Environmental, Community, and Indigenous Concerns Regarding the Yanco Battery Energy Storage System (BESS)

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Introduction

The Yanco Battery Energy Storage System (BESS) is a proposed large-scale energy storage facility located in Yanco, New South Wales, approximately 5 kilometres south of Leeton in the Leeton Shire Local Government Area. With a planned capacity of 250 megawatts (MW) and 1,100 megawatt-hours (MWh), the project represents a significant contribution to the state's renewable energy transition and decarbonisation objectives. This capacity would power approximately 80,000 homes, advancing New South Wales' clean energy agenda.

While BESS technology is essential to integrating renewable energy into the grid, it also presents unique environmental, community, and safety concerns. This report explores these issues in detail, focusing on the environmental impacts, fire hazards, regulatory gaps, community well-being, Indigenous cultural heritage, and lifecycle sustainability of the project.

Environmental Impact

Noise Pollution

The operation of large-scale BESS facilities produces continuous low-frequency noise, which can significantly affect local wildlife and human populations. For fauna, noise disrupts natural behaviours, including communication, mating, and foraging, leading to displacement and habitat degradation (Krause & Farina, 2016). For humans, exposure to persistent low-frequency noise has been linked to stress, sleep disturbances, and other adverse health outcomes, impacting quality of life and productivity (World Health Organization, 2018).

Water Contamination

The risk of hazardous chemical leaks from lithium-ion batteries, such as lithium, cobalt, and nickel, poses a significant threat to water sources. These chemicals can infiltrate surface water and groundwater, endangering aquatic ecosystems and the health of local communities relying on bore water for agriculture and drinking purposes (World Bank, 2020). The contamination of water supplies could have long-term consequences for regional agriculture and biodiversity.

Land Disturbance and Biodiversity

The construction and operation of BESS facilities often necessitate land clearing, which disrupts ecosystems, destroys habitats, and threatens biodiversity. The Yanco area includes

ecosystems that may support endangered or vulnerable species. Habitat loss and fragmentation can compromise ecological resilience and undermine conservation efforts in New South Wales (Department of Agriculture, Water and the Environment, 2021).

Fire and Explosion Risks

Nature of Fire Hazards

Fire hazards in lithium-ion BESS facilities primarily stem from a phenomenon known as **thermal runaway**, where overheating in one battery cell triggers a chain reaction across adjacent cells. This can lead to uncontrollable fires, emitting toxic gases and particles, including hydrogen fluoride and carbon monoxide, which pose severe risks to human health and the environment (Queensland Fire and Emergency Services, 2022).

Environmental Impact of Fires

The environmental consequences of BESS fires are profound. Toxic pollutants released during combustion can contaminate air, soil, and water, impacting flora and fauna. Fire suppression efforts, particularly those involving water, risk spreading contaminants to nearby water bodies, threatening aquatic ecosystems. Persistent organic pollutants may linger in the soil, affecting plant health and potentially entering local food chains.

Historical Incidents and Management Challenges

Past incidents, such as the 2021 Tesla Megapack fire in Victoria, demonstrate the challenges of managing BESS fires, which often require days to extinguish. Many rural fire services, including those in areas like Yanco, may lack the specialised equipment and training necessary to manage these risks effectively. This underscores the importance of robust fire prevention and emergency response planning.

Chemicals Used in Lithium-Ion Batteries

Key Components and Risks

Lithium-ion batteries contain several materials with significant environmental and health risks:

- **Lithium**: Mining requires substantial water use and contributes to land degradation.
- **Cobalt**: Often sourced from regions with poor environmental and labour standards.
- **Nickel**: Mining impacts include deforestation and soil erosion.
- **Electrolytes**: Highly flammable and reactive, posing safety risks during leaks or fires.

Chemical spills or leaks from BESS facilities can lead to contamination of soil and water, disrupting ecosystems and endangering human health. Flora exposed to these chemicals may experience growth inhibition or death, while fauna may suffer from bioaccumulation, leading to reproductive and population declines.

Community Impacts

Health and Well-being

Noise, air quality, and safety concerns from BESS facilities can adversely affect nearby residents. Persistent noise, especially at low frequencies, is linked to stress, sleep disturbances, and cognitive impairments. The risk of fire or explosion adds to community anxiety, necessitating transparent communication and emergency preparedness measures (World Health Organization, 2018).

Indigenous Cultural Heritage

The Yanco site may overlap with land of cultural significance to Indigenous communities. Construction and operation of the BESS could disrupt these sites, potentially violating the principles of free, prior, and informed consent as articulated in the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP, 2007). Protecting Indigenous heritage is essential, both as a moral imperative and a legal obligation.

Lifecycle and Sustainability Concerns

End-of-Life Battery Disposal

The disposal and recycling of lithium-ion batteries remain a major challenge. Without proper recycling infrastructure, the risk of environmental pollution from electronic waste increases. Toxic leachates from discarded batteries can contaminate soil and water, further exacerbating ecological impacts (World Bank, 2020).

Supply Chain Issues

The extraction of raw materials such as cobalt, lithium, and nickel often involves significant environmental destruction and human rights violations. Mining operations, particularly in developing countries, have been linked to deforestation, habitat loss, and unsafe labour practices (Amnesty International, 2019). Addressing these supply chain issues is critical to ensuring the sustainability of energy storage systems.

Recommendations

To address the identified risks and challenges, the following measures are proposed:

1. **Enhanced Fire and Safety Systems**
    - Install advanced fire suppression technologies and thermal management systems.
    - Provide specialised training for local emergency services.
2. **Environmental Monitoring and Mitigation**
    - Conduct regular soil and water quality tests to detect contamination.

    - Implement biodiversity offsets and preserve critical habitats during construction.
3. **Community and Indigenous Engagement**
    - Collaborate with Indigenous communities to safeguard cultural heritage.
    - Develop clear communication strategies for local residents regarding health and safety measures.
4. **Lifecycle Management**
    - Establish robust recycling protocols for end-of-life batteries.
    - Promote responsible sourcing of raw materials to minimise supply chain impacts.

Conclusion

The Yanco Battery Energy Storage System represents a significant step in advancing New South Wales' renewable energy transition. However, the considerable environmental, safety, and community risks associated with the project outweigh its potential benefits. The risks of fire and explosion, contamination of soil and water by hazardous chemicals, and the adverse impacts on local flora, fauna, and biodiversity are substantial and pose long-term environmental consequences.

Furthermore, the disruption to Indigenous cultural heritage, coupled with community health and well-being concerns, highlights significant gaps in the project's planning and consultation processes. The inadequate regulatory frameworks and unresolved issues surrounding the lifecycle of lithium-ion batteries, including ethical supply chain challenges and end-of-life disposal, exacerbate these risks.

Given the severity of these concerns, the Yanco BESS project should not proceed in its current form. Instead, efforts should be directed toward identifying alternative locations, technologies, or approaches that can deliver energy storage benefits while avoiding irreparable harm to the environment, local communities, and Indigenous heritage. Such a decision would demonstrate a commitment to sustainable and ethical energy development aligned with the principles of environmental stewardship and social responsibility.

References

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