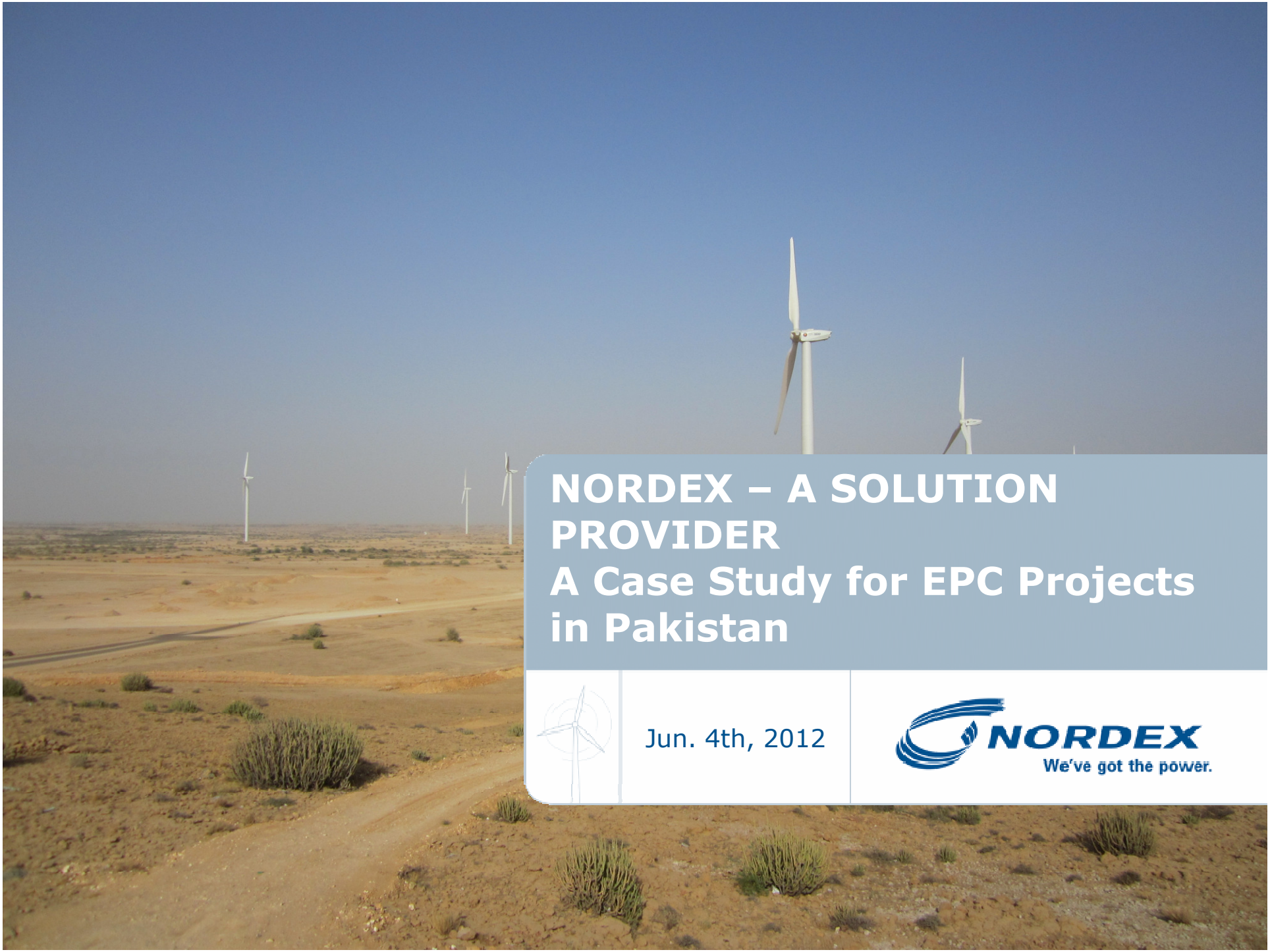

# NORDEX – A SOLUTION PROVIDER
# A Case Study for EPC Projects in Pakistan

Jun. 4th, 2012

NORDEX
We've got the power.

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2. Wind resources assessment
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4. Project site issues
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# 1. Project background

# One of our key markets in Asia - Pakistan

**An urgent need for the government to fill the gap between demand and supply of the power by resorting to renewable energy**

- GDP: average quarterly GDP growth from 1952 to 2011 is **5%**
- **Actual electricity production** is estimated between **10,000MW to 12,000MW**
- **Demand** for electricity is estimated **~14,500MW** (deficit 3,000 – 4,000MW)
- **65% of** Pakistan electricity is generated from **fossil fuel**, in which **80%** is **imported**. **Government wishes to exploit indigenous resources and reduce dependence on imported fuel.**
- Target for wind (majority) & solar by **2030**: **9,520MW**
- **Pakistan wind power potential: 350GW; Gharo-keti Bandar wind corridor: 50GW**

# One of our key markets in Asia - Pakistan

## Project development process

| Step | Title | Responsible Authority |
|---|---|---|
| 1 | Letter of Interest (LoI) | AEDB |
| 2 | Land Allocation for Wind Farm | AEDB |
| 3 | Feasibility Study | n.a. |
| 4 | Generation License | NEPRA |
| 5 | Tariff Determination | NEPRA |
| 6 | Submission of Performance Guarantee by the IPP | n.a. |
| 7 | Letter of Support (LoS) | - |
| 8 | Energy Purchase Agreement (EPA) | NTDC |
| 9 | Implementation Agreement (IA) | AEDB |
| 10 | Financial Close | n.a. |

Source: AEDB 2009

- **AEDB**: Alternative Energy Development Board
- **NEPRA**: National Electric Power Regulatory Authority
- **NTDC**: National Transmission and Despatch Company

# Our 1st successful touchstone in Pakistan

## FFC project owner, contractor structure

**The customer**

• Fauji Fertilizer Company is the largest fertilizer producer in Pakistan, with 60% market share. With intention to diversify its business with a strong commitment in the renewable energy arena, FFC embarked on a 50MW wind project in Jhimpir, Sihdh.

**The consultant**

• Fast track to initiate the project studies within 6 months of land acquiring, including wind assessment, topographical survey, prelim. geo-technical survey, transportation study, electrical grid study, and feasibility study

**The EPC contractor**

• FFC project bidding started **in May, 2009**. Bidders include Dwind, Sinovel, Goldwind, Siemens, GE and Nordex. Nordex won the bid and have the **contract concluded in Mar. 2010**.

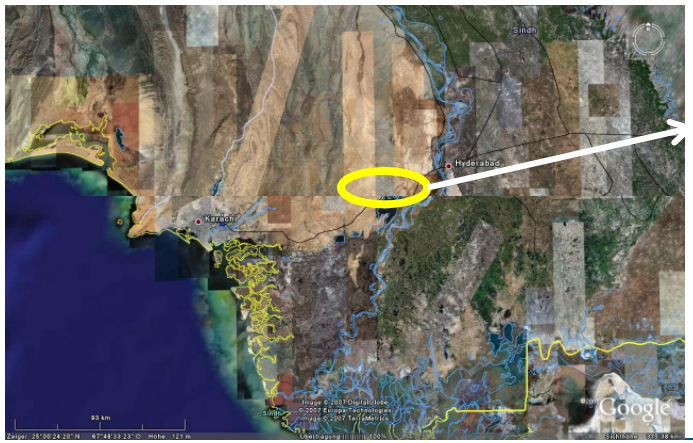
**The EPC sub contractor**

• **Descon Engineering:** a multi-disciplinary engineering, construction and manufacturing company.

• **Scope of work for the consortium:**
- **Nordex:** turbine supply, transportation and installation, 3rd party inspection, site management, commissioning, 2+3 years warranty
- **Descon**: tower production, civil work, and BOP

# FFC project profile

## A 50MW project in Gharo - Keti Bander – Hyderabad wind corridor


- **Project location: Sindh Province, South-eastern** part of Pakistan between Hyderabad and Karachi, approximately **100km inland from the coast** in a **semi-desert area** with rare vegetation.

- **Topographical situation:** a wide plain between the river Indus and a more hilly region westwards.

- **Wind resources:** mean wind speed of **7.8m/s at 80m height, an IEC 2** site

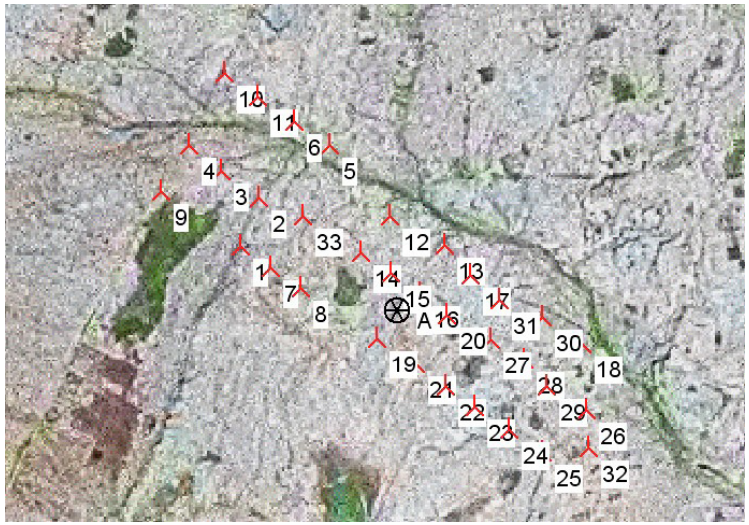
- **Temperature:** average annual temp is **27°C, 41.9°C maximum**

- **Grid-connection:** the wind farm connected to the main electrical network of Pakistan through a local grid.

- **Turbine chosen: Nordex S77/1500kW HCV**

# 2. Wind resources assessment

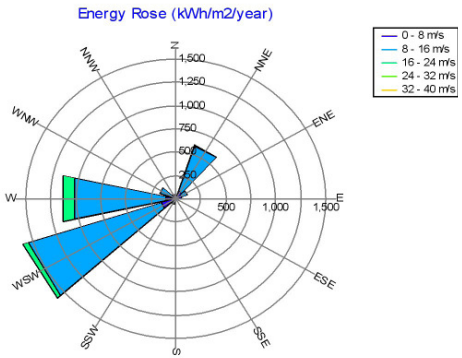
## Wind resources and site conditions

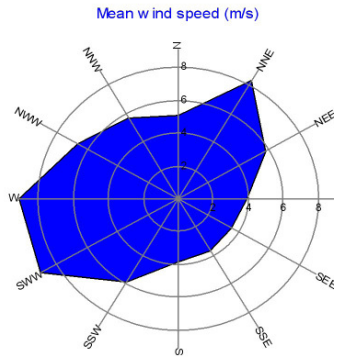


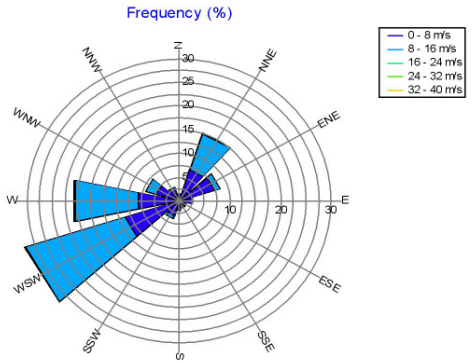

- LAHMEYER INTERNATIONAL Performed the wind measurement.

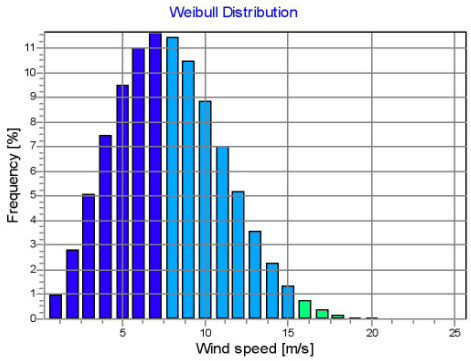
- The wind measurement data currently available from the AEDB gathered from the Nooriabad weather station.

- An 80m wind mast installed on FFC site.
- Air density at hub altitude: 1,179kg/m³
- Annual mean temp. at hub alt.: 21.7 – 21.9°C
- Ambient turbulence level: 4.7-14.7%



# 3. Financial model – project financing

# Financing environment

## Government provides a supportive incentive environment for wind

- **Project by project tariff determination**

- Elimination of wind risk inn certain areas (risk of variability of wind speed)
- Guaranteed electricity purchase
- Grid provision is the responsibility of the power purchaser, which eliminates the investors' risks in getting grid connection
- Attractive tariff (cost plus with up to 17% ROE), indexed to inflation & exchange rate variation (Rupee / Dollar)

- **Other incentives**

- Carbon credits available
- No import duties on equipment
- Exemption on income tax / withholding tax and sales tax
- Permission to issue corporate registered bonds.

- In October 2011, Pakistan introduced a FIT scheme that is planned to be available only for 2012. It is set **at PKR 12.61/kWh (€0.105/kWh) for foreign-financed** projects **and PKR 17.28/kWh (€0.143/kWh) for locally financed** projects and is limited to a total of 1,500MW.

## General practice in Pakistan

- **Ratio**

20 – 30% Equity, 70 – 80% Debt

*( in Project FFC 75:25)*

**Investors / Developers**

Large private companies / Groups
Pakistani investment funds
Foreign investment funds
Private equity

**Domestic Lenders**

- ALHabib Bank
- Islamic Commercial Bank
- etc.

**Foreign Lenders and Guarantors**

Asian Development Bank
Islamic Development Fund
Hermes
China EXIM Bank
ICBC

# 4. Project site issues

# FFC project execution

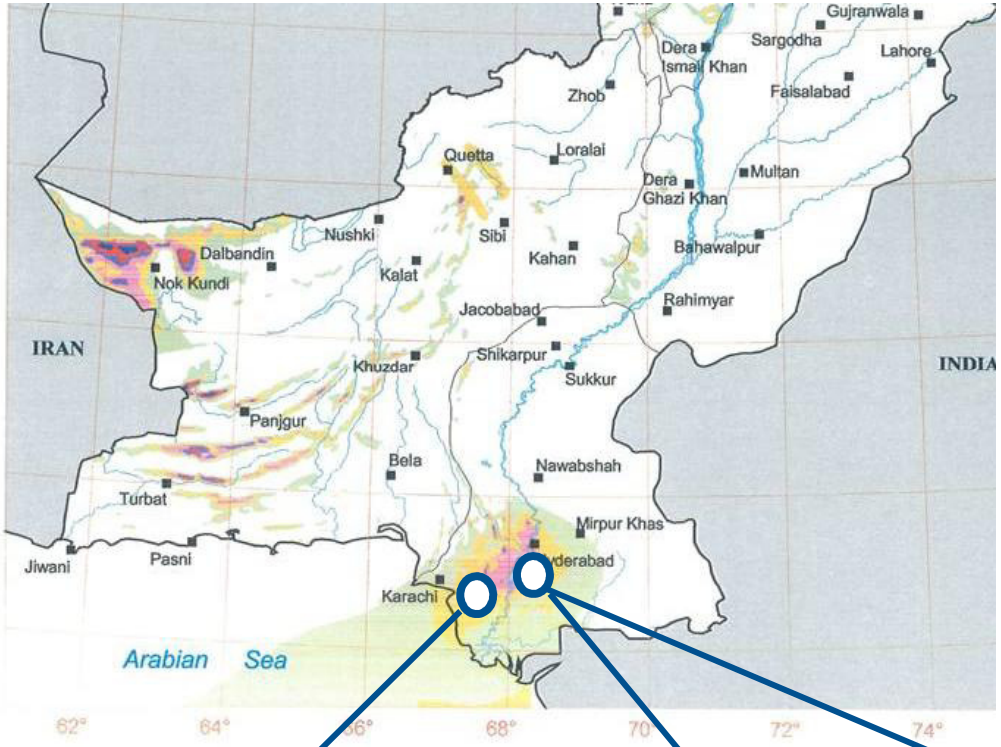
## The span of project execution before the warranty starts

| Task | Timeframe |
|---|---|
| Contract award | 03/2010 |
| Civil work | |
| Nacelle / Blade production | |
| Tower production | |
| Foundation | |
| Installation of WTG | |
| Mechanical completion | |
| Grid connection | |
| WTG Commissioning | |
| 500hrs maintenance | 09/2012 |
| Warranty period | 2+3 years |


- Land acquisition through Alternative Energy Development Board
- Construction issue: limited suitable local cranes; all construction equipments and skills available locally
- Transportation: relatively straight forward, to port Qasim and then by road to the sites

# Nordex other projects in Pakistan

**5 EPC projects with capacity of 250MW by using Nordex N100/2500, a certified IEC 2 turbine, to be completed before 2013-14**




Investors:

**FF:** Fauji Foundation

**FFC:** Fauji Fertilizer Company

**Gul Ahmed:** Gul Ahmed Energy Ltd.

**YEL:** Yunus Energy Ltd. (Lucky group)

**Metro:** Metro Power Co. Ltd. controlled by Gul Ahmed Energy Ltd.

**Gharo**
FF/ FWEL I: 20*N100
FF/ FWEL II: 20*N100

**Jhimpir**
FFC: 33*S77
Gul Ahmed: 20*N100

YEL: 20*N100
Metro: 20*N100

# 5. Project results – risks and opportunities

## Risks and opportunities

### Risks

• Country risks:
- General exposure to political-religious acts of violence
- Financial situation is improving

• Technical risks:
- High temperature on the site, occasionally rise above 40°C, a hot climate version with cooling system and increased ventilation necessary for the turbine.
- Unknown grid condition and impact on turbines

### Opportunities

• Huge demand for power. Planned installation till 2016

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Acc. |
|---|---|---|---|---|---|---|---|
| Government Target | 0 | 300 | 500 | 500 | 300 | 300 | **1900** |
| Nordex forecast | 0 | 100 | 250 | 300 | 300 | 300 | **1250** |

• Supportive policies and incentives
• Low land costs, high availability of land in good wind areas
• Investors more focused on quality products and cost per kWh

Source: Pakistan government website

MANY THANKS FOR YOUR ATTENTION.

**Nordex Asia**

Rm. 808, First Shanghai Center, No. 39 Liangmaqiao Rd., Chaoyang
Beijing, China
Telephone +86 (10) 8453 5188
Fax +86 (10) 8453 5158
E-Mail info@nordex-online.com