Energy (Renewable Transformation and Jobs) Bill 2023

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Queensland University of Technology

Submission to the Transport and Resources Committee

Energy (Renewable Transformation and Jobs) Bill 2023

QUT welcomes the opportunity to provide commentary to the Transport and Resources Committee on measures proposed within the *Energy (Renewable Transformation and Jobs) Bill 2023* (the Bill).

QUT supports the broad purpose of the Bill, which is to transition Queensland toward a clean, reliable, and affordable electricity system that will promote a sustainable future, both environmentally and economically. The achievement of this goal will address the impacts of climate change by reducing activities that result in greenhouse gas emissions, while creating high-value skilled jobs in expanding industries.

QUT recognises that transitioning the Queensland energy system will necessitate the development of infrastructure to deliver renewable energy. We understand that this will include, among other elements, the development of battery and new economy minerals industries to ensure that energy in Queensland is reliable and affordable.

We make respectful observations and recommendations surrounding central components of the Bill, namely: renewable energy targets; jobs; the Queensland SuperGrid; and amendments to the *Electricity Act 1994*.

Renewable energy targets

QUT acknowledges the pivotal role that universities currently perform, and will continue to perform, in creating a sustainable future. We aim to tackle the global challenge of clean, reliable, and affordable energy through a combination of strategy, campus operations, education, research, partnerships, and advocacy. We have made Sustainability and Environment a priority in our strategic plan, *Connections: QUT Strategy 2023-2027*.

QUT supports the proposed pathway towards renewable energy targets, the development of a clean energy system, and the adoption of more sustainable practices to increase responsiveness to climate change. The university sector has a special role to perform in supporting this transition, including sharing expertise about sustainability and renewable energy. Accordingly, QUT is committed to supporting the realisation of a sustainable trajectory by 2030.

Jobs

QUT supports the observation that renewable energy, which includes the battery and new economy minerals industries, can generate jobs within Queensland. Central to this achievement will be the education and training of a renewable energy workforce.

QUT is committed to the pivotal role of higher education in shaping a skilled workforce for the future energy industry. We are actively engaged in aligning curriculum with the evolving needs of the renewable energy industries, which are increasingly reflected in our undergraduate, postgraduate, and professional education curricula. As an example, the School of Chemistry and Physics is offering industry-relevant projects for undergraduate and postgraduate students leveraging the nation-leading capabilities and facilities present at the QUT Advanced Battery Facility (ABF). This facility is managed by the QUT Energy Storage Research Group (ESRG) at

the Banyo Pilot Plant Precinct. ESRG is advising on a redesign of the Bachelor of Science as well as developing micro credentials and graduate certificates to ensure that course content provides students and graduates with links to industry and renewable energy practices. Our School of Civil and Environmental Engineering offers the only Master of Sustainable Infrastructure qualification in Queensland, which provides the opportunity to develop expertise in sustainable infrastructure engineering. This includes a focus on integrated sustainability solutions to create an environmentally responsible future. Similarly, the Master of Renewable Energy provides comprehensive knowledge on renewable technologies and sustainable energy systems. At an undergraduate level, we also offer a Bachelor of Engineering (Electrical and Renewable Power), which equips graduates with the skills and knowledge that will be crucial to national efforts in reaching net zero emissions and achieving seamless integration of future renewable power generation. As we move towards a renewable energy future, QUT recognises the indispensable role of education and training in fostering the capabilities necessary for a transition to a sustainable energy landscape in Queensland.

QUT has a significant role in the battery and energy storage value chain in Queensland. Through the ABF we are building capacity in the domestic manufacture of large-scale battery energy storage systems (BESS). We are providing nation-leading services in battery and battery active material testing, qualification, and translational research and development. The Facility will be further expanded with the establishment of the Queensland Energy Storage Technology (QUEST) Hub underpinning both State and Commonwealth strategies to establish an Australian Made Battery Precinct in the State. The proposed Precinct will harness the research and development strengths of Queensland universities working with industry partners to build a battery industry across the whole value and supply chain.

Large-scale BESS will be critical to unlocking renewable energy potential and requires workforce training. At present, there are limited facilities capable of testing or demonstrating large-scale BESS in Australia. However, Queensland leads the country with the QUT Battery Testing Microgrid’s capability to test a large-scale BESS up to 250 kW in a grid connected environment. This represents an important, locally developed capability, which can serve as an essential training ground to upskill the renewable energy workforce in Queensland.

Through the Centre for Materials Science and the Centre for Clean Energy Technology and Practices, QUT is enabling real world focussed research that will place Queensland as a national leader in renewable energy transformation. Current projects include the development of green and safe electrolytes for batteries, battery recycling and repurposing, bio-inspired materials for sustainable energy production, and pilot scale green hydrogen production.

We also perform a pivotal role in shaping the future of energy through various strategic collaborations, notably with Lava Blue, an Australian battery minerals producer. Through these partnerships, QUT is establishing expertise and facilities to create robust supply lines for critical minerals that are essential to battery technologies. This also involves testing battery performance and systems under real-world conditions. The collaboration with Lava Blue significantly contributes to expanding the emerging battery industries and reinforces the status of Queensland as a global leader in the high-tech development of future energy requirements. Furthermore, this partnership has enhanced the capacity of Queensland to produce critical minerals and renewable energy systems, strengthening the sovereign battery supply chain and minimising environmental impact. By mid-2024 the Lava Blue demonstration plant will also house 200kW of solar PV panels and a BASF NaS pilot battery, which will be assessed for integration back into the grid and for running the demonstration plant operations.

QUT acknowledges the importance of both education and training in facilitating the delivery of workforce capability as Queensland transitions toward a renewable energy industry and a reliable energy grid. Understanding this need, QUT is working with TAFE Queensland to support the development and uplift of vocational training facilities and curriculum in renewable energy technologies and practices.

The Queensland SuperGrid
Transforming the electricity system in Queensland requires the development of energy infrastructure. QUT's ABF is already engaged in supporting the deployment of battery systems to meet the rapidly growing large-scale BESS requirements of Queensland. However, the availability of large-scale BESS will need to increase at pace to ensure the on-time achievement of renewable energy targets.

QUT supports the establishment of infrastructure frameworks that are necessary to build the Queensland SuperGrid and ensure delivery of renewable energy generation.

Within this support is a recognition that battery storage will be critical in the renewable energy transformation, as it enables stable and on-demand power from intermittent renewable energy sources, such as wind and solar. We highlight that long duration energy storage solutions will enable a higher penetration of renewables while stabilising the electricity grid. As shown previously, the QUT Battery Testing Microgrid places the university in a unique position to provide a locally developed research and testing platform for large-scale BESS.

Further, QUT provides expertise in digital energy transformation, the transition to smart grids, and prosumers (producer/consumers).

Amendments to the *Electricity Act 1994*
QUT recognises that achieving the objectives associated with the Queensland SuperGrid requires a clarification of certain terms within the *Electricity Act 1994* (the Act) to assist with the integration of new grid supporting technologies. These terms include: 'operating works,' 'battery storage device,' and 'reactive power compensation device.' QUT is well-positioned to provide commentary surrounding the term 'battery storage device.'

The Bill proposes that 'battery storage device':

(a) means plant that –
  (i) converts electricity into stored chemical energy; and
  (ii) releases stored chemical energy as electricity; and

  Examples—

  - an electrochemical battery, including a lithium-ion battery and a vanadium redox flow battery
  - a solid-state battery, including a lithium-metal battery

(b) includes any equipment necessary for the operation of the plant.

Although the proposed update to this term is accurate in relation to batteries that store energy via chemical mechanisms, it may be worth considering alignment of terms with definitions used in Australian Standard AS NZ 5139:2019 for consistency. The Standard defines 'battery' as 'unit consisting of one of more energy storage cells connected in series, parallel or series parallel arrangement' (1.3.11). Associated definitions include 'battery bank' (1.3.12), 'battery energy storage system' (1.3.13) and 'battery energy storage system enclosure' (1.3.14).

It is also worth noting that many emerging energy storage technologies do not store energy as chemical energy. As the objective of the amendment is to provide for temporary energy storage to stabilise supply from intermittent generation sources, the definition of 'battery storage device' should be technology-agnostic. Batteries can store energy in many other forms such as kinetic energy (fly wheels), gravitational potential energy (gravity batteries), heat (thermal batteries), pressure (compressed air batteries), and others, which by the proposed definition would exclude these systems from being 'battery storage devices.' The inclusion of other types of storage technologies will both capture other existing technologies that meet the broad objective of the Bill and help future-proof the legislation against future innovations in this area. A needlessly prescriptive definition could inadvertently result in Queensland missing out on new private sector

investments or federal funding initiatives, where these are directed to the same ultimate objectives but involve non-chemical energy storage technologies.

QUT recommends that consideration be given to either removing the technological specificity of the definition of ‘battery storage device’ or supplementing it with another sub-section that admits other forms of energy storage and allows scope for technologies not yet in production.

Conclusion
With that caveat, QUT otherwise supports the broad intent of the Bill and wishes the Committee and Parliament all the best in its deliberations.

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