

Case Study: Huaybong Windfarm, Thailand

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1a. Background of the Project

- 207 MW windfarm in Korat province, Thailand
- Groundbreaking July 2011, full operation scheduled for February 2013
- First private windfarm in Thailand; currently the largest going ahead in South-East Asia
- Owned by Chubu, Ratchaburi, WEH etc
- Financed by local lenders; Kasikorn Bank, Siam Commercial Bank

1b. Planning Phases

- Land rights complex due to state ownership; lack of precedent for
 - Wind farm in agriculturally designated land
 - Long term leases assignable to Lenders
- Community relations key; stumbling block for many other developers
- First-tier international consultants used
- High uncertainty in wind resource
- Good port and access roads; no major civil infrastructure barriers
- 75 km transmission line (115 kV) and utility grid reinforcement a schedule constraint

2. Wind Resource Assessment

- Rolling hills – reasonably simply terrain
- 10 masts on site at peak
 - 80-100 m
 - Erected from May 2008 to Dec 2009
 - 6-7 m/s wind speeds across site
 - Majority of energy at nights (off-peak)
 - Variation during day and by month
- Poor long term data
 - Met station readings unusable; low data recovery and inconsistencies
 - Data from government demonstration begun in March 2005 does not reduce overall uncertainty significantly
- 20% one-year uncertainty not unusual in Thailand
 - Long-term wind data main driver of uncertainty

3a. Turbine

- Key data for selected turbine: Siemens SWT-2.3-101

Parameter	Value	Parameter	Value
Rated Output	2,300 kW	Gearbox	Multi-stage
Concept	Variable Speed Pitch Controlled	Gearbox Manufacturer	Winergy
Generator	Squirrel Cage Induction Generator	Blade Length	49 m
Converter	Full scale	Blade Weight *	12.5 tonnes
Cut-in wind speed	3-4 m/s	Rotor Weight *	67.1 t
Rated power at	12-13 m/s	Nacelle Weight *	85.4 t
Cut-out wind speed	25 m/s	Tower Weight *	273.6 t

3b. Turbine

- Low “specific rated capacity” best for Thailand’s moderate windspeeds
 - If IEC class 4 still existed, Thailand would be an ideal market!
 - New turbine models coming to market, still limited track-record when financing in 2010
- Limitation on number of available turbine footprints, for land type
- At the time, Siemens machine offered right balance of
 - Turbine capacity, 2.3 MW
 - Rotor diameter, 103 m
 - Track-record
 - Competitive price

4. Financial Profile of Wind Project

Revenue:

- Peak/Off Peak tariff
 - Average for wind
~US¢8.6/kWh
- Incentives
 - “Adder” of
~US¢11.7/kWh
 - Totals ~US¢20.3/kWh
- CDM played no role
- Capital costs of USD 390 million
 - USD 1.87 million per megawatt
- Tax incentives
 - Corporate tax exemption for years 1-8
 - 50% corporate tax years 9-12
 - Import duty relief on equipment

5a. Project Siting Issues and Contracts

- Land Acquisition Issues
- Noise
 - Regulatory limits not strict (either on total or tonal noise)
 - Still need to be a good neighbour
- Telecommunications interference
 - No clear regulatory framework
- Managing neighbors
 - Large team to manage land use and other community concerns
 - Grievance mechanism during construction period
 - Community/visitor centre to be provided
 - Community funds
 - For all power within Thailand
 - Dedicated for the project

5b. Project Siting Issues and Contracts

- EPC contractor selection
 - Turbine Supply by Siemens
 - Balance of Plant by Demco
- Contract with utility:
 - Standard form for all renewable generators
 - No compensation in the event of grid outage
- Two 115 kV substations and 75 km line extension in BOP scope
- 115 kV network reinforcement by EGAT
- Interconnection will be a first
 - Grid operator standards for inverter based generators still evolving

6a. Pictures of the project



6b. What was fun and rewarding?

Rewarding

- Paving the way for future projects by overcoming first of a kind hurdles
 - Regulatory
 - Financing
 - Construction skills
 - Operation skills

Fun

- Best is still to come... when the first turbine goes up!

6c. What was frustrating?

- Project was long in gestation because of the first-of-a-kind issues
 - Difficult to convince stakeholders of a new kind of project
 - Regulatory issues still to be resolved to clear the way for future projects
- Mediation of contractor and community interests an ongoing challenge
 - Dust suppression
 - Land use / design changes
 - Crop damage etc

6d. Wish List to Accelerate Wind Development

- What Government can do?
 - Improve clarity of “priority dispatch” terms for renewables
 - Improve information on EGAT load flow scenarios
 - Provide clear mechanism to declare lack of telecoms / radar interference
- What the industry & others can do?
 - Develop / disseminate good quality mesoscale modelling for Thailand
 - Advocate to government on regulatory hurdles
 - Develop turbines suited to Thailand’s wind speed regime
 - Build local expertise