

Hi All (To whom it may concern),

The idea that we build a new "Backbone" in Australia has lots of properties ("Engineering Plans" have advantages and disadvantages)

Employment within Australia. To build towers, transformers and all equipment need to make a new backbone will require equipment and materials built in Australia (or limited supply from overseas). We have most of the knowledge already to undertake such a project.

Timeframes are adjustable and sections can be built before other part are ready however the start time need to be this year.

Spending on backbone is "program timeframe" (yes it may cost \$20-\$30 billion but you will not spend that in one year). It may only be \$1.5 - \$3 billion a year over 10 years (and you may have some income to cover spending from the sale of RE zone connections). Building SA to Dubbo and Dubbo to Qld may be the starting points, then Bass Link 2. As soon as either Dubbo to Qld or SA is ready adding Narromine to Parks then allows for the upgrade to Wellington, hence on to either Bayswater or Mt Piper.

The system will have the same voltage (500 kV) but sections will have different capacities SA to NSW (say Dubbo) may be less than 1000 MW (say 600 MW) but Dubbo to Qld may be 3000 MW (starting at 1000 MW). Bass Link 2 (1000 MW allowing for 50% capacity of wind 600 MW may be too small) may need Bass Link 3 added in 2025 or 2035. Some links within the network will need both upgrading plus the flow direction may change. A lot of this change need to be driven by the change to renewable energy (RE). Should we link into existing 500 kV systems, yes where possible. Do we link into every HV line that we pass on this new backbone, no but this will all be part of the plan that can be adjusted to suit as we proceed and as RE get added in some areas. The actual capacity of each line and the connection points will be part of the plan and easily adjusted to suit by the addition of additional capacity or additional links to existing lines (will or may change direction of flow in line, and some of these lines may also need have their voltage and capacity increased.

The important part is that Tas is linked to Vic, which is linked to NSW which is then linked to both Qld and SA and it's all new capacity in 500 kV to which we can add additional links to both to receive and export power.

The aim of the new backbone to provide access / exit points for power so that it can be used at the shortest transmission distance from the source. It is not to get power from Tas to SA or to get power from Qld to Tas.

As we build this new network it will improve network strength, and allow a distributed network to be much wider coverage in the current NEM.

The advantages of a whole new strong backbone is that in the failure of a major FF power supply the backbone should be able to cope better. With more interconnects and better capacity across state boundaries, there will be less price gouging.

Each of the states is currently thinking of new interconnects, but I think a new backbone is a much better idea. Build a new 500kV system in single circuit lines (designed for double circuit lines, making sure that right of way or easement it can be expanded to carry two separate double circuit lines). As part of the engineering plan we need to add connection points as we build (if we pass an 110,220 or 330 kV line we may add a connection point). The aim of the new backbone is to enable building the existing pathways that the backbone passes to transmit power to the region that needs the power and not having to upgrade existing pathways, only to realise that we should have built a new pathway years ago because of their limited capacity. The plan also has to account for the change in Transport as we move to electrical powered vehicles.

The new backbone should be built with a minimum of 1 circuit but planned in such a way so that to add additional circuits is relative easy to extend or add too. Part of the plan needs to include stronger towers at increased high as part of the protection against climate change and changing weather patterns or increased fire risks. The new backbone also need to traverse known RE zones to make RE additions possible. As the distributed generator adds capacity then we must be able to add transmission capacity as required. Some parts of the backbone may become triple circuits while other parts remain a single circuits. The backbone going north may be a double circuit before the connection Davenport to Dubbo becomes a double circuit

There will be a need for 500/330 kV, 500/220 kV and some 500/110 kV transformers to cover the connections to the 500 kV lines.

Where possible some of the transformer that are replaced with the new 500kV units should be reused (recycled within the network).

Some lines will need upgrading sooner than others. One that comes to mind is Dubbo to Wellington. This line appears to be two separate 132/110 kV. This need to be upgraded to a 500kV (replace the oldest line with a new line. Wellington will need a new 500/320 kV transformer which links Mt Piper and Wollar (hence on to Bayswater and longer term Wellington to Bayswater may need to change to 500 kV). One change that needs to be accounted for is that the direction of flow on some circuits is going to change. At some substations close to RE generators it may be better to connect to the lower voltage side for use locally rather than on the high side for export from the region.

The aim of the backbone in to increase the RE added to the network by making the radial lines from centralise generation to distributed generation progressively reversing the direction of many of these lines. Reverse direction connections (short links that currently do not exist being added to the network to improve flow towards the load centres e.g. at Beryl adding a new connection to the Wellington to Woolli 320 kV line enables the line Beryl to Wellington to be upgraded hence better flows from RE in western NSW towards the load centres of Sydney by then upgrading Beryl to Mt Piper).

The transmission built as part of this needs to be a separate company to allow for the right downs that is going to happen in the local companies that current own the

networks in about 5 years' time (most of these assets are old and not being written down in value. Some people are going to abandon the current networks (some should be encouraged to leave based on costs to maintain them, but most should not leave and if they do then how will the networks react to the losses. They will lose to solar anyway but we need the batteries for transport (there may be up to 6 million solar system on roof tops in the NEM area but do we want in Australia to buy 6 million batteries for households when we do not manufacture those batteries in Australia or another way to put this is "Lets send money and jobs offshore").

The life expectancy of Wind Farms 25 years and solar farms may be longer. With Wind Farms so will be repurposed with different nacelle and only a few will be removed completely (they will have the history of each WTG and use that to decide what happens to each WTG).

Solar Farms will be in the same mode, do they replace some panels as the old ones become faulty or do they wind down the production. Both Wind and Solar may choose to upgrade and add additional storage of some type (solar may be more likely to add battery storage over PHES).

Windfarms if they have the space available and they have height to install PHES may choose to add storage (and they may join with other local farms in the same location to give them better supply control and it could be as much as 1/3 of the power rating of the wind farm (a lot will add smaller amounts in the range of 10% to 20% based on the so called "5 Minute Rule due in 2021).

Connect Davenport SA to Dubbo NSW (via Broken Hill almost following the Barrier Hwy then on to Nyngan down to Dubbo). This line could connect north to Western Downs almost following the Newell Hwy (via Bulli Creek or as described ISP as the new corridor which will need the upgrades at some stage to the Dumaresq, Armidale, and Tamworth, and Bayswater).

At Western Downs a new backbone for Qld can be added later linking Ross to the new Powering Qld plan. Again interlinking the current network with alternative pathways both northwards and towards the coast.

At Davenport the new connection to Port Lincoln can be upgraded at any time.

From Narromine head south linking into Narrandera (via Parks, Forbes, and West Wyalong) and then on to Vic (Bendigo) and south to Ballarat and then interconnecting into the Bass Link 2 cable (at either Anglesea or Geelong or Moorabool or even Princetown if that the pathway chosen for the new Basslink 2). New connections may be need at Dubbo to link to Point Piper near Lithgow (linking into Sydney). At Mirrool link to Temora (or close by) linking in to (following B94 route) Yass then onto Canberra linking back to Western Sydney. At Narrandera new links both Lower Tumut and to Dederang back to Murry. Narrandera will also need to link to Darlington Point and on to Red Cliffs. From Narrandera south to Finley (via Newell Hwy) to Tocumwal and then on to Shepparton. This does not stop the idea that Kerang should be linked the Deniliquin and hence up to Darlington Point (and consideration should be given to the idea that this link should be 330 kV line

When the new Dubbo to Narromine to Parks link is completed then the feed from Wellington - Parks to can be used to feed Dubbo while the 500 kV line between Wellington and Dubbo if the Davenport to Narromine and on to Dubbo lines is not completed.

This plan need to have a time table of about 5 to 8 years. As with any good engineering plan, it can be either updated or modified to suit the changing needs of the plan. Different parts can be built first so long as there is an overall plan to follow.

To pay for this plan most parts of these area that the backbone traverses can be actioned off, The RE zones can be sized to 100 MW, so if generators want to add power to the back bone they need to buy access via the auction process. Obtain the pathway first then auction off access to work out what capacity is needed. Normal rules apply (not every bid will be accepted if overbidding occurs or under-pricing). Any transmission pathway upgraded as part of this plan becomes part backbone subject to auction rule. Existing sites may be exempt however if curtailed then the difference between normal access and curtailed access may be subject to the auction. Nyngan Solar Farm may be exempt for its current size (but if it wants to increase capacity it will be subject to the auction) but Silverton Windfarm may have to bid for access (part of Silverton Wind farm plan is a line to Red Cliff if they reapply for the currently cancelled stage 2 of their project).

The auctions are not designed to raise the total costs of this project, more to subsidise the costs of project (or projects to build the new backbone).

Basslink 2 (and may be Basslink 3 in 2025- 2030 using Flinder Island)

Dr John Tamblyn in his April 2017 "Feasibility of a second Tasmanian interconnector" identified a pathway of Smithton to Tyabb running at + - 320 kV at 600 MW with an estimated costs of some \$799 million - \$1100 Million. This would include some augmentation to the 220 kV line (Double Circuit) from Sheffield to Smithton and some additional augmentation at Tyabb.

I believe that the idea of Bass Link 2 needs to go ahead sooner, rather than later as the time taken will be some 5 or more years, and that there may be changes in how Hydro Tasmania operates it's Hydro (from continuous to Peaking Hydro and may even add Pumped Hydro to some dams or sites).

Robin Island have already stated that they will not proceed until there is a second Bass Link.

The pathway needs to be change along with the Voltage.

From Cape Grim in Tasmania to Anglesea (or could be an alternative somewhere in between Anglesea and Ocean Grove underground to the Anglesea - Pt Henry Substation link then overhead if that the way Anglesea is fed at this time or could be direct to Geelong or better direct to Moorabool substation, upgrade costs and interlinking with SA and NSW interconnection.

The cable needs to go to Naracoopa on King Island, (KI one in from Tasmania and one out to Victoria) and should be a 500 kV rated cable (allows for increase capacity operated at 320 kV 600 MW power) at 1000 MW rating.

An alternative shorter distance is to go from Naracoopa to Princetown, then overland to the 500 kV line and integrate with both new interconnects to both SA and NSW (more CRE zones added).

There will be a need to upgrade the link from Sheffield to Cape Grim Substation (new) and new connection points along the way including Robin Island (paid for by Robin Island).

System Strength is increased in North West Tasmania (could even add more Wind Power MW that just Robin Island)

This does several things aside from the power production available, KI has a potential of 1600 MW (name plate and this may increase to 2000 MW) wind power (anywhere above 300 MW and the extra cable required and the extra substation on KI will pay for themselves).

KI had a Hydro Tasmania project called TasWind and it was for 200 WTG's at 3 MW. See [http://ramblingsdc.net/Australia/WindTas.html#TasWind\\_Wind\\_Farm](http://ramblingsdc.net/Australia/WindTas.html#TasWind_Wind_Farm)

In the RIT-T one listing that is missing is "Community Value" of Interconnect Transmission pathway.

Community Benefits:

1 Optical Fibre (OF) connection to and from Victoria and Tasmania (OF is about \$600 per km when included in HVDC cable as opposed to stand alone OF of about \$60,000 per km). The whole of KI could have buried cables as part of their plan for modernisation over the life time of any big wind farm(s) and there may be several different types of WTG' on KI i.e. 2,3,4,5 or 6 MW sizes (even to 10 MW currently being designed) to cover different wind speeds available.

2 Current Electrical supplies on KI use about 2.6 Million litres of Diesel Fuel.

As with all Wind Farms both landholder and community benefits flow (and the idea of a CRE zone declared for sale may also pay for access or subsidised electrical power on the KI.

3 Increased employment on the KI. (Building time on KI may stretch to 5 to 10 years)

The estimated increase in costs are \$100 million (above that of the Bass Link 2 Costs and may be less if CRE zone is auction off, note auction capacity at rate of so many MW at known kV. Note also auction does not guarantee land holders will agree to host a WTG or WTG's).

If a third link is required then Flinders Island would become the next choice (community benefits first over just costs only).

If it is just left to "Governments only" and they have their way it will be just based on costs alone (what cheapest for us) and there will be a very big missed opportunity to add big MW's of power on KI and remove burning Diesel to generate electricity.

Another issue is that this change over to RE will happen quicker that most people think. It will not be 30 to 50 years as some think, but 7 to 10 years, Batteries (very few will be above 4 hr supply or larger the battery. smaller hr supply time. Even household batteries will have limited supply after 6 to 8 hrs) and longer term PHES (4 hr to 10 hr and some longer) will become the norm within the NEM.

Regards  
Robert Ongley