

Opportunity Title : Wind Farms for Grid Supply

Opportunity Summary:

Wind farms consist of an array of factory built wind turbines and the balance of plant infrastructure to collect the electricity and feed it into the electrical grid. Wind turbines are driven by zero-cost, non-polluting fuel, the wind. Technology development in the last 20 years for the rotor, drive train and electrical power conditioning equipment, have made wind power economically competitive and desirable as a replacement for other forms of generation that are environmentally less benign. Wide spread public support has created a regulatory environment where wind farm development is favoured through a relatively rapid permitting and environmental assessment process.

The Opportunity was assessed by 9 Evaluators.

Chart 1 - Opportunity Grid.

Shows the current grid position as determined by the Proponent, each Evaluator, the Evaluation Average, with respect to the Overarching Objectives: Expected Impact and Pathway Assets.

The Opportunity ratings have the following characteristics:

Pathway Assets = 7.5

Expected Impact = 7.5

R Value = 75%

(the R Value is a measure of the distance of the grid position for the proposed opportunity from the point X=10 and Y=10, with the point 10,10 representing 100% and the point 0,0 representing 0%)

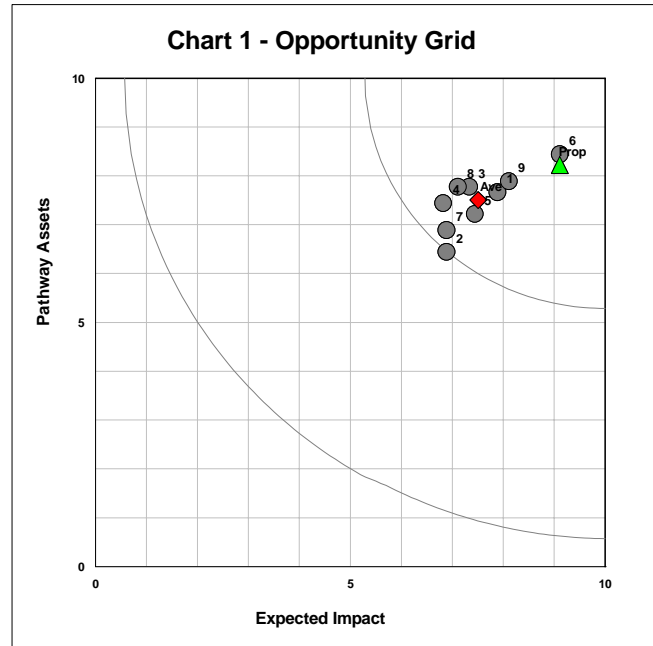
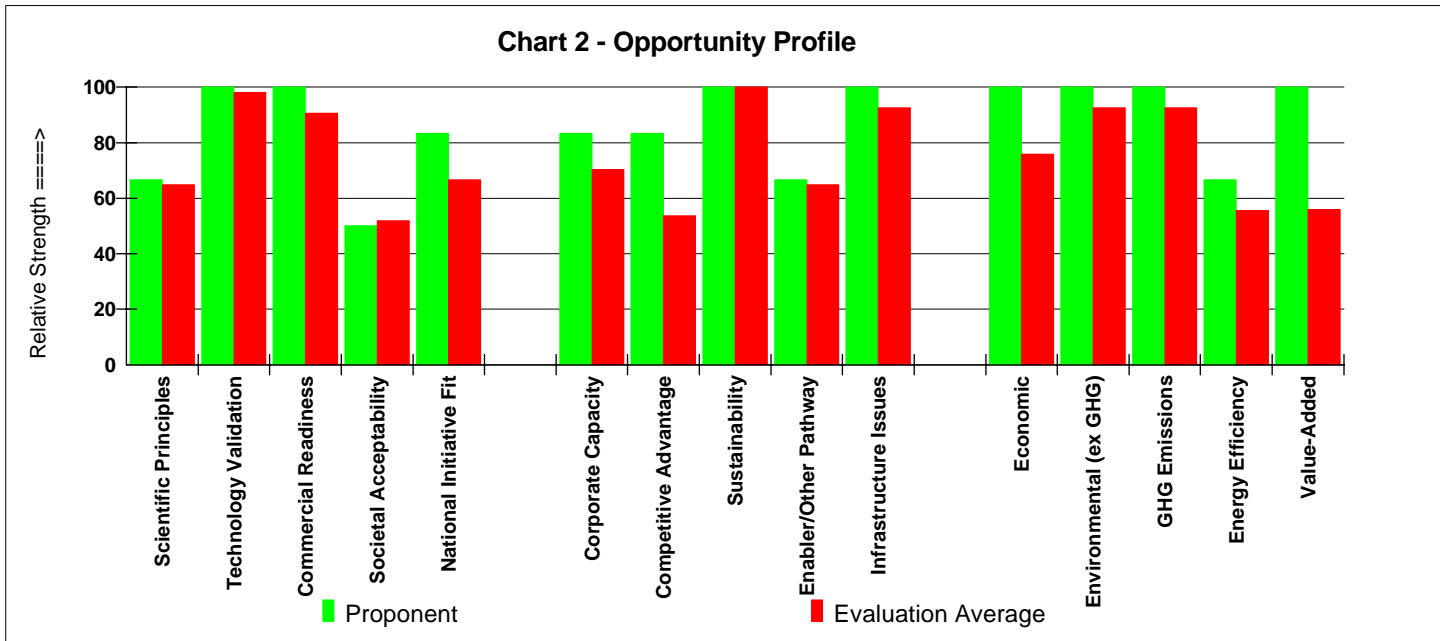


Chart 2 - Opportunity Profile.

Shows the ratings for each of the performance criteria, comparing the Proponent rating with the average rating of the Evaluators. This chart is useful in identifying strengths and weaknesses of the Opportunity and for tracking progress.



Opportunity Title : Wind Farms for Grid Supply**Expected Impact:****Evaluator 1**

There will two main issues affecting impact, public support and the competition for investment from other energy options.

Evaluator 2**Evaluator 3**

In a rush to get away, but it all seemed to work. Chris

Evaluator 4**Evaluator 5****Evaluator 6**

The economic impact of supplying and deploying the technology has been demonstrated (such as in Denmark). Though this technology does not create GHG emissions (which is quite positive), numerous other environmental impacts have yet to be studied in depth such as their impact on birds, bats, insect life and migration patterns, etc. Other environmental issues likely need to be explored, from the generation of noise (which becomes an issue in more populated areas) and the possible change in wind patterns, which may come to affect climate locally. An aggressive policy of developing wind-based generation will result in reduced dependency on fossil fuel electricity generation. However, the low power generating density per square kilometer leads to the need for large surfaces to exploit wind-based power generation: this is viable only where this resource is available, or where a shared resource with other users is possible. The impact of wind energy on the overall efficiency of electric power generation and transmission would be positive, as it would contribute to reduced dependency on fossil fuel based energy generally, and thereby reduce numerous negative related ancillary effects of GHG production and global warming. As a result, the value-add impact is potentially significant and would contribute quite significantly to fostering energy independence for Canada.

Evaluator 7

I agree in general with the potential but feel that expected the projected impact is overly optimistic. 10,000 MW by 2010 is highly improbable. The commercial infrastructure is not in place. Construction of wind generators and associated electrical transmission will take considerable time

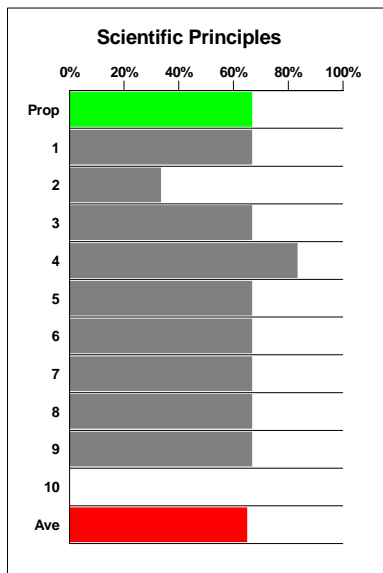
Evaluator 8**Evaluator 9**

One impact of wind power has not received the attention it deserves: the potential for local self-sufficiency in energy that would eliminate long transmission lines to many small users. Much is made of the need to connect wind turbines into the grid because it is non-dispatchable. However, one could also design local systems with storage capacity that would make inefficient long-distance transmission over expensive lines to farms, villages and little towns unnecessary. This subject needs good engineering design, but all the components are there, e.g.: pumped storage in local reservoirs (natural or built), hydrogen production, battery banks, etc. I believe that the change in the architecture of our power distribution to farms and small communities could prove to be very economical.

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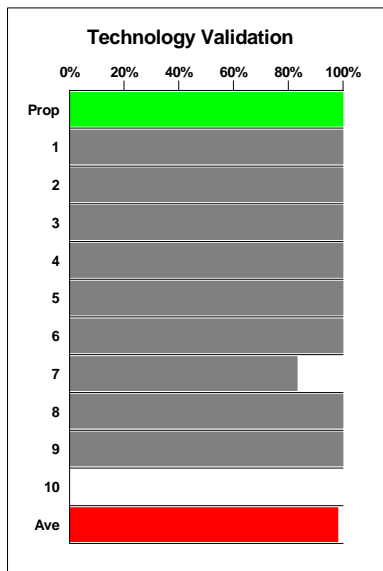
Chart - Evaluation Bar Charts.

The following 15 charts show the ratings for the Evaluator and Evaluation Average and comments by the Evaluators for each of the evaluation criteria.



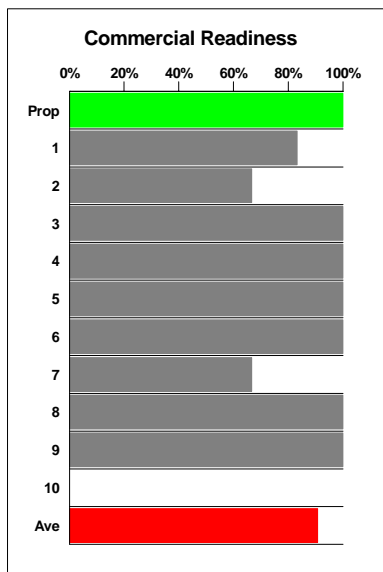
Comments:

1	The science is broadly understood, and the remaining questions have been identified.
2	Not all principles are understood.
3	
4	In fact, is close to a D except for forecasting and/or a breakthrough in the use of superconducting materials for generation
5	
6	
7	More information on long term life of gear systems may be needed
8	
9	agreed
10	



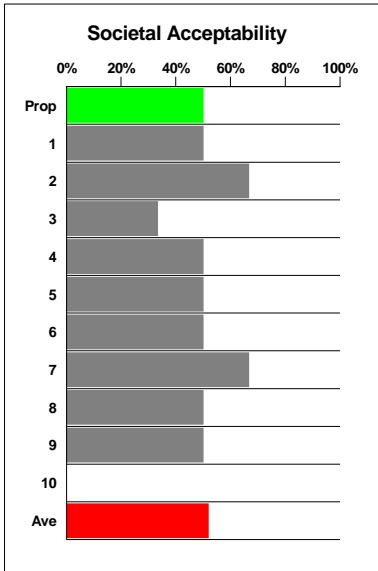
Comments:

1	I tried to find a reason for a less than D rating, but it would be hard to justify. My concerns with wind farms will appear in other cells in the matrix.
2	
3	
4	This is a fully validated technology - it is just not fully commercially viable yet.
5	Comment on criteria
6	
7	Current failure rates on gears are sufficient to justify development of gearless units
8	
9	agreed
10	



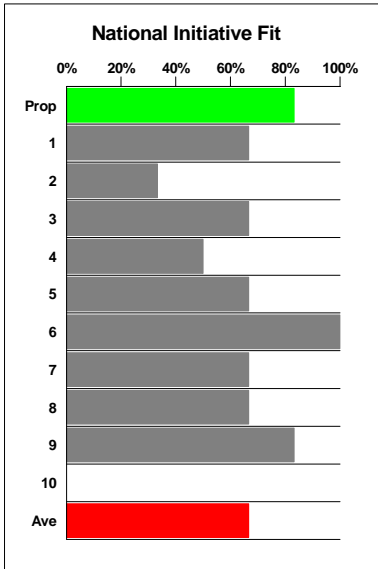
Comments:

1	I believe that there are risks involved that will need to be understood by Canadian investors.
2	Issues still remain related to the operational maintenance cost of the associated technology. Not mentioned in this proposal.
3	
4	Commercial sites are in operation
5	
6	
7	More regional experience may be needed to justify major risks
8	
9	agreed
10	



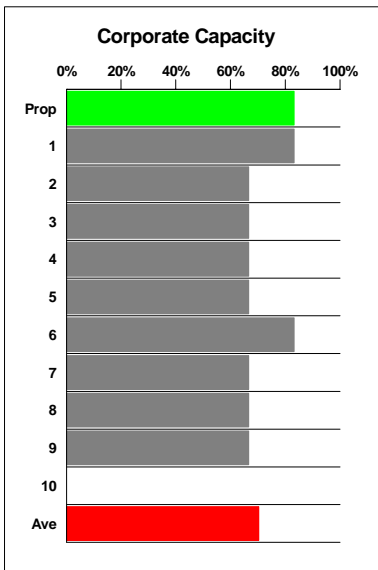
Comments:

1	The Proponent's BC rating and justification covers the positives and negatives very well.
2	Selection of location should mitigate negative societal impact.
3	Kills huge numbers of birds in the UK, including the very rare sea-eagle. An eyesore in the Indio valley Ca.
4	This is the ultimate clean source - but it has certain "obstrusive" factors that need to be overcome.
5	
6	
7	Possible land claims problems
8	Societal concerns would be mostly focused on the location ("not in my back yard attitude", impact on propriety value, etc), environmental noise and visual issues.
9	agreed
10	



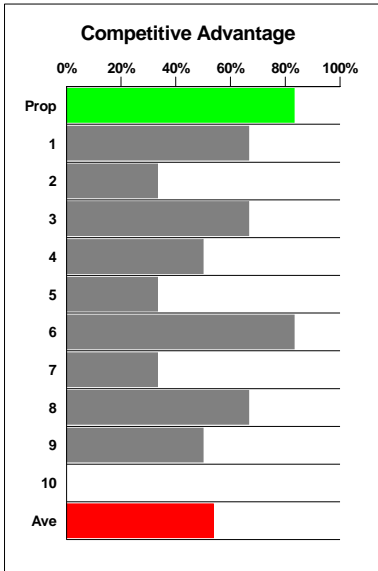
Comments:

1	The current standing of this pathway in Canada fits with a C rating.
2	C rating not demonstrated. Support is there but still an emerging technology from a national perspective
3	
4	This can be an important pathway - it has just not yet received the breadth and depth of support. It is still seen as a peripheral player by most of the public.
5	
6	
7	
8	
9	agreed
10	



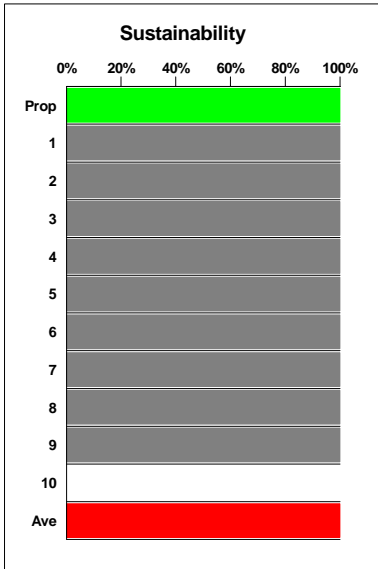
Comments:

1	The evolution of industrial capability has been much stronger than I would have expected a few years ago. A more deliberate pace appears to have paid off.
2	Capacity not clearly demonstrated
3	
4	Could be a D - but not yet enough critical mass focused on this in Canada to prove it
5	
6	
7	Canadian commercialization is still small. 10,000 MW in 2010 is not realistic on domestic production.
8	
9	We have a growing amount of experience and competence in the wind power area, but major industrial strength? Not yet.
10	



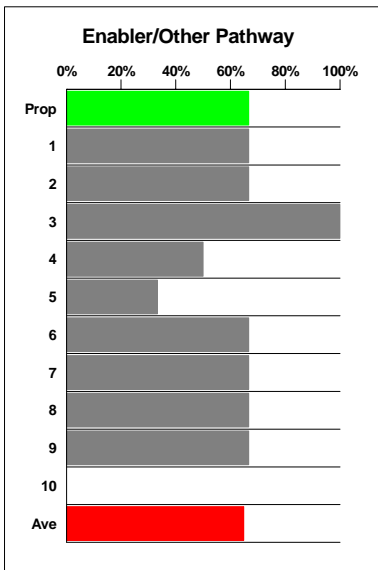
Comments:

- 1 Canada can certainly be a strong player but there is too much international effort to give us a unique competitive advantage. Who would have imagined little Lake Erie having a special place!
- 2 Many competing countries would have equal or better competitive positions.
- 3
- 4 Getting to a C or D would mean either achieving 20-30%?? penetration of the grid and major export sales of the resultant technologies and products. It is unsure we will want to do the first and may be too far behind to do the second
- 5
- 6
- 7 Foreign commercialization is well developed and competition would be severe
- 8
- 9 The benefits would come from substitution, and would depend on scale. A broad competitive advantage would require the assurance of new power on an industrial scale and at reasonable cost, and we're far from that.
- 10



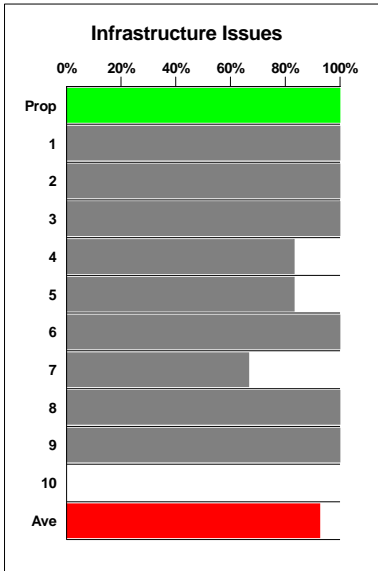
Comments:

- 1 Hard to visualize a downturn in the supply of wind.
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9 agreed
- 10



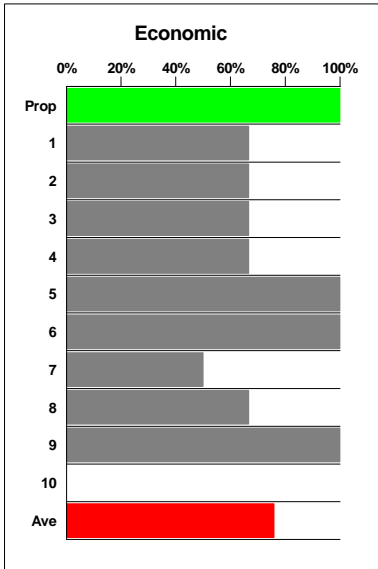
Comments:

- 1 There are many opportunities for integration, in addition to the relationship with water power.
- 2
- 3
- 4 The contributions of this pathway to others is not very unique - many others potential pathways have the same sort of synergies
- 5
- 6
- 7 Works well with hydro
- 8
- 9 agreed
- 10



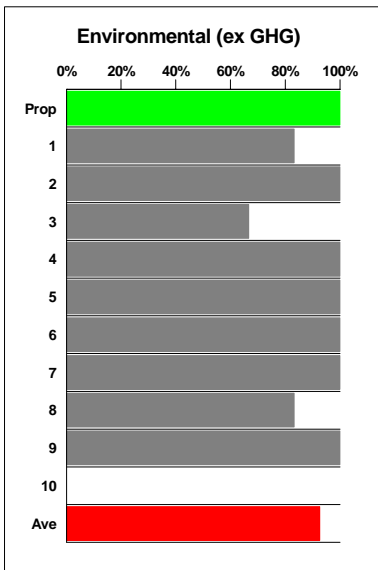
Comments:

1	There will likely be the need for localized infrastructure enhancements, but this is an ongoing task for the electrical grid system.
2	
3	
4	There are on-going issues about interconnection to the grid that are giving wind a poor reputation. These appear minor but must be addressed to get this to a D
5	
6	
7	Infrastructure is weak in some of the best wind areas
8	
9	agreed
10	



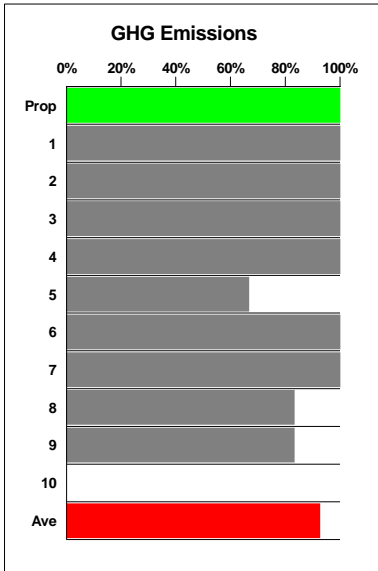
Comments:

1	Yes, it could be a D, but wind will be in competition with other energy options, and will have to jockey for a position in investments.
2	Significant commercial success not demonstrated
3	
4	The trade-off here is betting on the % penetration. If it were, say, 40%, this would clearly be a D. Is this likely.....???
5	
6	
7	Growth will be regional for some time
8	This technology is already being implemented commercially.
9	agreed
10	



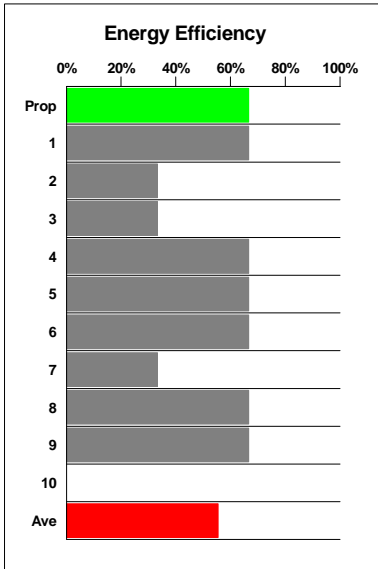
Comments:

1	I think wind energy will need to demonstrate through experience that the environmental impacts are as large as a D would indicate.
2	
3	
4	
5	
6	
7	
8	
9	agreed
10	



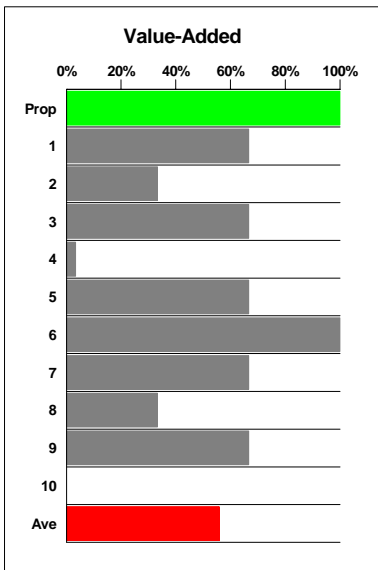
Comments:

1	The level of reduction will depend on how much substitution occurs, and also the level of GHG reductions that the other pathways achieve.
2	
3	
4	How significant, or course, is dependent on the % penetration
5	
6	
7	
8	
9	The impact will depend on the penetration.
10	



Comments:

1	It is hard to rate wind energy on efficiency, for the reasons the Proponent has identified.
2	Not proven as energy efficient
3	
4	
5	
6	
7	Efficiency not overly relevant
8	
9	agreed
10	



Comments:

1	Wind can only be judged on value-added by the release of other energy products for non-energy, or higher value, uses.
2	Not demonstrated or proven beyond a B rating.
3	
4	At its bottom line, this is just cheap electricity with no other products derived uniquely from this pathway.
5	
6	
7	
8	
9	I agree with the first sentence, but not the second. The replaced fossil fuels would probably be exported, not upgraded into value-added products as they should be.
10	