

## Submission on the Draft 2024 ISP

### Summary

AEMO's role has changed from increasing generation/ transmission to designing a VREG system requiring energy storage with a scope to 2050, and beyond. Simultaneously, governments are phasing out fossil fuels to electricity (energy type convergence) for societal needs: de-salination and water pumping, cooking/ heating/ refrigeration, finance/ commerce, transport, communications, medical, agriculture, etc. Obviously, electricity supply dependency will increase as fossil fuels/ generation are phased out.

The above leads to these considerations:

- Draft 2024 ISP Section 6.5 states “weather patterns from 2010-11 to 2019-20” were used “to analyse the future operability of the power system”. For its renewable drought analysis, AEMO should consider historical evidence of major volcanic explosions which produced ‘volcanic winters’ which lasted months to a year (refer Mt Tambora 1815 VEI 7);
- Draft 2024 ISP Section 7 does not appear to consider an enemy state attacking Australia’s (east coast) VREG + storage system. Unfortunately military conflicts and its preparations are increasing, and this path has many similarities with 1930’s path to WW2. AEMO is the only expert organisation and already know the vulnerabilities of developing Australia’s electricity systems. So AEMO should appropriately advise the Federal Gov’t. and ADF.

**These events are rare but their consequences will be horrific and extremely costly to Australia. AEMO has the expertise and smart people to perform risk assessments/ mitigation, advise governments and implement agreed risk management actions.**

### 1 Volcanic Winters

#### Introduction

Draft 2024 ISP Section 6.5 statements:

“Assuming new transmission is delivered as planned, renewable resources can be shared across the NEM, leaving only renewable droughts that affect considerable portions of the NEM as the key concern. “

“Historical weather patterns suggest that longer ‘dark and still’ periods of up to 3 days covering a wide geographical area are rare, with low risk of a NEM-wide event. However future weather may not replicate the past, especially with climate change, so there may be longer and more widespread renewable droughts.”

“ISP2024 examines weather patterns from 2010-11 to 2019-20 to analyse the future operability of the power system.”

#### Comment

The above renewable drought principle ignores historical evidence of major volcanic explosions producing a ‘volcanic winter’ which may last months ... to a year (refer Mt Tambora 1815 VEI 7). Here are some considerations:

- Fig 1 shows Australia is surrounded on 3 sides by active volcanoes. Of note, there are **76 active/ 71 inactive volcanoes in Indonesia. ‘Recent’ explosions were:** Mt Tambora 1815 VEI 7, Krakatoa 1883 VEI 6, Pinatubo 1991 VEI 6, Merapi 2010 VEI 4, Honga Tonga 2022 VEI 5 to 6;
- A major explosion will drastically reduce solar/ wind generation because atmospheric volcanic debris (ash/ water) and H<sub>2</sub>SO<sub>4</sub> aerosols will reduce the sun’s irradiance onto solar panels and change wind characteristics;
- Honga Tonga 2022 eruption blasted 146 million tons of water into the stratosphere and it may last 5-10 years. (

[https://en.wikipedia.org/wiki/2022\\_Hunga\\_Tonga%E2%80%93Hunga\\_Ha%CA%BBapai\\_eruption\\_and\\_tsunami](https://en.wikipedia.org/wiki/2022_Hunga_Tonga%E2%80%93Hunga_Ha%CA%BBapai_eruption_and_tsunami) ) This event's weather effect may explain the 225% decrease in daily kWh output occurrences which exceed 41.9kWh, of my solar panels (comparing 2022 to 2023 );

- Green Energy Export scenario and high CER penetration will help abate this possible renewable drought;
- Draft 2024 ISP relies upon natural gas generation of 16GW as backup. However, Minister Bowen has indicated a favourable response to a future COPS to limit or phase out fossil fuels.

#### Action suggested

AEMO could investigate tree rings/ ice cores/ crop failures to show how far south the effects of past volcanic explosions/ weather affect have travelled, its intensity and duration. Then AEMO can model above scenarios, advise governments and seek a government directive.

Note: I have limited knowledge of volcanology and meteorology.

The screenshot shows the Smithsonian Institution Global Volcanism Program website. The page features a navigation menu with 'Home', 'Reports', 'Database', 'Galleries', 'Resources', and 'Info & Contacts'. A 'Reykjanes (Iceland) Volcano Profile' button is visible. The main content area is titled 'Current Eruptions' and includes a text block explaining that 47 volcanoes were in continuing eruption status as of 15 December 2023. It also mentions that there are typically 40-50 continuing eruptions, and out of those generally around 20 will be actively erupting on any particular day. A link to 'annual eruption data is available' is provided. Below the text is a world map showing the locations of 19 volcanoes marked with orange cones. The map is labeled with 'EUROPE', 'ASIA', 'NORTH AMERICA', 'Pacific Ocean', 'Atlantic Ocean', and 'Indian Ocean'. The page footer includes copyright information for TomTom, Earthstar Geographics SIO, Microsoft, and OpenStreetMap.

## 2 Enemy attack

Draft 2024 ISP Section 7 Rationale for the ODP does not consider enemy attacks as a criteria for design of VREG + storage system.

### Introduction

Unfortunately, recent military conflicts and its preparations (PM Scholz “preparing for war”, 13/2/24) are increasing and this path has many similarities with 1930’s path to WW2. Similarities include:

- BRICS (Tripartite Pact);
- Russian/ Ukraine war (Czechoslovakia);
- Chinese desires to take Taiwan (Manchuria then China), South China Sea (Baltic Sea) and its current procurement of a shield around Australia (France).

An enemy state:

- Will recognise and exploit the vulnerabilities and dependencies of Australia’s east coast VREG + storage system with lumped REZs and transmission dependence;
- The compounding factor of society’s energy type convergence and residents’ reaction to blackouts;
- Could remotely launch strategic, surgical, co-ordinated and repetitive attacks to defeat or subdue Australia by relatively cheap, simple means.

### Comment

Here’s a simple explanation of above point:

**Enemy could remotely launch:** a land invasion is not required as attacks could be a mixture of missile, torpedo, drone or cyber (high number of Chinese inverters, IEDs, etc);

**Strategic:** AEMO ISPs have identified weaknesses, vulnerabilities, dependencies, project delays, and transmission topology. A soft attack could initiate phase faults for protection systems’ tripping and/ or cyber disabling of roof top solar/ battery inverters. A hard attack could destroy critical transmission circuit breakers or power cables from offshore wind farms.

**Surgical, co-ordinated:** AEMO publishes data which an enemy uses to model the above system and determine optimum event, season, locations, circuit breakers and synchronised timing of attacks (using GPS) to cripple the system;

**Repetitive attacks:** Historically, USA and Russia each have fired 100+ missiles or drones within 48 hours during their attacks. Similarly, an enemy will have large resources, select number of (repetitive) attacks and their durations, etc to achieve and sustain its set of goals.

### Action suggested

The recent DFR was apparently oblivious to Russian attacks upon Ukraine’s electricity system. It is prudent and efficient to consider national security of our electricity systems. AEMO’s modelling can identify vulnerabilities, solutions, harden the system (eg EM Pulse withstand), and develop resiliency and contingency plans. So there are needs for AEMO to advise the Federal Gov’t, and to seek an appropriate directive to incorporate into ISPs, and involve ADF.

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