3TIER's written testimony regarding the roles of the public and private sectors in renewable energy forecasting.

Presented by Dr. Pascal Storck, Vice President of 3TIER, at the hearing "Real-time forecasting for Renewable Energy Development" held on June 16, 2010 by the subcommittee on Energy and Environment of the House committee on Science and Technology.

Good Morning, Chairman Markey, ranking member Upton and the rest of the committee. I appreciate the opportunity to be here today to testify on the issue of public and private roles and research needs in renewable energy forecasting.

Electricity generation from renewable sources such as wind and solar comes with the disadvantage that the output is variable and fluctuates as the weather does. As renewable energy generation has come to supply an increasing amount of the electricity consumed in our country, with some regions (such as Texas/ERCOT) seeing 20% or more of hourly electricity demand satisfied solely by wind, the challenges of integrating this energy into our power system have been documented, studied and debated. One common theme that has emerged is that forecasting renewable energy output hours and days in advance is key to the cost-effective integration of this variable energy source.

The first point that I would like to make is that small and medium sized private businesses in the US have assumed a leadership role in providing wind and solar forecasting services. It is a vibrant and competitive private sector market, which continues to mature and is creating high paying technical jobs and exports. Our company, 3TIER, and our competitors routinely provide accurate forecasts of renewable energy output, hours and days in advance, to project owner/operators, system operators, utility companies, and power marketers. Our company alone provides wind energy forecasts for over 12,000 MW of installed capacity, representing over 100 individual projects and serving over 40 unique clients. 3TIER employs 60 staff in the production and delivery of these forecasts and other services for the renewable energy industry. To seize the opportunity of the global renewable energy market, we have established offices in India, Latin America and the Pacific Rim for the export our services.

As the renewable energy industry has grown, so has the experience level of the private sector in providing these forecasts. Our company, 3TIER, was founded in 1999, and we have played an integral role in the improvement of forecast accuracy as we invest in our forecast systems to meet the demands of our clients. In fact, recent work overseen by our colleagues at NREL has demonstrated that the current state-of-the art provides 80% of the value of a perfect forecast. In short, the private sector renewable energy forecasting community is strong and well-positioned to meet the demands of our clients, both today and into the future, and around the world

The second point I would like to make is that the government does have a fundamental role in supporting the private sector in our task of creating more accurate renewable

energy forecasts for specific clients. 3TIER, as well as our competitors, rely on accurate government weather forecasts on both the regional and global scale as inputs to our more specialized energy forecast systems. Improve the quality of these weather forecasts, by improving the observational inputs, the models themselves, and the systems that create the forecasts, and the private sector will improve the quality of the renewable energy forecasts. Improvement of the accuracy of the nation's fundamental weather forecasts is an enormous challenge and one that our federal agencies are uniquely positioned to achieve as a consequence of their scale and resources. Doing so will not only improve the quality of renewable energy forecasts supplied by the private sector, but will benefit transportation, agriculture and the other sectors that are affected by the weather, ensuring that investments made are not solely for the benefit of one industry.

The last point that I would like to make is that the roles between the government efforts and the private sector need to be clearly defined. Fundamental and applied research is required to solve the challenge of improving the nation's weather forecasts, but it should not be confused with operational research and development for specific industries and end users. The public sector can, and should, provide the best possible scientific foundation upon which the private sector can do what it does best: drive innovation and deliver services most nimbly and competitively to its customers. Confusion in these roles blurs the lines between business and government, creates a distorted marketplace, ultimately increasing the tax burden for these operational efforts while squeezing out the very companies that have been and can continue to effectively serve these markets. In these times of strong renewable energy industry growth and federal stimulus program funding, there is the opportunity—if not the obligation—for the public sector to work aggressively towards *complementing* the private sector's capabilities to provide the greatest benefits to the renewable energy industry. If this opportunity is not well planned and coordinated, there is the risk that federally-funded efforts could be redundant and in competition with services already provided by the private sector.

Working together, we can ensure a robust and second-to-none U.S.-based weather forecasting infrastructure as well as a competitive renewable energy forecasting industry that ensures that U.S. companies remain the world leader in this field.

Thank you for allowing me the opportunity to testify today and I look forward to any questions you may have.

Additional Material (see attached:Joint Statement on the Role of Government-Affiliated Renewable Energy Forecasting Activities Relative to the Private Sector, prepared by Bruce Bailey, Mark Ahlstrom and Pascal Storck on June 3, 2009

Joint Statement on the Role of Government-Affiliated Renewable Energy Forecasting Activities Relative to the Private Sector

Prepared By:

AWS Truewind (Albany, NY); **3TIER** (Seattle, WA); **WindLogics** (St. Paul, MN)

June 3, 2009

The integration of wind energy generation into the country's transmission system has been greatly facilitated by the availability of advanced wind forecasting services developed over the past decade by the private sector. The three leading U.S.-based supplier firms are AWS Truewind, 3TIER, and WindLogics. The primary subscribers of wind forecasts are Independent System Operators, individual utility companies, wind plant owners/operators, energy traders, and wind turbine construction companies. Collectively these subscribers now obtain high-value forecasts for short-term (sub-hourly to 7-days) planning and decision-making for most of the country's installed wind capacity. Solar forecasting is also growing in demand and is being provided by the same firms. The quality of the forecast information and the tools used to develop forecasts are the best available worldwide. Ongoing investments in research and development by these firms and their clients are continually advancing the state-of-the-art and tailoring products to specific user needs.

In recent months, our firms—representing the private sector renewable energy forecasting community—have been engaged in preliminary discussions with government-affiliated entities about the appropriate roles for public and private sector organizations in the development and supply of short-term wind forecasts to fulfill the needs of the wind energy industry. These organizations can be placed into three categories:

- Government operational forecasting and research entities (NOAA/NCEP and NOAA/FSL)
- Government basic atmospheric research entities (NCAR, DOE labs, NASA, etc.)
- Government renewable energy research entities (NREL, DOE labs, etc.)

These discussions have been prompted by our concerns over the emergence of "new" government wind forecasting research and product development that replicates what commercial providers have been doing operationally for years.

In these times of strong wind industry growth and federal stimulus program funding, there is the opportunity—if not the obligation—for the public sector (encompassing the three government entity types) to work aggressively towards *complementing* the private sector's capabilities to provide the greatest benefits to the wind energy industry's requirements for accurate wind forecasts. If this opportunity is not well planned and coordinated, there is the risk that federally-funded programs for the government entities in support of wind forecasting could be duplicative and in competition with services already provided by the private sector. Our goal is to participate with the public sector in seizing the opportunity before us and to work collaboratively to ensure that the wind energy industry's needs are

met in the most appropriate, sustainable and cost-effective way. In addition to wind, this initiative should be inclusive of other renewable energy technologies (e.g., solar, wave).

The following three broad points reflect our firms' recommendations for priority needs that federal entities can fulfill to the benefit of the entire renewable energy industry.

1. **Enhancing Publicly-Available Weather Data Networks** – The greatest opportunity for enhancing renewable energy forecasting skill throughout the United States is in increasing the number, quality, and reporting frequency of public weather monitoring stations. Current observational networks are relatively sparse and widely spaced and emphasize data collection at a height of only 10 m (or less) above the surface (compared to today's typical wind turbine hub height of 80 m). This situation makes it difficult to detect and forecast mesoscale weather events such as large wind speed or insolation deviations over short time periods (i.e., ramp events). Weather stations should also be upgraded with additional sensors (e.g., lidar, sodar, solar radiation instruments) to measure the portion of the boundary layer (up to heights of 200 m above ground) in which utility-scale wind turbines operate. The data distribution process must also be improved so that field observations are available to users in near real-time. This measurement enhancement program can be phased in over time, beginning with stations within and adjacent to concentrated renewable energy development regions. The benefits of this modernization program would be realized by all sectors of the economy that are vulnerable to severe weather events. A prerequisite and collaborative research component of this program would be to use numerical modeling techniques to identify what new locations would yield the best results for forecasting skill improvement (i.e., observational targeting).

2. **Research into Problem Flow Regimes** – Collaborative field and modeling research is needed in strategic areas of the country to better detect and forecast complex flow regimes, including low-level jets and stable layer flows, that lead to unexpected turbine outages, long-term turbine performance issues, and wind forecasting errors. Occurrences of these problem flow regimes often go undetected or under-detected because most wind monitoring towers are too widely spaced and shorter than the hub height of today's utility-scale wind turbines. A joint public-private research program should be initiated to identify and implement effective approaches to resolving this situation through innovative atmospheric measurement and modeling techniques.

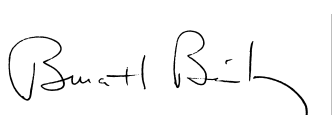
3. **Improvements in NWP Models** – Numerical weather prediction models developed and run by NOAA for national weather forecasting purposes in general underperform European prediction models in terms of forecasting skill. All forecasting organizations, including ours, rely on the outputs of government-run weather prediction models to initialize their own customized higher-resolution models to produce accurate forecasts of local winds and other weather conditions. The inferior skill level of U.S. government-run models has given European firms a competitive edge in this country and is forcing our firms to become more reliant on the same European prediction models. Improving the combination of model performance, data assimilation and model output resolution should be a high priority for the benefit of both the public as a whole and the U.S.-based renewable energy forecasting industry.

While there are other areas of potential interest to advance the science and utilization of renewable energy forecasting, they are secondary in importance and would be fruitless without first accomplishing the essential advancements identified above.

What is the best way to proceed with defining and implementing government entity participation in providing the country's renewable energy forecasting needs? Framing the answer to this important question should begin with the recognition of the current role and accomplishments already established by the private forecasting sector. This sector is well engaged with both the majority of operating wind farms throughout the United States and the full array of forecast users. It best understands the renewable energy industry's needs and the forecasting challenges yet to be overcome.

The next step should be deliberate engagement between the public and private sectors to jointly define government initiatives that would have the greatest impact on the advancement of wind and solar forecasting while avoiding duplication of effort. We propose the initiation of government-sponsored meetings of representatives from the public and private forecasting sectors to formulate a roadmap for addressing the country's renewable energy forecasting needs and challenges. The roadmap would include a collaborative research plan that defines key priorities and problems, identifies geographic regions where to focus first, defines technology and model development paths as well as data assimilation approaches, proposes respective roles and relationships, and develops budgets and a timetable. Sound planning, coordination and implementation will optimize the assets existent within the public and private forecasting sectors. It will also ensure a robust and second-to-none U.S.-based forecasting infrastructure and forecasting industry that enables the realization of the nation's full renewable energy potential.

Respectfully,



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