Transitioning to Renewables and a Low-Carbon Energy Grid: *A Pathway to Resolve the Firming Capacity Impasse*

Dr Ted Christie, *08 March2023*

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The challenge for stable electricity power on an energy grid, powered primarily by renewables, is to ensure continuous energy when the sun isn't shining, or the wind isn't blowing; or even if there is a sudden spike in demand i.e., ***'Firming capacity'.***

As renewables replace coal, significant issues over energy security have ignited public concern and controversy whether renewables, such as wind and solar energy, ensure stable electricity power.

Public concern resonates with the following opinion by the former Energy Security Board of Australia chairwoman, Dr Kerry Schott, as reported in the ***Australian Financial Review*** (28 February 2023):

> *'Former energy tsar, Kerry Schott, has criticised State governments, especially Victoria, for "demonising" gas, saying the fuel was crucial to shift the electricity grid from coal to renewable energy as part of the net zero transition… gas has to be part of the solution in the transition to renewable energy".*

The divergent opinion over scientific information that exists on this issue is problematic for policy decision-making by Government to meet the 2030 and 2050 Paris Agreement goals.

The foundation for resolving this policy issue requires an independent and objective evaluation of all feasible and viable options e.*g., solar, wind, hydro, hydrogen, bioresources, marine energy, nuclear, natural gas, clean energy technologies for existing fossil fuels, energy storage technologies*…. to find a

solution for managing emission reductions that is consistent with achieving the Paris Agreement's binding obligations for equity and sustainable development.

A key feature of this evaluation
would be to define the optimal energy mix
for a power system to ensure energy security and stable electricity power.

Specifically, how should renewables in a low-carbon energy grid be counter-balanced with flexible energy supply options that can be activated to guard against potential intermittency in the power system?

The choice of the problem-solving process to evaluate and resolve these scientific information conflicts is crucial for the integrity of decision-making.

An accepted concept from ***environmental dispute resolution*** is a relevant consideration to apply in the problem-solving process. That is, to insist on the use of objective criteria to evaluate and resolve scientific information conflicts.

"*Diffusion and adoption concepts*" provide the framework for setting objective criteria to evaluate and resolve information conflicts when transitioning to a low-carbon energy electricity grid. They have been an ***accepted body of knowledge in the social sciences*** for over half a century.

The approach: A low-carbon energy electricity grid should be recognized as a scientific innovation; and for decision-making on its implementation, to be based on the characteristics (or "*attributes*") which are relevant for the diffusion (or "*spread*") and adoption (or "*uptake*") of the innovation.

Some of the ***attributes that could be applied as objective criteria*** to evaluate and resolve existing scientific information conflicts for moving to a low-carbon energy grid, include: -

☑ ***RELATIVE ADVANTAGE***: *Expert opinion suggests that relative advantage is an essential condition absolutely necessary for adoption*.
Does the preferred power system have a clear advantage over competing alternatives for meeting emission reduction targets, sustainably. Achieving sustainable development requires its three dimensions *Environmental, Economic,* and *Social (*including *Cultural)* to be evaluated by weighting all

three dimensions equally, without inordinate focus on any one dimension.

- ☑ ***RISK:*** *A power system must be predictable, by keeping the system balanced between supply and demand; and dispatchable, by having the means to maintain that balance.* If there is an unacceptable risk or uncertainty, in terms of predictability and dispatchability of energy, the power system is less likely to be adopted.
- ☑ ***TRIALABILITY***: *The extent to which the operation of the preferred power system has been effectively evaluated, before a commitment to adopt is made, is a key factor determining the likelihood of it being taken up*. Where scientific uncertainty exists on an energy source to reduce carbon emissions *e.g. Hydrogen*, it would only be included in the evaluation when the uncertainty or environmental risk for its application had been resolved.
- ☑ ***COMPLEXITY:*** *Where the scientific information provided to the public to address their actual concerns is clear and perceived as easy to understand, it is more likely to be adopted.* Risk communication can be a log-in-the-road as decisions by science or politicians as to what constitutes an acceptable level of risk may be significantly different from public opinion.
- ☑ ***COMPATIBILITY:*** *Emission reduction measures that are compatible with intended industry and community values, norms, and perceived needs are more likely to be readily taken up* in transitioning to a net zero carbon economy; and to have a significant impact on a decision to adopt.

The goal for the evaluation outlined
would be to ensure that the public
have confidence in Government:
For public trust to prevail, and not public disbelief or concern.