REZ comments with structure headings by Geoff Sharples

Am supportive of more renewables on the grid however the scale and the true purpose of the REZ should be reconsidered.

Scale:

From the NP /TE call of March 31 it sounded like the Ngawha plant would cover Top Energy's territory's needs leaving only North Power's ~ 200MW load. If 2,000MW of solar were to be added, then the local load would hardly matter particularly considering the generation profile of solar compared to the load profile of the region. This effectively means exporting ~ 2,000 MW during solar peak and importing 200 MW for evening load peak.

Having a high concentration of intermittent generation with the same failure mode on a single line at one end of the grid, at a volume that would exceed local demand by a factor of ten sounds like a recipe for expensive grid management issues. This could shift the region from having a relatively easy grid to manage, to a having a very difficult grid to manage.

The cost to manage the unintended consequences would need to be allocated to someone.

Is Northland and place to test this?

Given that Northland only has a single line, little balancing generation and not much controllable day-time load, it seems like a sub-optimal choice for the first experiment at this scale. If it works in Northland then it should work anywhere, but if it fails then it would be a major setback for large scale renewables. For the best chance of success, it would be prudent to try this were there are more ways to manage the power with controllable load or more than one line and at a more manageable scale.

The purpose:

It has been stated that this has been driven by the volume of interconnect requests. If that is the primary problem to be solved then the other problems will get less attention.

The purpose should be to address the long-standing problems of resiliency, energy equity and energy hardship. Looked at through these lenses, the REZ would need to be adjusted or alternative approaches considered.

General comments on the proposal:

The explanations of risk management and benefits has been unconvincing in the lack of detail and knowledge particularly with respect to the scale of the challenges that will be created.

The basic maths needs to work:

It sounds like the 600 MW of spare capacity on the line south of Bream Bay would be soon allocated to projects pretty local to Bream Bay. Therefore, the upgrade for the REZ generation north of Bream Bay would need to run from the far North all the way south to the main GXP that ties to the Auckland load.

The maths and grid loading should be made really clear.

1) Show the current load and generation profiles at each GXP all the way down to the main interconnect near Auckland.
2) Then show what would those load and gen profiles really look like if the REZ were built out to plan.
3) How will power quality and intermittency be managed at each GXP?
4) What would be the interaction between the local grid at each GXP?

It is difficult to imagine that, would not cause local voltage and thermal problems either directly or indirectly.

(On the NP/TE call the it was stated that "consumers should not be funding this".) That sounds like an aspiration, not a promise, which means that consumers could end up footing the bill for managing the issues that arise.

The mitigation strategies described were uncertain or nowhere near the right scale to matter and are likely to cause local issues.

Batteries: For almost every question about how issues with solar would be managed, the answer seemed to be that "someone" would install batteries. Is there an economic analysis that supports this faith that batteries will be installed under market forces to manage the intermittency and arbitrage in the non-solar portion of the day? Other markets have indeed seen a proliferation of batteries but only after costly issues made batteries the least costly fix. If batteries are economic, then why are the solar projects not all adding batteries to serve up smoothed power? Batteries can be a solution but the market needs to be enabled and structured, not merely hoped for otherwise you will end up with batteries in parts of the grid that cause secondary challenges.

EVs: EVs and aggregation of EV charging are talked about as if they are a solution to managing intermittency. They can help but they are nowhere near the scale they would need to be. Consider the basic maths. There are about 80K houses in Northland. Say an EV miracle occurs and there are suddenly 20K EVs in Northland (25% of homes). A fast charger is 7.5 kW. So, if every EV was fast charging at noon that would be 150 MW. But EVs get 6km/kW so on average they only need about 4 hours at 7.5kW once a week. So best case you would likely have about 20 MW of EV charging load at a given hour on a given day. That is 1% of the 2,000 MW of solar – not much of a dent and you would have to get everyone to be charging their car during the middle of the day rather than using it, requiring a lot of down town EV fast charging infrastructure. From a scale perspective this would be equivalent to a consumer claiming that they would be using their 50 W computer charger to balance their 5 kW rooftop solar array. Moreover, the REZ solar will come online in big blocks while the adoption of EVs and other controllable loads will be incremental. Not only is there a mismatch in scale there is a mismatch in timing.

The benefits were not convincing and might not arise

Cheaper energy: There was talk of cheaper energy for Northland. But the energy will be produced at a time when consumers are using very little. Consumers will still be paying for energy produced south of Northland in the mornings and evenings and this may be more expensive and fossil based to manage the duck curve.

Jobs for Northland: Large scale solar construction is a specialized business and requires experienced firms and labour that financiers can trust. A select few established Northland firms that meet these criteria could do well and hire more locals, but this will not necessarily create lots of jobs for people who are not currently in the industry and it is very likely that experienced firms and labour from outside the region will do much of the high value work. Solar is low cost, in part, because it is quick build and it requires very little O&M. That translates to very few long-term jobs. "Local jobs" is a classic promise that is seldom fulfilled particularly with large scale solar or large-scale wind.

Attract Businesses to Northland with cheap power: For a business looking to relocate, the cost of energy is but one factor and for most it is well down the list. Also, they will look at their total potential power bill over the entire year. The low-cost solar power will be produced only during the day only on some days. On other days (cloudy and rainy days) and early mornings and late evenings the power will come from the south and perhaps be more expensive. It is possible that a businesses' annual power bill may not decrease sufficiently to drive a move to Northland. Depending on time of use, it could increase.

Resiliency: On its own, solar has a negative impact on resiliency. Claiming that 2,000 MW of solar will add resiliency to Northland's grid needs to be reconsidered or explained.

Costs

There are several big costs from the REZ

1) Other grids that have introduced large volumes of solar (and wind) have seen nodal prices go into single digits or negative during peak generation periods only to spike back up as fossil plants need to ramp back up quickly to infill intermittent the intermittency and to manage the solar ramping down at the end of the day. Being able to describe the "Duck Curve" is not the same as being able to managed it. This duck curve could be far more accentuated than California's and they have many tools including controllable load, pumped hydro, batteries, peaker plants and systems and experience people to manage it.
    a. This will mean that the economics for small scale solar will be crushed. Small scale and residential generators won't get much for exported solar and then they will be hit with higher evening prices.
    b. At first this may appear to allay long held concerns about too much solar in the distribution grid. However, this could drive the opposite problem as those who can afford it purchase EV's and home batteries. Residential customers could be drawing their full 15 kW of cheap solar during the day. Problem is that this will be uneven with feeders serving wealthy neighbourhoods experiencing overload and voltage drops. This scale of battery adoption may not be enough to materially manage the large scale solar but it will be enough to require local grid upgrades.
    c. This leads to the third impact which is that lines companies will need to upgrade the bill will go to disproportionately to less wealthy house-holds who can't afford the battery arbitrage game. – This has occurred in other markets with local solar adoption and is very likely to occur with local battery adoption.
    d. Fast ramping fossil fuel plants will likely be needed to manage intermittency and this will lead to more GHG being released by those plants.
2) Energy Equity and social license. Energy Equity and social license can impact anyone regardless of race or national origin. The goals and objectives in this regard need to be clearly stated and turned into metrics that need to be hit for all communities. This can include engagement in planning, operations and benefit sharing. The REZ consultation filings for Australia could provide good guidance on this element. While wealthy consumers and businesses with time to think about energy can lower their bills, those experiencing energy hardship would be price takers and could see their energy bills increase.
3) Resiliency. Large scale solar, concentrated in a region will be subject to similar cloud and weather patterns. It will make approximately zero positive difference to local

resiliency as if the line from the south goes down there would be no way to balance that much solar.

4) Externalities: Coal was considered cheap because the externalities (pollution) were shifted to someone else. Large scale solar is cheap, in part, because the externality of balancing the grid and supportive infrastructure are shifted to someone else. Until there are clear answers from load studies and scenario planning it will not be clear who will be paying for the externalities. If the externalities were fully paid for by large scale solar, it might not seem as cheap.

Other proposals to consider

The true cost of large scale solar and the purpose

It is clear that line upgrades are more economic a certain scales. And it is clear that lots of requests for solar interconnects have been made. This does not mean that these requests have to be granted at the 2,000 MW scale. There needs to be serious consideration in relation to the scale with respect to the local load. Maybe double or triple the local load is manageable, but 10X is a really big jump. A REZ that could start at a reasonable scale and ramp over time would be much more likely to succeed. So the upgrade would be more expensive per MW – perhaps that is because the externality would be better accounted for.

The true cost of adding large scale solar should be compared to adding DER scale solar in terms of the true costs of balancing the grid.

The purpose should be reconsidered. Address the needs of community first and then have business interests respond to community needs rather than meet the needs of business interests and then try to sell the idea as a positive to the community.

Culture shift in lines companies:

Lines companies in Aotearoa have long been conservative, incrementalistic, and "fast" (or "slow") followers. To suddenly jump to this scale and "put it all on red" seems out of character. How would they suddenly have the skills in-house to assess this risk or manage it? Big risk that this does not work and after absorbing all the bandwidth and capital causes lines companies to retreat again from adopting innovation. There are many other innovations that need to be implemented in the local grid to manage the energy trilemma / transition.