Submission to the New South Wales Department of Planning and Environment: Maison Dieu Solar Farm 60MW with a 40MW/2hr Battery Storage

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Project: Maison Dieu Solar Farm 60MW Solar Installation with 40MW/2hr Battery Storage, Singleton, NSW

Executive Summary:
The Maison Dieu Solar Farm project presents significant environmental risks, including habitat destruction, threats to endangered species, incorrect carbon accounting, long-term pollution from solar panel degradation, and the exacerbation of the heat island effect. The inclusion of a 40MW/2-hour battery storage system adds further environmental risks, such as hazardous material waste, fire risks, and broader carbon lifecycle impacts. The cumulative effects on biodiversity, soil health, water systems, and local temperature regulation suggest that the project poses too great a risk to proceed in its current form.

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1. Environmental Impact

a) Habitat Destruction and Fragmentation:
The construction of the Maison Dieu Solar Farm will require the clearing of remnant vegetation, which plays a crucial role in supporting endangered species such as the koala (Phascolarctos cinereus) and the greater glider (Petauroides volans) (Crowther et al., 2022; Smith, 2023). Habitat fragmentation exacerbates threats to these species, as in other projects like Lotus Creek, where poorly planned relocation efforts will result in the euthanasia of displaced koalas due to the absence of suitable alternative habitats (Smith, 2023).

Koalas rely on eucalyptus trees for food and shelter, and habitat loss will significantly reduce their ability to survive and reproduce (Queensland Government, 2023). The greater glider, which depends on mature forests for foraging and nesting, is similarly vulnerable to habitat fragmentation caused by large-scale solar installations (Schuster et al., 2019). Fragmentation increases edge effects, which expose wildlife to higher risks from predators, competition, and environmental stressors (Laurance et al., 2022).

b) Soil Erosion and Water Runoff:
Large-scale solar installations typically lead to significant soil disturbance, which increases erosion and sedimentation in nearby waterways (Brown et al., 2021). In the case of the Maison Dieu Solar Farm, this poses a direct threat to aquatic species like the platypus (Ornithorhynchus anatinus), which relies on clean, oxygenated water (Schuster et al., 2019). The project's erosion control measures are insufficient to prevent such long-term impacts on water quality and biodiversity (Smith et al., 2022).

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2. Wildlife Impact and Endangered Species

a) Impact on Koalas and Other Species:
Koalas are highly sensitive to habitat disruption, and the clearing of forested areas will directly threaten their survival (Crowther et al., 2022). At the Lotus Creek Wind

Farm, inadequate relocation efforts lead to poor outcomes, including the euthanasia of displaced koalas (Smith, 2024). Similar outcomes are likely for the Maison Dieu Solar Farm unless robust conservation strategies are implemented. Additionally, the greater glider (Petauroides volans), which relies on uninterrupted forests for foraging and shelter, will suffer from habitat fragmentation, potentially leading to significant population declines (Smith et al., 2022).

Moreover, the vibration caused by the construction and operation of renewable energy infrastructure can have negative effects on sensitive species such as koalas and the powerful owl (Ninox strenua) (Queensland Government, 2023). Prolonged exposure to vibration disrupts natural behavior, leading to increased stress levels, displacement, and decreased reproductive success in both arboreal and ground-dwelling species (Smith, 2023).

b) Avian Species at Risk:
Solar farms pose considerable risks to bird populations, particularly large raptors and migratory birds. Birds such as the wedge-tailed eagle (Aquila audax) and the white-bellied sea eagle (Haliaeetus leucogaster) are particularly vulnerable due to the collision risks posed by reflective solar panels, which may be mistaken for water (Walston et al., 2016). Similar impacts were observed at the Wellington Solar Farm, where avian mortality rates, particularly among raptors and migratory species, increased significantly despite mitigation measures (Jones et al., 2020).

Fragmentation and edge effects further exacerbate these risks. Birds reliant on continuous habitats, such as the superb parrot (Polytelis swainsonii), experience declining populations in fragmented landscapes as their nesting and foraging grounds are disrupted (Laurance et al., 2018). Moreover, studies on frugivorous birds reveal that species with specialized diets are more vulnerable to habitat fragmentation due to the loss of mutualistic relationships with fruiting trees, as seen in fragmented ecosystems like the Amazon rainforest (Laurance et al., 2022).

c) Impact of Heat on Wildlife:
The heat island effect generated by solar farms can have severe impacts on local wildlife. Increased surface temperatures can lead to thermal stress, particularly for species such as the koala (Phascolarctos cinereus), which is highly sensitive to temperature fluctuations (Crowther et al., 2022). Heat stress can lead to dehydration, disorientation, and even death in extreme cases, particularly when combined with reduced water availability due to drought conditions (Smith, 2023).

Research has also indicated that the creation of thermal belts—areas of concentrated heat caused by large-scale renewable energy projects—can alter local microclimates, reducing the availability of essential resources like water and forage (Laurance et al., 2022). For example, thermal belts formed by solar farms can reduce cloud cover and moisture distribution, leading to a decline in regional precipitation levels and further threatening vulnerable species like the platypus (Ornithorhynchus anatinus) and greater glider (Petauroides volans) (Rainforest Reserves Australia, 2024).

3. Heat Island Effect and Thermal Belts

a) Heat Island Effect:
The heat island effect is a well-documented phenomenon associated with large-scale solar farms. Solar panels absorb and reflect heat, leading to localized temperature increases. Studies have shown that renewable energy projects can raise surface temperatures by up to 4°C (Li et al., 2018; Barron-Gafford et al., 2016). This increase in temperature can disrupt local microclimates, affecting biodiversity and agriculture. For species like the koala (Phascolarctos cinereus), which are sensitive to temperature fluctuations, the rise in local temperatures may lead to dehydration, heat stress, and even increased mortality (Crowther et al., 2022). The heat island effect can also exacerbate drought conditions by increasing evaporation rates, further threatening species dependent on stable water sources, such as the platypus (Ornithorhynchus anatinus) (Rainforest Reserves Australia, 2024).

Research reveals that the heat island effect is compounded by the loss of remnant forests, which would otherwise provide natural cooling through evapotranspiration. Without these natural buffers, renewable energy projects like the Maison Dieu Solar Farm could lead to a dangerous feedback loop of rising temperatures and declining biodiversity (Rainforest Reserves Australia, 2024).

b) Formation of Thermal Belts:
In addition to the heat island effect, renewable energy projects such as solar farms contribute to the formation of thermal belts—continuous regions of elevated temperature created by the absorption and reflection of heat from solar panels and the disruption of air currents by wind turbines (Smith, 2023). These thermal belts can alter local weather patterns, reducing cloud cover and moisture distribution, which in turn affects regional precipitation levels (Zhu et al., 2019).

The clearing of forests for renewable energy projects exacerbates the formation of these thermal belts, as forested areas typically moderate temperatures and play a vital role in local water cycles (Zhang et al., 2020). In Queensland's Great Dividing Range, renewable energy projects have contributed to reduced regional rainfall by 15%, leading to prolonged droughts and severe impacts on agriculture and biodiversity (Rainforest Reserves Australia, 2024). Similar outcomes are likely in the Singleton region, where the Maison Dieu Solar Farm could significantly alter local climate patterns.

Furthermore, the formation of thermal belts threatens to exacerbate climate disruptions on a broader scale. As seen in Eungella National Park, where renewable energy projects are expected to lead to rising temperatures and the destruction of rare ecosystems, the Maison Dieu project may pose similar risks to Singleton's unique biodiversity, particularly if key forested areas are cleared for construction (Rainforest Reserves Australia, 2024).

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4. Battery Storage System Environmental Impact

a) Materials and Waste:
The inclusion of a 40MW/2-hour battery energy storage system (BESS) introduces significant environmental concerns related to the extraction of raw materials like

lithium, cobalt, and nickel. These processes are known to cause extensive habitat destruction and water contamination in mining regions (Schönfeld et al., 2019). Additionally, the disposal of used batteries presents long-term waste management challenges, as improperly disposed batteries may leach hazardous materials into the soil and water systems, further endangering local wildlife and ecosystems. Proper recycling and disposal plans need to be implemented to mitigate these risks, but current strategies remain insufficient in addressing the long-term impacts of battery waste (Schönfeld et al., 2019).

b) Fire Risk:
Battery energy storage systems (BESS) are prone to thermal runaway, which can lead to fires or explosions. These incidents can release hazardous chemicals and toxic fumes into the environment, putting nearby ecosystems and human communities at risk. Additionally, the potential for fire hazards may place further strain on emergency response resources in the region. Considering the environmental sensitivity of the project site, these risks demand strict fire safety protocols to be in place before construction begins.

c) Carbon Lifecycle and Energy Efficiency:
The carbon emissions associated with the lifecycle of battery components, including their manufacture, transportation, and disposal, must be considered in the overall carbon accounting of the project. The extraction of raw materials and the energy-intensive processes involved in manufacturing the batteries contribute significantly to the project's total emissions (Hertwich et al., 2018).

The end-of-life disposal footprint is not fully captured by the existing model. The decommissioning of both solar panels and batteries, including the disposal or recycling of these components, also generates additional emissions that are overlooked in the current accounting process. Consequently, the Maison Dieu Solar Farm's purported contribution to net-zero carbon goals is significantly overstated, as its embedded emissions from these overlooked phases negate much of the project's carbon savings (Smith, 2023).

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6. Legislative Breaches and Inadequate Mitigation Strategies

a) Inadequate Wildlife Conservation Strategies:
The wildlife conservation plan for the Maison Dieu Solar Farm is insufficient, particularly in its provisions for protecting endangered species like the koala and greater glider (Smith & Johnson, 2023). Without continuous monitoring and robust relocation strategies, the project risks breaching the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (AEMC, 2024). Similar failures were documented at the Lotus Creek Wind Farm, where inadequate measures led to significant wildlife mortality (Smith, 2024).

b) Lack of Comprehensive Carbon Lifecycle Analysis:
The failure to fully account for the carbon emissions associated with the construction, operation, and decommissioning phases of the project raises questions about its contribution to Australia's net-zero targets (Rainforest Reserves Australia, 2024). Without a comprehensive assessment of the carbon costs involved in the manufacture,

transport, and disposal of solar panels and battery systems, the environmental benefits of the Maison Dieu Solar Farm are overstated (Zhang et al., 2020).

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7. Case Studies: Impacts from Similar Projects

a) Case Study 1: Lotus Creek Wind Farm:
The Lotus Creek Wind Farm in Queensland provides a cautionary tale of poorly managed renewable energy projects. The failure to protect local koala populations will result in high mortality rates and poorly executed relocation efforts (Smith, 2024). This project demonstrates the risks of large-scale developments without adequate biodiversity conservation strategies.

b) Case Study 2: Wellington Solar Farm:
At the Wellington Solar Farm, habitat fragmentation and avian mortality rates increased, particularly among migratory birds and large raptors such as the wedge-tailed eagle (Aquila audax) (Jones et al., 2020). Despite mitigation strategies, population declines were recorded, highlighting the need for more stringent environmental safeguards (Walston et al., 2016).

Conclusion:
Given the significant environmental risks posed by the Maison Dieu Solar Farm, including those related to the battery storage system, it is clear that the project, in its current form, presents a substantial threat to local biodiversity, water systems, and climate stability. The inadequate mitigation strategies, combined with poor carbon accounting, material shedding, long-term pollution risks, and fire hazards related to the battery system, suggest that this project should not proceed without substantial revisions.

Recommendations:

1. **Comprehensive Wildlife Monitoring:**
   Implement long-term monitoring of endangered species, with adaptive management strategies to address unforeseen impacts.
2. **Improved Carbon Lifecycle Accounting:**
   Recalculate the project's carbon emissions to include construction, material production, and decommissioning phases, particularly accounting for the environmental cost of the battery storage system.
3. **Stricter Erosion and Waterway Protections:**
   Strengthen erosion control measures to prevent sedimentation and water pollution from both the solar farm construction and battery storage system installation.
4. **Enhanced Mitigation for the Heat Island Effect:**
   Introduce vegetative buffers and other cooling technologies to mitigate localized temperature increases, exacerbated by the combined effect of solar panels and battery storage.
5. **Fire Safety and Waste Management Plans for Battery Storage:**
   Develop comprehensive fire safety and hazardous waste disposal protocols to address the risks associated with thermal runaway and the environmental hazards posed by battery system failures.

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