Case Study: The World In Motion Wind Turbine Company, 2008[1]

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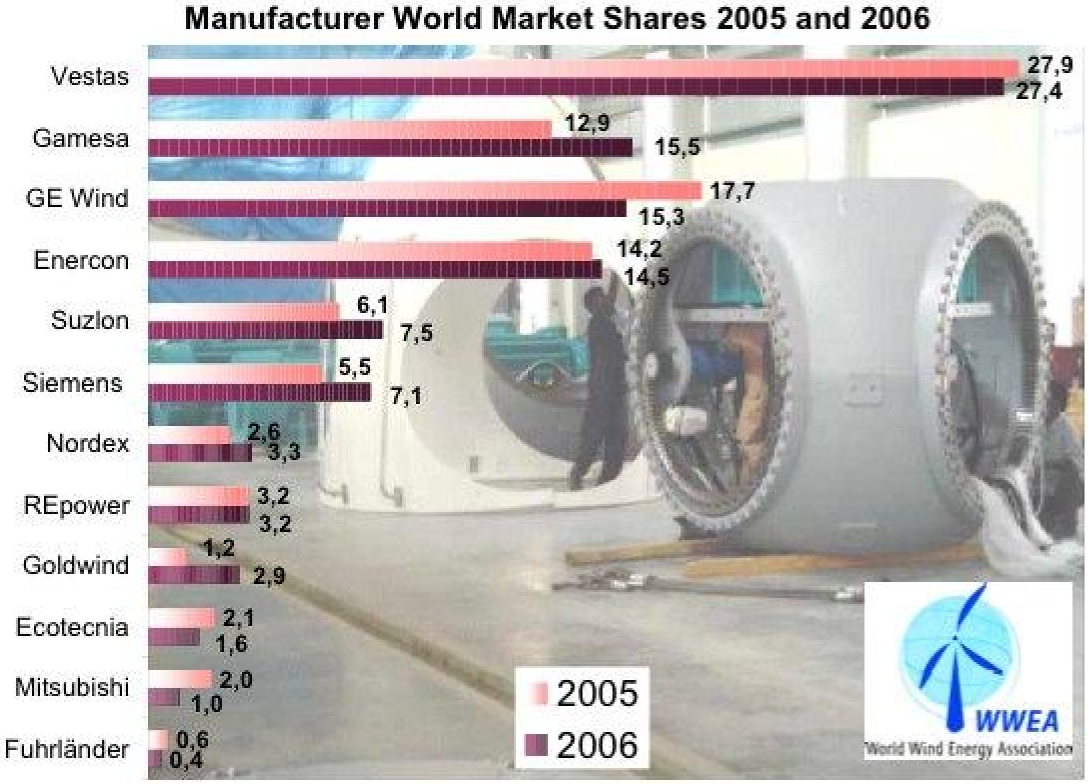
(Disclaimer: all references to the World In Motion Wind Turbine Company and employees are fictitious)

Abstract: The U.S. wind turbine manufacturing industry is experiencing explosive growth in demand for its industrial-scale product, with 45% growth in 2007 on the base of installations from 2006. How does a start-up in this industry handle suppliers and transportation in the short run, while considering all options for long-run global supply of critical components?

Key Words: Wind Industry, Global Procurement, Capacity Constraints, Collaborative Transportation Management, Organizational Structure

In January 2008, Jackson Brown was dealing with a problem he could have never imagined back when he worked in the automotive industry. There, when he made a request of his suppliers, they took his words as a pronouncement from the Oracle at Delphi. Six months ago, he left a comfortable management position at one of the big three car manufacturers in Detroit and moved to Omaha, Nebraska, to take the promotion of a lifetime to Senior Executive Vice President of Supply Chain for the World In Motion Wind Turbine Company (WIM), which had just started operations in 2006 after a successful IPO that raised $300 million. Now, the situation with his new suppliers has changed significantly. When he succeeds in getting the sales representatives of his most critical suppliers on the phone, he feels as if they want to get him off the phone as quickly as possible, so they can go do something more important: like play golf!

It was clear that his suppliers were making money as fast as they could make parts, but the problem was that most of the parts were going to Jackson's competitors with headquarters in Europe. The main exception to that rule was even worse from the perspective of WIM; the suppliers seemed to keep GE well stocked with everything from bearings to castings as well as blades and generators. A conglomerate, GE is the major player in wind turbine manufacturing in the U.S., with a 45% market share (see Chart 2 on page 8 of http://www.awea.org/Market_Report_Jan08.pdf), and in a close race for 2nd largest in the world. The Danish pure play, Vestas, has a dominant 28% share of the world wind turbine market today, but is fighting the German conglomerate, Siemens, for the number two position in the U.S. (see Figure 5 in http://www.nrel.gov/docs/fy07osti/41435.pdf). The top 6 players in the U.S. market for 2007, in order starting with the largest producer, were GE, Vestas, Siemens, Gamesa, Mitsubishi, and Suzlon.   Globally, the largest 6 players for 2006 were Vestas, Gamesa, GE Wind, Enercon, Suzlon, and Siemens.



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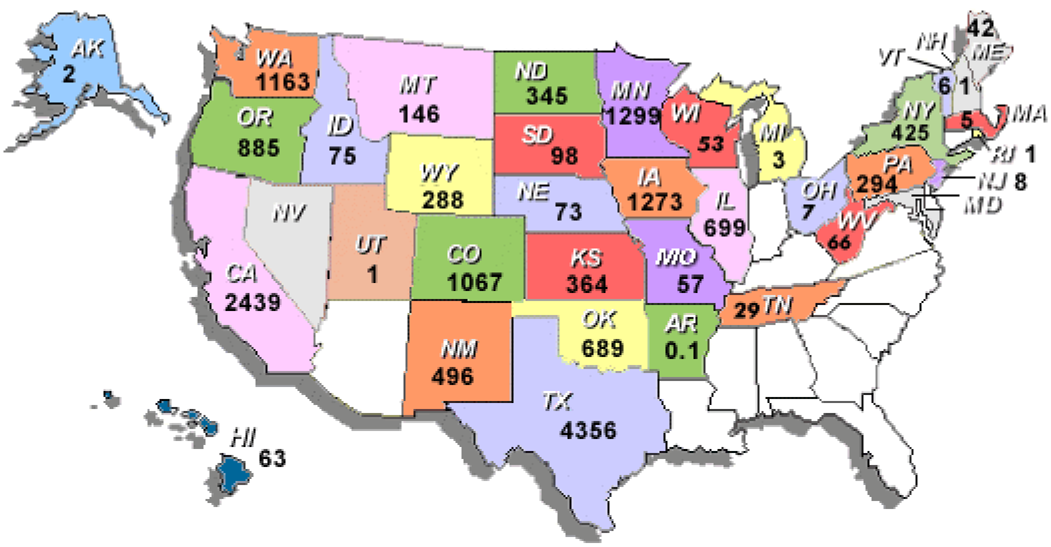
Industry Situation: Consolidation and Capacity Constraints

Consolidation is a constant among wind turbine manufacturers seeking to gain scale and to vertically integrate: just in 2006 and 2007, Siemens acquired Flender and Robicon, and Suzlon acquired RePower and Hansen Transmission. Suzlon claims to be the most vertically integrated of the major wind turbine manufacturers in the industry, a response to shortages of critical components. Items that are especially in short supply include bearings and gearboxes. These components for wind turbines compete for manufacturing capacity with mining and other heavy industries, even though the components may not be interchangeable. Sometimes it seems as if there is a gold rush to set up wind turbine manufacturing in Iowa and surrounding states. The attraction is proximity to the strongest concentrated wind resources in the mid-U.S. (http://www.awea.org/newsroom/pdf/Top_20_States_with_Wind_Energy_Potential.pdf) with empty factory space and rail spurs near shipping on the Mississippi and Missouri Rivers and interstate highway routes, coupled with low labor wage rates (approximately $16 to $22/hour plus benefits for skilled factory workers laid off from other industries). Jackson found out after he started work that even experienced procurement specialists made about the same income as workers on the factory floor. Moreover, the work culture is to work 60 hours per week in salaried positions.

The rate of growth in the wind power industry is stunning. In the U.S. in 2007, new installations totaled 5,244 MW (for a year-end total of 16,818 MW installed and commissioned) or 45% increase on the previously installed capacity (http://www.awea.org/Market_Report_Jan08.pdf). This represents an acceleration of commissioned installations from record years of 2,454 MW for 2006 and 2,431 MW in 2005 on top of a base of 6,718 MW at the end of 2004. The 5,244 MW of new capacity represents 30% of all new U.S. electrical generation capacity for 2007 and wind installations now exceed 1% of U.S. electricity generation. Worldwide, the installed totals have increased from 47,553 MW at the end of 2004, to 59,091 MW at the end of 2005, to 74,223 MW for 2006, to 94,112 MW at the end of 2007 (http://www.awea.org/newsroom/pdf/070202__GWEC_Global_Market_Annual_Statistics.pdf, http://www.gwec.net/index.php?id=30&no_cache=1&tx_ttnews[tt_news]=121&tx_ttnews[backPid]=4&cHash=f9b4af1cd0 and http://www.gwec.net/index.php?id=30&no_cache=1&tx_ttnews[tt_news]=139&tx_ttnews[backPid]=4&cHash=6691aa654e). As for installed domestic wind generation in MW at the end of 2007, capacity is heavily weighted to the Texas panhandle and surrounding region, the West Coast, and the crescent from southern Minnesota through Iowa to western Illinois, as illustrated in the following map (source: http://www.awea.org/projects/).



The Magnet for Locating in the Midwest and West

As mentioned above, the logistical advantages combined with wind potential, state tax incentives, skilled labor and educational facilities for wind maintenance are enough to convince turbine manufacturing companies to set up shop in or near the Midwest and West. Suzlon has blade manufacturing in Pipestone, MN. Siemens is producing blades in Ft. Madison, IA. Vestas is building a blade factory in Windsor, Colorado. In addition, a contract blade manufacturer for GE is opening a new facility in Aberdeen, SD. GE produces their turbines in California and Georgia. LM Glasfiber, the Danish firm leading the world in turbine blade manufacturing, has one blade facility in Grand Forks, ND, and is adding a larger capacity facility in Little Rock, AR. Mitsubishi produces blades in Mexico, in a joint venture with TPI Composites. Gamesa produces its own blades in Pennsylvania and uses LM Glasfiber blades, too. New competitor Clipper assembles their turbines, less blades and towers, in Cedar Rapids, IA. For towers, there are many domestic choices and overseas capacity to tap into. Some domestic tower producers include Ameron, DMI Industries, and Tower Tech.

WIM assembles its turbine components in Omaha, NE, and contracts for blades and towers to be delivered to the project sites. Shipping for a 51-meter blade that weighs 15 metric tons is costly, giving an advantage to domestic production, but there are plenty of low-cost international producers, too, if you can figure out how to cheaply ship something more than 165 feet long and rigid (http://scmr.uark.edu/research/WhitePapers/SCMR-WP025-1007.pdf). Towers are just as awkward to ship. For turbines of the size that WIM produces, the best match is a tower at least 80 meters tall. The base of these have a diameter of 4.8 meters (15.4 feet) and are 36 meters (120 feet) tall and weigh 70 tons.

Competitive Environment: The Economics of Wind, a Big Business

Jackson Brown's purchasing staff sometimes has to scrounge up what component capacity they can find on the spot market. The turbine manufacturers could sell as many turbines as they can build as long as the Production Tax Credit (PTC)—a tax credit currently equal to $0.02/kWH and indexed to inflation—continues to be in effect in the U.S. The problem is that the current PTC is set to expire at the end of 2008. Unless the PTC is renewed by Congress and the President early in 2008, there will be a disruption in orders for components, since many components have a lead time of several months. Investment in global capacity is constrained by the uncertainty in the Federal Tax Laws of the U.S. (see p. 10 of http://www.ieawind.org/wnd_info/KWEA_pdf/NWTC_WindTechApp.pdf). This has the follow-on effect of discouraging long-term investment on the part of capital-intensive suppliers. Components like blades and towers are more labor and handling-intensive; bearings and gearboxes are in capital-intensive industries, with products similar to the booming mining industries. The suppliers of bearings and gearboxes feared that the notoriously cyclical mining industry could tank at the same time that the PTC may no longer be giving added incentives to the wind industry, so they hesitated and did not increase capacity greatly. For Kaydon Bearings of the U.S. (http://www.kaydonbearings.com/wind_energy.php) or SKF of Sweden http://www.skf.com/files/289708.pdf) to make the large capital investment to keep up with the demand of the wind industry, they would need to be motivated to take a large risk at a time when many think the U.S. economy is nearing a recession. Nacelle (enclosure) castings are in the middle ground: if you are willing to pay the price and eat the transportation costs, there are foundries for castings in S. Korea, Brazil, Poland, Slovakia, and China, among other places.

The Situation Heats Up: Overbearing Suppliers

Alice Cooper, a sales representative for one of the major bearing manufacturers was contacted by WIM's lead procurement manager, James Taylor. When James finally caught Alice at her desk, she informed James that bearing prices had increased by 25%, effective immediately. James protested and Alice suggested that James try her competitor.

Sure enough, when James got hold of Ozzy Osbourn of the competitor bearing manufacturer, Ozzy told James that his company had raised prices 30%. Both of them said that any new orders would be back ordered for at least 3 months and would require a guaranteed funds transfer as prepayment in full in order to reserve a place on the production schedule. They said that Chinese mining companies had placed the largest order in the history of bearings, split between the two companies. Alice and Ozzy independently said that the Chinese miners seemed desperate, because they had production shut down as a result of a lack of bearings. In addition, because of the consolidation of the gearbox manufacturers, the restrictions on gearbox availability were at least as bad.

As a backup, Jackson had contacted start-up gearbox and bearing manufacturers in China and Brazil about a collaborative arrangement. These young firms offered products with similar performance claims to WIM's current suppliers at half the price. Transportation would be costlier and lead times longer. But when they sent some sample product, 50% was out of spec and the variability was even worse! He would never have dealt with start-ups when he was in the automotive industry, but now things were different. The start-ups were anxious to gain business, and Jackson had good process engineers available. However, that kind of debugging and quality system establishment could take a year to deliver acceptable bearings and gearboxes. More importantly, Jackson knew that the ops guys were desperate for components—now!

The Order Book and the Payoff?

WIM had orders on the books that were already being delayed, waiting for parts and production. The first 25 WIM turbines in 2006 had been a success in the sense that they were producing electricity reliably, but WIM had accepted firm orders for 100 units total, not just the 25 produced. All orders included cash deposits of 25% up front, plus payments based on production progress. In addition, impatient customers had production options, which meant that these customers had placed a 10% deposit for the privilege of waiting to see if there was excess capacity for the year. The 75 delayed turbines slid into 2007, where orders for 225 and options for 100 more were waiting; only 150 were completed. Due to the burgeoning costs of inventory (see accompanying financials), the order books for 2008 had been held to just 250 firm orders, but when 2007 fell 150 short of the firm orders, the 150 backordered turbines slid to 2008. The options for 100 were renewed and 50 more were added for the new year; all of the turbine manufacturers were booked. The firm orders for 2008 were now for 400 (250 original plus the 150 backorders), with 350 firm orders for 2009 and 500 firm orders for 2010, not counting production options. To make matters even worse, many customers were hedging the capacity of any turbine manufacturer that would accept their option deposits, especially this year with PTC expiration looming. But, all of the manufacturers faced the same world-wide limitations on bearings and gearboxes. WIM had orders for 2011 and 2012, "but what is the point?" – Jackson thought to himself.

Pricing and KWH Production: A Competitive Advantage?

The current price for turbines is about $1,800 per kWH, installed. Of that, WIM would get $1,000 per kWH (or $2.6 million per unit) for the main turbine. WIM's technology, and perhaps its competitive advantage, included the largest domestically manufactured turbine at 2.6 MW, with a 104 m blade sweep. The three blades are 51 meters in length each and the hub is 2 meters in diameter. Larger turbines with larger blade sweep are more efficient in capturing the wind and increasing their production factor (PF). A production factor of .33 means that the turbine averages electricity production of 1/3 the nameplate generating capacity on an annual basis. In 2006, many projects in the U.S. were seeing an average PF of .38 or more with slightly smaller blade sweep than available from WIM. This is a WIM competitive advantage: their blade sweep is the largest in the industry for terrestrial turbines, meaning a higher PF for most sites.

Mission Possible?

You are a consulting firm, hired by the Board of Directors of The World In Motion Wind Turbine Company to advise Jackson Brown and his CEO, Olivia Newton-Johns. Exactly what advice do you have for Jackson and Olivia, and why? What steps should they take in the short-term versus the long-term and why? Please take into account the nature of the industry, i.e., an industry with explosive growth, but questionable stability.

In addition, feel free to consider and address any of the following issues you feel are critical to their future success. These areas might include, but are not limited to:

- Supplier management issues, i.e., how to handle the existing suppliers / situation in the short run, perhaps developing new suppliers for the long run?
- How can a start-up company like WIM compete for major components?
- What influence will other start-ups, like Clipper in the U.S.A. and Goldwind in China, have on the competition for components and customers?
- Are there transportation or location issues that need to be addressed?

- What organizational structure should WIM pursue and what incentives should they employ? And why?
- Address WIM’s relationship to its customers. Propose a strategic plan for customer value.
- Lastly, is there any need for an ABC analysis, an inventory study, or a time value of money study?

World In Motion Wind Turbine Company
Annual P & L

	2006			2007			2008 (Projected)		
		Ave %	$		Ave %	$		Ave %	$
Revenues	Units	completion	Thousands	Units	completion	Thousands	Units	completion	Thousands
Initial Order Payments (Work in Progress)*	75	25%	48,750	75	25%	48,750	50	25%	32,500
Progress Payments (beyond 25%)*	75	10%	19,500	150	15%	58,500	200	20%	104,000
Final Product Sales	25	100%	65,000	150	100%	390,000	200		520,000
Interest (4% on mean cash)						6,531			13,417
Revenue Subtotal			133,250			503,781			669,917
Costs									
Overhead, Sales, &General			25,000			50,000			51,750
Operating									
Raw Materials			20,410			32,078			43,427
Components (Gearboxes, Bearings, Castings) **			86,320			204,776			294,580
Transportation of Major Components			21,580			51,194			64,808
Labor			26,650			98,894			128,119
R & D			10,000			39,000			52,000
Cost Subtotal			189,960			475,942			634,684
Profit (Loss)			(56,710)			27,839			35,234

* Work In Progress payments recognized as revenue in year prior to expected completion of unit

**As in case text, WIM realized the reduced level of production vs. plans and took steps to curb the rate of inventory growth for 2008.

World In Motion Wind Turbine Company
Cash Flow
(Thousand $)

	2006	2007	2008 (Projected)
Annual Profit (Loss)	(56,710)	27,839	35,234
Capital Investment	(231,730)	(130,124)	(248,444)
Factory and equipment	100,000		
HQ	25,000		
Change in Inventory *	106,730	130,124	101,154
Deposits with Suppliers			147,290
Depreciation	6,250	6,250	6,250
Buildings and Machines (20 year life)	6,250	6,250	6,250
Financing Activity	608,750	113,781	188,917
IPO	300,000		
Interest (4% on mean cash)		6,531	13,417
2007 Order Fees	146,250		
2008 Order Fees	162,500		
2009 Order Fees		227,500	
2010 Order Fees			325,000
Production Option Fees		26,000	13,000
Revenue Recognition			
2007 Order Fee Charge		(146,250)	
2008 Order Fee Charge			(162,500)
Cash at Beginning of Year	-	326,560	344,307
Change in Cash	326,560	17,747	(18,043)
Cash at End of Year	326,560	344,307	326,264

* As in case text, WIM realized the reduced level of production vs. plans and took steps to curb the rate of inventory growth for 2008.

World In Motion Wind Turbine Company
Balance Sheet
(Thousand $) End of Year

	2006	2007	2008 (Projected)
Assets			
Cash	326,560	344,307	326,264
Buildings & Equipment	118,750	112,500	106,250
Inventory	106,730	236,854	338,007
Inventory Obsolescence	(8,320)	(18,304)	(27,170)
Deposits with Suppliers			147,290
Total Assets	543,720	675,357	890,642
Liabilities			
Owed to Suppliers	17,788	39,476	31,786
Owed to Transportation Providers	3,597	8,532	10,801
Owed to Employees	2,221	8,241	10,677
Owed on R&D obligation	833	3,250	4,333
Order Deposit Fees & Options	308,750	416,000	591,500
Total Liabilities	333,189	475,499	649,097
Shareholder's Retained Value	210,531	199,858	241,544