Submission to the Australian Energy Regulator (AER)
Powerlink Transmission Determination 2027–2032

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Executive Summary

This submission raises serious concerns regarding the Powerlink 2027–2032 Transmission Determination. While Powerlink Queensland plays a pivotal role in maintaining the state's electricity transmission network, the infrastructure expansion proposed to support large-scale renewable energy projects is driving irreversible environmental, agricultural, and economic damage. The cost is not merely financial—it is ecological, biological, and existential.

The proposed transmission program enables cumulative ecological destruction, undermines climate targets through flawed carbon accounting, and facilitates contamination of land and water systems. It threatens biodiversity, contributes to habitat loss and potential extinction events, and places a growing economic burden on rural landholders and energy consumers. These outcomes conflict with the precautionary principle and Australia's legal and ethical commitments to sustainable development.

This submission offers a detailed, scientifically grounded critique of Powerlink's proposed rollout, based on eleven key areas of impact including biodiversity loss, PFAS contamination, irreversible land degradation, climate manipulation via heat islands, consumer exploitation, and procedural failings. It concludes with strategic, enforceable recommendations to prevent further environmental and economic harm, including a moratorium on future approvals until cumulative reviews are completed, mandatory impact modelling, and transparent public accountability measures.

The Australian Energy Regulator is urged to enforce ecological responsibility, legislative integrity, and public interest protections in its assessment of this determination.

- **Halt further approvals** until full ecological, carbon, and community impact assessments are transparently conducted.
- **Enforce regulatory integrity** by demanding a cumulative impact review across Powerlink's entire REZ network footprint.
- **Protect critical biodiversity, food production, and water systems** before irreversible harm occurs.

1. Introduction

This submission presents a comprehensive, scientifically grounded critique of the Powerlink Determination. It includes detailed analysis across twelve sections, addressing cumulative ecological damage, carbon mismanagement, chemical contamination, biodiversity threats, financial burdens, and legal failings. The submission provides compelling evidence that the proposed rollout, without meaningful ecological and economic safeguards, risks undermining Queensland's climate and conservation obligations. It calls for a moratorium on approvals until full cumulative impact assessments are completed, alongside mandatory modelling, transparent public reporting, and legislative accountability.

It concludes with firm, enforceable recommendations and a call for the Australian Energy Regulator to uphold public trust by restoring scientific integrity, ecological foresight, and procedural fairness to Queensland's energy infrastructure expansion.

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2. Cumulative Impact and Ecological Degradation

Queensland's REZ-linked transmission infrastructure expansion is not occurring in isolation. It is layered upon multiple large-scale wind, solar, and battery developments occurring simultaneously across rural, agricultural, and remnant forest landscapes. The environmental impact of this expansion cannot be fairly evaluated without modelling the **cumulative consequences** of overlapping energy projects.

Each corridor carved for transmission lines fragments native vegetation, displaces wildlife, and intensifies fire risks. Powerlink's role in facilitating transmission for multiple concurrent projects results in large-scale biodiversity fragmentation that has not been adequately addressed under current regulatory frameworks (Gibbons et al., 2008; Taylor et al., 2021).

The clearing of critical habitats including koala woodlands, glider territories, and grassland ecosystems supporting ground-nesting birds like the brolga creates conditions ripe for **regional extinction events**. The EPBC Act (1999) mandates protection of matters of national environmental significance, yet projects facilitated through Powerlink's network have proceeded without cumulative assessments under this legislation.

Furthermore, the ecological footprint expands beyond the visible infrastructure. Construction activities, dust, noise, vibration, and traffic cause **sub-lethal impacts** on sensitive fauna. Nesting failures, migration disruptions, and stress-induced mortalities have been recorded near infrastructure projects lacking comprehensive environmental oversight (Barber et al., 2010).

Without a coordinated environmental strategy, Queensland risks trading genuine biodiversity for bureaucratically sanitised progress.

3. Incorrect Carbon Accounting and Lifecycle Emissions

One of the most persistent and misleading assumptions underpinning the current energy transition is the presumption that renewables are inherently carbon neutral. This view fails to account for the substantial **embedded emissions** in materials, manufacturing, transport, construction, and especially decommissioning. Powerlink's infrastructure expansion facilitates this flawed narrative by supporting projects that neglect full **lifecycle carbon accounting**.

Studies show that concrete production, steel manufacture, turbine blade composites, and battery minerals contribute significantly to greenhouse gas emissions long before any electricity is generated (Fischedick et al., 2014). High-voltage transmission infrastructure itself, including towers, insulators, substations, and cabling, has substantial carbon intensity during fabrication and delivery.

Further compounding the issue is the lack of **decommissioning plans** and emissions projections for post-operational waste. Wind turbine blades are notoriously difficult to recycle and are already piling up in landfills globally (Assefa & Ambell, 2021). Solar panels and lithium batteries pose their own toxic disposal issues, many of which have yet to be addressed in Australian energy frameworks.

Additionally, **land-use change emissions** are routinely ignored in carbon budgeting. Clearing native vegetation for infrastructure corridors or solar arrays releases stored carbon and disrupts the soil microbiome, further reducing carbon sequestration capacity. These biogenic losses are rarely included in emissions modelling, despite their relevance.

By enabling this energy infrastructure without accurate carbon accounting requirements, Powerlink risks accelerating Australia's emissions trajectory under the guise of decarbonisation.

The expansion of Powerlink infrastructure carries significant, underacknowledged risks to Queensland's groundwater, catchments, and surrounding ecosystems due to toxic chemical exposure, particularly **PFAS (per- and polyfluoroalkyl substances)** and heavy metal leaching. These risks stem from substations, battery installations, transformers, cable insulation, and fire suppression systems that use fluorinated foams or coatings.

PFAS are known as "forever chemicals" due to their persistence in the environment. Once released, they can contaminate soil and water for decades. In the context of large-scale battery storage facilities and high-voltage substations, the use of PFAS-based foams during construction or emergency response scenarios poses a long-term threat to surrounding aquifers and ecosystems (Sunderland et al., 2019).

Additionally, heavy metals such as lead, cadmium, copper, and zinc are frequently released during construction and operation of energy infrastructure. Runoff from disturbed sites or concrete foundations may contain leachate that enters waterways, particularly during Queensland's seasonal rains and flooding cycles (Mahin, 2010).

Research has shown that even trace levels of PFAS in water can impact aquatic life and bioaccumulate through the food chain, affecting birds, fish, amphibians, and ultimately humans (Giesy & Kannan, 2001). Despite this, current environmental impact assessments for

transmission corridors and battery storage projects have failed to assess cumulative water contamination risk.

Solar farms and battery arrays also carry the risk of fire-related chemical contamination. Fires in lithium battery installations, now recognised as an emerging environmental hazard, may release highly toxic compounds, including hydrofluoric acid and PFAS derivatives. There is little regulatory capacity or infrastructure to contain these pollutants, particularly in rural areas where water catchments are vulnerable.

It is critical that PFAS risk assessments and long-term groundwater monitoring be made mandatory in all infrastructure projects facilitated by Powerlink. Without this, Queensland risks irreversible harm to its agricultural viability, drinking water supplies, and aquatic biodiversity.

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4. PFAS, Chemical Leaching, and Water Contamination

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5. Blade Shedding, Plastic Pollution, and Soil Contamination

A frequently overlooked but increasingly documented hazard associated with wind energy infrastructure—particularly in regions supported by Powerlink's transmission network—is **blade shedding**. Wind turbine blades, often composed of epoxy resin, fibreglass, and carbon composites, degrade over time, releasing microfibres and plastic particulate matter into surrounding landscapes.

Each blade may shed **tens of kilograms** of material over its lifetime due to weathering, erosion, and lightning strikes. Studies confirm that fragments as small as nanoplastics can be carried by wind and water, embedding into soil, contaminating crops, and entering aquatic systems (Keller et al., 2021). These pollutants are persistent, non-biodegradable, and harmful to plant growth and soil microbiomes (Hartmann et al., 2019).

These fibres often contain bisphenol A (BPA) and other endocrine-disrupting chemicals, which leach into the soil and water table. The risk is compounded in Queensland's diverse ecosystems, where rain events can wash blade debris into nearby rivers, wetlands, or agricultural areas. Such contamination affects both biodiversity and **food security**.

Moreover, decommissioned blades—due to their complex composition—are not recyclable by conventional means. A growing volume of retired blades are already being buried in landfills, exacerbating soil pollution and land use pressures. In the absence of regulated take-back schemes, Powerlink's facilitation of these turbine-based projects contributes to the long-term toxic load.

Urgent research and regulation are needed to quantify and mitigate this threat. It is essential that any infrastructure approved under Powerlink's transmission footprint require enforceable environmental safeguards regarding blade wear, monitoring, and disposal.

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6. Transmission Expansion and Heat Island Effects

The cumulative deployment of transmission infrastructure in support of Queensland's Renewable Energy Zones is altering local and regional climates in measurable and concerning ways. These impacts include the intensification of **heat island effects**, disruption of **natural thermal belts**, and interference with **localised rainfall patterns**, especially across agricultural and remnant forest landscapes.

High-voltage transmission corridors require extensive clearing of vegetation, often through biodiverse or agriculturally productive regions. The removal of tree cover—combined with the installation of metallic towers, conductors, and access roads—creates conditions conducive to surface heating. Scientific studies show that areas cleared for energy infrastructure exhibit significantly higher daytime and nighttime temperatures than surrounding vegetated zones (Zhao et al., 2014).

This disruption of **surface albedo** and **soil moisture retention** intensifies microclimatic heat zones, contributing to reduced soil productivity and altered growing conditions for both native and agricultural species. In farming regions, thermal belt disruption can interfere with frost protection, crop development cycles, and pollinator behaviour (Jackson et al., 2020).

Moreover, transmission corridors often act as **barriers to wind and rainfall movement**, fragmenting natural hydrological cycles and increasing localised drought stress. These effects are amplified when infrastructure is installed in parallel with adjacent solar farms or wind projects, creating broad patches of artificially warmed land that mimic semi-urban environments.

Queensland's regional ecosystems have evolved under specific temperature, rainfall, and wind conditions. Artificial disruption of these climatic variables places entire ecosystems—flora and fauna alike—under increasing stress.

Given the projected scale of Powerlink's transmission buildout across REZs, the **climate footprint** of these corridors must be acknowledged. Infrastructure-induced microclimate changes are not benign and should be included in the environmental modelling of transmission approvals.

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7. Irreversible Harm to Agricultural Land

The construction and operation of transmission infrastructure—particularly across Queensland's agricultural zones—poses an enduring and often irreversible threat to productive farmland. These impacts are not temporary construction nuisances; they fundamentally alter the viability, fertility, and safety of land relied upon for food production.

Transmission infrastructure requires wide easements that restrict land use, prevent tree regrowth, and fragment paddocks, reducing both usable area and farming efficiency. In regions where irrigation or rotational grazing systems operate, these disruptions can render previously viable sections of land unusable. Soil compaction from heavy machinery during construction has been shown to reduce crop yields and damage root structures long after transmission lines are installed (Hamza & Anderson, 2005).

Furthermore, herbicides used to manage vegetation along transmission routes may leach into adjacent soils and waterways, affecting both crops and native plants. The forced exposure of cleared land beneath transmission lines also increases vulnerability to erosion, invasive species, and waterlogging.

Where infrastructure is co-located with solar or battery facilities, there are also concerns about leaching of toxic substances—including cadmium, antimony, and PFAS derivatives—into soils. These substances pose long-term risks to livestock, cropping systems, and potentially human health through bioaccumulation (Huang et al., 2020).

In many cases, landholders report financial loss due to reduced productivity, devaluation of property, and the ongoing operational restrictions placed by easement conditions. There are no effective remediation mechanisms once land is degraded by these compounded effects.

As Queensland faces the dual pressures of climate change and population growth, safeguarding its agricultural land is essential to food security. Any approval of transmission infrastructure that compromises this must be treated as a permanent land-use trade-off, not a marginal inconvenience.

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8. Fauna and Flora at Risk – A Biodiversity Crisis

The expansion of Powerlink's transmission network across Queensland's Renewable Energy Zones directly intersects some of the most biodiverse and ecologically sensitive regions in the state. This expansion contributes to widespread **habitat fragmentation**, **loss of keystone species**, and potential **local extinction events**—a trajectory that undermines decades of conservation work and breaches Australia's biodiversity commitments.

Queensland is home to more threatened species than any other state in Australia. Many of these such as the greater glider, koala, northern quoll, and various frog and bat species are already listed as vulnerable or endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Fragmentation of their habitat through transmission corridors not only isolates populations, but disrupts migration, reproduction, and access to food and shelter (DoEE, 2019).

Large-scale linear infrastructure often creates **ecological traps**, where animals are drawn into risky or degraded environments. Edge effects from cleared corridors increase predation, disease spread, and exposure to invasive species. Additionally, many bird species—including migratory shorebirds and raptors—are vulnerable to **collision mortality** with transmission infrastructure (Loss et al., 2014).

Powerlink's network extensions intersect critical habitat corridors along the Great Dividing Range, Brigalow Belt, and coastal lowlands regions already pressured by land clearing and development. Without strategic avoidance planning, cumulative degradation will continue pushing species closer to extinction.

Biodiversity collapse is not only an ecological tragedy but also an economic and social crisis. The health of Australia's ecosystems underpins pollination, pest control, water regulation, and carbon sequestration. It is critical that all infrastructure projects facilitated by Powerlink undergo full **ecological impact assessments** at a landscape level.

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9. Economic Burden on Consumers

The infrastructure buildout proposed under the Powerlink Transmission Determination 2027–2032 comes with not only ecological costs but also a **significant financial burden for consumers**, particularly in regional and rural Queensland. This rollout—driven by a rapid, centralised transition toward industrial-scale renewables—is occurring without the implementation of adequate safety mechanisms, regulatory oversight, or protections against cost blowouts and stranded asset risks.

Powerlink operates under a regulated asset base (RAB) model, meaning that costs associated with infrastructure projects are recouped over time from electricity users. While this model may suit stable, long-term infrastructure, it is poorly suited to the speculative, high-turnover nature of renewable energy zones (REZs), where project lifespans are uncertain and full lifecycle costs remain largely unquantified.

Households and small businesses ultimately bear the financial consequences of this regulatory framework, which lacks price safety nets or expenditure caps. Once transmission lines and associated substations are constructed, consumers are locked into decades of repayments—regardless of whether the linked energy projects remain viable, deliver stable power, or fail to operate at projected capacity (Mountain & Percy, 2021).

The **absence of integrated cost-benefit analysis** for communities affected by these infrastructure rollouts raises serious legal and ethical questions. Public funds and private utility bills are being used to underwrite projects that bypass competitive evaluation, ecological scrutiny, and proper emissions accounting.

Moreover, Powerlink's transmission infrastructure is frequently constructed to accommodate speculative capacity from proposed wind and solar farms, many of which lack environmental approvals or grid connection certainty. This approach shifts development risk away from private investors and onto the public, a structural flaw that contradicts principles of fairness and responsible governance.

From a legal standpoint, this could constitute a breach of the **National Electricity Objective** under the *National Electricity Law*, which requires that planning promote efficient investment in—and efficient operation and use of—electricity services for the long-term interests of consumers. Proceeding without robust cost controls, community benefit assessments, or climate adaptation measures may fail to meet this standard.

Equally concerning is the potential for **stranded assets**. As energy technologies evolve and decentralised solutions like rooftop solar, community batteries, and microgrids grow more accessible, large-scale transmission may become economically obsolete in some regions. Without sunset clauses, review points, or off-ramp mechanisms, consumers are effectively being signed up to pay for infrastructure that may no longer serve them.

The AER must reject any blanket assumption that all transmission infrastructure is beneficial. It should instead require Powerlink to present rigorous, evidence-based justifications for cost recovery, demonstrate long-term public benefit, and account for cumulative ecological and financial risks in its investment plan.

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10. Legislative Breaches and Community Consultation Failures

The Powerlink Transmission Determination 2027–2032 reveals troubling deficiencies in both legislative compliance and genuine community consultation. Projects supported by Powerlink infrastructure have proceeded under exemptions or streamlined pathways that often **bypass core provisions** of environmental protection and planning legislation.

Under the EPBC Act, projects likely to significantly impact matters of national environmental significance must undergo **rigorous environmental assessment**. Yet, many transmission-linked renewable projects avoid this scrutiny by being segmented or by using outdated referral thresholds (Australian National Audit Office, 2020).

Similarly, compliance with the *Nature Conservation Act 1992* (Qld) and regional biodiversity planning instruments has been inconsistent. Critical habitats have been cleared without transparent offset plans or meaningful application of the **precautionary principle**, which requires action in the face of uncertainty to prevent environmental harm (McGrath, 2017).

Equally concerning is the marginalisation of local communities and landholders in the planning process. Consultation periods are often short, poorly advertised, and focused on information delivery rather than genuine engagement. Many stakeholders report finding out about infrastructure approvals only after decisions have been finalised. This undermines social licence and raises legal and ethical concerns around procedural fairness.

Where First Nations land or culturally significant sites are impacted, there have also been instances where **free, prior, and informed consent** has not been sought or documented, in breach of national and international obligations.

To restore public trust and legislative integrity, the AER must ensure that Powerlink's infrastructure expansions are subject to consistent, transparent, and participatory decision-making processes.

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11. Recommendations

In light of the critical environmental, legal, economic, and social risks outlined throughout this submission, the following recommendations are offered to the Australian Energy Regulator (AER) as necessary conditions for the responsible progression of Powerlink's 2027–2032 Transmission Determination:

11.1 Impose a Moratorium on Transmission Expansions Pending Full Cumulative Impact Assessments

No further infrastructure approvals should be granted until comprehensive, transparent cumulative environmental assessments have been conducted across all Renewable Energy Zones. These assessments must consider direct, indirect, and long-range effects on biodiversity, land use, climate, and community health.

11.2 Mandate Independent Lifecycle Carbon Audits

Lifecycle carbon emissions must be accurately measured—including emissions from construction, transport, vegetation loss, and decommissioning. Independent audits should be required to prevent reliance on unverified or biased carbon accounting.

11.3 Enforce PFAS and Contaminant Risk Reviews

Projects must not proceed without thorough soil, groundwater, and stormwater contamination assessments. This includes PFAS, heavy metals, and fire-suppression chemical risk evaluations, especially where battery systems, transformers, or substations are involved.

11.4 Prioritise the Protection of Agricultural and Remnant Vegetation Zones
Transmission corridors must avoid high-value agricultural land and biodiversity hotspots. Easement regulations should enforce ecological buffers, require habitat restoration offsets, and prohibit fragmentation of key wildlife corridors.

11.5 Require Biodiversity Safeguards and Species Recovery Offsets
All infrastructure projects must demonstrate compliance with the EPBC Act and relevant State biodiversity conservation frameworks. Monitoring, mitigation, and offset plans must be binding, transparent, and adaptive to new ecological data.

11.6 Reform Community Consultation Practices
Ensure consultation processes are accessible, inclusive, and conducted at early project stages. Landholder rights must be respected, and communities must have access to legal advice, independent experts, and the right to challenge proposals through formal mechanisms.

11.7 Introduce Financial Safeguards for Consumers
Cap allowable transmission cost pass-throughs under the RAB model. Establish cost-benefit review triggers, asset obsolescence criteria, and consumer compensation frameworks where infrastructure imposes unmitigated burden.

11.8 Align All Approvals with the Precautionary Principle
Where scientific uncertainty exists regarding environmental or health risks, regulatory decisions must err on the side of environmental protection. This principle should guide all AER assessments of Powerlink's future transmission proposals.

These recommendations reflect the minimum standards necessary to safeguard public interest and ecological integrity in the face of rapid energy infrastructure expansion.

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12. Conclusion

Queensland stands at a pivotal moment in its energy and environmental future. While the transition to renewable energy is critical, it cannot be pursued at the expense of the very systems it aims to protect. The Powerlink Transmission Determination 2027–2032, in its current form, reflects a failure to safeguard biodiversity, food-producing landscapes, public health, and economic fairness.

This submission has presented clear, evidence-based arguments highlighting the environmental degradation, policy shortfalls, and long-term consumer burdens associated with unchecked transmission infrastructure expansion. It has also outlined actionable recommendations that, if adopted, would help restore transparency, accountability, and ecological balance to Queensland's energy framework.

It is now the responsibility of the Australian Energy Regulator to ensure that the integrity of this process is upheld—not only in economic regulation but in the public and environmental interest. The AER must not allow outdated regulatory models or political pressure to override the need for precaution, public consent, and intergenerational stewardship.

Only through reform, oversight, and scientific scrutiny can Powerlink's role in Queensland's energy transition be guided in a way that is genuinely sustainable, socially responsible, and worthy of public trust.

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