PV Technical Issues:

1) Fluctuating power supply is in no way suitable to supply constant grid power as required for normal operation of machinery and appliances. Example: Goulburn has ca. 25 MW peak power (summer). This results in an increase of grid voltage from nominal $V_{nomi\text{-}AC}$ = 230 V to $V_{real\text{-}AC}$ = 253 V (measured on several power outlets throughout Goulburn!), amounting to +10 % voltage.

We can calculate by 1.1 × $V_{nomi\text{-}AC}$ that (due to R = const. = V/I) we get I = $I_{nomi\text{-}AC}$ × 1.1 → P = V × I = 1.21 $P_{nomi\text{-}AC}$ → 21 % extra power by PV → 25 MW = 21 % of power demand in Goulburn. The estimate of total P demand in Goulburn is then ca. 120 MW = 300 A at 400 KV.

Consequences: over-voltage damages appliances and machinery slowly over time due to gradually damaging insulations in motors (e.g. compressor in fridge) or by successively frying electronics (e.g. electronic bonds in central gas heating system, washing machines, etc.).

2) Remediation of fluctuating power can be achieved by very large lithium-ion batteries, BUT:

Those batteries have a safety problem due to high energy density combined with self-discharge and/or quick charge heating up the battery (positive feedback loop), eventually setting the battery stack on fire. Once burning – see to Boeing 778 (Dreamliner) problems and Teslas burning down – Lithium gets exposed to air and oxidizes violently, as all alkali metals do, with excessive heat. Extinguishing such a fire is extremely difficult and dangerous, not to mention environmental pollution: burning plastics, copper, graphite/graphene. (see: Fire and chemical hazard)

Planning issues:

1) PV modules have a warranty of 25 years to deliver 90% of their initial peak power. How come Lightsource bp assumes the lifespan of the solar power plant with "*at least 40 years*" (Assessment of Impacts, 240)? How can Lightsource bp even remotely guarantee such a statement, given that *100% (5 out of 5) solar power plants ("farms") were sold to Chinese investors within 5 years ad max (!!)* from completion of construction? *What irrevocable guarantees exist from Lightsource bp as the prospective construction company for a Photovoltaic Power Plant to be operated and maintained with the current and future environmental standards of New South Wales and federal Australia?*
2) There does not seem to be any serious operating and risk assessment procedures with rescue and back-up systems in place, as a required for any commercial power plant. Moreover, local planning authorities which supposed to check such implementation from the angle of environmental/sociological/economical impact have not only been left out, but by-passed altogether. This implementation is another clear sign that proper legislation is not in place.
3) A "Renewable energy" installation (Lightsource bp should have a look at the 1st law of thermodynamics: energy cannot be "renewed"/generated nor annihilated) is proposed to replace pristine farmland and zoned nature habitats and re-assigned to PV power plants. There is plenty of space on rooftops in cities (e.g. Sydney), where electricity users could directly supply their needs, circumventing a lot of problems (transmission, storage, fire hazards, chemical run-off in pristine natural habitats, etc.) only coming into existence with such mega-installations in locations far from being suitable, environmentally friendly, and – above all – unsafe to operate.

Socio-economic impact

As per own Executive Summary: *"The Project will contribute the following economic outcomes for the region:*

- 155 direct and 245 indirect jobs during construction, totalling 400 FTE total jobs nationally (over 18–24 months during construction), including 60 FTE jobs for the region.

- 14 FTE total jobs (4 FTE direct and 10 FTE indirect) nationally during operations, including 6 FTE jobs for the region" (Executive Summary xi)

Solar power plants consist of complex specialized equipment, requiring highly skilled technical specialists to install and maintain it. In analogy to setting up a fuel station, such teams of specialists travel around the country to set up solar power plants. There is no local work force involved. Maintenance and breakdowns are dealt with by another team of specialists again. It is way more economic to have such teams travelling around to fix such issues.

What is left as work to the community is in the event of fire, usually due to inverter failure (blow-up), lightning strike, which is likely in a 5 km^2 area, or sort-outs of module or medium power cables, of high-power transformer failure. All of these likely triggering bush fires. In reverse, bush fires may trigger a fire in the power plant. (see: Fire and chemical hazard)

In regards to jobs: The EIS states that Lightsource bp built five large-scale solar plants in Australia since they entered the Australian market in 2018 (EIS, Introduction p 3). On December 15, 2023, Giles Parkinson wrote in the journal 'Renew Economy. Clean Energy News and Analysis.' (https://reneweconomy.com.au/lightsource-bp-sells-five-australian-solar-farms-to-chinese-buyer/): *"Lightsource bp says it has sold five of its Australia solar project to the China-based Beijing Energy International Australia (BJEI Australia) for an equity value of $813 million."* Lightsource bp sold all of the realised Australian solar plants to foreign companies within the span of 5 years. Given that track record, with no long-term contracts *"a target of 5% local workforce"* (Executive summary, xi) will remain a statement with no consequences. It is nothing but a promise the community cannot accept.

Environmental Issues

Fire and chemical hazard. A grass fire in the region moves at a speed of approx. 4 to 8 m/s without hazardous winds. To extinguish such fire an amount of approx. 500 litre = 0.5 m^3 of water is needed for each metre of fire front. The shortest front of the proposed solar power plant is ca. 2 km (north end). For this front *alone*, 1000 m^3 water (1 Mega-liter) are required as a minimum. For the proposed Gundary solar power plant, Lighthouse bp has *"a combined capacity of 180,000 L"* (executive summary, x). That allows for securely extinguishing a grass fire (without flare-ups hours later) on a width of ca. 360 m – which is 18 % of the shortest boundary of the proposed power plant.

The fumes originating from different kinds of plastics (PVC insulation, etc.), epoxy-resins (module sealings, electronic components, etc.) and transformer cooling oils (see below) in every inverter and high-power transformer are highly toxic. Moreover, since no exact disclosure is given by manufacturers ("trade secret"), firefighters would not even know with required accuracy what to expect and what filters to use in their gas masks. Rural fire services are usually not equipped with fresh air breathing apparatuses. The rural fire service in QLD therefore issued a directive that a fire in a solar power plant should just burn without them interfering, except it sets the environment downwind on fire, in which case they would have to act/still at considerable risk due to toxic fumes.

However, the main problem is the transformer cooling oil. This oil contains tetra-fluoro- and tetra-chloro-dioxine which are highly toxic, teratogenic, mutagenic and cancerogenic (the Agent Orange/White/ Blue) used as defoliation agent in the Vietnam war. Those dioxines have a high boiling point, are electrically insulating, and have a high heat capacity, making them the ideal cooling liquid

from a purely technical view point, which can be tolerated when adequate measures such as high-risk containment and prompt action of hazChem expert personnel are in place 24/7. Acute toxicity to all live forms in case of catastrophic failure is not addressed anywhere in the EIS to the proposed solar power plant.

In addition to air and ground pollution, Gundary plains is "*part of the Sydney **drinking water catchment***" (Strategic Context, 24). Lightsource bp is aware that Gundary plain drains into the Mulwaree river which finally feeds into Warragamba Dam, the *main supply of drinking water for Sydney.* Therefore, any exposure to hazardous run-off from solar panels (chemicals: Pb, Cu, Al, PVC, plastic softeners, epoxy resin), associated power electronics (flame retardants set free by permanent heat when in operation, solder metals – Pb, Cu, epoxy resins of electronic components and boards, cables) or batteries (chemicals: graphene, Cu, Li, plastic softener, epoxy resin) must be prohibited. Needless to say, in case of a converter blow-up or other catastrophic event such as burning solar panels, high power cable or – in particular – Li-Ion batteries, this run-off *must* be contained on the spot, as otherwise the local soil is heavy contaminated with toxic chemicals. This also refers to partially oxidized species of environmentally problematic chemical compounds such as plastics and epoxy resins which may contain tetra-fluoro/chloro-dioxy-furane (dioxine class).

Flood hazard. The EIS states on page 187: *"Flooding within the Project Area is not recorded and no anecdotal information, such as surveyed flood debris marks on landmarks such as fencing, were available for this study."* We observed on surrounding property (that shares a fence with the proposed site) a substantial amount of flood debris visible up to ca. 1.1 m above ground – and the property has a higher elevation than the proposed location for the solar power plant.

Hail hazard. No hazard mitigation report mentions hail damage of PV modules. The major hail strike in Canberra during 2020 is a good example of prevalence of such weather conditions in the area.

Decommissioning and waste. *"After its operational life, the Project would either be decommissioned (by removing all infrastructure and returning the site to its existing land capability) or repurposed with new PV equipment subject to technical feasibility and planning consents."* (Introduction, p1)

As of today, worldwide there is ONE (!!) company (LuxChemtech GmbH Freiberg, Germany) which can recycle Silicon solar cell modules to nearly 100 % on an industrial scale. The recycling consists of about 100 processing steps, yielding silicon, aluminium, glass, rubber, silver and lead as recyclables, and epoxy resin and other plastic-based compound materials as waste. Epoxy resins are of particular concern. They are environmentally robust, taking hundreds of years to decay. Since epoxy resins are phenol-based polymers, their decay sets free phenol which is toxic and cancerogenic. Such decay products would dissolve into ground water (phenol has a reasonably good solubility in water). Such environmental problems present a major environmental issue. Lightsource bp's generic statement as cited above borders on lip service and clearly shows that the claim of solar modules being environmentally harmless is not considered with the necessary depth nor expertise, especially in the light of a claimed 40-year operating life of the projected solar power plant.

Further, there is the issues of remedy works to be done once the power plant reaches its end-of-life. Any open pit coal mine in Australia must provide a remediation plan plus the financial means up front to put such measurements into action in order to guarantee that the landscape is converted back to its original/natural habitat as possible withing reasonable efforts. Why is such a plan not in place, and why – if existent – is it not publicised?

Sheep grazing. There are anecdotal reports from farmers throughout Australia who cannot let graze sheep for wool production on a solar panel area as the wool gets tangled in the rotation system of the

panels and gets ripped off. Firstly, it is animal cruelty, secondly the outcome for farmers is loss of livestock or the reduction in fleece production as the wool needs to be shorn off too early to reduce the risk of injury. So, the statement: *"co-located use for livestock grazing is anticipated"* (Executive Summary XVI) is likely to be negated.

Climate change. *"The Project provides for cleaner, more reliable electricity generation while reducing greenhouse gas emissions and the impacts of climate change."* While there is no doubt that the Earth's climate is warming since ca. 1975 – see: https://shop.elsevier.com/books/evidence-based-climate-science/easterbrook/978-0-12-804588-6 for a scientific treatise of the matter – the amount of anthropogenic CO_2 amounting to ca. 3 % of the total CO_2 emission of the planet, is not a real concern for the climate. We would appreciate it very much if Lightsource bp would *not* follow the opinion piece of the day, but would get informed to be able to hold up in sound scientific discourse.

6.13.1.3 Assessment of Impacts, Level 1 Qualitative Analysis (p197 [pdf])

…" The hazardous components of the Project are located at distances greater than the expected impacts of a credible hazard event from the nearest non-associated residences." …

We note that a fire in the solar power plant (lightning strike, hail strike, bush fire, inverter/battery/transformer blow-up or thermal runaway – take your pick) has lots of environmentally problematic fuel (see above), whereby considerable smoke development (toxic fumes) is one of the highest hazards, together with groundwater and soil contamination. We seriously doubt that Lightsource bp can control such events to a degree where water, soil, and neighbouring settlements are *not* exposed to serious risk.

"It is considered that all 'avoidable' risks have been avoided and the Project location is appropriate." On what grounds does Lightsource bp arrive at this conclusion? This statement is a generic waver that "on reasonable grounds, nothing will happen". On reasonable grounds, car traffic is safe; only, we got thousands of casualties in Australia every year.

Level 2 Semi-Quantitative Analysis (p. 233 [pdf])

"Hydrogen fluoride (HF) is the most toxic gas likely to be present in a significant release event during a LIB thermal runaway/fire event involving the type of cells that are likely to be used in the Project."

While HF is a serious hazardous chemical, it is by far not the only one in case of a fire, see to our remarks above on furanes and dioxines originating from incomplete oxidation of organic polymers (plastics), electronic components, and transformer/transverter cooling oil. Just looking at HF is a somewhat superficial analysis which does not reflect a real fire situation.

"Based on the dispersion modelling undertaken, the potential injurious impacts for the worst-case scenario are considered unlikely to extend to the nearest off-site dwelling."

Exposure to serious risks – see below – is not just about neighbouring properties; Gundary plains are part of the Sydney water catchment area, see to our remarks above under **Fire and chemical hazard**.

"The estimated maximum 1-hour concentration of HF under stability class F conditions with a 1.5 m/s south-westerly wind at dwelling R4"

We presume that Lightsource bp is aware that the *average* wind speed on Gundary plains is ca. 3 m/s year round - https://www.weather-atlas.com/en/australia/goulburn-climate - which obviously does not reflect high gale forces which frequently reach 14 to 17 m/s, and occasionally up to 25 – 30 m/s.

Such gales become a serious problem with bush fires and on-site fires, fuelling combustion and carrying aerosols and fumes way further an in way higher concentrations as is 'predicted' by some semi-qualitative model clearly favouring boundary conditions and outcomes which fit the agenda of Lighthouse bp.

"LIB Fire" … "Fire scenario modelling was undertaken to estimate the incident heat flux experienced by a receiver at varying distances from the BESS. "

While excessive heat is a major problem in confined spaces such as electric vehicles, the main hazard originating from LIBs burning in the open are the toxic fumes of plastic encapsulations, Li_2O aerosol particles undergoing caustic reactions with water as ubiquitous in the respiratory system of men and animals ($Li_2O + H_2O \rightarrow 2$ LiOH[caustic] + H_2 [explosive in air]), and a massive spillage of such toxic substances into the soil and water. It is beneath us how such a major risk factor/scenario is not even addressed in any form.