

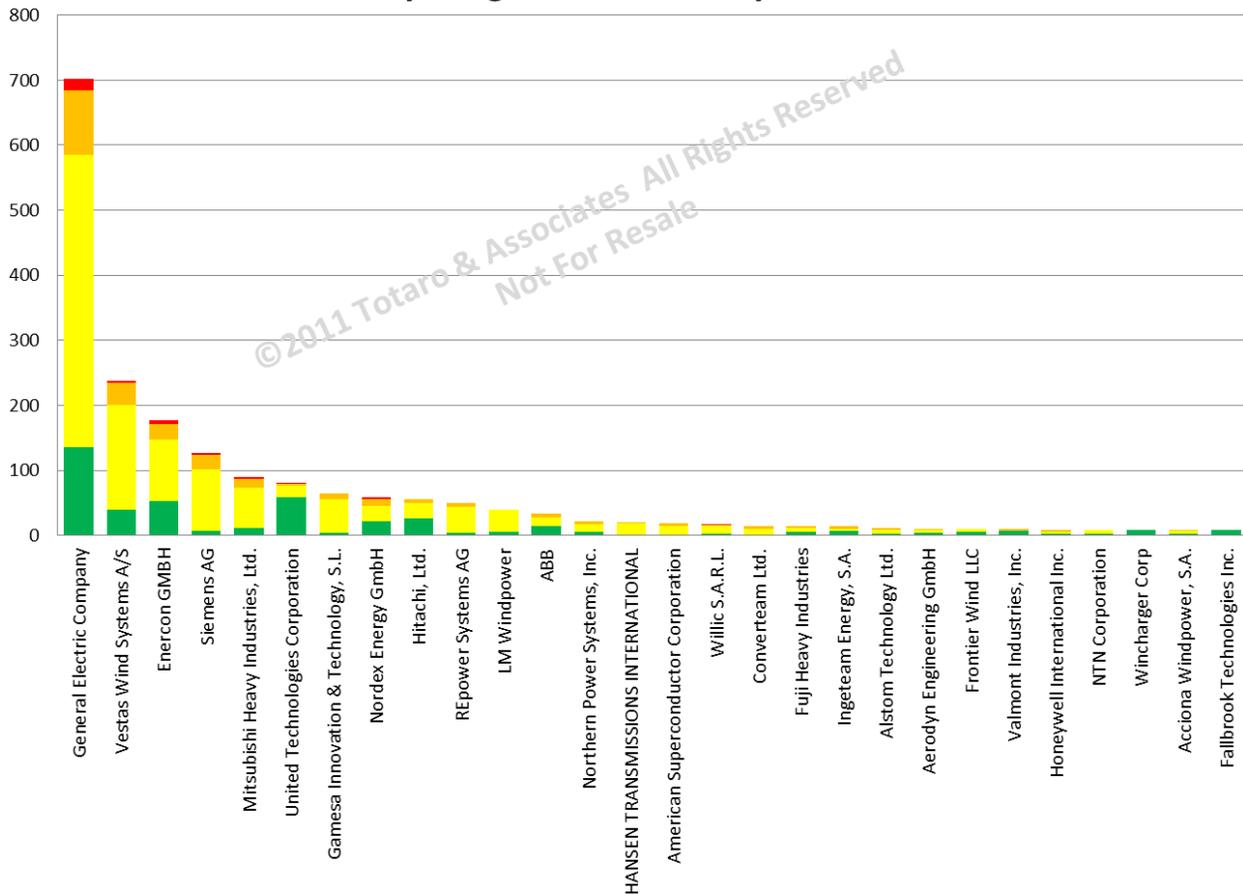
**Is GE's Wind Patent Portfolio Sustainable Without Future Licensing?**

Analysis and cost estimation of their patent portfolio suggests a bubble... but will it break?

by Philip Totaro, Principal, Totaro & Associates

General Electric Company (GE) has vastly outpaced all of their competitors in intellectual property (IP) protection in many industries, but particularly wind turbines. Data from our efforts in analyzing the landscape of issued patents and pending applications from the horizontal axis, utility-scale wind sector indicates just how far ahead they are. The chart below shows the totals of the published portfolios of patents and applications from the top companies in the US. The breadth of GE's portfolio has been a direct result of focusing of resources as well as past success in licensing and litigation.

**Utility Scale, Horizontal Axis Wind Turbine Patent Landscape (US Only)  
 - Classification by Assignee with Industry Relevance Assessment**



While we won't go so far as to say they are using the size of their IP portfolio as a scare tactic to get their competitors to license from them, the scope of their portfolio is certainly intimidating to those who have not taken to time to analyze it in depth.

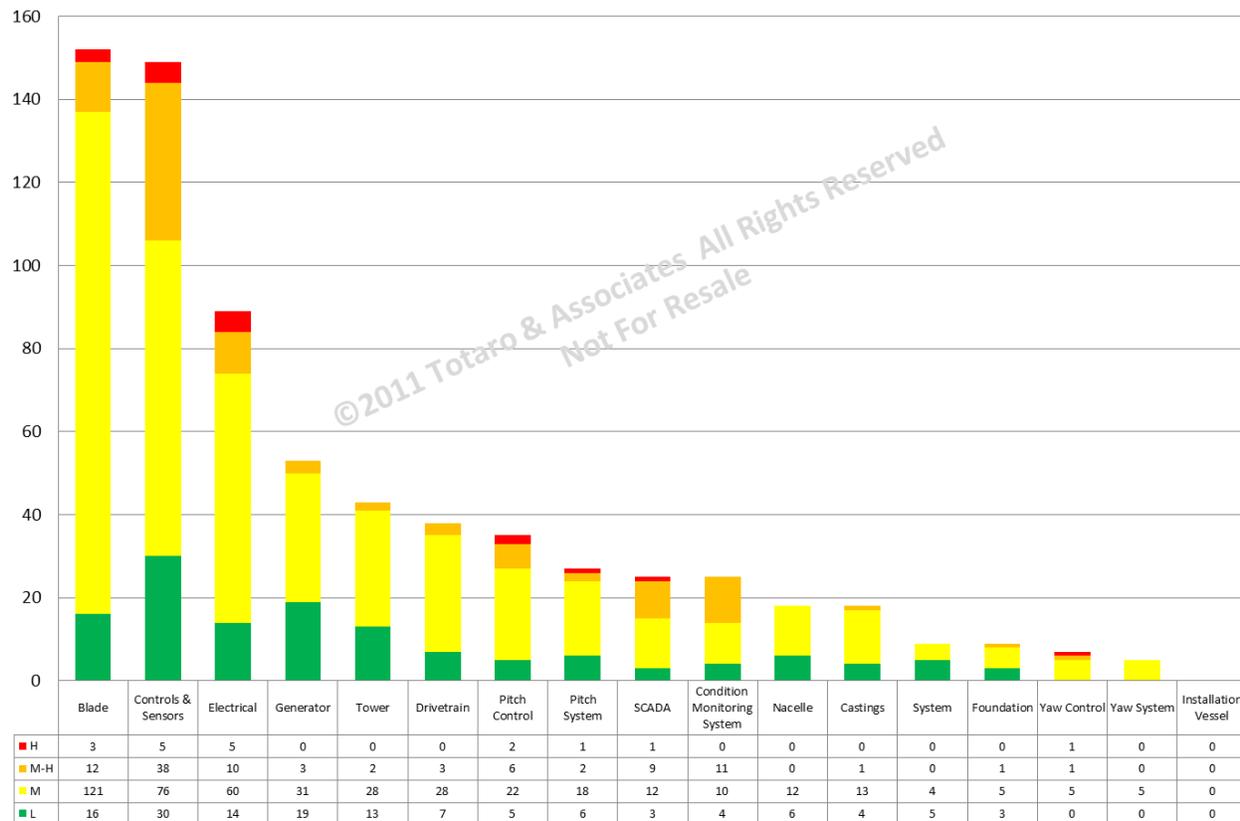
It is interesting to note that while they are better than the industry averages, GE's portfolio is not vastly superior to most of their competition on a percentage basis as it relates to the number of

High risk patents and apps (3% for GE vs. 1% for the Industry) and Medium/High risk patents and apps (14% for GE vs. 10% for the Industry) represented on the chart above in red and orange respectively. However the scale that their portfolio has achieved affords them the luxury of having greater numbers of patents in key areas of technology. Put it another way, if 10% of a patent portfolio will be subject to assertion then it's better to have 1000 patents in the portfolio than 10 or even 100.

Interestingly, they appear to use the patent process as a means of defensive publication, whereby they file on virtually every idea they generate internally in the hopes that they can get the patent, but even if the application is rejected they have prevented their competitors from patenting it out from under them. Their legal machine consisting of their in-house and outside counsels work to ensure a very high conversion rate from filings to issuances, based on the quality of claim construction during the drafting of the original application and personal engagement with the examiners to shepherd their applications through the process. They have also been one of the top utilizers of the "Green Patent Fast Track."

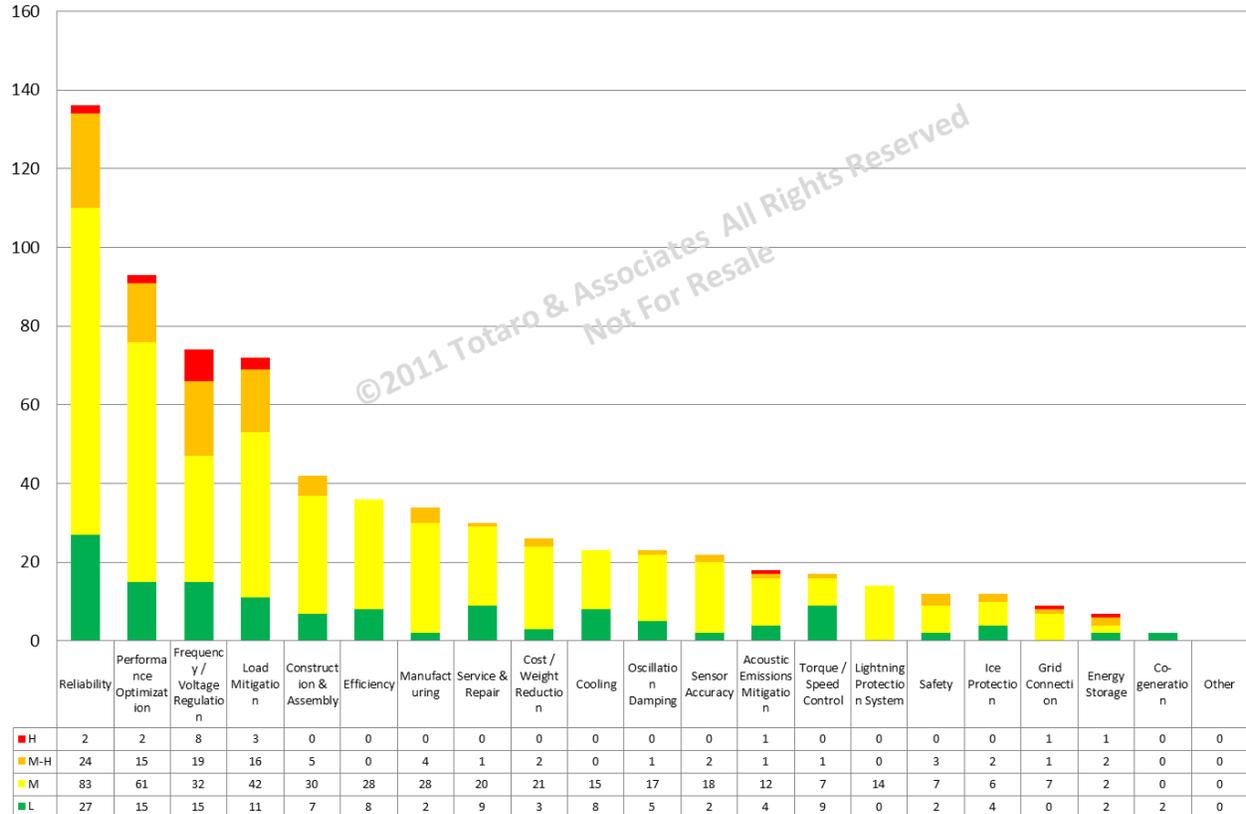
Deeper analysis of their portfolio indicates the areas of focus for the components and technologies in their portfolio. Their component focus has been in those same areas which the industry has rallied around. Blade aero performance and structure, controls for performance optimization and load mitigation as well as electrical system reliability enhancement are all trends which are seen throughout every wind turbine OEM.

**Utility Scale, Horizontal Axis Wind Turbine Patent Landscape (US Only)**  
**- Classification by Component with Industry Relevance Assessment**

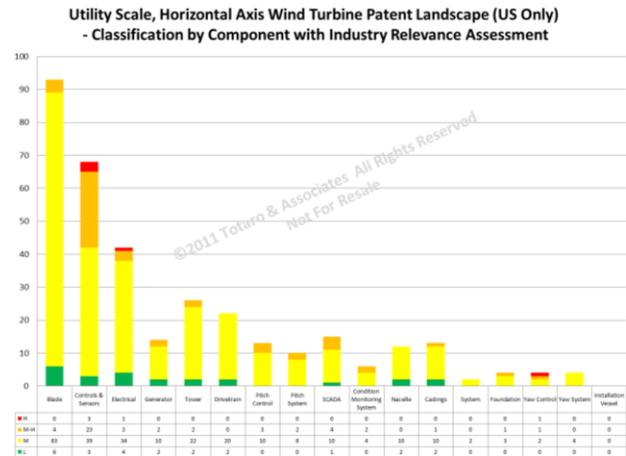
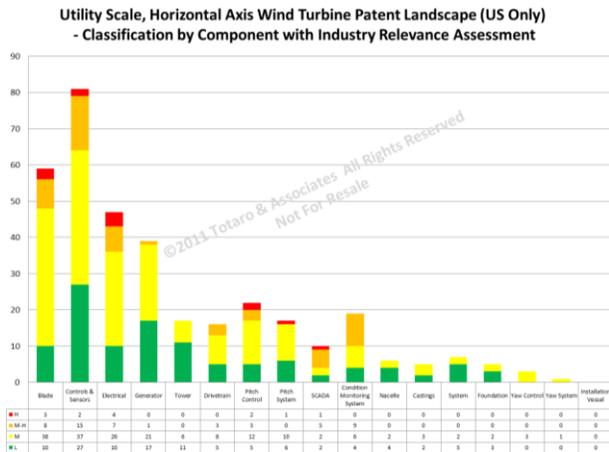


A look at their technology focus indicates they are mostly in line with industry trends on this as well.

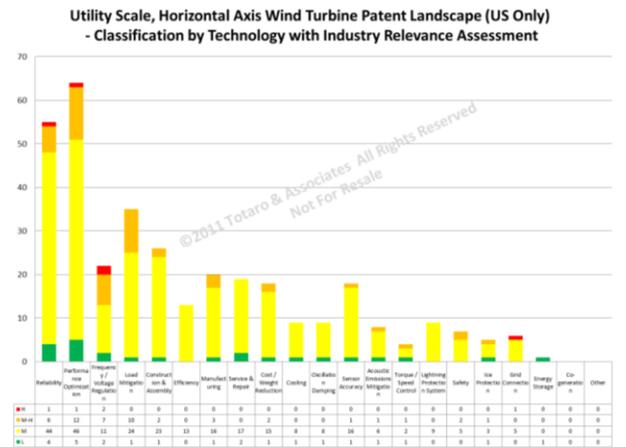
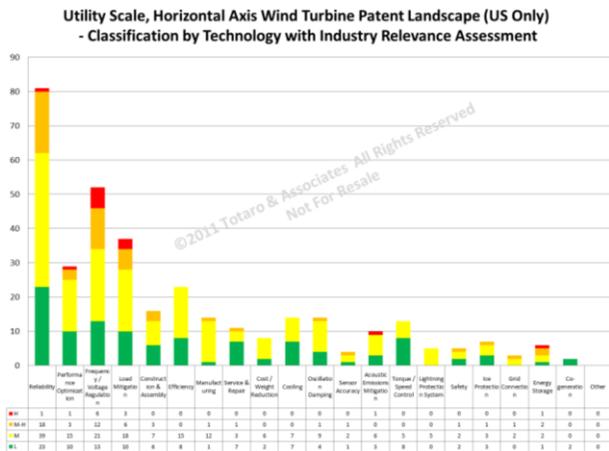
**Utility Scale, Horizontal Axis Wind Turbine Patent Landscape (US Only)  
 - Classification by Technology with Industry Relevance Assessment**



Interestingly a comparison of the issued patents in their portfolio vs. the pending applications reveals some interesting trends as well. Here we offer a side-by-side comparison of the issued patents on the left and the pending applications on the right broken down by component keyword. The differences between the two charts indicate areas where innovation has occurred in the past vs. more recently. From this it is clear that while blades are the highest component on the cumulative chart, that is largely due to influx of innovation on swept blades, circulation control, as well as the serrated trailing edge being utilized on the new 1.6-100m platform.



We also offer a side-by-side comparison of the issued patents on the left and the pending applications on the right broken down by technology keyword. It is clear that certain areas of technology development have been more important based on the same comparison logic discussed above. Performance optimization has dominated their product strategy in the past few years, and their patent portfolio reflects that trend.



GE is also famous for identifying key technologies which are required within the industry at a future point in time, such as power factor control, VAR support or more recently curtailment, and then develop a multi-patent “fence” around those technologies. They also look to bracket around their competition with patents. This is accomplished by identifying the High or Medium/High risk patents or applications of their competitors and analyzing the weaknesses of those claims to determine areas of potential IP capture, coupled with assessment of competitive intelligence to determine where their competition is going technologically. Of course they are also known to get involved in cultivation of regulatory requirements and then subsequently patent a “system” which can regulate a wind turbine or farm to comply with that standard, potentially calling into question the allowable scope of protection obtained.

In developing the breadth of this portfolio they have followed some basic tenets of IP strategy in seeking blanket protection in most areas of technology and components in the industry space. This is the result of their focused brainstorming sessions and engagement of a broad swath of

engineering as well as internal and external Legal/IP team members to identify patentable inventions and complete invention disclosures and applications. These protocols, established in the mid-2000s have served them well in the last few years where the number of filings has doubled compared to previous years. This was enabled by the revenue generated from their successful licensing activities, although the ongoing Mitsubishi litigation is likely draining some of that benefit away.

		Filing History - Patent Applications and Issued Patents, by Filing Year																					
Industry Relevance		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
High															2	2	1	2	2	3	5	1	
Medium / High													1	1	5	4	10	9	11	22	19	16	1
Medium			3	3		3	1		1			1	2	6	12	19	29	27	54	87	102	99	1
Low		1	2						1	1		3		2	8	14	28	25	9	16	9	10	
<b>Total</b>		1	5	3	0	3	1	0	2	1	0	4	3	9	27	39	68	63	76	128	135	126	2

Nevertheless, one must ask if this pace is sustainable, since each application has a certain cost associated with it and the revenue generated from licensing must exist in order to justify the continued scope of the portfolio. The spike in filings starting in 2003 after the Enron Wind acquisition and again in 2008 with a focus on future licensing is reminiscent of the huge increase in the pace of filings from Aloys Wobben, Chairman of Enercon GmbH, in 2002 – 2003 after the settlement of the Kenetech/Zond/Enron Wind/GE International Trade Commission (ITC) matter in which they were effectively denied entry into the US market. The portfolio of Enercon patent filings proved to be unsustainable as is evidenced by the sharp drop-off in their number of filings per annum lately, in spite of new innovation being developed on their liquid cooled generator.

Based on a patent budget calculator which we developed to assess the year-over-year costs for cultivation and maintenance of a patent portfolio, we have been able to determine the approximate costs for maintaining their portfolio. Certain assumptions had to be made in this analysis, so there is likely some variability in the cost, however we believe it to be accurate within an order of magnitude. Even though the patent landscape we have analyzed covered only the US, we know GE uses the US as their primary priority filing locale and their foreign filing strategy can be inferred from a look at the family members of their US patents. Assumptions are as follows:

- The majority of their filings are **US, CN, and EP**.
  - Filings which were categorized as L or M will follow this protocol for cost calculation.
- Important inventions get filed in a broader scope of countries, specifically **US, CN, EP, IN, MX, JP, KR, CA, BR** and **AU**.
  - Filings which were categorized as M/H or H will follow this protocol for cost calculation.

- Filings per annum used in the calculation from 2001 – 2010 were actual numbers.
  - Filings prior to 2001 were not very significant and were excluded from the calculation for simplicity.
- Filings from 2010+ were assumed at the same average rate per annum from 2008 – 2010 for filings out until 2020.

The results of this calculation based on the scope their portfolio and following the protocol outlined above shows that the cost is quite substantial particularly in the out years. In 2020 alone they will spend US\$31M on prosecuting and maintaining their portfolio.

Patent Budget Per Annum (in Millions of USD)																								
2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
0.05	0.4	1.1	2.9	4.6	7.1	7.8	10.3	14.6	16.4	17.4	18.5	19.5	20.8	22.1	23.4	25.1	27	29	31	30.8	24	23.8	23.2	23.9

Continued turbine sales as well as licensing will clearly be necessary to support that size of portfolio. With the expiration of a core patent in February of this year, US5083039 (‘039), which covered field oriented control of an induction generator as well as dynamic VAR control at the turbine, a new suite of technologies has emerged technologically, but not necessarily on the assertive license front.

Their recent acquisition of Convertteam also adds to their portfolio of full power conversion and permanent magnet generator technology. This architecture is quickly becoming the most pervasively deployed platform amongst the wind turbine supply base. However, it remains to be seen if this technology architecture will be part of the next wave of assertion and licensing. If history has anything to say, then you can bet on future licensing, but the scope may be affected by the outcome of the ongoing Mitsubishi litigation. If GE is successful in upholding the validity of their patents against Mitsubishi then one will presume they will be emboldened to pursue licenses on the new technology platform. If Mitsubishi prevails, then we could see another round of lawsuits from the licensees of ‘039 and the other DFIG related technologies demanding their royalty payments back. This could leave GE gun-shy to broadly license the way they did with ‘039 and other related patents.

To get a deeper look into the patent landscape of the horizontal axis, utility-scale wind industry please visit [www.totaro-associates.com](http://www.totaro-associates.com) and ask about **Wind Patent Watch™**, a subscription service providing a weekly digest and analysis of the published patents and applications from General Electric and the rest of the industry.

**About the Author**

Mr. Philip Totaro is the Principal at Totaro & Associates, a consulting firm focused on innovation strategy, competitive intelligence, product development and patent search. Mr. Totaro has experience in strategic planning as well as creating and protecting intellectual capital. He has worked for such companies as General Electric, United Technologies Corporation and most recently he oversaw Intellectual Property and Competitive Assessment for Clipper Windpower. He has helped cultivate and disposition over 450 innovations, and his assessment has led to over 250 issued patents. His strategic market analysis has led to the funding justification of over \$500M in R&D investment and the development of multi-million dollar

product and service offerings. He has provided legal and technical due-diligence for over \$1B in M&A, including the recent takeover of Clipper Windpower by United Technologies Corporation. To find out more or get in touch please visit [www.totaro-associates.com](http://www.totaro-associates.com).