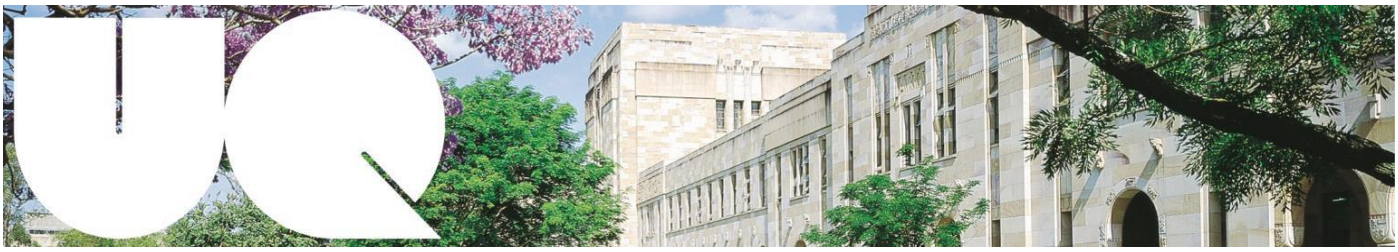

Submission to the Queensland Government's discussion paper

'Advancing Queensland climate: Making the transition to a low carbon future'

Version 2

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Contents

I am a researcher at the Energy Economics and Management Group (EEMG) University of Queensland. Thank you for the opportunity to submit recommendations to the Queensland Government's discussion paper 'Advancing Queensland climate: Making the transition to a low carbon future discussion paper'. My recommendations are based on research findings from the following six major research projects that I completed over nearly seven years while working at the EEMG. The foci of the six projects are climate change and energy.

1. China's new low-carbon policies and their implications for Australia
2. Increasing Wind Power in Australia
3. Collinsville Solar Thermal Project
4. Analysis of institutional adaptability to redress electricity infrastructure vulnerability due to climate change
5. Market and Economic Modelling of the Intelligent Grid
6. The impacts of carbon trading on the Australian electricity industry

I acknowledge the project funders.

1. Australia-China Council and Department of Foreign Affairs and Trade
2. Australian Research Council and Wind Generator's Consortium
3. Australian Renewable Energy Agency and RATCH Australia Corporation
4. National Climate Change Adaptation Research Facility
5. Commonwealth Scientific and Industrial Research Organisation
6. Australian Research Council and AGL

My recommendations are grouped by three sectors: (1) electricity, (2) biofuels and (3) mining and resource. Contact me by email, p.bell2@uq.edu.au, if you would like any clarifications.

1. Electricity sector recommendations

The retail and generation markets in Australia's National Electricity Market (NEM) are dominated by three vertically integrated retailer-generators AGL, EnergyAustralia and Origin. This lack of competition results in unnecessarily high prices for retail electricity consumers. For instance the recent retail price rises in Queensland and the gaming in the wholesale market by the generators in South Australia to inflate prices (Climate Council 2016). These same three retail-generators own large fleets of emissions intensive generators making them Australia's first, second and third largest emitter of carbon dioxide respectively (CER 2016). The three vertically integrated retail-generators obligation to maximise returns for their shareholders is served by keeping its high emission generation fleet running as long as possible. The retailer-generators' ownerships of large high emissions fleets provides a strong profit motive to avoid meeting their Large Renewable Energy Targets (LRET) obligations and any financial penalties for not meeting their LRET obligations can simply be passed onto their retail customers. This situation is contrary to mitigation efforts and costly for retail customers. Additionally, there are increasing disconnections as retailers companies seek to increase profits. (https://www.vinnies.org.au/page/News/National/National_Media_Releases_from_2015/Flow_on_effects_of_utility_bill_disconnections/). As well as action to address climate change, there is an imperative to improve competition to reduce prices for retailer customers or reregulate the industry.

The following recommendations are designed both to improve competition to reduce prices for retail customers and to introduce technology to reduce emissions.

1.1 Matching electric water heater demand with solar PV output

Solar PV produces maximum output around midday, reducing demand met through the National Electricity Market (net demand) around midday. This reduction in net demand causes underutilisation of the network infrastructure and reduces wholesale electricity prices around midday. This reduced net demand reduces the profitability of commercial solar PV installations. Additionally, the market based solar PV feed-in tariff offered to retail customers is much lower than the retail tariffs operating. Switching the electric water heaters on for a couple of hours either side of midday would create demand to meet the surplus electricity produced by solar PV. Operating electric water heater then would also helping overall system stability. Solar PV owners using their own generated power for their electric water heaters would experience a net financial gain. For example as at 29 August 2016, Click Energy Charges Tariff 31 OP Night rate at $0.1961 per kWh and pays a solar tariff of $0.1000 per kWh. There is a potential net savings $0.0961 per kWh on heating water. The retailers are likely to oppose this recommendation because switching on the electric hot water heaters around midday will reduce their profits.

Recommendation 1.1: Establish a working party to investigate the extension of Tariffs 31's* hours to include hours either side of midday to utilise solar PV output in electric water heaters.

(* https://www.dews.qld.gov.au/electricity/prices/tariffs)

1.2 Untying retail customers and solar PV producers

Currently, electricity retailers pay their customers for their solar PV output. This tying together of retail customer and solar PV producer is unnecessary and stifles innovation and competition. For instance Queensland company Redback Innovations a developed software to trade solar PV out via the cloud. This creates the opportunity to bypass the tradition retailers and generators to form virtual generators. This is disruptive technology that can reduce prices for customers and reduce emissions by better using introduce batteries and solar PV in conjunction. Changes to government regulation would help foster similar innovations that will help reduce emission and retail prices. The retailers are also likely to oppose this recommendation because it will reduce their profits.

Recommendation 1.2: Enable solar PV owners to sell their surplus electricity to companies other than their electricity retailer.

1.3 Improving competition using a five-minute settlement period

Queensland's half-hourly wholesale electricity spot market prices are determined by averaging the six five-minute dispatch intervals. (https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Settlements-and-payments/Prudentials-and-payments/-/media/E426F899A8124D988815A96DEF0FF298.ashx). This averaging process was suitable for the time when the National Electricity Market was dominates by fossil fuel generators that is in the absence of intermittent generation but unsuitable for increasing penetrations of intermittent generation. There are technical and market based reasons to adopt a 5-minute settlement period. Technically, adopting a 5-minute interval for calculating the wholesale market spot prices rewards companies that can respond quickly to the intermittency of renewable energy sources. Energy storage device such as batteries can fill this role. The five-minute interval settlement period will

allow the coevolution of technologies to support renewable energy. See the submission for a five-minute settle by Sun Metals Corporation to the Australian Energy Market Commission for change to the Electricity Rules for more details (http://www.aemc.gov.au/Rule-Changes/Five-Minute-Settlement). The market based reason for the change to five-minute settlement period is that it reduces the ability for fossil fuel generators to game the market. The Climate Council (2016) discusses the wholesale market gaming recently in South Australian to manipulate prices. The owners of the fossil fuel generators will oppose the following recommendation because the five-minuet settlement will reduce their profits.

Recommendation 1.3: The Queensland Government make a submission to support the change to the Electricity Rules to establish a five-minute settlement period*

(* http://www.aemc.gov.au/Rule-Changes/Five-Minute-Settlement)

1.4 Prioritisation of smart meter deployment

The poorly managed customer relations during the deployment of smart meters in Victoria created an air of antipathy towards smart meter deployment in Australia. However, smart meter deployment is part of solution to climate change but now requires a more carefully planned approach to overcome public apprehension and particularly among the disadvantaged groups. This could be achieved by making the smart meters an opt-in for most Queenslanders and making smart meter mandatory for the owners of solar PV and those with a history of high electricity demand. These two groups are likely to be wealthier than the general population and any behavioural changes induced on these two groups by the smart meters more beneficial to system stability. Other valuable lessons from Victoria's rollout include, ensuring there are in-house devices available with the smart meters installations and the cost of the smart meters are amortised over the life of the meter. The lack of promised in-house displays and the single upfront cost of the smart meters were part of the reason for the political backlash against smart meters in Victoria.

Recommendation 1.4: Establish a working party to implement a Queensland wide smart meter rollout with in-house displays targeting higher demand consumers users and those residents with solar PV and amortising the costs.

1.5 Enabling higher penetrations of renewable energy in the National Electricity Market

The focus of the discussion paper is Queensland but the National Electricity Market (NEM) is a system where the other States in the NEM affect Queensland and vice versa. Hence there is requirement to discuss the NEM as a whole. The transmission structure in the NEM is the legacy of linking together once separate State networks designed for fossil fuel generators. We find this legacy transmission system is inadequate for increasing penetrations of renewable energy to meet the 2020 Large Renewable Energy Target (LRET) (Bell et al. 2015a, 2015b, 2015c, 2015d, 2015e, 2015f, 2015g). The recent price volatility in South Australia demonstrates how inadequate the transmission system is in the NEM. The Australian Energy Market Operator (AEMO 2010a, 2010b, 2011a, 2011b) evaluated implementing a high capacity transmission backbone to the NEM called NEMLink but found NEMLink fail to meet the regulatory investment tests for transmission. However, AEMO assumed the existing generation fleet in the evaluation but both Queensland and South Australia are planning ambitious LRET beyond the national 2020 LRET. It is imperative that the

adequacy of the current transmissions systems is evaluated with high penetration of renewable energy up to 100% and the NEMLink proposal is revaluated with high penetrations of renewable energy up to 100%.

Bell et al. (2015g) analyse wind speed and electricity demand correlation to determine the ability of wind turbine generators to meet electricity demand in the NEM without the aid of energy storage. They find the most advantage from the lack of correlation between wind speed between the NEM's peripheral states including Queensland, South Australia and Tasmania. Additionally, the correlation between electricity demand and wind speed is strongest between these states. Similarly, they find the most advantage from the lack of correlation between electricity demands in each of these states. Furthermore, increased geographical spread of wind power increases predictability, reduce variability and minimises near-zero or peak output events (Georgilakis 2008; Gupta 2016); the NEM stretches 5,000 km from far north Queensland to Tasmania providing an incredible geographical spread of wind power (AEMO 2016). Australia ranks among the top three countries in the world for solar and wind resources (Drew 2016). AN adequate transmission networks is required for Queensland retailer customers to benefit from the renewable resources available in the NEM and facilitate the absorption of higher penetrations of renewable energy to displace fossil fuel generators.

Recommendation 1.5: The Queensland Government lobby the Australian Energy Market Operator to revaluate the NEMLink proposal under higher penetrations of renewable energy up to 100%.

1.6 Knowledge transfer from Korea's National Smart Grid Rollout

Korea is the first country in the world to implement a national smart grid roll-out, starting in 2010, and is operating one of the world largest test-beds in Jeju Island to develop and test related technologies. Facilitating Australia's importation of ideas and technology from the roll-out would help modernise Australia's electricity system. I have been investing knowledge transfer with researchers at the Korea Energy Economics Institute (KEEI), Chonnam National University (CNU) and Hyundai.

Recommendation 1.6: Establish a working party of stakeholders — both government and non-government — to establish a knowledge transfer of the findings form the Korea's National Smart Grid Rollout.

1.7 Decommissioning schedule for the fossil fuel generation fleet

The recent wholesale sport price rises in South Australia where in part caused by the poorly timed closure of fossil fuel generators. There is a requirement to coordinate the decommissioning of fossil fuel generator with the introduction of renewable energy and the provisions of sufficient transmission to accommodate the renewable energy to prevent unnecessary price increases for retail customers in the NEM. Recommendation 1.5 discusses the requirement for sufficient transmission to accommodate higher penetration of renewable energy. The owners of fossil fuel generators are promoting idea using taxpayers money to subsides the decommissioning of fossil fuel generators. However, payment for decommissioning should be unnecessary as decommissioning costs should have been incorporated in the coal generator's original feasibility study. Additionally, most of the coal plants in the NEM are operating beyond their expected life time, having returned

profits to their shareholders in excess their initial investment. Companies that have recently bought coal generators have knowingly bought an asset with a highly uncertain future. The companies requesting tax payers funds for decommission of recently purchased coal generators are purely opportunistic. In addition, there are opportunity costs of using taxpayers' funds to pay companies to decommission coal power station versus using the taxpayers' funds to help vulnerable Queenslanders disconnected by the retail companies. The generation company shareholders would be wealthier than the Queenslanders being disconnected by the retail companies. Remembering that the retail and generation markets are dominate by three vertically integrated retail-generators and many of their shareholders are not Australian.

Recommendation 1.7: Establish a working party of stakeholders to determine a timetable for the decommissioning of fossil fuel generators and ensure the fossil fuel companies have sufficient funds to cover the decommissioning.

1.8 Non-financial penalties for retailers that fail to meet their LRET obligations

The current financial penalties for retailers who fail to meet their LRET are easily passed onto the retail customers. These penalties fail to truly penalise the retail company or to encourage investment in renewable energy but do make the retailer customers poorer. Additionally, the three large vertically integrated retail-generators have the added incentive to protect the profits of their fossil fuel generators. There is a requirement for non-financial penalties that the retailers are unable to pass onto to their retail customers. One suggestion is that retailers who fail to meet their LRET obligations are unable to take new customers until they meet the requirements.

Recommendation 1.8: Establish a working party to investigate non-financial penalties for retailers failing to meet their LRET obligations.

1.9 Reducing overheads among network service providers

While the retail and generation markets are amenable to increasing competition to help reduce price s for retail customers, the networks are a natural monopoly and reducing prices for retail customers comes from amalgamating these networks to reduce overheads. The Queensland Government has recently amalgamated its two distribution network service provider to help cut overheads and duplications. However, as previously discussed Queensland is part of the National Electricity Market (NEM) and Queensland retail prices reflect decisions made in other parts of the NEM. Recommendation 1.5 discusses the requirement for a high capacity transmission backbone in the NEM to link the peripheral State to take advantage of the lack of correlated wind speed and demand between these States. However, the NEM requires sufficient transmission capacity through the states of Victoria and NSW to maximise the benefit of wind power in the peripheral states and the NEM more generally. But providing an optimised network structure for the deployment of wind power faces a major coordination problem as the NEM covers seven jurisdictions and contains 25 network service providers (NSP) (AER 2016). These multiple jurisdictions and NSPs serve only 19 million residents (AEMO 2016) and present a costly duplication of overheads. For comparison, South Korea has a single combined transmission distribution company serving 51 million residents within a single legislation. Amalgamating the transmission companies would help reduce prices for retail

customers and help facilitate the integration of renewable energy. Concurrently, there is a requirement to consider ring-fencing the monopoly company to demarcate what is part of the monopoly company and what should be open for competition. The Australian Energy Regulator outlines this debate. (https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/electricity-ring-fencing-guideline-2016)

Recommendation 1.9: Establish an inter government working party to investigate amalgamation of the transmission system with suitable provisions for ring-fencing.

1.10 Increasing competition in the retail and generation sectors

The Queensland Commission of Audit (QCA 2013, fig. 2) presents the ownership patterns in the NEM by indicative share. In the retail sector, three publicly listed or privately owned vertically integrated retail-generators companies, AGL, EnergyAustralia and Origin Energy own over 70% of the entire retail market and nearly 90% of the private market. This equates to considerable market power.

In the generation market, the same three retailer-generator companies own about 64% of the private market but since 2013 AGL bought Delta & MacGen from the NSW Government. This takes the same three retailer-generators market share of the private sector to 68%. These three retailer-generators are well positioned to buy the remaining state owned generation assets. Without intervention, the situation will develop where the market power by the big three retail-generation companies will become similar to the market power exerted by Woolworths and Coles within the Australian supermarket sector.

Furthermore, Apergis and Lau (2015) find a high degree of market power exercised by the generators in the NEM and this market power has consequences for prices and mitigating carbon dioxide. As discussed, the Australian generation and retail market is dominated by three privately owned retail-generator companies, AGL, EnergyAustralia and Origin Energy. These companies are Australia's first, second and third highest emitters of carbon dioxide, respectively (CER 2016), being the owners of large fossil fuel generation fleets. This fossil fuel ownership presents a conflict of interest between the three large retail-generators and both the deployment of wind power generation and augmentation of the transmission system because both wind and transmission augmentation reduce the ability of fossil fuel generators to generate at prices above their marginal cost (Spiecker, Vogel & Weber 2013).

The demerger of the retail and fossil fuel generation arms of the vertically integrated retail-generation companies would reduce market power enhancing competition to help reduce retail prices. This demerger would also prevent retail-generator companies from using cross-subsidies to circumvent the policy objectives underpinning the LRET as discussed in Recommendation 1.8. The demerger would also help reduce the impact of any bankruptcies in the fossil industry on the retail electricity sector, as discussed in Section 3.

Recommendation 1.10: Establish a working party of stakeholders to investigate the demerger of the three vertically integrated retail-generators.

2. Biofuel sector recommendations

The Queensland Government has put in place a price signal that is successfully driving the production of ethanol in Queensland but the E10 mandate focuses on passenger cars. There lacks a similar price signal to drive investment in biofuels for aviation, shipping and other land transport. There also lacks a similar price signal to drive the production of biogas. Using an increasing mandatory percentage blend of biofuels with fossil fuels would encourage the petrol chemical industry to become part of the transition to a zero net emissions future. Additionally, the price signal will enable Queensland to meet the US Navy's Great Green Fleet initiative (GGFI) by developing the distribution and blending equipment required for the biodiesel producers and petrochemical industry to coevolve. Biodiesel blending and distribution is already occurring in Malaysia that is increasing the percentage of biodiesel in fossil fuel diesel from seven percent (B7) to ten percent (B10). (http://www.mybiodiesel.org.my/).

2.1 Blending an increasing percentage of biofuels with fossil fuels

The following three recommendations look to establish a price signal to kick-start biofuels production and their integration into the existing petrochemical distribution network.

Recommendation 2.1(a): Establish a working party of stakeholders to determine a timetable for increasing levels of biodiesel within the existing diesel distribution network.

Recommendation 2.1(b): Establish a working party of stakeholders to determine a timetable for increasing levels of biofuels within the existing aviation fuel distribution network.

Recommendation 2.1(c): Establish a working party of stakeholders to determine a timetable for increasing levels of biogas within the existing gas distribution network.

2.2 Royal Australian Navy and the US Navy's GGFI

There are at least three reasons why the Royal Australian Navy (RAN) should adopt the US Navy's GGF initiative (1) improving national security by developing fuel sources independent of politically unstable countries, (2) maintaining interoperability with the US Navy and (3) the US Navy is unable to enter into take-off agreements with Australian biofuel producers. The last point will impede the ability of Queensland biofuel producers from securing finance for investment in biofuel projects. RAN would be more like to enter in take-off agreements to enable the financing of projects.

Recommendation 2.2: The Queensland Government lobby the Federal Government to adopt a similar initiative to the US Navy's Great Green Fleet Initiative for the RAN.

2.3 Exporting biogas within the existing LNG export infrastructure

The current export of fossil fuel gas as LNG provides our trading partners with a lower emissions fuel than coal but LNG only provides a transitionary arrangement before more zero carbon or carbon neutral options become available. China does have great potential to develop a significant portion of its energy needs from renewable energy (Drew 2016) and has significantly increased its nuclear generation fleet. This situation contrasts with densely populated Japan that has limited renewable

energy resources and is in the process of closing its nuclear generation fleet after the Fukushima accident. Our other major energy trading partner, South Korea, is more densely populated than Japan, also has limited renewable energy resources. After some corruption involving falsification of nuclear power station safety certificates, the Korean Government extended the shutdown of nuclear power stations pending further investigations (http://www.reuters.com/article/us-nuclear-korea-idUSBREA160C820140207). Both Japan and Korea will continue to be net importer of energy. There is an opportunity for Queensland to provide these countries with renewable energy in for the form of biogas. This opportunity can be achieved by introducing biogas into the existing LNG export infrastructure to gradually transition to a carbon neutral trade in biogas. Establishing this trade would require some international collaboration with our trading partners. I have been discussing this trade arrangement with researchers in the Korean Energy Economics Institute (KEEI) and Korea Gas (KOGAS).

Recommendation 2.3: The Queensland Government establish an international body of stakeholders to investigate the export of biogas within the LNG export infrastructure.

3. Mining and resources sector recommendations

The Paris Agreement of COP21 was an important political step forward, providing a statement of commitment by 185 nations to limit global warming to below 2°C above pre-industrial levels and most nations also signed up to 'the intent to pursue a 1.5°C target'. Meeting this commitment requires keeping most of the remaining fossil fuel reserves underground. This requirement has profound implications for the solvency of the fossil fuel companies and State and Federal Government revenues that rely on the unsustainable fossil fuels royalties and excise duties. There two ensuing issues (1) developing alternative and sustainable Government revenues and (2) ensuring fossil fuel companies place adequate funding in trust to repair the damage caused by fossil fuel extraction.

3.1 Developing sustainable Government revenue

There is a requirement to find a source of revenue to replace the royalties and excise based on fossil fuels. The horizontal fiscal equalisation of GST revenue between the States means that even the Sates without fossil fuel based royalties will be affected by the loss of royalty revenue. The loss of fossil fuel based royalties and excise duty will also affect the ability of the Feral Government to fund joint Federal-State expenditure. As a solution, reducing global companies' tax avoidance is a promising area to develop sustainable revenue. For instance the European Commission has ordered Apple to repay as much as 13 billion euros plus interest after finding Ireland had illegally slashed the iPhone maker's tax bill between 2003-2014. (http://www.bloomberg.com/news/articles/2016-08-30/apple-s-14-5-billion-eu-tax-ruling-what-you-need-to-know)

Recommendation 3.1: The State and Federal Governments investigate alternative sustainable source of revenue to replace the royalties and excise duties based on fossil fuels.

3.2 Ensuring fossil fuel companies' trust funds are adequate

The precipitous decline in gas and oil prices and the bankruptcy of the largest privately owned coal company in the world, Peabody, earlier this year indicates the financial vulnerable of fossil fuel companies. The chance of further bankruptcies in the fossil fuel industry is highly likely. There is the

requirement to ensure the companies profiting from the extraction of fossil fuels pay for the repair cost without recourse to the tax payer.

Recommendation 3.2: The Queensland Government audit the fossil fuel companies to ensure they have sufficient funds in trust to repair the damage caused by their extraction of fossil fuels.

3.3 Ensuring transfer of fossil fuel company's restoration liabilities

This recommendation extends Recommendation 3.2 for the situation where a fossil fuel company sells a fossil fuel extraction site to another fossil fuel company, the buyer. There should be a requirement to ensure a simultaneous transfer of funds in trust, from the seller to the buyer, equivalent to the restoration cost of the site at the time of sale.

For example, without the transfer in trust to clean up the site, a hypothetical large international company called CIQ has extracted most of the resources from the fossil fuel site creating major environmental damage to the site. CIQ now wants to sell the site to a small local company XYZ at a cheap price. But if XYZ goes bankrupt and unable to restore the site, the CIQ profits from the site are distributed to the many foreign shareholders and the Queensland taxpayers hold the liability to clean up the site.

For example, with the transfer in trust to clean up the site, the hypothetical large international company CIQ has extracted most of the resources from the fossil fuel site creating major environmental damage to the site. CIQ now wants to sell the site to a small local company XYZ. CIQ transfers to the Queensland Government the equivalent of the restoration costs to hold in trust before the CIQ can sell the site XYZ. Even if XYZ goes bankrupt and unable to restore the site, the Queensland Government now has sufficient funds in trust to restore the site. The CIQ profits from the site are distributed to the many foreign shareholders but less the cost of the restoring the site that are held in trust by the Queensland Government.

Recommendation 3.3: The sellers of fossil fuel extraction sites pays to the Queensland Government to hold in trust funds equivalent to restoration costs before the site can be sold.

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