Project Title: Dakota Turbines

RE: Clarification of Reviewers Comments

1. Objectives:

Reviewer 1A – "Dakota Turbines wants to reduce the payback period… by two years…"

This references our statement that known improvements will get our payback period from the current 12 years to less than 10. The larger issue is that we are already projecting a payback period well under ½ the time of our competition. The two programs used for these calculations are the "payback calculator" on the Bergey website, and a quite sophisticated software program "WindPower" downloaded from www.wind-power-program.com Our data is compared to available 3rd party data for several other turbines in our size range, in making these comparisons.

Reviewer 1A – "…the proposal does not mention where the inverter would be manufactured" & "…the product market might already be saturated"

The inverter would also be manufactured/assembled in our facility in Cooperstown. Other than the proprietary control module, the rest of the inverter is comprised of easily ordered, off the shelf components, assembled in an appropriate enclosure.

Google may find a wealth of companies claiming to have inverters for sale, but upon follow up not a single inverter for single phase was available in the 30 to 40kW range. Two companies did have plans (blueprints) for inverters in that size range, but if we are going to proof-test a design – it might as well be our own.

Reviewer 3A – "There is no documentation for their cost of energy and payback estimates." & … "and also team up with someone who has some blade design and construction expertise."

The stated price of $.07 for energy is exactly, or very near the price of all rural electricity in ND. That information would be available on any REC web site. The payback estimates are based on the projected annual production numbers for our turbine, and similar 3rd party numbers for our competition, all of which were run through the Bergey and WindPower programs to establish payback time frames.

We did not specifically name a blade manufacturer, because we are still in the process of evaluating two different companies and their proposed designs. We do however state, …"working with blade manufacturers, using the latest blade design and optimization software, we have identified blade designs that would achieve over 85% efficiency."

2. Achievability:

Reviewer 1A – "Dakota Turbines have already identified a 22% efficiency increase… & …"average efficiency across the entire range…, or … peak efficiency"

Reviewers 1, 2, and 3 - indicate a do-able but aggressive schedule

The 22% mentioned is the actual percentage difference between the calculated efficiency of our current blades (63%), and that of a new design calculated to be in excess of 85%. That is indeed a 22% difference, but that represents a 34.92% increase in efficiency over our current blade. The efficiency ratings of blades in percentages, are "normalized" across the entire wind regime.

We would concur that this is a tight schedule. Delays in the implementation of the SWCC protocols, or a major setback in our testing procedures could cause us to run beyond the 18 month timeframe. However, we believe the timing is right to bring this turbine to market, and will do everything in our power to stay on schedule.

3. Methodology:

Reviewer 1A - …"the current design calls for the use of hand-wired boards"… & …"suggests a lack of understanding about the electrical system."

This is obviously a misunderstanding of what we thought we had explained. "Going from hand wired boards to printed circuits, will in itself solve many of the 'cross-talk' and/or 'electrical noise' problems..." but "…that also makes it more difficult to identify the source of problems…" & "It is our intent to have all the major noise issues solved before the printed boards are made…"

We would never even consider using hand wired boards on a final product. In the mean time however, we will attempt to solve ALL noise issues on the hand wired boards as they are easier to find and fix. By the time we print the circuit boards there will hopefully be NO noise or cross talk issues that the printed boards NEED to fix.

Reviewer 2A – "My only question is their claim of achieving an 85% efficiency on their blades. I don't know that this is achievable, but they may have not explained their goal correctly."

All mention of blade efficiency is as a percentage of the Betz limit. Both the 63% efficiency of our current blades, and the projected 85%+ of the new design, are percentages of the 59.3% available power under Betz Law.

Reviewer 3A - "Their commitment to the new small wind certification process is significant and a very positive aspect of their methodology. Their methodology outlines the general areas of work, but does not provide much specificity on the actual tests they will perform."

The Small Wind Certification process documentation is several hundred pages long, and very detailed. We appended a copy of the AWEA sub-set of criterion that gives a general explanation, but even that part of it is un-definable in a few sentences.

4. Contribution:

Reviewer 1A – "The 'sliding stator' technology should allow the turbine to be very competitive on the market…" & …"may be acquired by other existing turbines and improve their efficiency."

We agree. (rating: 3)?

5. Awareness:

Reviewer 1A - …"PI..." …"appears to lack understanding of the main subsystem, namely the electrical system…"

This again references the "hand wired board issue" previously explained. A misunderstanding of fact, that probably contributed to a very low rating.

Reviewer 3A - ..."I am a bit troubled by their claims of 63 – 85% efficient rotor blades."

Blade efficiency is always cited in a simple percentage format. We should have explained that the number is a percentage of the theoretical maximum – Betz Limit (59.3% of power available)

Reviewers 1, 2, and 3 – All three mentioned the lack of literature cited

Our computers contain hundreds, if not thousands of PDF's on a wide variety of topics. Many of the NREL and other agency contacts are a result of following up on information presented in these research papers. Although important during the discovery process, none is relevant to the task at hand, other than the pending SWCC process.

6. Background:

7. Project Management:

8. Equipment Purchase:

9. Facilities

10. Budget:

Reviewer 1, 2, and 3 – A common thread through the categories above was a lack of detail. In fact, that was mentioned throughout the review comments.

It is impossible to even adequately explain the major components in a complex project in 10 categories, on about 10 double spaced pages, let-alone go into the kind of detail the reviewers would like to have seen. We understand the need for brevity, but obviously it also contributes to scoring discounts that have nothing to do with the worth of a project.

Overall Comments and Recommendations:

Reviewer 1A - "It seems like an unnecessary expense since 10-20kW (single phase) inverters already exist on the market." & …"a large portion of ND's power grid is only single phase, a 3 phase system offers a much clearer signal…, …this efficiency may pay for the necessary upgrades…"

Unless more recent searches, and subsequent follow-ups on those searches, would find a single phase inverter in the 30 to 40kW range, there is not anything available. We had no intention of building an inverter at this point in the project. The fact that the inverter now exists is the result of not being able to buy one to move the turbine project forward in an earlier time frame.

As it turns out, economics alone would more than warrant manufacturing our own inverter. The retail price charged by other turbine manufacturers in our size range, and the cost of a couple of the 3 phase inverters that are available, averaged about $30,000 +/-. Being able to build an inverter for about $5000 is a huge cost savings for us. Being able to sell it at several times the cost and still be competitive, is a huge financial advantage.

In addition, our current design for the inverter can be easily modified for 3 phase applications. We have briefly touched on the basic design of the turbine being scalable from 10 to 100kW. The inverter design can also be scaled by the use of similar components of proper size, and changes in the parameters of the underlying control software. Both the scalability and 3 phase options have been anticipated and incorporated into the planning of our current single phase inverter.

Upgrading to a 3 phase line where none exists is not an option. The straight forward line costs are over $10/foot. The average consumer is probably several miles from the nearest 3 phase system, as such the cost of installing 3 phase would far exceed the cost of a turbine.

Not related to the Reviewers comments, but of significance to our project.

Since the grant application was written, we have increased our electrical output by about 40%, not including the additional gains expected by the new blades. That puts our calculated payback period at 9 years. The blades would drop that to about 7 years. We would hope to provide the hard data to verify these numbers by the meeting on Dec. 7th.

Thank you for the opportunity – Keith Monson