



**Azure International  
Technology & Development (Beijing) Limited**

## **Wind Project Finance in China a quick snap-shot**

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Research Director**



# Development activity

## Summary



**2.6 GW installed**

**~ 100 “projects” operating**

**1.4 GW in 2006 alone**

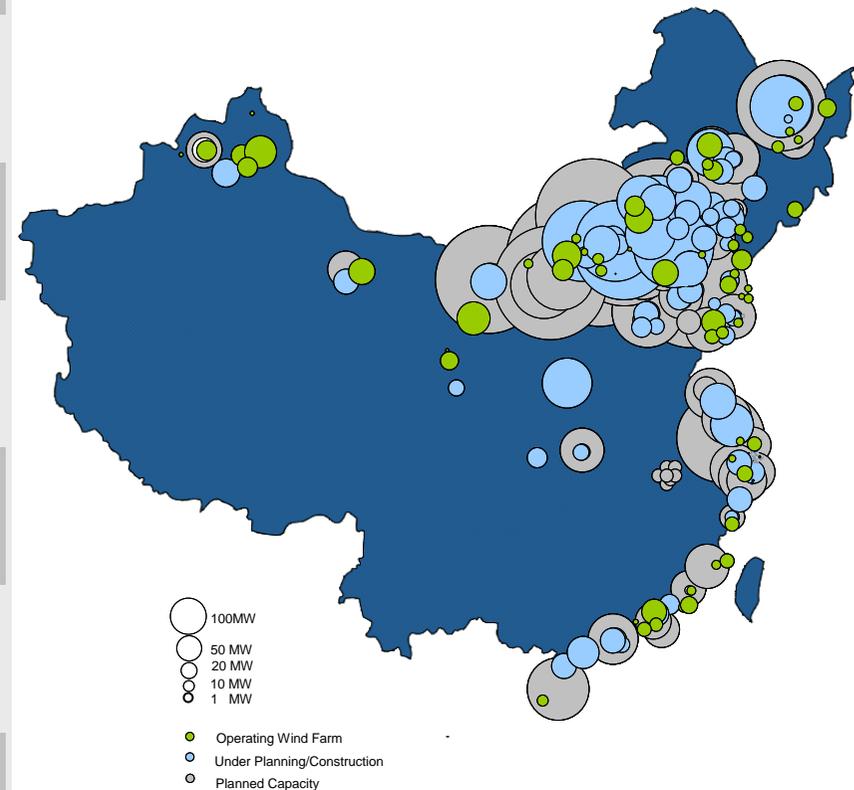
**~8 GW of turbines ordered**

**~350 separate installation orders**

**~200 active project dev Cos.**

**~ 30 parent Cos. represent 90% of 2006 project installations and turbine orders**

### Accelerating development activity



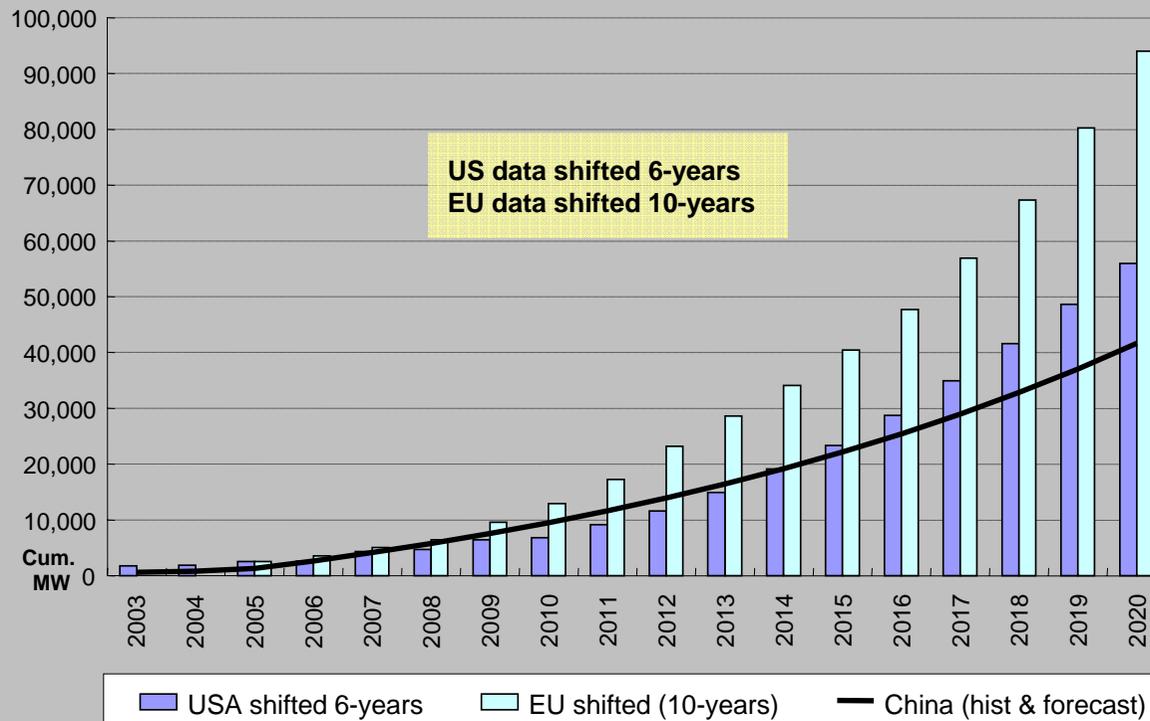
Source: Azure International  
Note: Activity summary as at 1H 2006

# Accelerating development

40 GW by 2020 = US\$ 24bn debt & US\$ 6bn equity

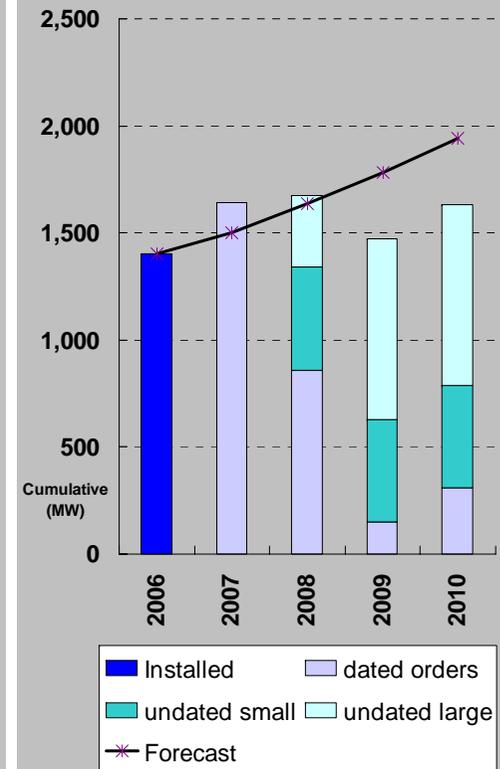


## New capacity: similar up-take to EU 15 & USA



Source: GWEC, BTM for EU & US forecasts, Azure International forecast for China

## WTG orders 7.8GW (incl de-facto "policy orders")



Source: Azure International

# Who will finance?

## The status quo



- **Broad power sector interest**
- **Established players have balance sheets, relationships with banks, and can get 80% debt with 20% equity financing**
- **So far very little private or foreign equity or foreign institutional lending although project sponsors and banks are interested**

### Leading wind players according to development activity

| Rank | Equity owned cap<br>YE2005<br>(kW) |       | Equity owned cap<br>YE2006<br>(kW) |       | Equity weighted<br>cap & orders<br>(kW) |       | Equity weighted cap &<br>near-term development<br>(2007~2015)<br>(kW) |       |
|------|------------------------------------|-------|------------------------------------|-------|---|-------|---|-------|
|      | Co.                                |       | Co.                                |       | Co.                                     |       | Co.   |       |
| 1    | Longyuan                           | 332   | Longyuan                           | 700   | Longyuan                                | 2,715 | Longyuan  | 2,388 |
| 2    | State Grid                         | 273   | State Grid                         | 366   | Huaneng                                 | 1,115 | Huaneng   | 1,356 |
| 3    | Ningxia Power                      | 112   | Datang                             | 316   | Shenhua                                 | 833   | Datang  | 1,319 |
| 4    | Datang                             | 77    | Ningxia Power                      | 157   | Datang                                  | 819   | Shenhua   | 1,070 |
| 5    | Huaneng                            | 63    | CECIC                              | 129   | Huadian                                 | 680   | Shandong Luneng   | 1,019 |
| 6    | Guangdong Yudean                   | 52    | Shenhua                            | 124   | Guangdong Nuclear                       | 600   | Guangdong Nuclear   | 675   |
| 7    | Shenhua                            | 50    | Huaneng                            | 104   | Ningxia Power                           | 480   | Huadian   | 576   |
| 8    | Inner Mongolia Power               | 44    | Guangdong Yudean                   | 100   | State Grid                              | 390   | CECIC   | 529   |
| 9    | HLJ Huafu                          | 41    | HLJ Huafu                          | 71    | CPI                                     | 300   | State Grid  | 511   |
| 10   | Jilin Wind Power                   | 34    | HK Construction                    | 58    | CECIC                                   | 274   | Ningxia Power   | 381   |
|      | total:                             | 1,078 |                                    | 2,125 |   | 8,206 |   | 9,822 |
|      | percent of total activity:         | 85%   |                                    | 80%   |   | 79%   |   | 64%   |

Source: Azure International

Note: Big 5 domestic power producers highlighted in yellow

# Debt financing

## Key trends



- Period of transition towards “commercial lending”
- Low domestic interest rates (6.38%); no shortage of liquidity
- Relationship banking
- Risk adverse / look for name and balance sheet
- De-centralized geographic organizations lead to limited product specialization
- Few examples of limited recourse lending (concessions, 1 – 2 others)
- WTO opening of banking sector may be opportunity for international specialists
- 2006 wind cap may have increased by 1.4GW, but overall power generation increased by 105GW

### Lending to wind is a small niche within power sector lending

#### Big 5 cap expansion in 2006

|               | installed<br>2006 total<br>(MW) | installed<br>2006 wind<br>equity (MW) | wind<br>(% total) |
|---------------|---------------------------------|---------------------------------------|-------------------|
| Genco         |                                 |                                       |                   |
| Guodian Group | 9,394                           | 368                                   | 3.9%              |
| Huaneng       | 13,632                          | 41                                    | 0.3%              |
| Huadian       | 13,510                          | 20                                    | 0.1%              |
| Datang        | 12,405                          | 238                                   | 1.9%              |
| CPI           | 4,178                           | 0                                     | 0.0%              |

#### Estimated total costs for new generating capacity (Thermal US\$ 500/kW, Hydro US\$ 750/kW, Wind US\$ 1000/kW)

| Developer     | installed<br>2006 total<br>(US\$ Bn) | installed<br>2006 wind<br>(US\$ M) | wind<br>(% total) |
|---------------|--------------------------------------|------------------------------------|-------------------|
| Guodian Group | 4.9                                  | 367.7                              | 7.5%              |
| Huaneng       | 6.8                                  | 40.8                               | 0.6%              |
| Huadian       | 6.8                                  | 19.5                               | 0.3%              |
| Datang        | 6.3                                  | 238.3                              | 3.8%              |
| CPI           | 2.4                                  | 0.0                                | 0.0%              |

#### Estimated total borrowings by Big 5 for 2006 cap expansion (assuming 80% debt for all projects)

| Developer     | Loans assoc.<br>2006 cap. Installed<br>(US\$ Bn) | Loans assoc.<br>2006 wind<br>cap. Installed<br>(US\$ M) | wind<br>(% total) |
|---------------|--|---|-------------------|
| Guodian Group | 3.9  | 294.1   | 7.5%              |
| Huaneng       | 5.5  | 32.6  | 0.6%              |
| Huadian       | 5.5  | 15.6  | 0.3%              |
| Datang        | 5.1  | 190.6   | 3.8%              |
| CPI           | 1.9  | 0.0   | 0.0%              |

Source: Company data, Azure International

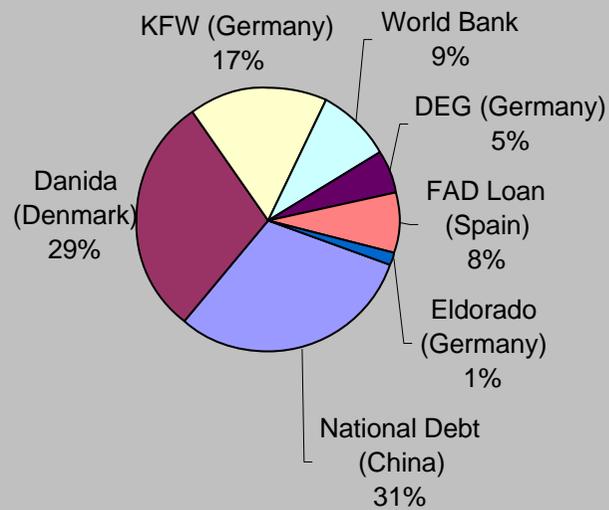
# Debt financing

## Short history of domestic lending to wind



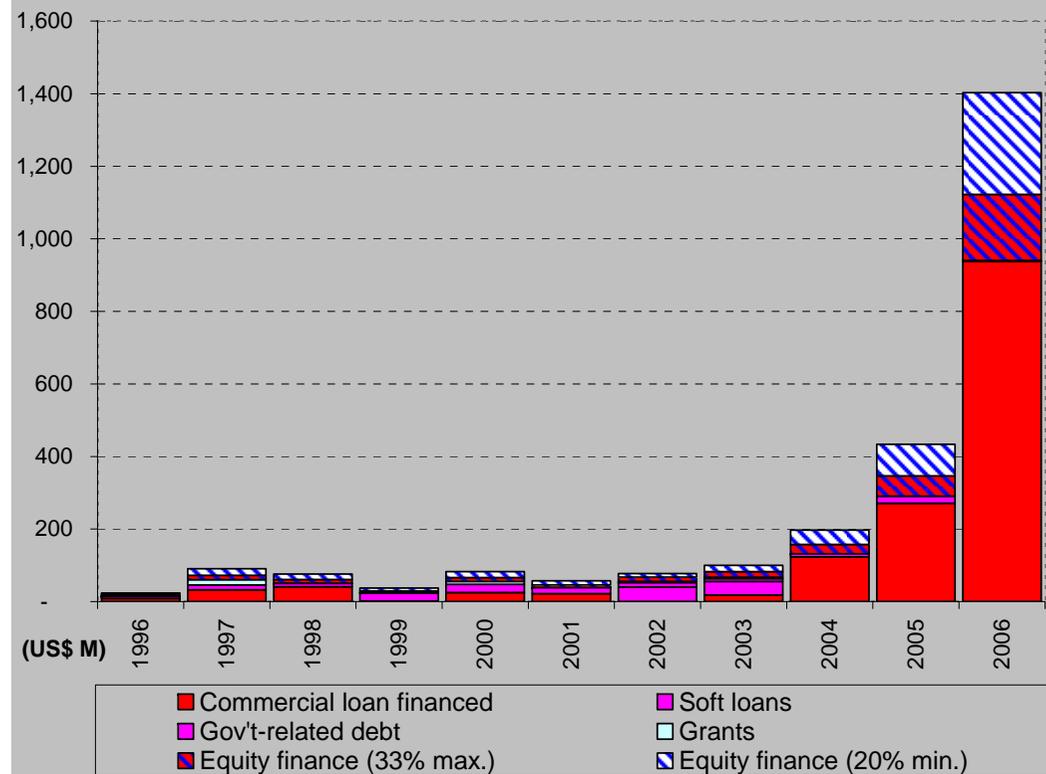
### Concessionary financing for large-scale wind

Cumulative loan support: US\$ 178M



Note: Cumulative grants of US\$ 33M also identified  
Source: Data from lending institutions

### Financing for estimated spending on new installations (estimated values at constant US\$ 1M/MW)



Source: Azure International estimates

# Domestic vs. foreign invested projects

## Analysis: 17 UNFCCC Registered CDM projects



### Model variables for comparison (sample cap. weighted ave)

|                                   |        |
|-----------------------------------|--------|
| Full-load hours (hrs)             | 2,271  |
| Feed-in tariff (RMB/kWh inc. VAT) | 0.5473 |
| Capital costs (RMB/kW)            | 9,219  |
| Emission factor (tce/MWh)         | 0.9431 |

### Domestic financing

Banking: Relationships

Interest rate: 6.38%

Gearing: up to 80% debt

CDM (adds approx RMB 0.06/kWh)

Tax: 33% unifying to 25%

### International financing

Banking: Commercial negotiation  
risk appropriation  
documentation  
(expertise: technical, legal and financial)

Interest rate: Commercial negotiation

Gearing: maximum 67% debt

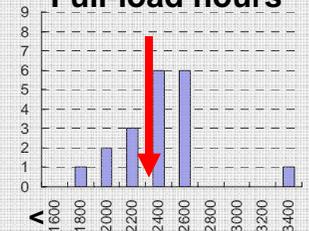
No CDM

Tax: 15% unifying to 25%

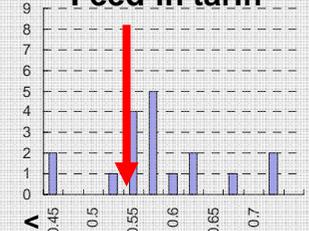
Project IRR: 10%  
Equity IRR: 14%

Project IRR: 9%  
Equity IRR: 10%

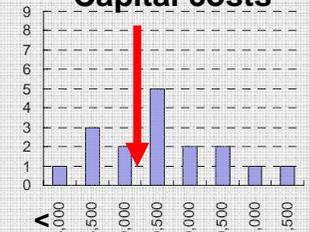
Full-load hours



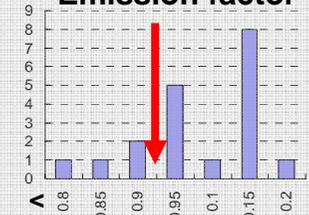
Feed-in tariff



Capital costs



Emission factor

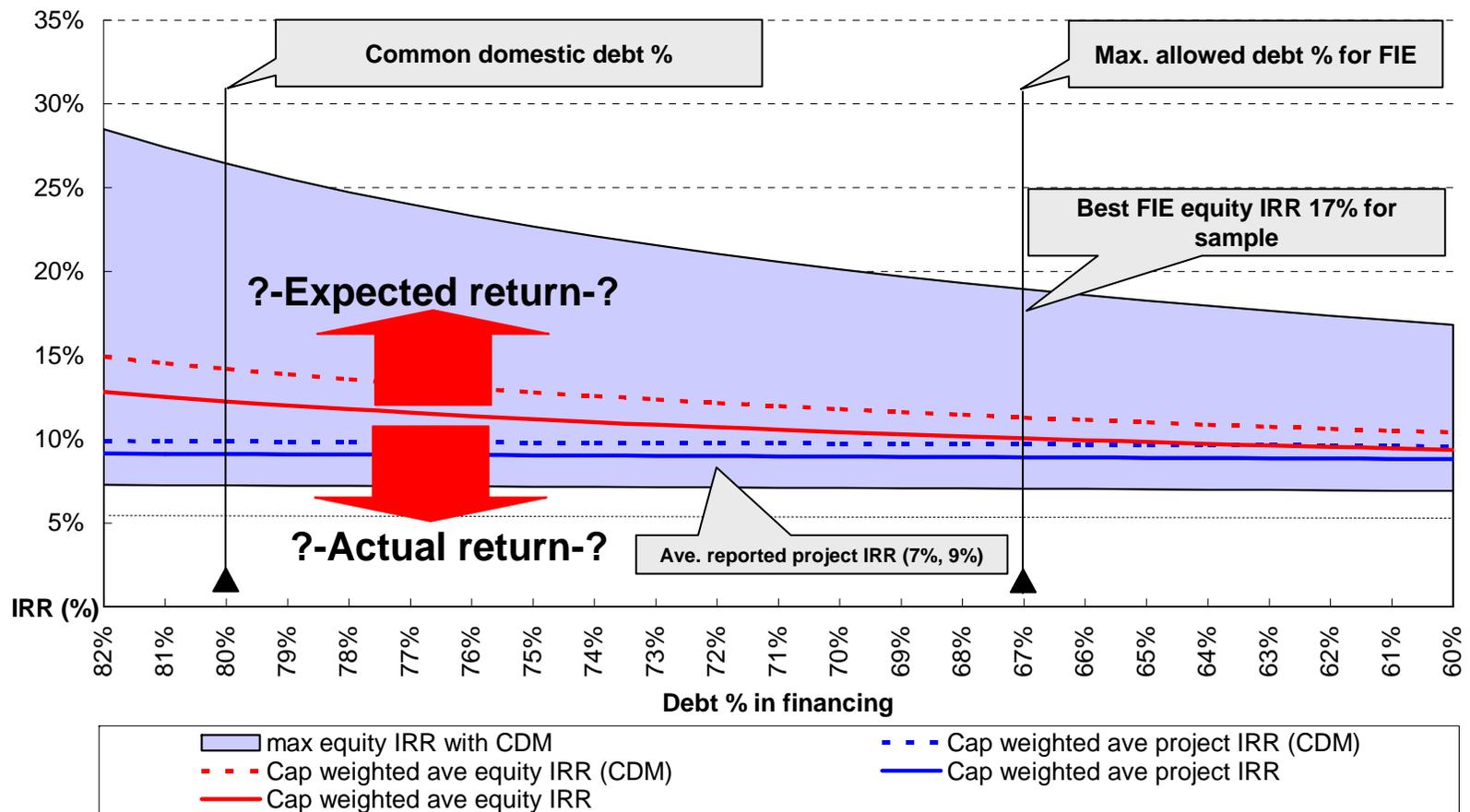


# Equity financing

Projects always worth more to domestic owners



Project & Equity IRRs based on 17 project sample (Leverage & CDM)



Source: Azure International analysis

REFF China 2007

29 – 30 March, 2007

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# Conclusions

## Where are the opportunities for international capital?



- **Local players have advantages, and most equity & debt will come from domestic power companies & banks**
- **Niches for experienced international developers & banks**
  - **Large or technically difficult projects**
  - **Regions encouraging foreign investment – Go west**
  - **Innovative financing structures**
  - **Early-stage risk capital**
  - **Minority partnership**

# Azure International

## Contact information



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