indonesia, Egypt, Indonesia, the Philippines, the USA and Vietnam;
- The UBI Tower Sole Member Co., Ltd.<sup>16</sup>, 100% owned by the Vietnamese, located in Kim Xuyen commune, Kim Thanh district, Hai Duong province, which makes 300 wind power towers a year and exported to Germany 15 towers in 2011, India 35 in 2010 and 125 in 2011, and other countries.

<sup>14</sup> CS Wind Tower (2009) <http://www.cswindtower.com>, accessed Feb. 2012.

<sup>15</sup> VINA HALLA Heavy Industries (2008) <http://www.vinahalla.com>, accessed Feb. 2012.

<sup>16</sup> UBI Tower (2011) <http://ubitower.vn>, accessed Feb. 2012.

### 3. Investment in Wind Power Projects in Vietnam

#### 3.1. Investment Procedure

There is no national plan for wind power development now and consequently, there is no specific procedure for investment in wind power projects. For reference, the GIZ/MoIT Wind Energy Project<sup>17</sup> has taken the following steps:

Step 1: Site selection – Due to the absence of a national wind power plan, site selection is based on relevant data such as wind data, wind energy atlas, etc., of the past. Permission from the Provincial People's Committee (PPC) and provincial Department of Industry and Trade (DoIT) is needed for site surveying and resource assessment needed for a feasibility study.

Step 2: Assessment of wind resources at the selected site – Wind measuring poles are installed (if not available at the selected site) and wind is measured for at least 1 year.

Step 3: Pre-feasibility study and request for inclusion in the power development plan – If the project area has wind resources, a pre-feasibility study for investment in the area is prepared and submitted to the MoIT together with a request to include the project in the power development plan. The MoIT shall consider and submit it to the Prime Minister for approval (as wind power is still strange in Vietnam and there is missing protocol for it, all wind power projects larger than 50 MW need approval by the Prime Minister. After the Prime Minister approval, the project documents are to be submitted to the DoIT for approval.

Step 4: Investment report (Feasibility study) – After the DoIT approval of the pre-feasibility study, an investment report (feasibility study) is prepared and submitted to the MoIT for appraisal.

Step 5: Signing of power sale contract with the EVN: In accordance with Prime Minister Decision 37/2011/QĐ-TTg<sup>18</sup>, the EVN is to buy all of the plant's wind power output. Contracts on power sale, grid connection and electric measurement system design are signed. A standard power sale contract form is awaiting Government approval.

Step 6: Project implementation – The project will not start until the approval of the technical design and investment report by the related agencies such as DoIT, Department of Construction, Department of Natural Resources and Environment and others.

Step 7: Building – Building starts.

#### 3.2. Incentive Framework

Incentives and preferential treatment offered by the Vietnamese Government to the wind power industry have emerged increasingly clearer in recent legal documents. In July 2011, the Prime Minister issued Decision 1208/2011/QĐ-TTg<sup>19</sup> to approve the National Power Development Plan for the 2011 – 2020 period with a vision to 2030, under which the Government sets the priority to develop renewable energy for power generation and increase the percentage of this power in the total power output from 3.5% in

<sup>17</sup> GIZ/MoIT (2011) Information on wind energy in Vietnam. Prepared by Khanh NQ. Website: [www.windenergy.org.vn](http://www.windenergy.org.vn)

<sup>18</sup> Decision No. 37/2011/QĐ-TTg on incentives to develop wind power projects in Vietnam. (in Vietnamese)

<sup>19</sup> Decision No. 1208/2011/QĐ-TTg issued on July 21<sup>st</sup>, 2011 to approve the National Power Development Plan for the 2011 – 2020 period with a vision to 2030. (in Vietnamese)

2010 to 4.5% by 2020 and 6.0% by 2030. The wind power output will rise from the currently insignificant level of just 31 MW (a humble figure as compared to countries in the world, see further Table A3, Appendixes) to 1,000 MW to account for 0.7% of the total power output by 2020 and 6,200 MW (2.4%) by 2030.

The Government's commitment to renewable energy in general and wind power in particular has become firmer after the Prime Minister issued Decision 37/2011/QD-TTg<sup>20</sup> on June 29<sup>th</sup>, 2011, which went into effect on August 20<sup>th</sup>, 2011. The decision offers incentives to wind power projects in Vietnam, thereby they are entitled to the following preferential treatment in terms of funding, tax and fee:

- 1) **Funding:** *The investor can raise funds in different forms allowed by law from individuals and organizations in and out of the country and have access to State credit for investment as legally regulated.*
- 2) **Tariffs:** *The investor is exempted from tariffs on goods imported to create fixed assets and goods used as raw materials, input or semi-finished products that are not available at home for the project's operation in line with the Law on Export Taxes, Law on Tariffs and other regulations on export and import duties.*
- 3) **Corporate income tax:** *The exemption and reduction of corporate income tax for wind power projects is the same way as other projects enjoying preferential treatment in investment in line with the Law on Investment, Law on Corporate Income Tax and other documents guiding the enforcement of these laws.*

*In addition, there is **other preferential treatment** in infrastructure for wind power projects as follows:*

- 1) *Projects on installing wind powers, lines and transformer stations connected to the national grid are entitled to exemptions and reductions in land rental in line with the current law applicable to projects of special investment treatment.*
- 2) *In accordance with the power development plan approved by the competent authority, the provincial People's Committee allocates land to the investor to implement wind power projects. The compensation for and support to site clearance complies with the provisions of land law in force.*

### 3.3. Wind Power Price List

Support to renewable energy projects is included in Decision No.18/2008/QD-BCT<sup>21</sup> issued by the MoIT on July 18<sup>th</sup>, 2008, regulating the price list of avoided cost tariff and example of power sale contract applicable to small power plants that use renewable energy. The price list of avoided cost tariffs is set on the basis of the avoidable cost on the national power system when 1 kWh is generated from the small power plant to the power distribution grid. The price list of avoided cost tariffs is prepared and publicized every year. The price list of avoided cost tariffs for 2011 (Table A4, Appendixes) was issued together with

<sup>20</sup> Decision No. 37/2011/QD-TTg on incentives to develop wind power projects in Vietnam. (in Vietnamese)

<sup>21</sup> Decision No. 18/2008/QD-BCT on the price list of avoidable cost and example of power sale contract applicable to small power plants using renewable energy. (in Vietnamese)

Decision No. 66/2010/QĐ-DTĐL<sup>22</sup> dated December 31<sup>st</sup>, 2010, whereby the avoided cost tariff averages 916 VND/ kWh (~ 4.4 US cents/ kWh).

The GIZ Wind Energy Project has worked with the MoIT in pricing power that is connected to the grid in Vietnam. In this regard, the Prime Minister has issued Decision No. 37/2011/QĐ-TTg<sup>23</sup> on incentives for wind power projects, whereby the EVN shall pay wind power projects 1,614 VND/ kWh (VAT-excluded, equivalent to 7.8 UScents/ kWh) upon power delivery. This price is subject to change if there is fluctuation in the VND/USD exchange rate. The State will provide support of 207 VND/ kWh (equivalent to 1.0 UScents/ kWh) to the power price for the power buyer for purchasing all the output from wind power plants through the Vietnam Environmental Protection Fund. This means the power buyer or in this case, EVN must pay only 6.8 UScents/ kWh. However, if compared to countries in the region and the world, the supported price of wind power in Vietnam is still low (see Table A5, Appendixes).

### 3.4. Financing of Wind Power Projects

The study was conducted by the Institute of Energy (MoIT) calculates fundamental investment rate plans for a wind power project on the basis of basic input parameters (project scale is 30 MW, average wind speed is 7 m/s, owned capital is 30% and borrowed capital is 70% with the interest rate of 10%, price level for CO2 emission is approximately 01 US cent/ kWh, etc.) and technology of each country. Results show that the US and European technologies fully meet standards of the IEC and the estimated investment expenditure is 2,250 USD/ kW with the levelized power cost of about 10.68 UScents/ kWh while the investment rate is 1,700 USD/ kW with the levelized power cost of about 8.6 UScents/ kWh for Chinese technology. This calculation with the supposed capital-return time of the project is around 20 years and the equipment depreciation time is 12 years. Thus, in case investors sell the emission right with 01 UScent/ kWh more, plus the price level of 7.8 US cents/ kWh, then the total cost price of wind power is 8.8 UScents/ kWh<sup>24</sup>. With the wind power cost price of the above technologies, then selection of technology with the current wind power cost price of 8.8 UScents/ kWh is still a big question. In the investment rate for a wind power project, the cost price of turbine accounts for 70 - 80% and the rest are other expenses such as foundation construction, maintenance and construction of new transportation roads, pole and turbine installation, internal power system establishment and power connection, hiring of consultants and other additional expenses (Table A6, Appendixes)<sup>25</sup>.

A recent proposed research assumes that the State should still support wind power through the Vietnam Environmental Protection Fund, but instead of relying on the State budget, electricity use fees of customers will be directly collected through bills of power companies (a form that is widely used in other countries). This research puts forth the price support level of the State from 1 - 4 UScents/ kWh, then each household has to pay additional 1,666 – 6,666 VND/ month in the monthly electric bill based on the

<sup>22</sup> Decision No. 66/QĐ-DTĐL of 2010 on the price list of avoidable costs for 2011 issued by the Director of the Power Regulation Authority. (in Vietnamese)

<sup>23</sup> Decision No. 37/2011/QĐ-TTg on incentives for the development of wind power projects in Vietnam. (in Vietnamese)

<sup>24</sup> Thuy TK (2011) Wind power- specific solutions. Website: <http://tuoitre.vn>, accessed: Aug. 2011. (in Vietnamese)

<sup>25</sup> European Wind Energy Association – EWEA (2009) Economics of wind energy. Report. Website: [http://www.ewea.org/fileadmin/ewea\\_documents/documents/publications/reports/Economics\\_of\\_Wind\\_Main\\_Report\\_FINAL-Ir.pdf](http://www.ewea.org/fileadmin/ewea_documents/documents/publications/reports/Economics_of_Wind_Main_Report_FINAL-Ir.pdf), accessed: Feb. 24, 2012.

total wind power capacity of 1,000 MW by 2020 put forward in the Power Master Plan VII (Thuy TK, 2011).<sup>26</sup>

Although there are still obstacles in the current wind power price mechanism, other favourable support policies have partially opened the door for domestic and foreign investors after a long-wating time. In addition, it is also financially feasible when wind power projects borrow capital from banks. For a wind power project with the capacity scale of 50-100 MW, then the loan will be 80-160 million USD, which is nearly equal to the charter capital (3,000 billion VND, equivalent to 150 million USD) of almost all commercial banks in Viet Nam now<sup>27</sup>. Recently, international financial organizations such as WB, Asian Development Bank (ADB), Japanese Bank for International Cooperation (JBIC), German Reconstruction Credit Institute (Kreditanstalt für Wiederaufbau - KfW), Dragon Capital and some other banks have increasingly operated in Viet Nam. Therefore, this is considered to be an important source of financing for renewable energy projects in general and wind power projects in particular. A calculation shows that the project is only feasible when the interest rate is about 3 - 5% (Dung NH, 2011)<sup>28</sup>. However, only power projects of the EVN have received loans from these banks so far.

#### *International financial organizations*

WB provided credit for the Renewable Energy Development Project (REDP) in the period 2009-2014. The project will provide credit of 201.2 million USD through domestic banks such as Bank for Investment and Development of Vietnam (BIDV), Joint Stock Commercial Bank for Foreign Trade of Vietnam (Vietcombank), Saigon Commercial Bank (Sacombank), Asia Commercial Bank (ACB) and Vietnam Technological and Commercial Joint-stock Bank (Techcombank) for investors of renewable energy projects to reborrow. Only renewable energy projects which have the installed capacity of not more than 30 MW with 100% power generated from renewable energy source are considered for borrowing capital. The maximum borrowing level does not exceed 80% of loan value from participating commercial banks for investors and the minimum borrowing period is 12 years, the period of grace/extension is not more than 3 years<sup>29</sup>. The capital borrowing period is from 2010 to 2014. However, projects which borrowed from this source of capital have not been updated in this research.

ADB has many financial support tools, including: lending for public and private sectors, co-financing, guarantee and technical assistance. However, ADB has only financed two renewable energy projects so far: 1) The Project "Development of renewable energy, expansion and improvement of electrical networks of remote poor communes", the implementation time is from 2009 to 2015 with the total investment of around 202,5 million USD in which the capital borrowed from ADB is 151 million USD and the rest is the counterpart fund of the Government<sup>30</sup> and 2) The Project that ADB supports the Mekong Sub-region countries to use renewable energy. The non-refundable aid of 4 million USD is extracted from the North European Development Fund, together with counterpart funds of 600,000 USD from Cambodian, Laos

<sup>26</sup> Thuy TK (2011) Wind power – specific solutions. Website: <http://tuoitre.vn>, accessed: Aug. 2011. (in Vietnamese)

<sup>27</sup> GIZ/MoIT (2011) Information on wind energy in Vietnam. Prepared by Khanh NQ. Website: [www.windenergy.org.vn](http://www.windenergy.org.vn)

<sup>28</sup> Dung NH (2011) Repeated mistakes must be avoided. Website: <http://tuoitre.vn>, accessed: Sep. 15, 2011. (in Vietnamese)

<sup>29</sup> Huong L (2009) 200 million USD for "Renewable energy development project". Website: <http://dantri.com.vn>, accessed: Feb. 2012. (in Vietnamese)

<sup>30</sup> Ministry of Planning and Investment (2009) Development of renewable energy funded by ADB, Website: <http://oda.mpi.gov.vn>. (in Vietnamese)

and Vietnamese governments.<sup>31</sup> So far ADB has not financed any wind power project in Viet Nam. According to recent information, ADB is intending to reserve 2 million USD to provide technical assistance for the wind power field in four countries, including Viet Nam, Mongolia, the Philippines and Sri Lanka.<sup>32</sup>

*KfW* had some financing programmes, for example the Initiative for Climate and Environmental Protection (Initiative für Klima und Umweltschutz - IKLU) programme. A project of the IKLU programme in Viet Nam is a small and medium-sized hydroelectric power plant (hydroelectric power of less than 30 MW in capacity is considered a form of renewable energy in Viet Nam) and energy efficiency. In the first phase, attention is paid to the hydroelectric power plant of 20 MW in capacity with a special preferential loan up to 50 million USD and after having some initial successes; the programme extends to other forms of renewable energy. There has been an agreement of the German government through *KfW* to support a loan of 35 million USD for Thuan Binh wind power project of the EVN. However, whether the project is able to get the loan or not depends on results of assessment from *KfW*.

*Dragon Capital* is an investment group that has been operating for quite a long time in the Vietnamese financial market. It has just established the Clean Development Fund Mekong Bhahmaputra (2010) investing in clean energy field, energy-saving programme and environmental treatment with the capital of 45 million USD in the initial stage (about 100 million USD in the following stage). The Fund can provide financial support of 7 million USD.

#### *Domestic financial organizations*

Although there are quite a lot of *commercial banks* in Viet Nam, the charter capital of banks (the Government stipulates the charter capital of more than 3,000 billion VND, equivalent to 150 million USD) is not capable of providing loans for projects (for example, for a wind power project of 50-100 MW, then the loan will be 80-160 million USD). Therefore, programmes of commercial banks are mainly co-financing or provision of certain credit for projects, the presence of banks has been mentioned in the REDP programme of WB.

*Vietnam Development Bank (VDB)* has many financial programmes for renewable energy projects such as lending for short and medium-term development investment or re-lending of ODA capital of the government, cooperation international banks. It is a state bank that has the charter capital of 10,000 billion VND (about 500 million USD) and is directly supervised by the Ministry of Finance. The maximum capital borrowing level is 85% of the total project investment capital and the maximum borrowing period is 20 years with 5 years of grace. Credit programmes for renewable energy: 1) VDB signed an ODA credit with the Japanese government on 10/10/2009 with the value of 40 million USD in which 30 million USD was reserved for energy-saving projects and 10 million USD for renewable energy projects, and the implementation time was in 3 years (2010-2013); 2) Recently, VDB has signed a cooperation programme with the US EXIMBANK for the credit of 1 billion USD for the wind power development programme in the Mekong River Delta in the 2011-2015 period and the US EXIMBANK has committed to act as a guarantee for VDB to borrow from other international banks and then let wind power project to re-borrow.

<sup>31</sup> Phuong Nguyen (2011) ADB supports the Mekong Sub-region countries to use renewable energy, Website: <http://www.baocongthuong.com.vn>. (in Vietnamese)

<sup>32</sup> Shah J (2012) ADB quantum leap in wind. Presentation.

The wind power project in Bac Lieu invested by Cong Ly Trade and Service Company Limited is the first project in this area that has been borrowed from the preferential credit source of this cooperation programme with the interest rate of 5.4 % per year. However, wind power investors must commit to use the US wind power technology when accessing this loan.

#### *Clean Development Mechanism (CDM) prospect for wind power projects*

Wind power can be developed into CDM projects. Conditions for appraisal to be CDM projects are mentioned in detail in the research of the GIZ/MoIT (2011)<sup>33</sup>. In fact, the wind power project of REVN (capacity of 30 MW) is a representative CDM project in Viet Nam and it has received a certain financial amount from selling the CO<sub>2</sub> emission right (about 1 UScent/ kWh).

### **3.5. Obstacles to Investment in Wind Power**

Wind power is a new field in Viet Nam; therefore, it is difficult to avoid obstacles in the development process. Some of obstacles/ barriers can be mentioned below:

1) It is considered to be a big obstacle when there is no reliable, synchronous and unified wind data in the whole Viet Nam's territory at present. In fact, wind data are discrete and intermittent, difficult to access because of having no data sharing from agencies/organizations even for research purpose. With the aim of further updating in the wind atlas for Viet Nam as well as supporting provinces to implement the wind power development planning. The GIZ/MoIT Wind Energy Project is carrying out wind measurement in 10 sites in some central highland and central coastal provinces (wind speed sensors are set at altitudes of 80m, 60m and 40 m AGL).

2) *Economic and financial aspects:* The investment expenditure in wind power projects has increased higher in recent years due to changes in price in the world material market, leading to an increase in the production cost of wind power equipment (cost price of turbine accounts for 70-80% of the investment rate). This means that investment rates for projects also increase. It is estimated that the investment rate for a wind power project ranges from 1,700 – 2,000 USD/ kW, depending on each technology (Chinese technology is considered to be the cheapest). The current low wind power price is considered the biggest obstacle to investors. Meanwhile, the investment capital for a wind power project is very big (with the capacity of 50-100 MW, a wind power project needs credit of 80-160 million USD), so even international financial organizations also limit their lending due to the project feasibility (a project needs to prove its capital-return capacity) and need guarantee of the Government. For domestic commercial banks, it is not feasible because of their low charter capital and only the state bank is able to provide credit for wind power projects.

3) *Technical human resources:* At present, there is no intensive branch of learning (discipline) in renewable energy in general or in wind power in particular in universities, colleges and vocational schools. Lecturers in wind energy still lack and syllabuses are still limited, creating a big gap in human resources for this new field of "green" technology. And it is an obstacle for the development of this field in Viet Nam. In the short term, Viet Nam needs to develop and integrate an intensive training programme into the education system in order to meet demands of technical human resources.

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<sup>33</sup> GIZ (2011) Information on wind energy in Vietnam, Website: [www.windenergy.org.vn](http://www.windenergy.org.vn). Prepared by Khanh NQ

4) *Technical infrastructure*: Infrastructure (road and bridge system, electrical system, transportation equipment, etc.) of Viet Nam is still backward. Therefore, transportation of out-of-gauge and super heavy goods meets a lot of difficulties. A typical example, it took the wind power project of REVN in Binh Thuan 2 months to just transport 5 wind turbines from Phu My seaport to the project location on the 300 km stretch of road. Additionally, due to having no suitable crane for erection of wind turbines, the company had to hire a crane from Singapore, and then equip itself with this type of crane. The company is considered to be the only unit in the whole country to have the equipment to meet requirements of this work.

Many areas are assessed as having high wind potential. However, access to these areas is difficult because their infrastructure is still weak (too small roads, many superelevations, no bridges, etc.), making development of projects almost impossible. Alternatively, investors have to use more expenditure to reinforce the infrastructure, leading to a remarkable increase in the total investment expenditure.

In addition, most of the wind power equipment is not localized. Although there were some mentioned producers such as GE (USA), CS Tower (South Korea), etc, all their products have been exported to the world market.

Lack of services providing replacement equipment, repair, operation and maintenance (O&M) for the system is also one of causes that make the investment expenditure of the project increase. Dependence on foreign experts will certainly bring about time dependence, leading to the fact that the project availability is assessed as being still low.

5) *Policy and planning*: are assessed as biggest obstacles to development of this field in Viet Nam. National and provincial plans, investment procedure, contract for sale and purchase of electricity have not been completely issued. Coordination among competent authorities for wind power has also been loose and inhomogeneous. A typical example, now a lot of wind power projects in Ninh Thuan and Binh Thuan are being stuck in underground titanium mineral planning zones of wind power planning areas. According to regulations of the Ministry of Natural Resources and Environment, mineral exploitation is the national priority, that is to say, after titanium is exploited (normal titanium exploitation takes around 30-50 years), then projects on these areas will be allowed to carry out. This leads to delay in licensing and implementation of wind power projects because of having to wait survey results from the Ministry of Natural Resources and Environment. Moreover, unclear and non-transparent communication among government agencies and provinces is also an obstacle.

The above reality shows that although the number of projects is increasing, most of them are still in the land keeping and waiting forms. The vicious circle happens again because this reality has bad effects on local planning.

#### **4. Conclusions and Recommendations**

Viet Nam has high potential to develop wind power projects. Recent preferential policies of the Government have shown a special interest in “green power” generation field. Moreover, the increasing number of wind power projects has proved the potential of wind power market in Viet Nam.

Mechanisms to support development of wind power projects issued by the Government have partially helped wind power projects to be more feasible so that they can borrow capital from banks. Interest of



international financial organizations in Viet Nam and Viet Nam Development Bank (VDB) is an important source of financing for renewable energy (namely wind power), the field which requires big investment capital due to high cost price of technology. However, in order to make financing of international financial organizations feasible, investors expect to get support and guarantee of the Government.

Wind power is a new field in Viet Nam, so there are still many barriers to development such as infrastructure, human resources, policy and especially wind power price which is still considered to show no economy to wind power projects. As a result, investors are still hesitant to carry out projects and expect to get higher power price support from the Government.

Support mechanisms and legal documents are being elaborated and completed by MoIT. Hopefully, procedures and information on development will come to investors more clearly and fully in the near future.

## Appendixes

Table A1: Vietnam power transmission network in the period 2009 - 2010

Length of the high-voltage electric power transmission network (2009 - 2010)	Number of transformer station
500 kV grid: 1,528 km – 4,243 km (until 6/2011: 4,323 km)	500 kV transformer station: 11 TBA – 16 TBA (until 6/2011: 16 TBA)
220 kV grid: 2,830 km – 9,870 km (until 6/2011: 10,040 km)	220 kV transformer station: 54 TBA – 62 TBA (until 6/2011: 63 TBA)

Table A2: List of wind power projects in Vietnam<sup>34, 35</sup>

No.	Investor Name (Project Name)	Project location		WT Supplier	Capacity (MW)		Land Area (ha)		Investment	Status
		Commune - District	Province		1st Phase	Registration	Project area	Survey area		
1	Thanh Tung Group	Mẫu Sơn District	Lang Son	Avantis Turbine AV928	-	200	-	-	EUR200 million (US\$300 million)	-
2	Phuong Mai Wind Power JSC (Phuong Mai 1 Wind Power Plant)	Nhon Hoi Economic Zone, Quy Nhon City	Binh Dinh	Vestas	-	30	-	-	VND880 billion US\$42 million)	-
3	GGP Corporation (Germany) (Phuong Mai 2 Wind Power Plant)	Nhon Hoi Economic Zone, Quy Nhon City	Binh Dinh	-	-	200	-	-	-	-
4	Central wind power JSC (belongs to PC3)	Nhon Hoi Economic Zone, Quy Nhon City	Binh Dinh	-	-	21	-	-	US\$40 Million	-
5	Vietnam Renewable Energy JSC (REVN)	Phuoc Minh Commune, Thuan Nam District	Ninh Thuan	-	30	30	27.2	272	-	Approved by PPC (Preparing TKKT)
6	Vietnam Wind Energy Co. Ltd. (Greta)	Cong Hai Commune, Thuan Bac District	Ninh Thuan	-	66	66	15.5	310	-	Approved by PPC (Preparing DADT)
7	Vietnam Wind Energy Co. Ltd. (Greta)	Loi Hai Commune, Bac Phong, Thuan Bac District	Ninh Thuan	-	-	90	45	900	-	Preparing investment report
8	Thuong Tin Energy JSC	Phuoc Huu, Phuoc Thai, Phuoc Hau, Phuoc Dan, Ninh Phuoc District	Ninh Thuan	-	12.5	50	7.88	965	-	Approved by PPC (Preparing TKCS)
9	EAB MTV Co. Ltd. & Viet Wind Power Co. Ltd.	Phuoc Huu Commune, Ninh Phuoc District	Ninh Thuan	-	40	120	17.82	453	-	Approved by PPC (Preparing TKCS)

<sup>34</sup> Provincial Department of Industry and Trade (DoIT (Documents updated until May 2011). (in Vietnamese)<sup>35</sup> DEVI (2011) Locations of wind energy projects in Vietnam. Website: <http://devi-renewable.com>, accessed: Dec. 2011.

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10	EAB MTV Co. Ltd. & Viet Wind Power Co. Ltd.	Phuoc Thanh Commune, Bac Ai District	Ninh Thuan	-		18	5.4	600	-	Under approval of PPC (CNDT)
11	(An Vien) Thuan Phong Energy Development JSC	An Hai, Phuoc Hai, Ninh Phuoc, Phuoc Dinh & Thuan An District	Ninh Thuan	-	70	180	114	2230	-	Approved by PPC (Preparing DADT)
12	(Huong Dien) HD Investment JSC	An Hai, Phuoc Hai, Ninh Phuoc, Phuoc Dinh & Thuan An District	Ninh Thuan	-	-	97.5	50	980	-	Under approval of PPC (CNDT)
13	Pacific Asia Enfinity Limited Co.	Phuoc Minh Commune, Thuan Nam District	Ninh Thuan	-	-	90	30	607	-	Preparing investment report
14	Pacific Asia Enfinity Limited Co.	Phuoc Minh Commune, Thuan Nam District	Ninh Thuan	-	-	41	10	200	-	Preparing investment report
15	Pacific Asia Enfinity Limited Co.		Ninh Thuan	-	-	115	30	600	-	Preparing investment report
16	Aerogie.plus Solutions AG	Phuoc Dinh Commune, Thuan Nam District	Ninh Thuan	-	28.5	70	21.24	430	-	Preparing investment report
17	Electricity of Vietnam	Loi Hai, Cong Hai, Thuan Bac District	Ninh Thuan	-	30	100	26	523.2	-	Preparing investment report
18	Vietnam Renewable Energy JSC (REVN) (Binh Thuan - Wind Farm No. 1)	Binh Thanh Commune, Tuy Phong District	Binh Thuan	Fuhrlaender Germany	30	120	150	1500	-	in operation (1st phase)
19	Asia Clean Energy Development and Investment - Service - Trade Co. Ltd. (Tien Thanh Wind Power Plant)	Tien Thanh Commune, Phan Thiet City	Binh Thuan	-	30	51	17	320	-	Preparing investment project report
20	Asia Clean Energy Development and Investment - Service - Trade Co. Ltd. (Phuoc The Wind Power Plant)	Phuoc The Commune, Tuy Phong District	Binh Thuan	-	30	30	8.6	420	-	Preparing investment project report

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21	Binh Thuan - Sai Gon Power Plant Development Investment JSC (Binh Thuan - Sai Gon Wind Power Plant)	Hoa Thang Commune, Bac Binh District	Binh Thuan	-	-	200	91	2000	-	Preparing investment project report
22	Mien Dong JSC	Hoa Phu Commune, Tuy Phong District; Phan Ri Thanh Commune, Bac Binh District	Binh Thuan	-	39	110	-	1240	-	Preparing investment report
23	Asia Renewable Energy JSC (Thuan Nhien Phong Wind Power Plant)	Hoa Thang Commune, Bac Binh District	Binh Thuan	-	30	50	13.3	305	-	Preparing investment project report
24	IMPISA - PetroVietnam Power Corporation Joint-venture	Hoa Thang Commune, Hong Thai, Cho lau Town, Bac Binh District	Binh Thuan	-	165	600	-	5700	-	Preparing investment report
25	PetroVietnam Power Corporation (Wind-Diesel Hybrid Project)	Phu Quy Island District	Binh Thuan	Vestas Denmark	6	6	-	-	-	Preparing grid-integration
26	Thuan Binh Wind Power JSC (Phu Lac Wind Power Plant)	Phu Lac Commune, Tuy Phong District	Binh Thuan	-	24	50	17	400	VND863 billion (US\$ 41 million)	-
27	Thuan Binh Wind Power JSC (Vinh Hao Wind Power Plant)	Vinh Hao Commune, Tuy Phong District	Binh Thuan	-	-	60	-	568	-	Preparing investment report
28	Van Thanh Co. Ltd	Hong Phong Commune, Bac Binh District	Binh Thuan	-	40	120	-	775	-	Preparing investment report
29	HD Investment JSC	Tien Thanh Commune, Phan Thiet City; Ham Cuong Commune, Ham Thuan Nam District	Binh Thuan	-	-	50	-	620	-	Preparing investment report
30	EAB	-	Binh Thuan	-	-	50	-	-	-	Wind measurement
31	WPD Vietenergy JSC	Tien Thanh Commune, Phan Thiet City; Ham Cuong Commune, Ham Thuan Nam District	Binh Thuan	-	-	100	-	620	-	Wind measurement
32	Highland Wind Power JSC	Pleiku City	Gia Lai	-	-	40.5	-	-	VND1500 billion	CDM documents submitted to DNA

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									(US\$71 million)	Vietnam by Jan. 31, 2011. Wind mast installed Nov. 28, 2009
33	Cavico Transport and Construction	Ninh Loan commune, Đức Trọng district, Lâm Đồng province	Lam Dong	-	30	300	-	-	US\$57 million (phase I)	Phase I (30MW) will start by Dec 2011
34	Aerogie.plus Solutions AG	Con Dao Island	Ba Ria - Vung Tau	-	-	6	55.27	-	-	-
35	EAB Corporation (Germany)	Con Dao Island	Ba Ria - Vung Tau	-	12	12	-	-	-	Preparing construction (Plus 3 MW Diesel; wind power price is 25 US cents per kWh)
36	EAB Corporation (Germany)	-	Ba Ria - Vung Tau	-	50	100	-	-	-	Wind measurement
37	Hoa Viet Corporation	Coastal area of Go Cong	Tien Giang	-	-	100	-	-	-	Approved by PPC on feasibility study
38	Asia Clean Energy Development and Investment - Service - Trade Co. Ltd. (Tien Thanh Wind Power Plant)	Thanh Phong, Thanh Hai, Giao Thanh, Thanh Phu District	Ben Tre	-	10	30	-	Planned survey at 3 sites	-	Investor has asked to erect wind measurement
39	Lien Nghia Investment JSC	Binh Dai Commune, Ba Tri District	Ben Tre	-	30	250	-	1000	-	Investor has asked to erect wind measurement
40	Lien Nghia Investment JSC	Hiep Thanh Commune, Duyen Hai District	Tra Vinh	-	28.5	93	13.2	1420	-	Submitted investment report to PPC
41	EAB (Germany) and TRASESCO General Services and Trade JSC (Vietnam) (Duyen Hai Wind Power Plant)	Duyen Hai District	Tra Vinh	-	-	30	-	-	-	-
42	Vietnam Green Power JSC	Vinh Hai Commune, Vinh Chau District	Soc Trang	-	27	100	15	40	VND5000 billion (US\$238 million)	Preparing investment report

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43	Lien Nghia Investment JSC	Trung Binh Commune, Tran De District	Soc Trang	-	30	100	-	15	VND4867 billion (US\$232 million)	Preparing investment report	
44	EAB Corporation & TRASESCO General Services and Trade JSC	Vinh Phuoc and Vinh Tan Communes, Vinh Chau District	Soc Trang	-	30	50	-	20	-	Preparing investment report	
45	Cong Ly Trade and Tourism Co. Ltd.	Lai Hoa Commune, Vinh Chau District	Soc Trang	-	100	200	-	500	VND5000 billion (US\$238 million)	Preparing investment report	
46	Cong Ly Trade and Tourism Co. Ltd.	Vinh Trach Dong Commune, Bac Lieu City	Bac Lieu	Installed 16MW (10 x GE's 1.6-82.5 wind turbine) Expected to generate electricity from April 2012	16	99	484	528.4	VND4500 billion (US\$214 million)	Under construction	
47	Lien Nghia Investment JSC	Ngoc Hien and Dam Doi Districts	Ca Mau	-	-	250	-	-	-	-	
48	Cong Ly Trade and Tourism Co. Ltd.	Mui Dat Commune, Ngoc Hien District	Ca Mau	-	-	50	-	-	-	-	
<b>Total Capacity:</b>						<b>4,876</b>					

Table A3: Capacity and growth rate of countries in the world for the period 2006-2010<sup>36</sup>

Position 2010	Country	Total capacity end 2010 (MW)	Added capacity 2010 (MW)	Growth rate 2010 (%)	Position 2009	Total capacity end 2009 (MW)	Total capacity end 2008 (MW)	Total capacity end 2007 (MW)	Total capacity end 2006 (MW)
1	China	44,733	18,928	73.3	2	25,810	12,210	5,912	2,599
2	USA	40,180	5,600	15.9	1	35,159	25,237	16,823	11,575
3	Germany	27,215	1,551	6.0	3	25,777	23,897	22,247.4	20,622
4	Spain	20,676	1,527.2	8.0	4	19,149	16,689	15,145.1	11,630
5	India	13,065.8	1,258.8	10.7	5	11,807	9,587	7,850	6,270
6	Italy	5,797	950	19.6	6	4,850	3,736	2,726.1	2,123.4
7	France	5,660	1,086	23.7	7	4,574	3,404	2,455	1,567
8	UK	5,203.8	1,111.8	27.2	8	4,092	3,195	2,389	1,962.9
9	Canada	4,008	690	20.8	11	3,319	2,369	1,846	1,460
10	Denmark	3,734	309.0	8.9	10	3,465	3,163	3,125	3,136
...									
48	Philippines	33.0	0.0	0.0	42	33.0	25.2	25.2	25.2
50	Vietnam	31.0	22.3	254.3	57	8.8	1.3	0.0	0.0
70	Indonesia	1.4	0.0	0.0	70	1.4	1.2	1.0	0.8

Table A4: Avoided cost tariff in 2011

Electricity price (VND/kWh) (~cents/kWh)	Dry season			Wet season			
	Peak hour	Normal hour	Off-peak hour	Peak hour	Normal hour	Off-peak hour	Surplus electricity
North region	603 (2.8)	590 (2.8)	561 (2.7)	529 (2.5)	498 (2.4)	484 (2.3)	242 (1.2)
Centre region	573 (2.7)	567 (2.7)	563 (2.7)	481 (2.3)	468 (2.2)	460 (2.2)	230 (1.1)
South region	757 (3.6)	568 (2.7)	555 (2.6)	511 (2.4)	501 (2.4)	492 (2.3)	246 (1.2)
Capacity price (whole country) VND/kWh (~cents/kWh)	1,772 (8.4)						

 Table A5: Summary of wind tariffs worldwide (latest updated Sep. 20, 2011)<sup>37</sup>

No.	Country	Onshore Wind		Offshore Wind	
		Years	US cents/ kWh	Years	US cents/ kWh
1	China (Maximum)		8.9		
2	Spain (Maximum)	20	12.2	20	23.9
3	German	20	12.1	20	20.2

<sup>36</sup> World Wind Energy Association – WWEA (2011) World wind energy report 2010. Website: [www.wwindea.org](http://www.wwindea.org), accessed: Dec. 2011

<sup>37</sup> Paul Gipe (Oct. 06, 2011) Snapshot of Feed-in Tariffs around the World in 2011. Website: <http://www.renewableenergyworld.com/rea/news/article/2011/10/snapshot-of-feed-in-tariffs-around-the-world-in-2011?page=3>

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4	France	15	11.1	15	17.5
5	Portugal	15	10.0		
6	Denmark (Maximum)	20		20	11.2
7	Greece	20	11.8	20	13.1
8	Thailand (> 50 kW)	10	11.6	NA	
9	<i>Philippines (Proposed in July 2011)</i>	12	24.6	NA	
10	<u>Vietnam</u>	<u>20</u>	<u>7.8</u>	<u>NA</u>	

Table A6: Cost structure of a typical 2 MW wind turbine installed in Eupore<sup>38</sup>

Item	Investment (EUR 1,000/MW)	Share of total cost (%)
Turbine (ex works)	928	75.6
Grid connection	109	8.9
Foundation	80	6.5
Land rent	48	3.9
Electric installation	18	1.5
Consultancy	15	1.2
Financial costs	15	1.2
Road construction	11	0.9
Control systems	4	0.3
<b>Total:</b>	<b>1,227 (~ US\$ 1.8 million/ MW)</b>	<b>100</b>

Table A7: Useful Bank Contacts

Full name	Title	Main Duties
<b>World Bank (WB) – 63 Ly Thai To Str., Hanoi, Vietnam</b>		
Mrs. Pham Nguyet Anh	Project manager T: +84 (0) 4 9346 600 # 311 M: 0903 458 616 E: <a href="mailto:npham@worldbank.org">npham@worldbank.org</a>	Project management and coordination
Mrs. Le Kim Dung	Project Assistant T: +84 (0) 4 9346 600 # 319 E: <a href="mailto:dle2@worldbank.org">dle2@worldbank.org</a>	General information
<b>German Kfw Bank</b>		
Claudia Loy	E: <a href="mailto:claudia.loy@kfw.de">claudia.loy@kfw.de</a> or E: <a href="mailto:Enrico.spiller@kfw">Enrico.spiller@kfw</a> I: <a href="http://www.kfw.de">www.kfw.de</a>	
<b>Dragon Capital Clean Development – 1901 Me Linh Point, 2 Ngo Duc Ke, District No.1, Ho Chi Minh City, Vietnam</b>		
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<sup>38</sup> European Wind Energy Association – EWEA (2009) Economics of wind energy. Report. Website: [http://www.ewea.org/fileadmin/ewea\\_documents/documents/publications/reports/Economics\\_of\\_Wind\\_Main\\_Report\\_FINAL-lr.pdf](http://www.ewea.org/fileadmin/ewea_documents/documents/publications/reports/Economics_of_Wind_Main_Report_FINAL-lr.pdf), accessed: Feb. 24, 2012.



**STATUS OF WIND POWER DEVELOPMENT AND FINANCING OF THESE PROJECTS IN VIETNAM**

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