



Happy New Year!

Chinese wind turbine market:

Characteristics, experience, export potential

Winterwind

Ostersund, Sweden 12 February 2013

Live Presentation

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Azure International

- company summary profile



- A clean energy technology research & advisory, commercialization & investment boutique founded in 2003
- Based in Beijing and dedicated to leveraging the Chinese clean energy market and value chain into businesses with global potential
- Team's professional experience combines deep local and international cleantech business management; strong network of technical, financial and institutional partners
- Unique, in-house research/knowledgebase combined with hands-on execution capabilities in sourcing, operations and marketing
- Proven decade-long track record in commercializing clean energy technologies in China



Presentation overview

- outline

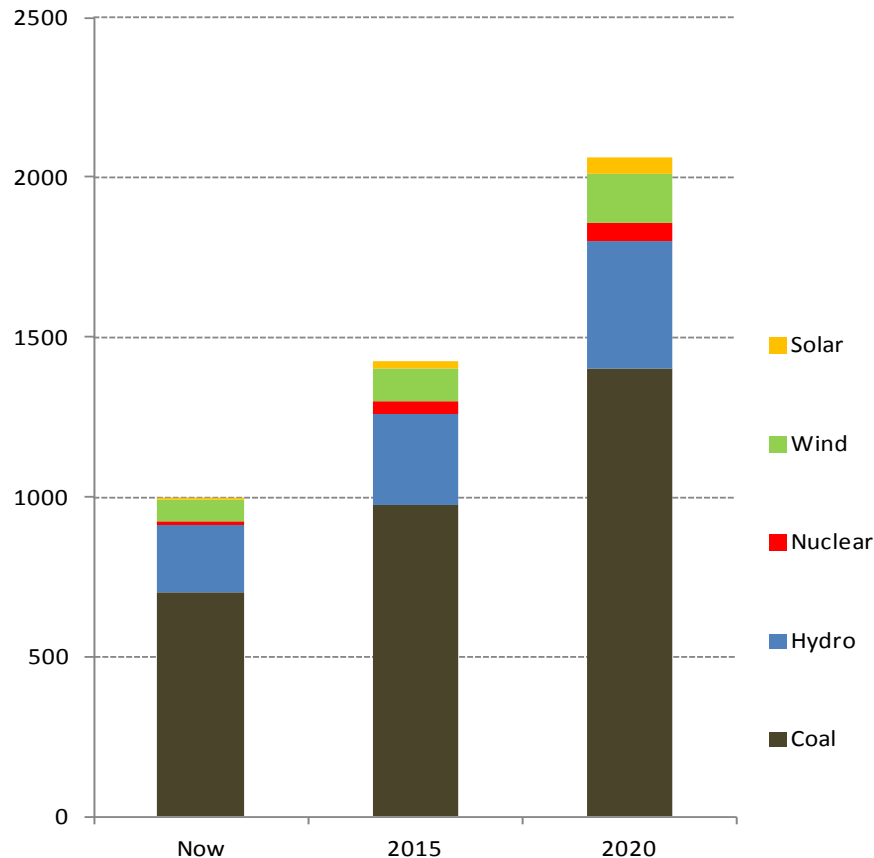
- (1) Introduction to Azure International
- (2) Capacity & potential in China
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- (5) Conclusions



Plans, pipelines, capital

- China plans to add 1.2TW generating capacity

Planned Power Generation Capacity (12th 5-year plan, GW)



Source: 12th 5-year Plan, SERC, Azure International estimates

Total funding need:

- RMB 2.6 Trn to 2015
- RMB 6.2 Trn to 2020

Wind funding needed:

- RMB 180 Bn to 2015
- RMB 340 Bn to 2020

Solar funding needed:

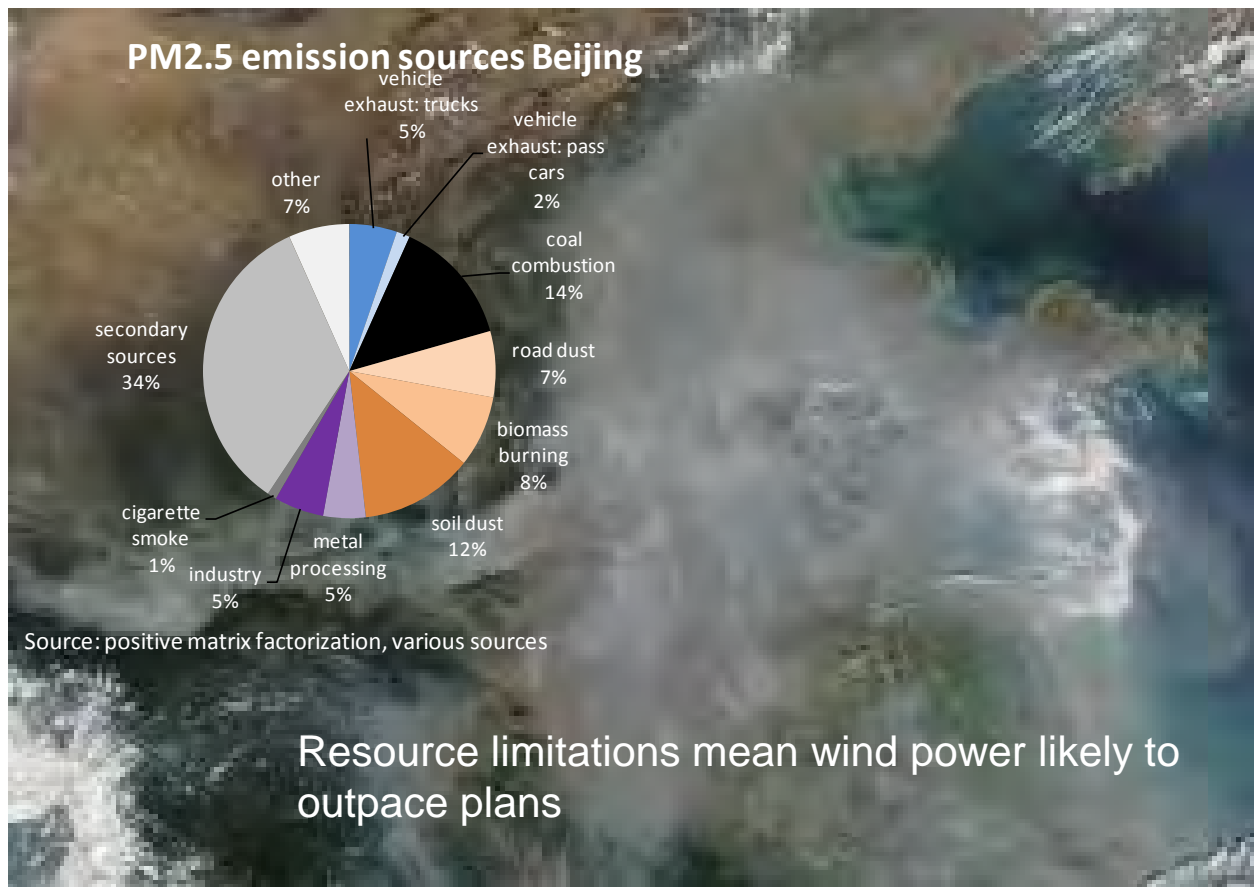
- RMB 190 Bn to 2015
- RMB 350 Bn to 2020

Plans, pipelines, capital

- China plans to add 1.2TW generating capacity



Adding 1.2TW generating capacity (mostly coal) poses an unprecedented environmental challenge already obviously problematic: Water, Air quality, Global warming...

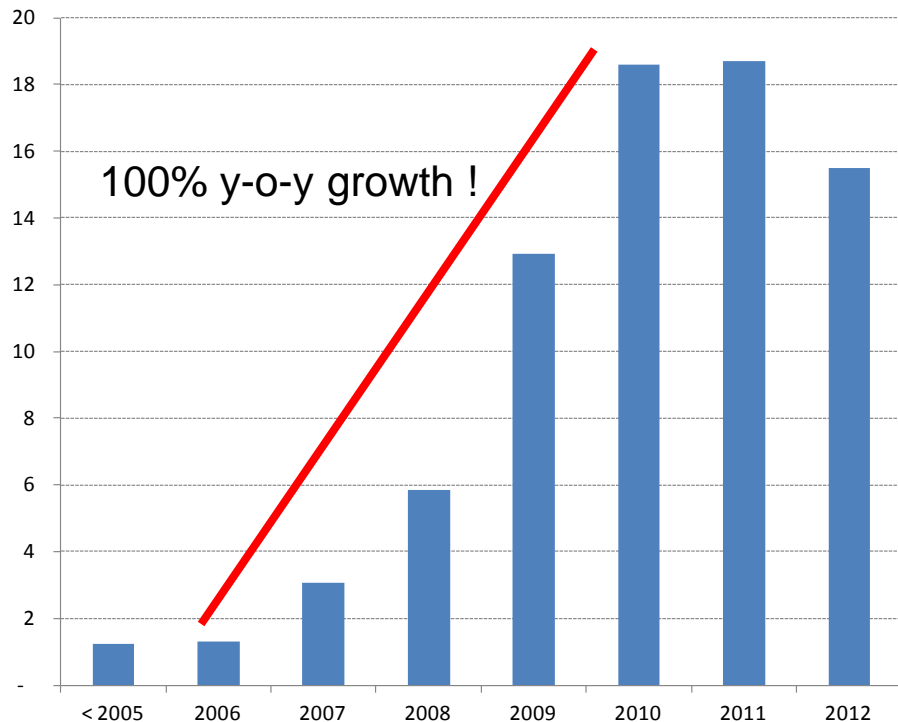


Plans, pipelines, capital

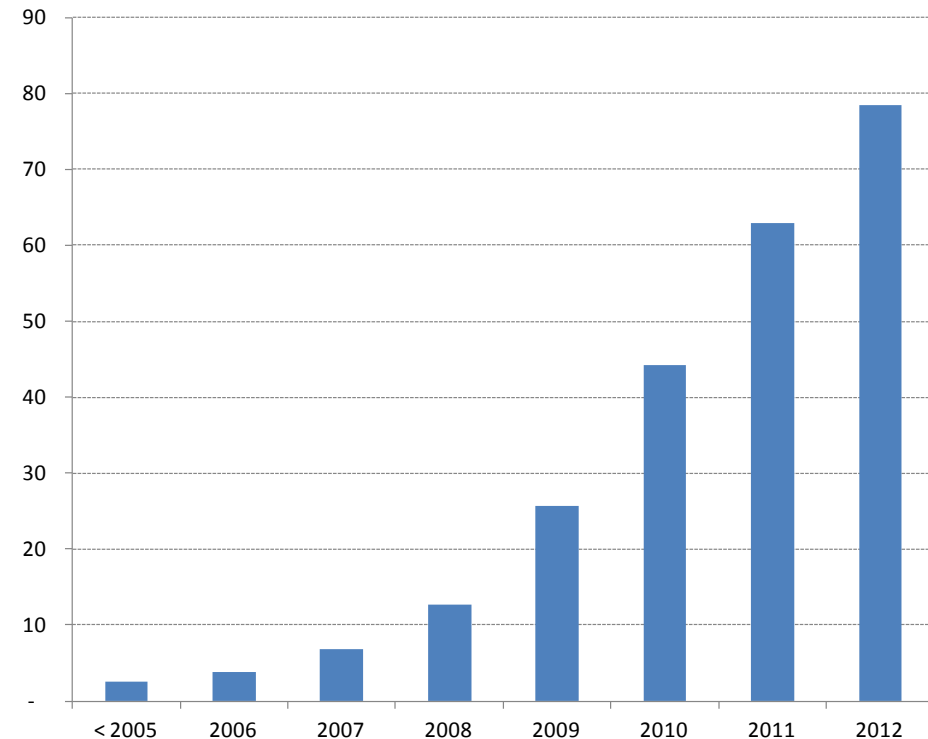
- renewable energy targets & pipelines

- China has seen an unprecedented scale-up and is now the operating the world's largest wind fleet

Installed capacity (GW, annual)



Installed capacity (GW, Cumulative)



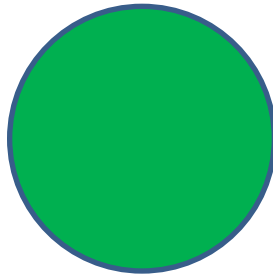
Plans, pipelines, capital - renewable energy installed

- Pipeline activity reflects economic transactions leading to capacity
- Wind power Installed base already world's largest

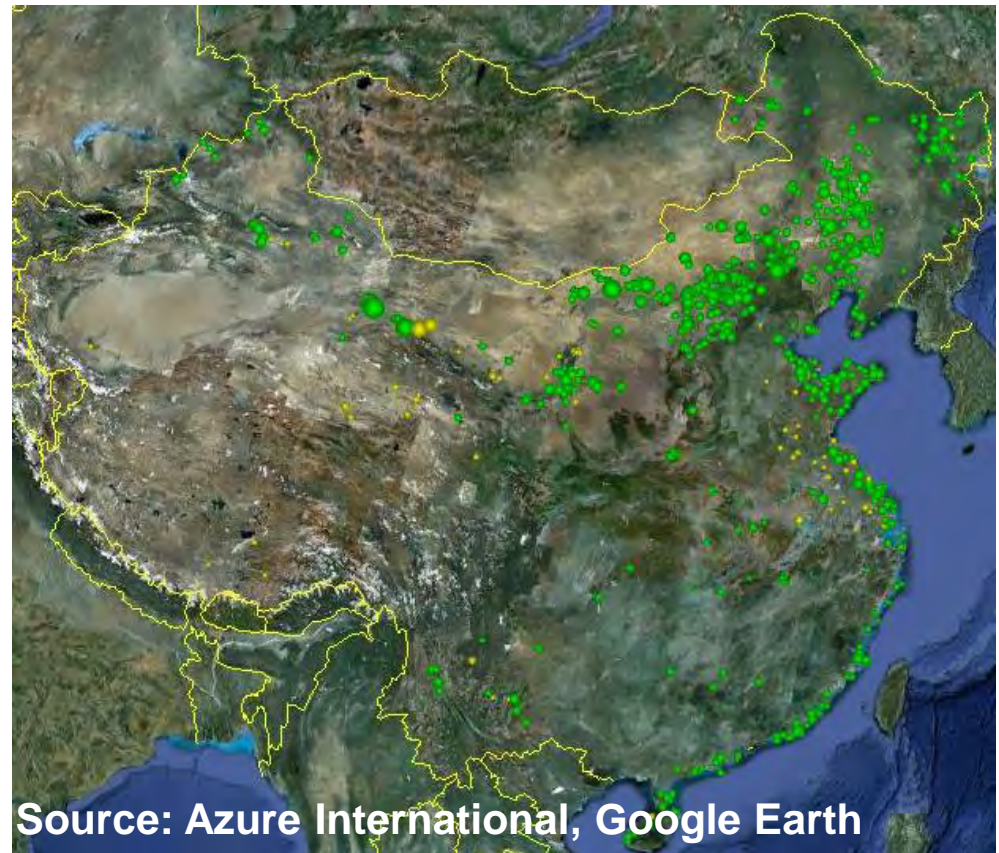
Solar PV 5+GW



Wind 70GW



Source: Azure International data



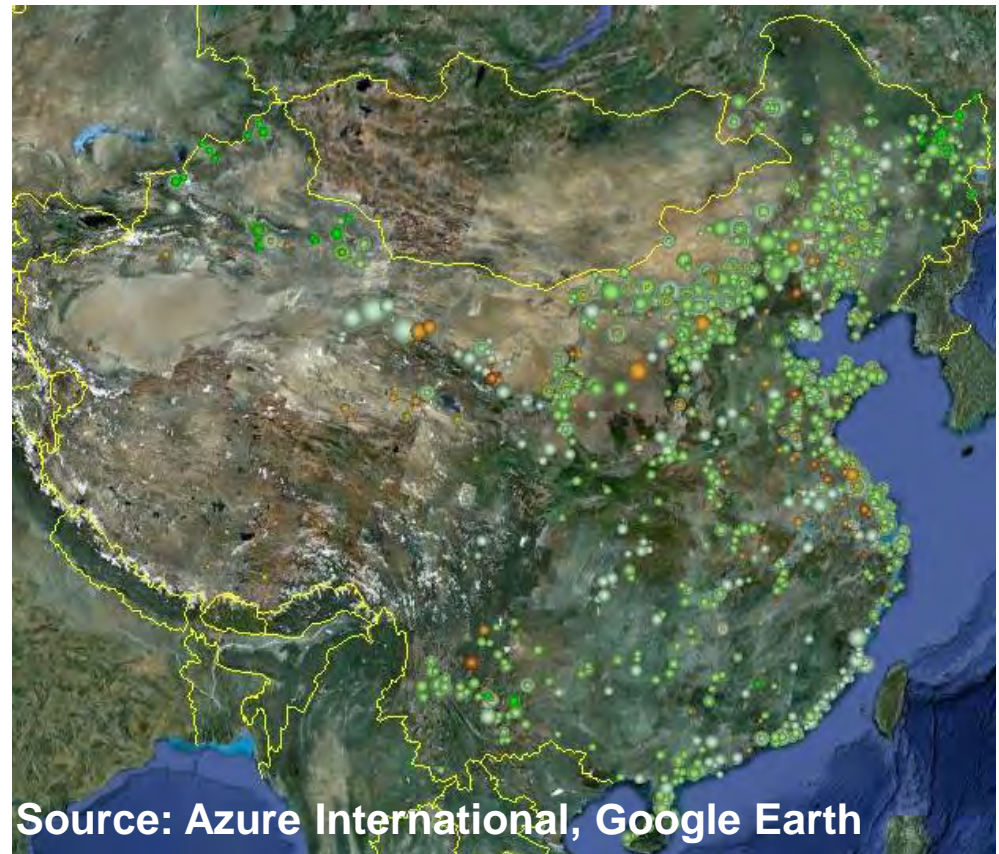
Plans, pipelines, capital - renewable energy under development

- Ongoing early development activity across the country indicates considerable further potential

Solar PV 85GW



Source: Azure International data

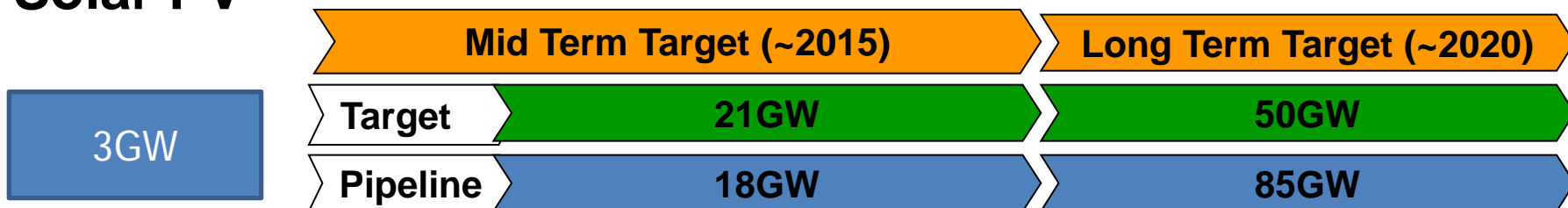


Plans, pipelines, capital

- renewable energy targets & pipelines

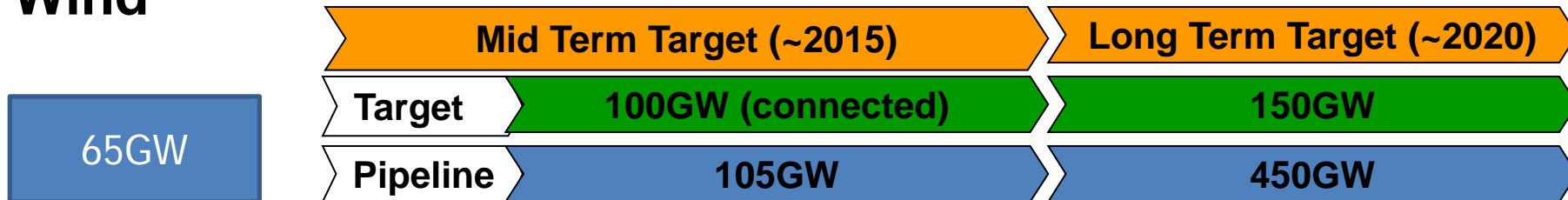
- Central targets and bottom-up pipelines intersect reasonably well and confirm economic interest in out performing capacity targets in the long run if feasible

Solar PV



Source: Azure International for pipeline data, targets from NDRC and other Chinese government planning authorities

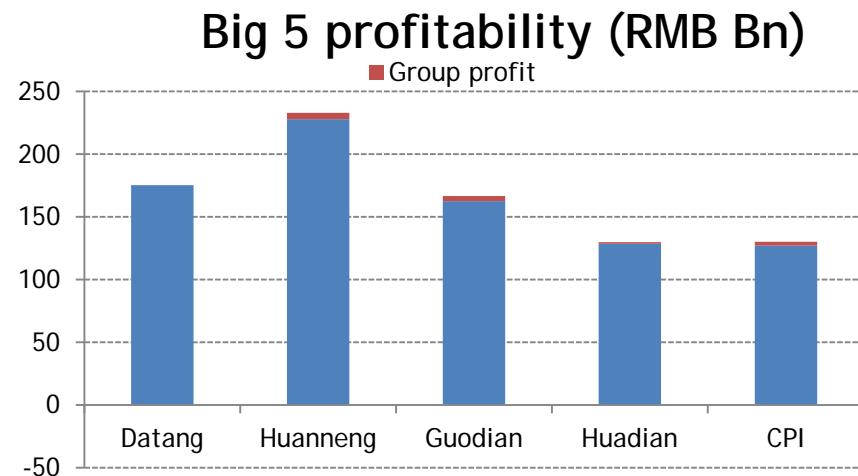
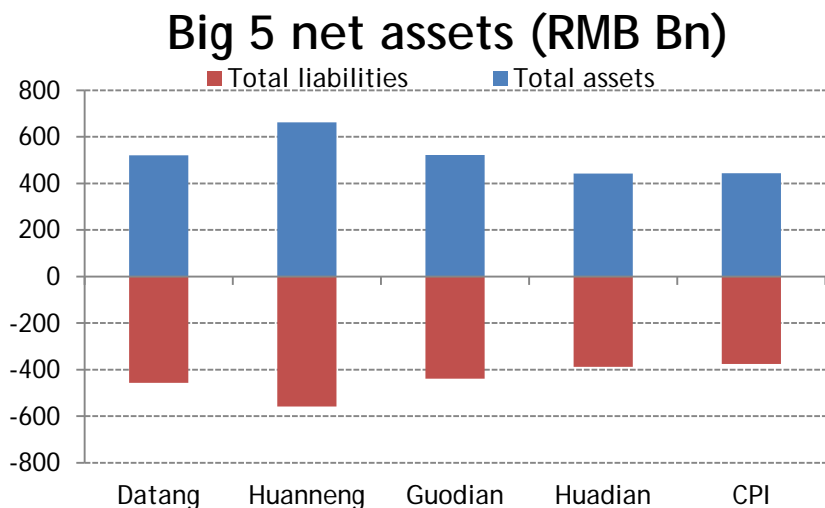
Wind



Plans, pipelines, capital

- China's big 5 generators

- Lots of assets (SOE groups total RMB 2.6Tr or US\$ 400Bn)
- Profits low (2010 net margins average 1.6%, Datang posts loss)
- All net profit practically invested in capacity additions (2010 RMB 14bn or US\$ 2.2Bn)
- Overall balance sheets weak (2010 $d/(d+e) \Rightarrow 80\%$)



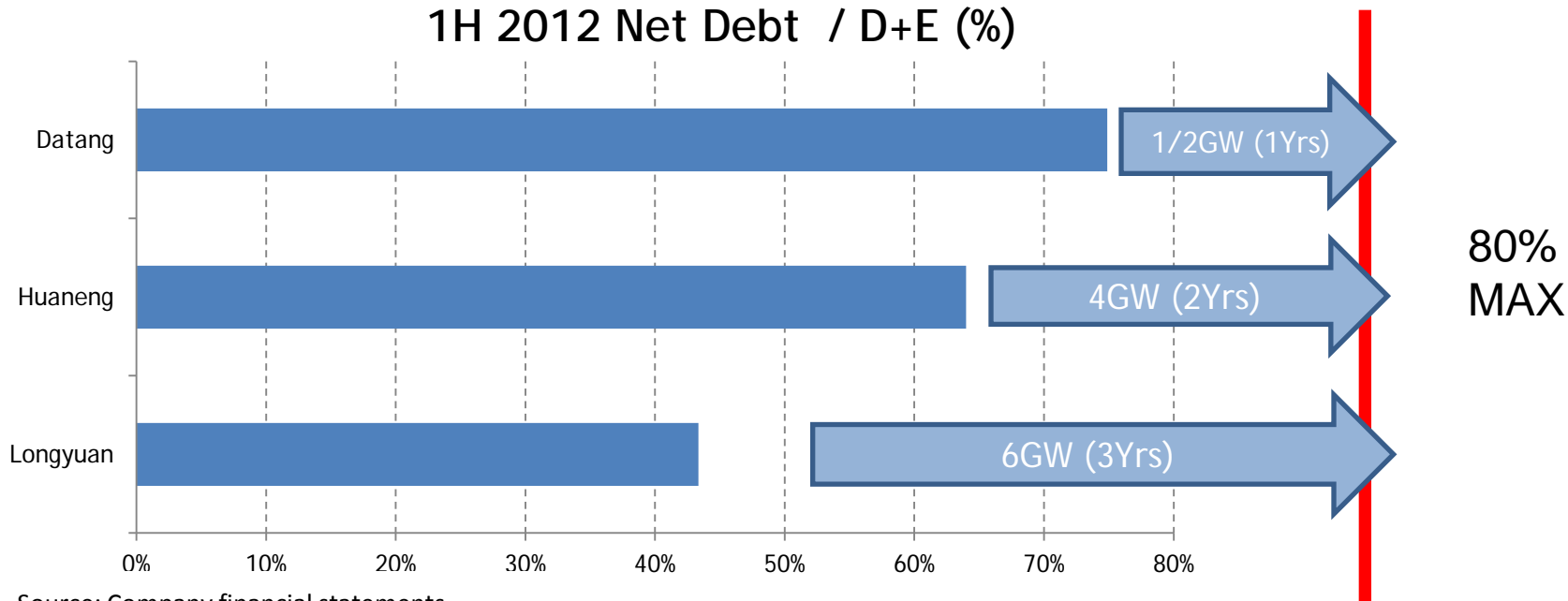
Source: public declarations y SOE group level companies, not audited or confirmed

Plans, pipelines, capital

- Hong Kong listed renewables subsidiaries

- Better capitalized with funds raised in HK IPOs
- Room for more leverage on balance sheets, but eventually capital is required for continued asset expansion
- Given current capital market conditions, companies will be trying to conserve capital

1H 2012 Net Debt / D+E (%)

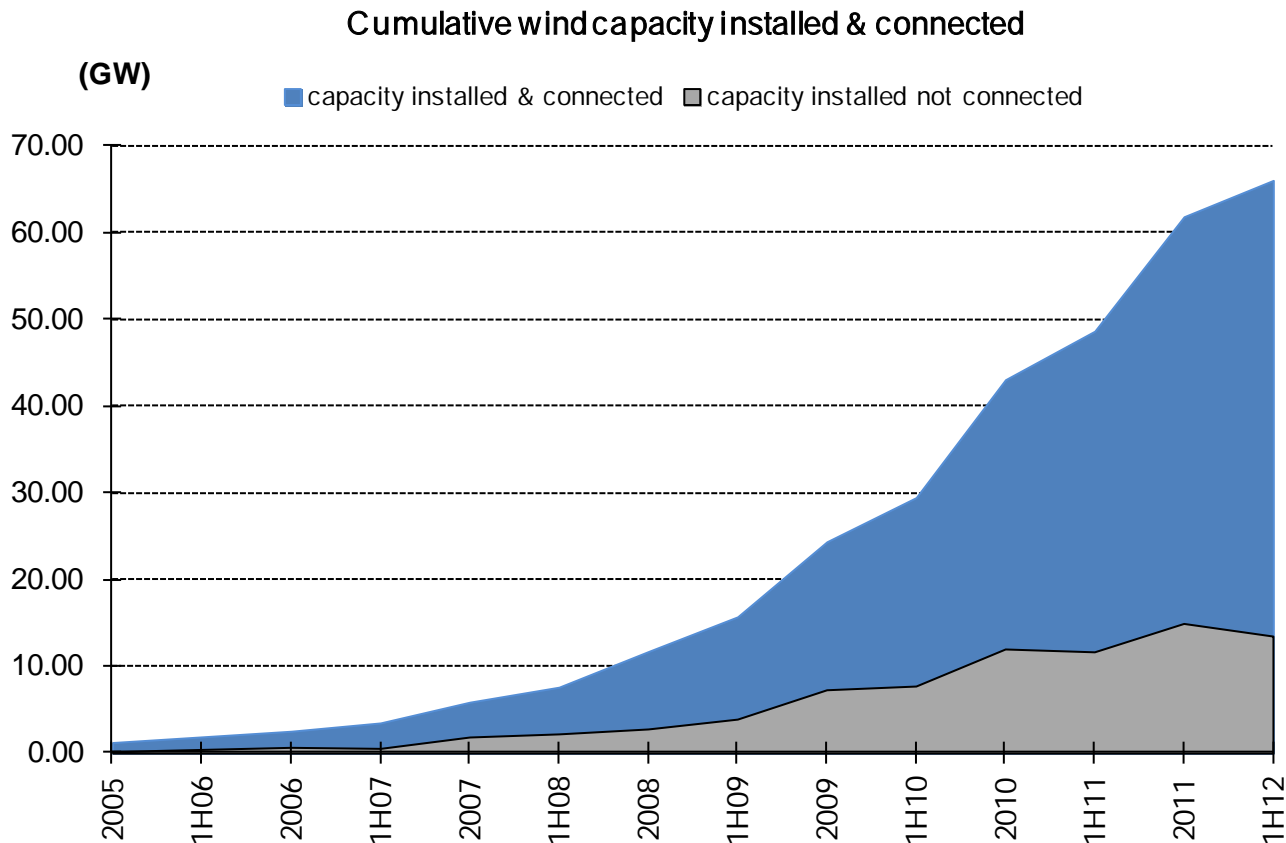


Source: Company financial statements

Plans, pipelines, capital

- surcharge & redistribution fails to deliver cash

- Interconnection delays likely caused by delayed cash reimbursement to deficit grids; ie lack of funding causes delays!



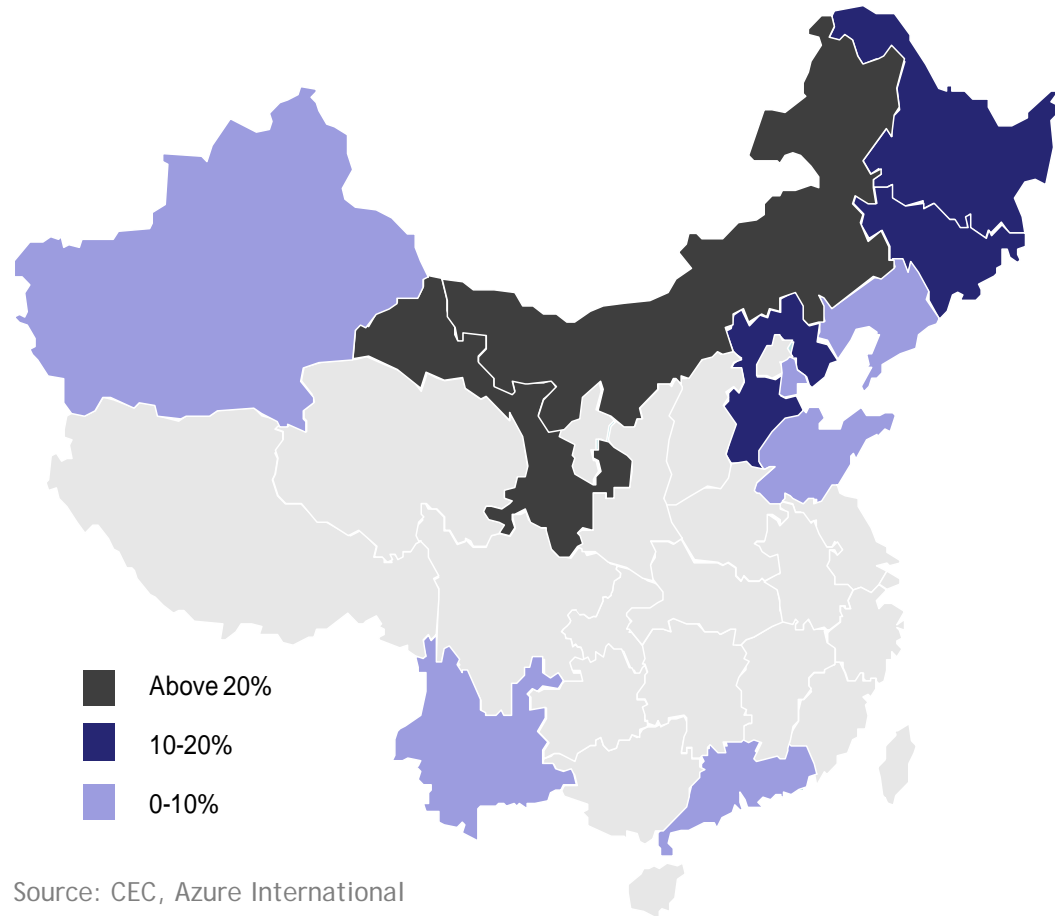
Source: Azure International

Plans, pipeline, capital

- surcharge & redistribution fails to deliver cash

- Curtailment is also correlated with degree of deficit under Surcharge & Redistribution mechanism
- Lack of funds also means economic uncertainty once grid connection is completed

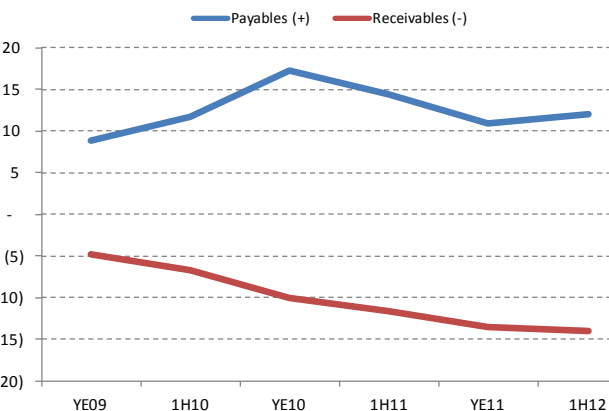
Curtailment by province (2009-2011)



Source: CEC, Azure International

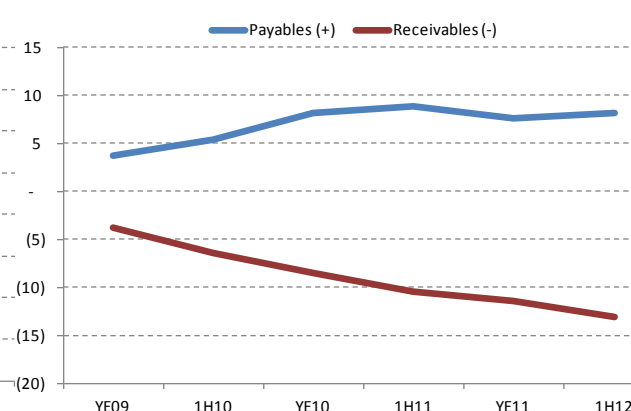
Plans, pipelines, capital - receivables in the value chain

Sinovel - receivables vs. payables (RMB Bn)



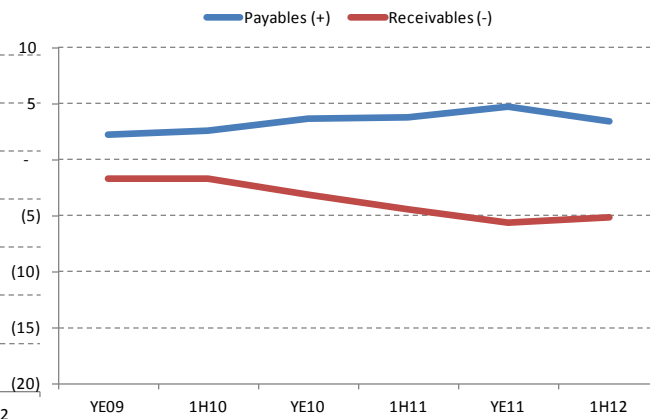
Source: Company financial statements

Goldwind - receivables vs. payables (RMB Bn)



Source: Company financial statements

Mingyang - receivables vs. payables (RMB Bn)



Source: Company financial statements

- Sinovel, Goldwind, Mingyang together represent 43% of all installed wind generation capacity as at end Oct 2012
- Knock-on effect clearly affecting working capital of equipment suppliers
- Payables less receivables already at RMB 9bn (neg) for Sinovel, Goldwind and Mingyang
- Market saw relatively stable installations in the timeframe
- 1H 2011 working capital funding increase basically locked-up all capital raised in previous IPOs of the equipment manufacturers



Plans, pipeline, capital

- borderline bankability caused by administration

Average plant age close to 1.5 years operating only, with most operating projects actively repaying long-term loans

70GW+ installed, financing 80% debt (2-year repayment holiday) puts sector exposure on banks at some RMB 280bn

- 7-year repayment and 6.5% interest means wind sector must repay RMB 50bn in fixed principal and interest payments p.a.

2012 sector revenue at 2k effective hours by WA FIT is RMB 78bn, with:

- RMB 46bn from the OGT, and
- RMB 32bn from top-up to FIT, of which

This leaves some RMB 50bn of timely received cash revenue for servicing debt payments

Further capacity expansion can't effectively be funded through retained earnings/cash; utilities must access (existing) equity

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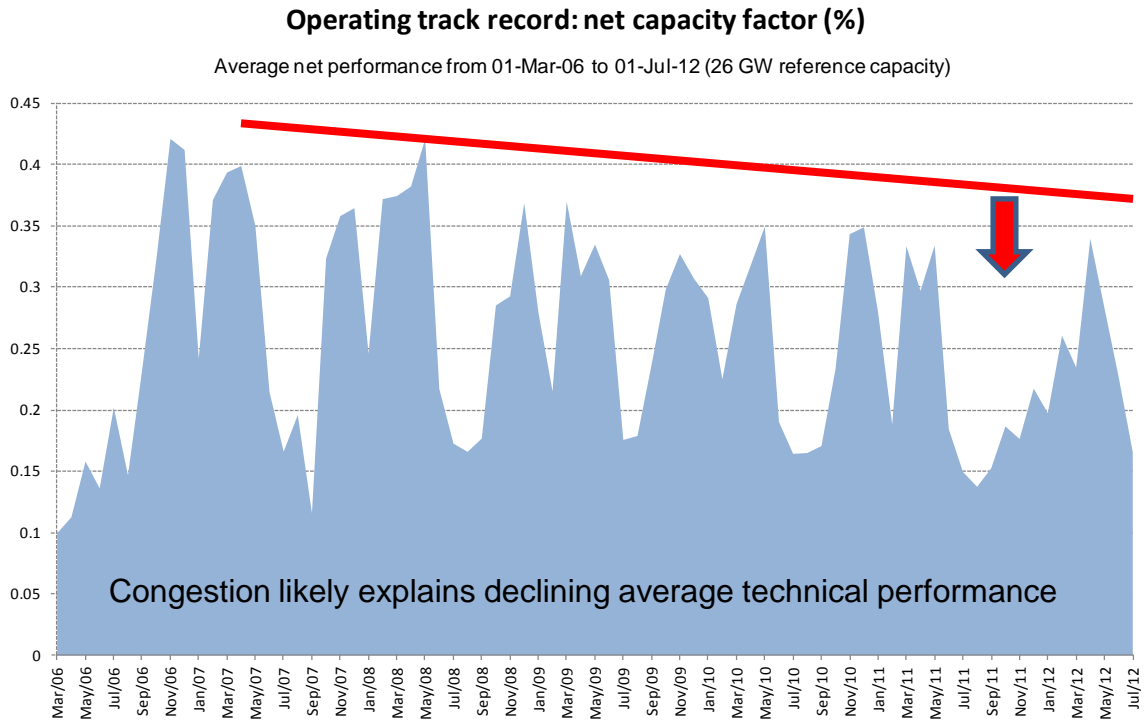
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Operating history in China

- overview

- Over 5 years operating history documented
- Azure International data shows turbines are operating reasonably well
- 5 GW shown; data set covers 20% theoretically available generation for market ('06-'11) shows net performance of 22%
- Can be compared to net results for Germany

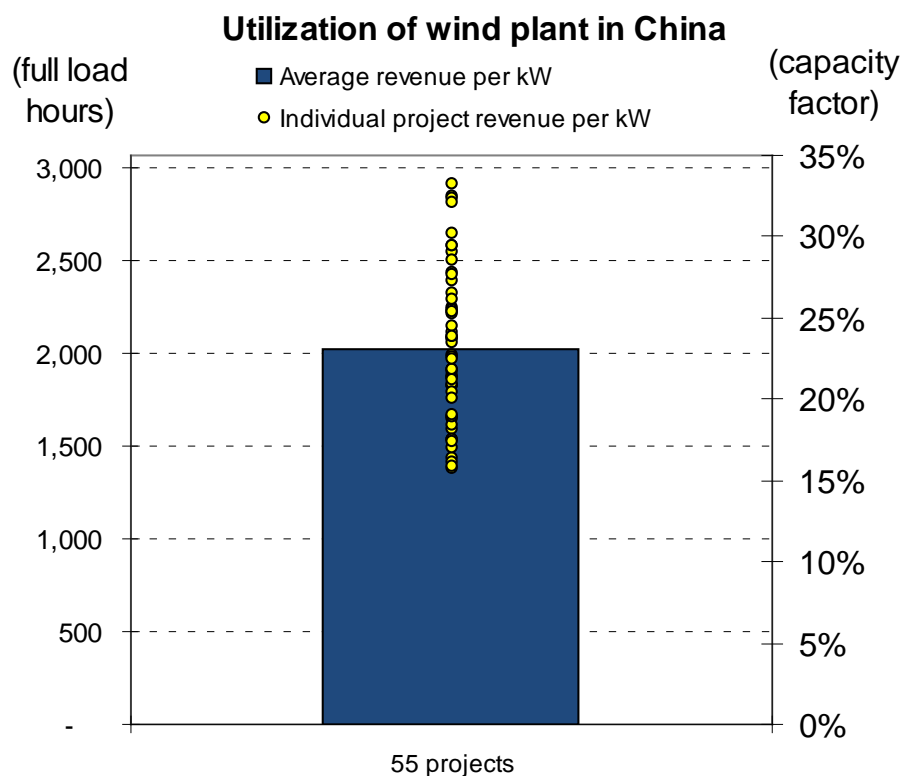
- Growing verifiable evidence of reasonably robust turbine operations in China
- Results reflect curtailment and seasonality



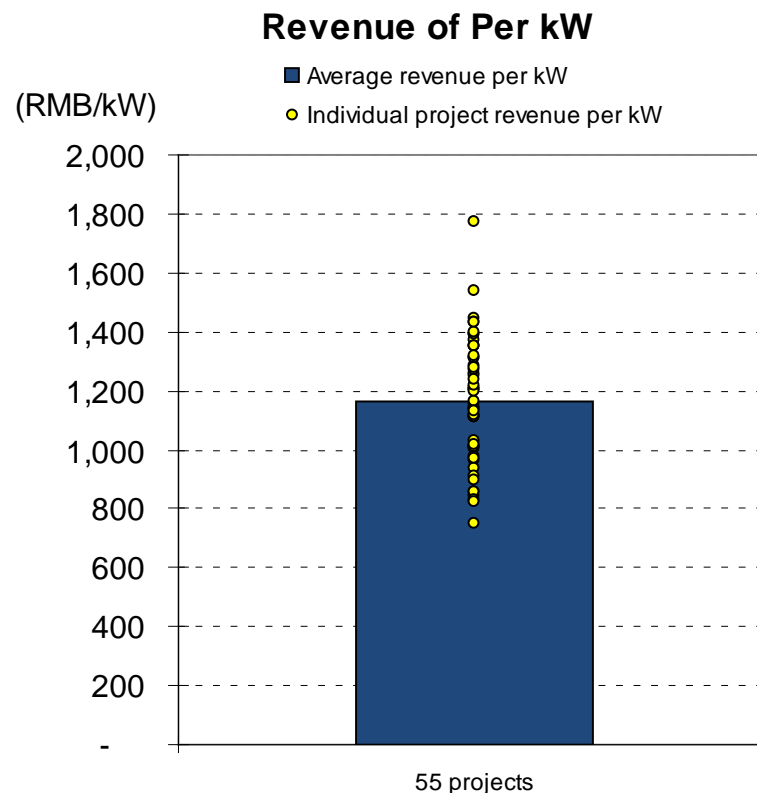
Source: Azure International data

Operating history in China

- average vs. project level



Source: Azure International, UNFCCC



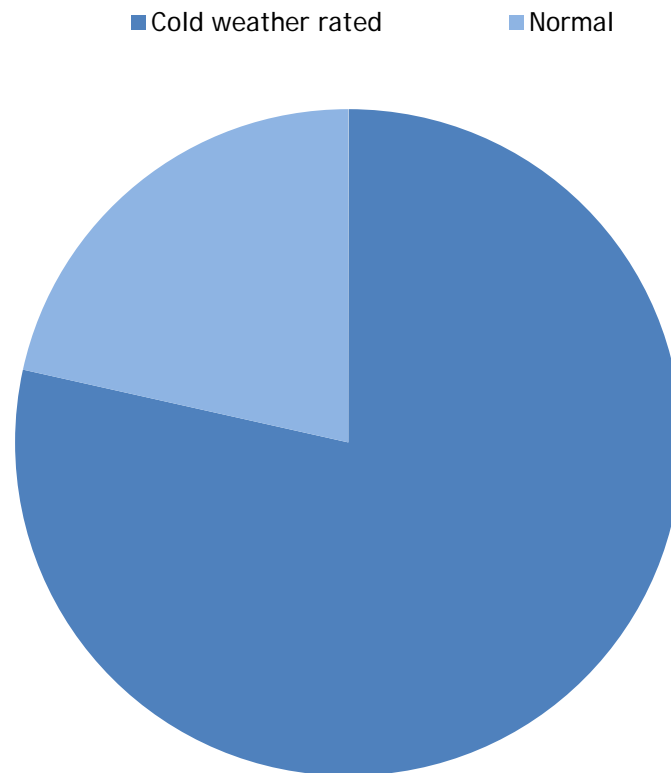
Source: Azure International, UNFCCC

Operating history in China

- cold weather dominates

- Most of the fleet in high wind speed areas in north China
- In these regions, equipment is rated to operate regularly in temperatures to minus 35 degrees
- Generally dry conditions in north China mean ice is generally not an overall issue
- Abrasion through fine dust is a common problem

Chinese fleet exposure

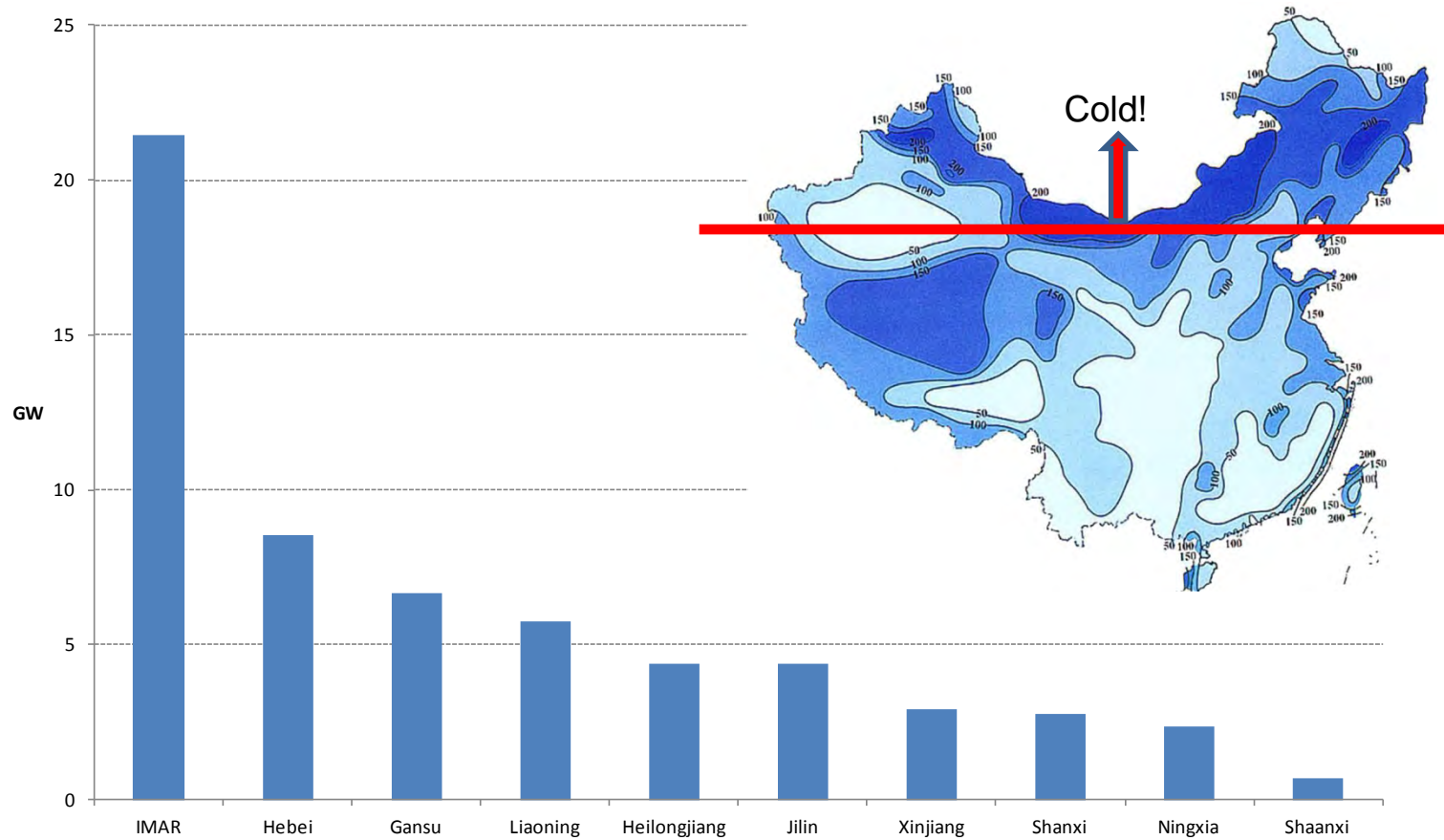


Source: Azure International

Operating history in China

- cold weather dominates

2012E Installed wind capacity in cold weather rated provinces (>500 MW)



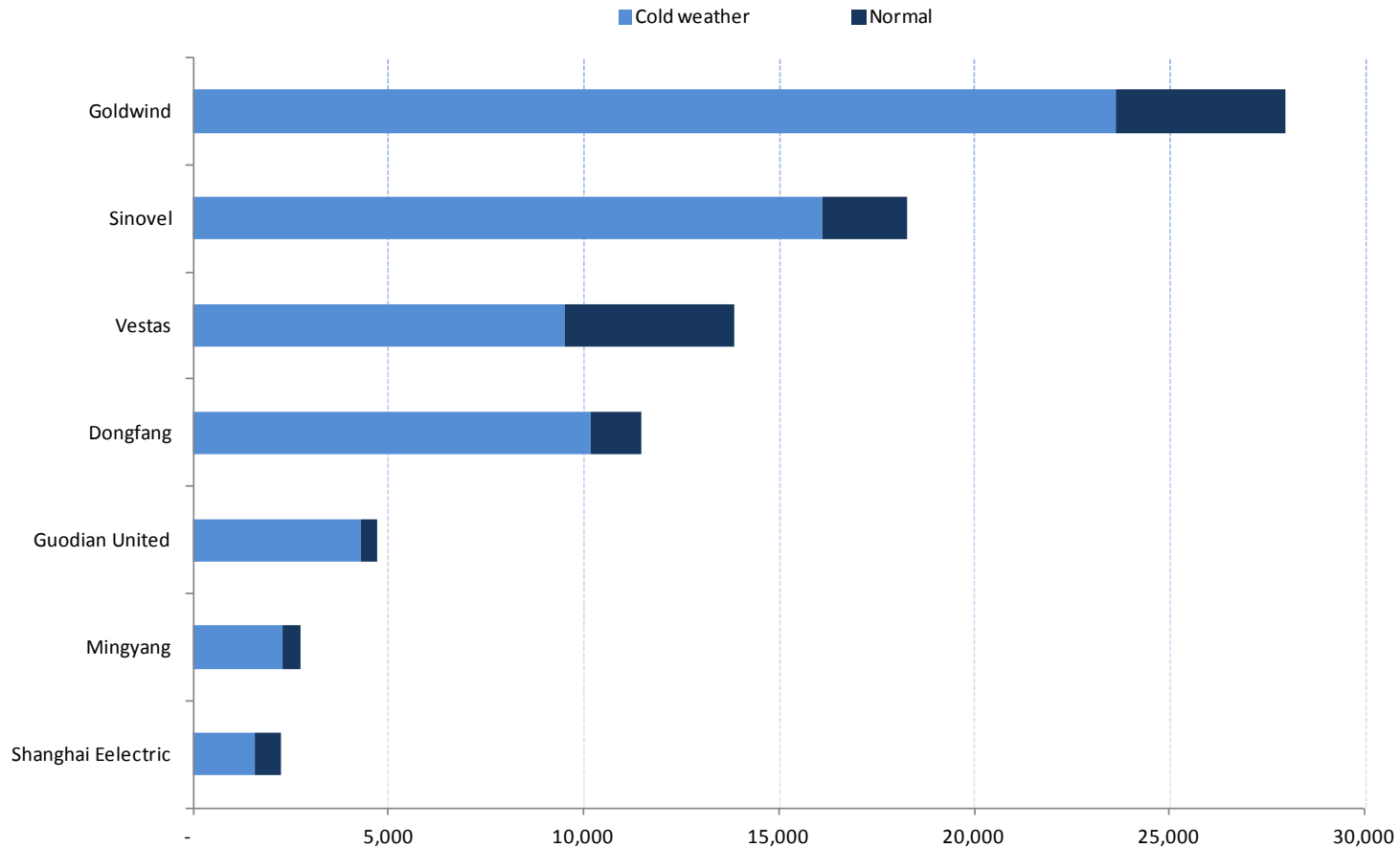
Source: Azure International

Operating history in China

- volume accelerates fleet operating experience



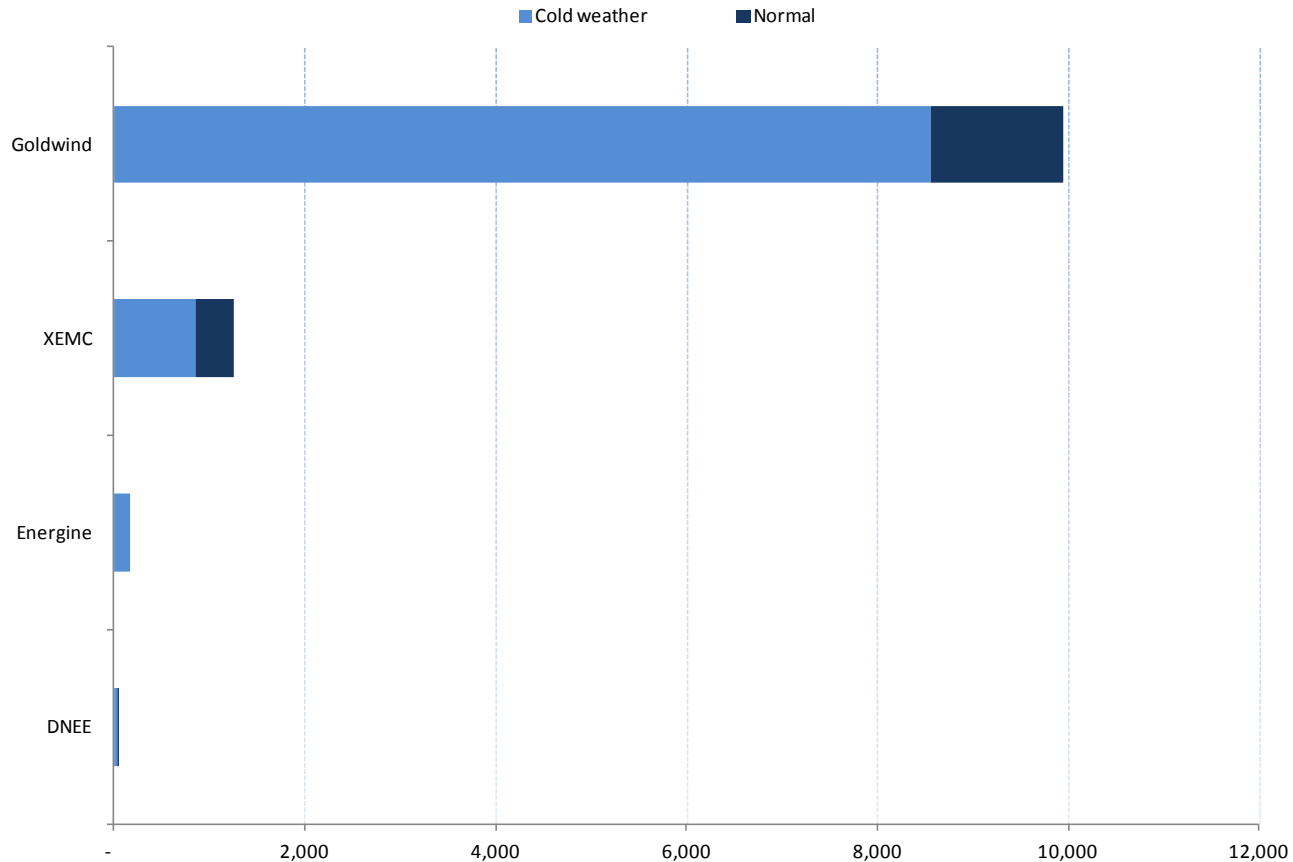
Fleet operating experience (turbine years)



Source: Azure International

Operating history in China - direct drive leadership?

Fleet operating experience direct drive (turbine years)



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Export potential

- value proposition & risk

International expectation of value:

“Deeply discounted capacity with manageable risk or reliability tradeoff”

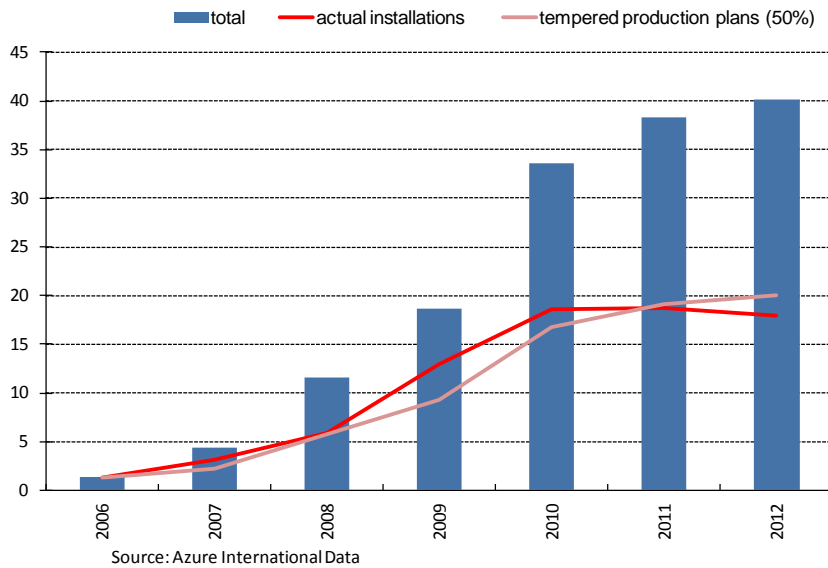
Azure:

Because of differences in market maturity, capital markets, value chain integration, differing levels of quality control and sourcing relationships, international sourcing needs to be carefully managed to ensure highest valued is obtained (& Azure can support international buyers)

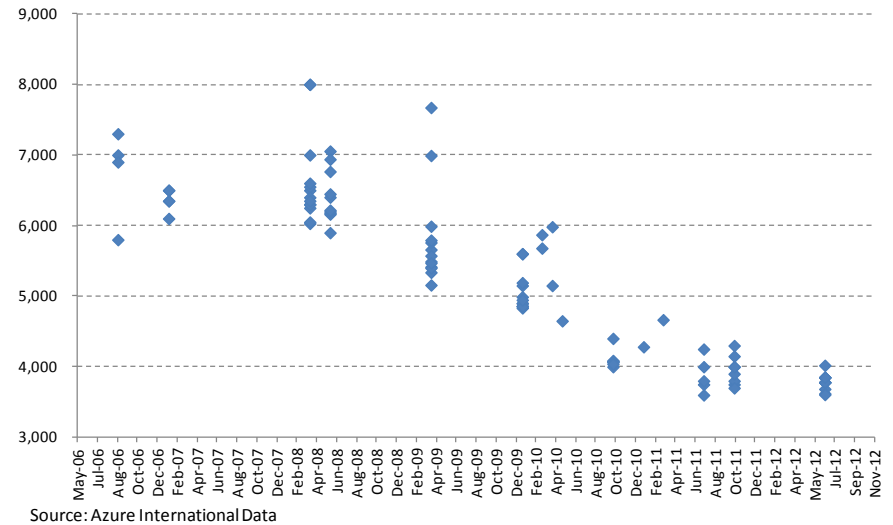
Export potential

- available capacity & competitive pricing

Supply side (Production plans vs installations)



Wind turbine bid price in China (incl. VAT) - 1.5MW (RMB/kW)



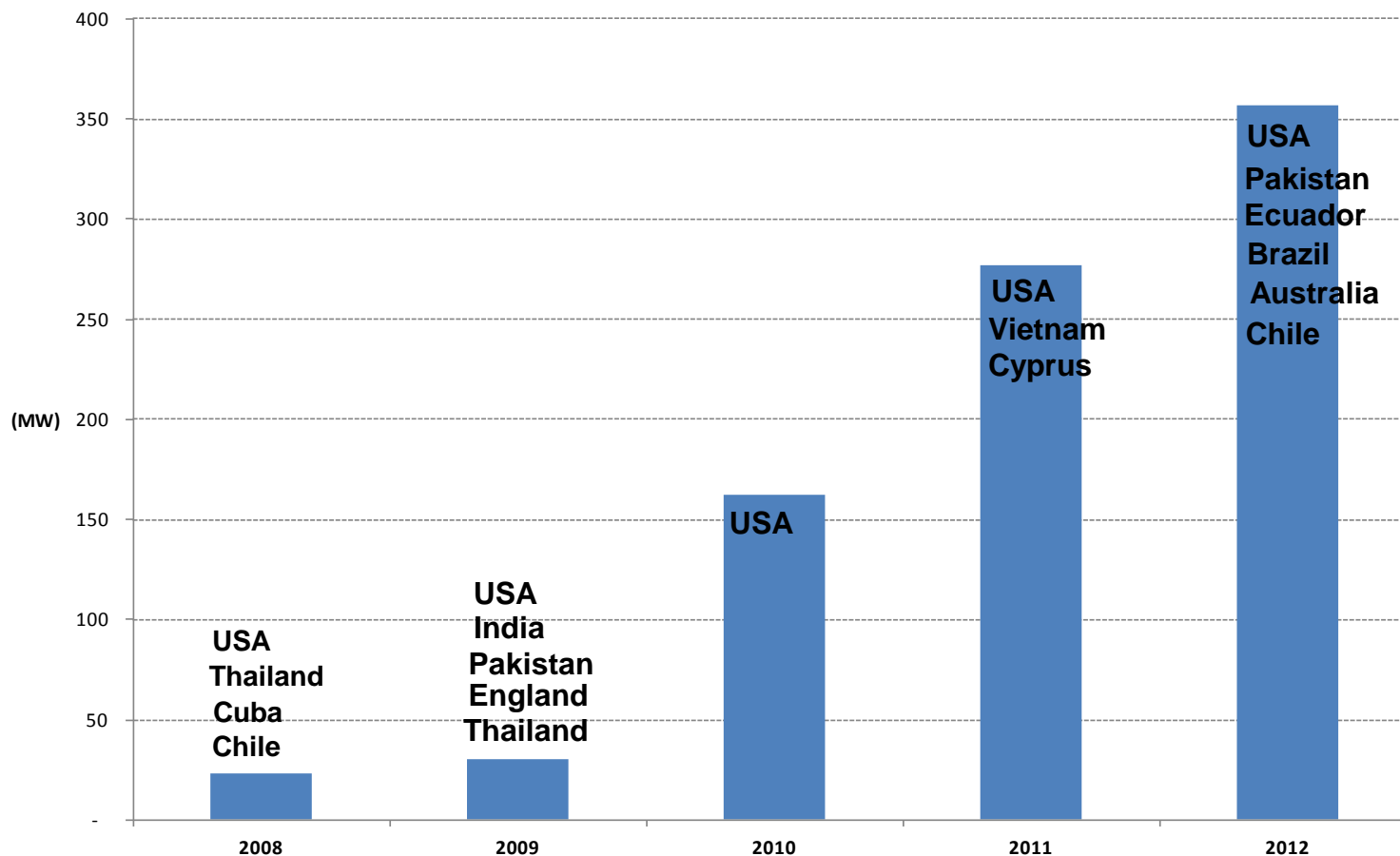
“Apparent” excess capacity

strong price competition has halved capacity costs as industry reached scale

Export potential

– exports already started

Turbine exports form China (MW)



Source: Azure International

Export potential

- expectation gaps and context



- At present negotiations for Chinese turbine for developer participation in a growing number of projects around the world are frustrated by huge gaps and different expectations that exist because of differences in China and international markets
- Context: 100% y-o-y growth, average turbine operating experience is just over 1.5 years
- Shift from most turbines under warranty in early 2013, to most turbines beyond 2-year warranty period
- Warranty periods quietly extending...it's a buyer's market

Export potential

– context & risk interpretation (capex and opex)

China

ROW

Capex

Lower cost

Higher cost

Opex

2 year warranty period

5 year warranty period is common, but cost of services is charged to client

Warranty periods currently being expanded

Enercon: warranty period > 12 years

Entire Chinese fleet now operational for an average period of under 2-years

Public data on turbine models which have been operating for more than 10 years

No public data on failure rates

Project financial model includes failure rates

Assumes fixed yearly O&M cost with no major failures

e.g changing 15% of gearboxes every 5 year period

Export potential

– annual energy production interpretation

China

Considers losses but not uncertainty

ROW

Considers losses & uncertainty

Example:

- GROSS equivalent full load hours: 3500h
- Estimated energy losses: 20%
- Net energy production: 2800 full load hours

This is the value given in a typical local FSR, it is a P50, there are as many chances that this result is exceeded than chances that it is not reached.

- Estimated Uncertainty: 15%
- P75: 2517 full load hours → 75% chance of being exceeded
- P90: 2262 full load hours → 90% chance of being exceeded

This is the value used by western developers for project assessment

Export potential

- other commercial DD & finance related issues



- Country risk, currency risk, policy risk, political risk
- International banks & insurance difficulty in getting comfortable with risks although international listings have helped add some balance sheet visibility for some leading companies
- Most Chinese banks are unable to lend in foreign currency, long-term parent company guarantee treatment remains unresolved particularly with regards to potential future asset ownership transfers, PPA uncertainty and unfamiliarity with non-PPA market based subsidies
- Service and maintenance treatment/coverage

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Conclusion

- Closing remarks

- China is already a world leader in wind markets
- The position and its leading companies as an important global industry leader will be optimized if the industry can demonstrate long-term success in its home market
- International markets and approaches particularly around policy and finance differ considerably from the China experience
- Execution of growing Chinese brand turbine deals depends on refining approaches to international markets and Chinese overseas direct investment, but experience is growing...

- Other available studies

Other reports available:

- A) Wind Development Bottom-Up (updated monthly, predictive)
- B) Wind Turbine Manufacture Bottom-Up (updated monthly, predictive)
- C) Wind Gearboxes Bottom-Up (updated annually)
- D) Large Castings Bottom-Up (updated annually)
- E) Blades Bottom-Up (updated annually)
- F) China Offshore Industry: Sponsored by WWF Norway, and available at:
http://assets.wwf.no/downloads/china_norway_offshore_wind_final_wwf_march_2010.pdf

Bespoke assignments (suggestions/examples):

- Market segments, new products, competitor analysis, policy & market analysis
- Customer, partner, strategic buyer identification
- Project pipeline identification/acquisition (China, Australia, USA, Europe)
- Turbine and component quality due diligences, procurement support
- Investment related commercial and technical due diligences
- Wind measurement, project design, micro-siting, turbine selection
- Permitting & approvals, company structuring & setup
- Energy strategy: carbon foot-printing and emissions optimization & offset

Conclusion

- final remarks -

2012 3Q China Wind Market Quarterly:



2012 China Grid Scale Energy Storage:



- Reports available through Azure International's partner Greentech Media (GTM) at www.greentechmedia.com

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Happy New Year!

