



Laos' First Wind Farm- 600MW Wind Energy Development

Infusing Clean Energy to a Sustainable ASEAN Grid Future

Present to:

Quantum Leap in Wind Power Development (QLW) Deep Dive Workshop
Asia Clean Energy Forum 2016

6 June 2016

ASEAN Largest Wind Farm

IEA signs deal for largest Asean wind farm in south Laos

ITTHICITAN
THE SUNDAY NATION
VIENTIANE

THAI renewable company Impact Energy Asia (IEA) plans to build the largest wind farm in Asean - and generate 600 megawatts on 400,000 rai in southern Laos - under an agreement signed by the Lao government and the company on Friday.

"Called Monsoon Wind Farm, the US\$1.5 billion [Bt50 billion] farm will be located near the Mekong River across from Ubol Ratchathani," said Woramol Khamkanist, who heads the firm.

The accord was signed by Laos' Deputy Minister for Investment and Planning Dr Khamniang Phonsena and IEA director Paradai Suebma. Laos' Deputy Minister for Energy and Mining Vilaphon Veelawong and Royal Thai Embassy official in Laos

Rujikorn Saengchan also attended the signing.

Woramol said: "We are encouraged by the support from the Lao and Thai governments."

The wind project will be turned over to the Lao government after a 25-year concession.

The wind farm covers two districts: Dak Cheung in Sekong province and Sanxay in Attapeu province. The governor of Attapeu Dr Nam Viyaked also witnessed the signing.

Monsoon Wind is due to deliver its payload in 2019. It will be built on land where 4,000 people live in six scattered villages.

"The wind farm does not encroach on arable land or harm the environment," an IEA engineer said. "It will not disrupt the lives of people."

About 95 per cent of the power is expected to be sold to Asean markets,

mainly to Thailand and buyers bordering the Mekong. The project is also critical to Thailand's energy needs.

"In the next 10 years, local production of natural gas and LNG will be depleted and much of our LNG needs will have to be imported to replace local demand," IEA executive Somboon Lertsuwanaroj said.

The project will also play a key role in the Asean Power Grid Policy to sell power from Laos via Thai and Malaysia grids to Singapore, which has pledged to buy Lao power to assist one of the poorer members in the group.

"It is only prudent that we rely on ourselves and a sister nation such as Laos, with which we share a common language, culture and historical ties," Somboon said. "After all, Laos, with its Lan Chang [million elephants] culture is truly a twin of our Lan Na [million ricefields] heritage."

Malaysia hopes for major breakthrough on Laos, Thailand, Malaysia and Singapore Power Integration Project (LTMS-PIP)

May 28, 2015,
Thursday

on the Laos, Thailand, Malaysia Senior Officials Meeting (33rd

gkll said participating countries grid before exporting energy to

WIND ENERGY

IES, Denmark's Vestas join for largest wind farm to provide low-cost energy

Ads by Google Wind Farm Farm Energy Energy

THE NATION May 25, 2016 1:00 am

THAILAND-BASED energy developer Impact Electronics Siam Co Ltd (IES) has selected Danish-based wind turbine manufacturer Vestas as preferred technology/EPC partner to develop a 600 MW wind project in southern Laos.

The project, which can be completed in 2020, is set to become the largest wind farm in Asean. The signing ceremony of the memorandum of understanding is expected to be held at the Danish Ambassador's residence in Bangkok next month.

ASEAN ministers adopt statement on climate change

Update: October, 30/2015 - 09:21



The 2015 ASEAN joint statement on climate change was adopted by participants of the 13th ASEAN Ministerial Meeting on Environment, which wrapped up yesterday in Ha Noi, - VNA/VNS Photo

HA NOI (VNS) — The 2015 ASEAN joint statement on climate change was adopted by participants of the 13th ASEAN Ministerial Meeting on Environment, which wrapped up yesterday in

Approving the joint statement on climate change was one of the major aims of the 13th AMME.

The statement is scheduled to be submitted at the 27th Summit held in Malaysia in November and presented at the 21st Conference of Parties held in Paris in December.

Laos promotes Thai-built wind farm on Asean stage

THE NATION

LAOS AIMS to use Monsoon Wind Power, Asean's largest wind farm as an exemplary prototype for Asean - a boost towards reaching the "COP 21" targets.

Monsoon Wind Power is a 600-megawatt wind-farm project that site covers two districts in southern Laos - Dak Cheung in Sekong province and Sanxay in Attapeu province.

The project has been developed by a Thai renewable-energy firm, Impact Electronics Siam Co.

Laos has high hopes for the project and views it as a prototype for the development of the country's alternative-energy source, which has the potential to support

a sustainable energy future for all. Chantho Mitthanpheng, deputy director of the Institute of Renewable Energy and Promotion under the Lao Ministry of Energy and Mines, pointed out the potential of Monsoon Wind Power as a major advance in Laos' alternative-energy sector while giving a speech at the "Sustainable Energy and Technology Asia Exhibition and Conference".

Benefits for all

He said the wind farm would undoubtedly benefit all parties, including Laos, Thailand or even the Asean region, since it is expected to have Asean's largest wind-energy capacity, generate clean energy to be sold at a fair price and promote the well-being of the

community surrounding the project site.

In an effort to facilitate alternative-energy development, Laos plans to increase renewable energy supply by 2025.

The 21st Conference of the Parties (COP21) held in Paris last December saw delegates from countries sign a pact that aims to avert the rise in global temperatures beyond the threshold of 2 degrees Celsius.

At this forum Thailand also pledged to cut emissions of greenhouse gas by 20-25 per cent by 2030 from 2010 levels, equivalent to a cut in GHG emissions of about 111 million to 129 million tonnes.

Monsoon Wind Power is expected to avoid 87 million tonnes of GHG emissions throughout the project lifecycle compared with fossil-fuel power plants.

Thailand's Cabinet on April 5 gave its approval to the country's participation in the "Partnership for Market Readiness" programme, under which the World Bank will provide Thailand, as a PMR member, with a US\$3-million (Bt405 million) grant for the development of initiatives that will help Thailand achieve its GHG emission-reduction goal.

According to World Bank statistics, Thailand is the 22nd-largest GHG emitter in the world and the fifth-largest in the East Asia and Pacific region.

Over the past decade, the energy sector has been the most important source of GHG emissions in the country.



Key Highlights

“Monsoon Wind Project has strong belief to deliver the clean energy with the competitive tariff to those conventional fuel in order to spread the implementation of sustainable renewable energy project to all around the region”



✓ **First Wind Energy Project Development Agreement (“PDA”) approved by Laos**

We signed the PDA , through our wholly owned subsidiary called IEA, with the Government of Laos in August 2015 to exclusively developed a 600MW wind energy project in Sekong and Attapeu province

✓ **Connecting ASEAN Power Grid and Transportation**

Our newly build 230kV dedicated transmission line can considerably support and extension and be part of the ASEAN Power Grid, the new build and improvement of access road is open the new transportation path within Thailand, Laos, Vietnam

✓ **Improving living quality and infrastructure**

Not only the access to the electricity but transportation, job opportunity, local economic, health quality, education and welfare shall be improved

✓ **ADB and IFC indicate its strong support**

We have received the preliminary support letter indicate the debt financing of about USD 1.05 billion

✓ **Tackling with the Paris Agreement**

The Project can deliver the clean energy which create a carbon saving of over 20m tCO2 over the project life

✓ **Building the bridge to unlock a huge potential of small hydro**

We have identified a huge potential of over 1,000MW small hydro projects located spread surrounding the project area which considerably a single project is not feasible to bear the grid connection cost. Our 230kV T/L can help bridging and unlock this hydro capacity

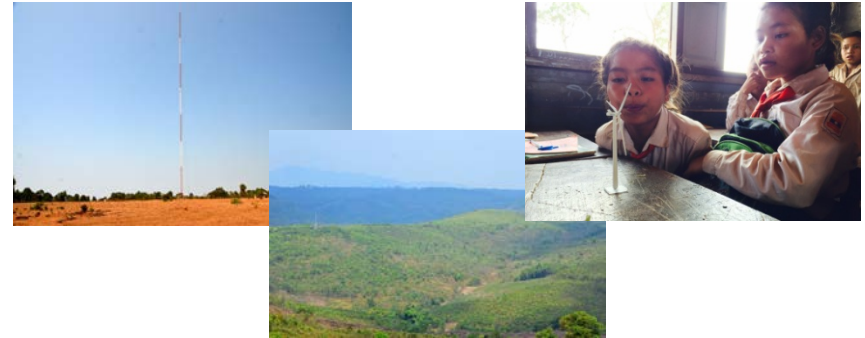
✓ **LTMS Potential**

Potential to participate in the Laos-Thailand-Malaysia-Singapore Power Integration Process

Project at a glance

“First of its kind wind energy that executed Project Development Agreement with GOL”

Project Company	Monsoon Wind Farm Project
Project Cost	Approximately USD1.5 billion
Installed Capacity	600 MW
Location	Sekong and Attapeu provinces, Lao PDR
Area	<ul style="list-style-type: none"> 68,000 ha granted under PDA Actual use, including project facility and transmission line, is estimated to be 400 - 625 ha (subject to wind turbine model)
Potential Offtakers	Thailand and ASEAN countries
EPC	Vestas
Lender	In shortlisted
FA	Kasikorn Bank
TA	DNV GL
Grid Connection	<ul style="list-style-type: none"> 230 kV transmission line from Project's internal substation to Ban Lak 25 Substation, Pakse District, Lao PDR 500 kV transmission line from Pakse to Ubon Ratchathani 3 Substation, Thailand
Concession Period	25 years from COD
Targeted FCD	2017
Construction Period	Estimated 42 months
Targeted SCOD	2020



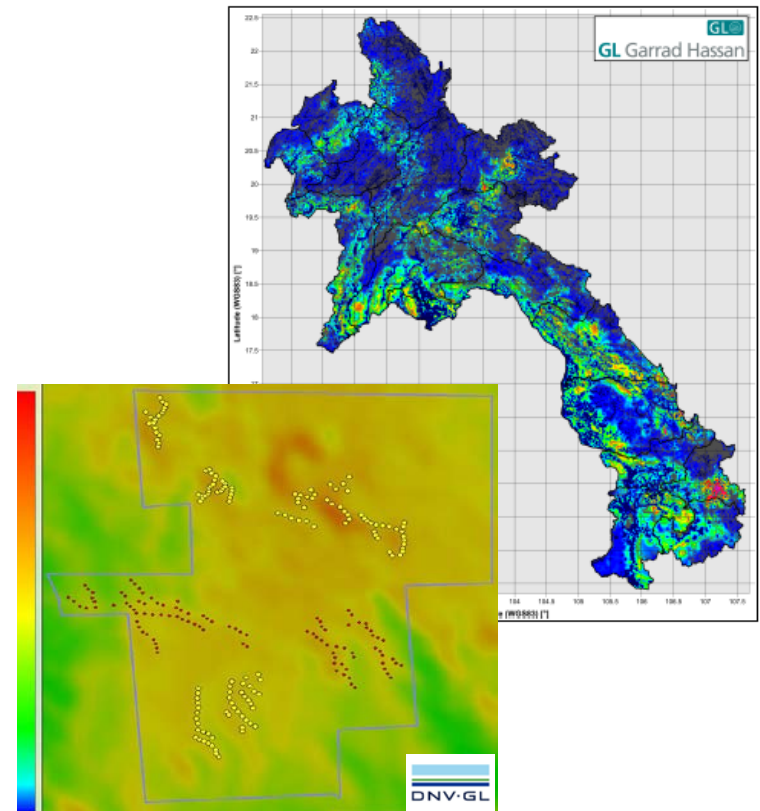
Optimized the Site Selection

Site has been technically determine and search through out the whole country with wind measuring start since July 2012

Wind Resource Measurement

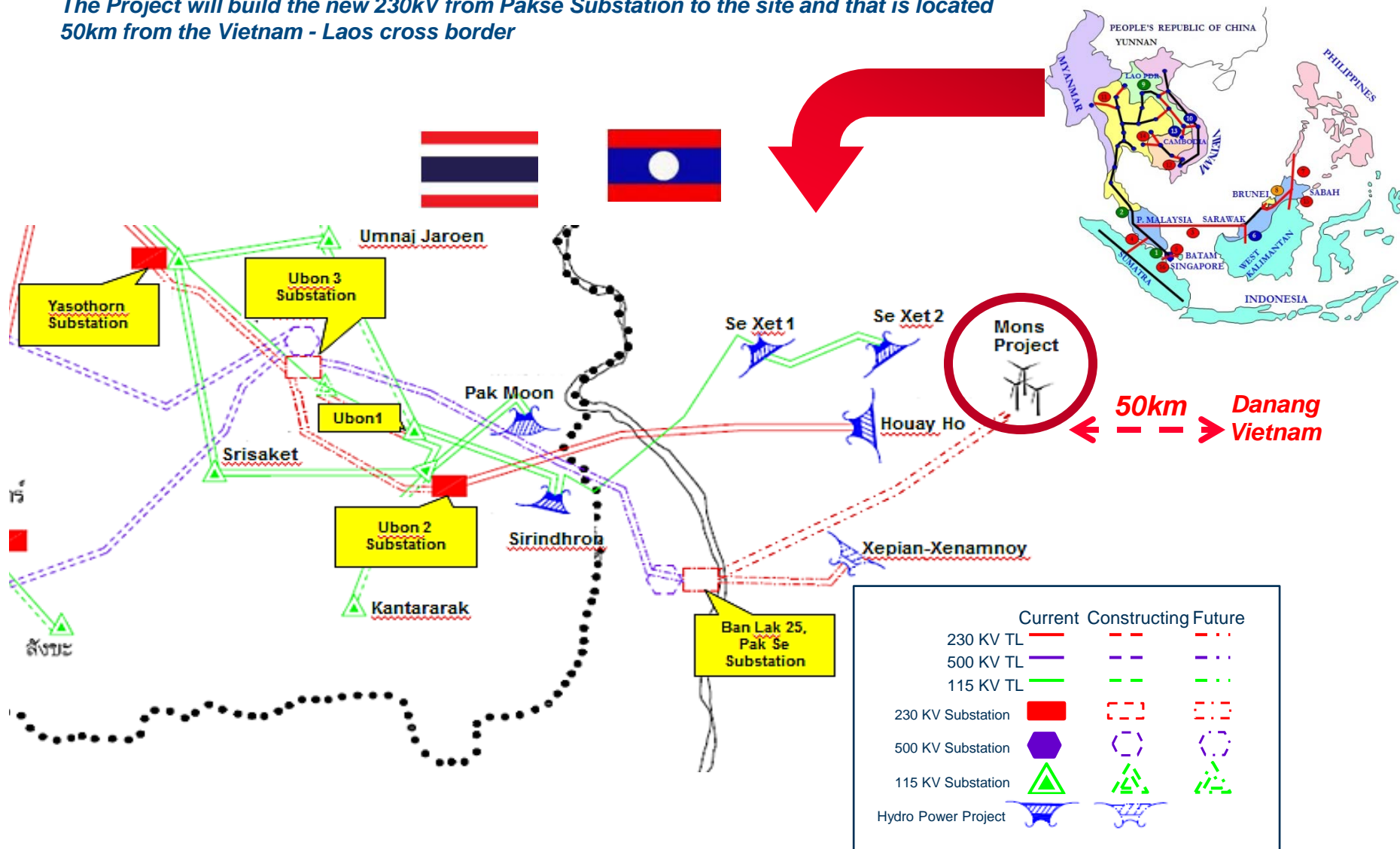
- DNV GL was engaged to identify the potential wind farm sites in the whole country of Laos in 2011.
- The site identification has involved estimation of the wind resource based on mesoscale and microscale wind speed modeling. The estimated wind resource was then combined with various constraints including:
 - Proximity to transmission line
 - Potential site access based on proximity to existing roads
 - Land use and not in national protected area
 - Site capacity
 - Expected high wind resource
 - Terrain complexity
- Project area is among the potential locations that have been selected as preferred sites around the whole Laos country.
- **100 m height wind monitoring mast** was installed by DNV GL in order to measure the wind resource at the Project site since July 2012. The mast installation is **compliance with IEC 61400-12 standard**.
- The long term wind assessment was conducted by using **measured wind data since 2012** together with various reference stations from MERRA, ERA-Interim databases and DNV GL's Virtual Met Data.
- According to **DNV GL's assessment, the average extrapolated long-term mean wind speed at 139 m height is at 6.3 m/s.**
- IES is installing **2 additional 140 m height wind masts** in the Project area and targeted to start measuring wind resource **in end of June 2016**.

“The best wind area selected from the whole country study”



Infusing Wind Electrons to ASEAN Grid

The Project will build the new 230kV from Pakse Substation to the site and that is located 50km from the Vietnam - Laos cross border

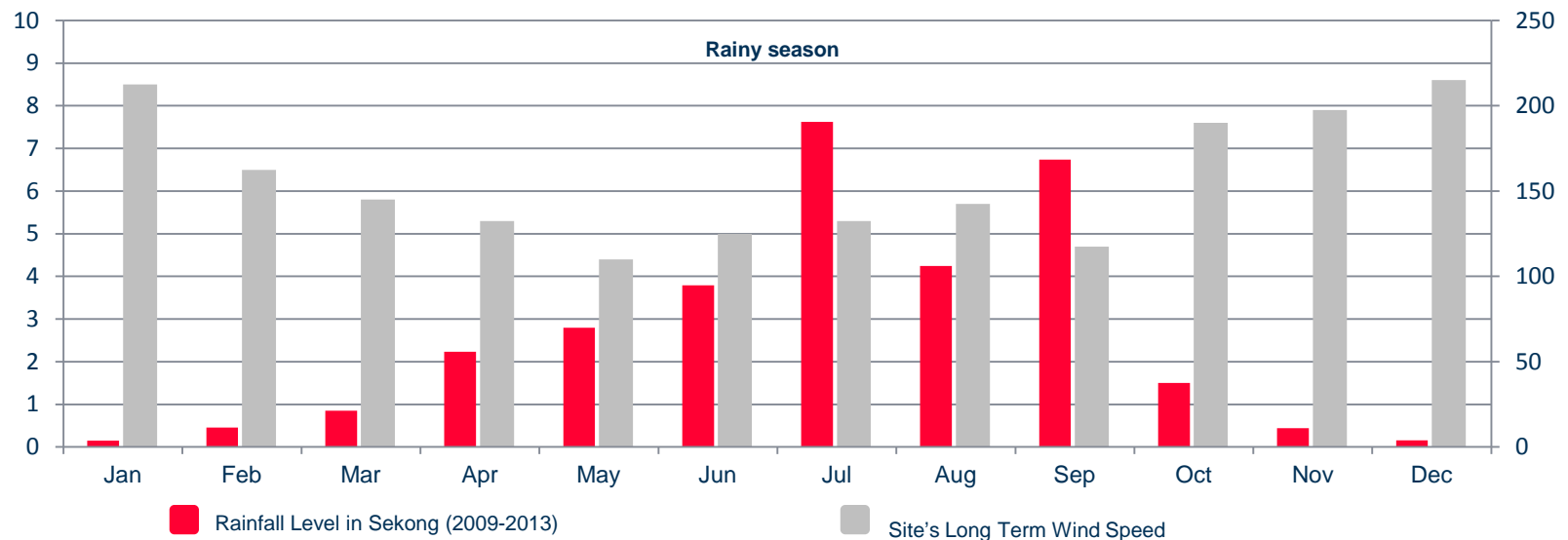


Stabilized Crossed Border Grid

Complimentary between wind energy production and hydro energy production improve a grid supply stability cross country

Trend of Average Rainfall and Wind Speed at Site Location

“Energy diversification for stable annual generation from Lao PDR”



Balance of Wind and Hydro Power Project

- According to the nature of resource availability, hydro power projects operate at its most effective capacity in the rainy season; on the other hand, wind power projects operate at its most effective capacity in dry season.
- Since Lao PDR relies mainly on electricity that generates from hydro power, the increase of electricity generated from wind project would enhance the total energy generation to be stable throughout the year.