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		operationally flexible than methane-based turbines. In fact, there may be an argument to suggest hydrogen use in turbines designed for gas may reduce their reliability and uptime. **Reducing risk of fuel cost escalation –** CarbonTP's perspective is that comparing hydrogen with other fuels is fundamentally flawed. Hydrogen should be viewed as a storage mechanism for renewable energy as previously noted. Therefore, hydrogen should be compared with other alternatives to storage such as the cost of overbuilding renewables capacity coupled with grid scale batteries, vehicle to grid technology, demand response, pumped hydro, etc. When compared against these alternatives, hydrogen is likely to be significantly more expensive as illustrated above. **Decarbonisation of the West Australian Economy** – Current applications of hydrogen are a significant decarbonisation problem. For hydrogen to be viewed as a solution to decarbonisation, existing production of hydrogen should be addressed first. CSPB use >40,000 tonnes of hydrogen annually, made from natural gas to make ammonia emitting >400,000 tonnes of CO_2 in the process. Using renewable hydrogen capacity for electricity generation will only serve to delay decarbonisation of such applications and have a lower emissions reduction impact. Renewable energy can be better used directly to decarbonise power generation and make hyd of. e6 (ay-6o 5.2)-5.MMC /LBody <<

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	SWIS assist in achieving the decarbonisation objectives of the State Government?	too expensive compared to alternatives and the inefficiency would lead to extensive capital destruction. For WA, a more cost-effective solution is likely to be overbuilding of renewables and long duration lower cost storage technologies, such as iron flow batteries, coupled with V2G, demand management and Gas Turbines burning methane for emergencies. In CarbonTP's view, electricity decarbonisation through hydrogen appears to be trying to solve the difficult last 10% of grid decarbonisation before addressing the much easier 70% of grid decarbonisation opportunities. It is likely that in decarbonising the 70% the solution to the last 10% will become more apparent. CarbonTP appreciates that burning hydrogen through WA government(at)-6.6 (b15 ( )1)8. (i)2.6 (a)w5eprt s ttd- ecoruttbe 70%the413 TDa2 T

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		hydrogen notwithstanding claims from many countries that a certain percentage of blending with natural gas is possible. Hydrogen storage infrastructure does not exist on the SWIS and the only economically viable solution to storing meaningful quantities of hydrogen is man made salt caverns in suitable underground formations. If stored as ammonia, there is a significant processing cost penalty to consider.
Technical feasibility		
5	To the extent you are able please reflect on some of the technical issues, challenges and considerations in the utilisation of hydrogen in the generation of electricity. To what extent can these technical issues and challenges be overcome? How should this impact on the consideration of a Renewable Hydrogen Target for electricity generation in Western Australia?	The technical challenges and cost of storage and shipping should not be underestimated. How will the hydrogen be delivered? Current technology is to use a tube trailer which will transport approximately 1 tonne of hydrogen at high pressure. To pressurise the hydrogen will require ~15% of the useful embodied energy contained within the hydrogen and transporting it via road from point of manufacture to point of use will consume additional energy. A typical Prime mover with a single trailer consumes ~1.2kWh/km. Therefore if the source and point of consumption are 100km apart requiring a round trip of 200km the transport will consume the equivalent of 12kg of hydrogen or another ~1% of the delivered cargo. These steps will add significantly to the delivered cost. How will hydrogen be stored? Storage is currently achieved through use of high-pressure cylinders The US DOE has data on the cost of pressurised hydrogen storage with current costs being Est.US$14/kWh of capacity Converting to AUD this is equivalent to ~AU$22,000/MWh of storage capacity. If cycled once daily this would add ~$15/MWh of power generated and if cycled weekly it would add ~$100/MWh of power generated based on a 30 year life and 7% WACC. Our conclusion is that current distribution and storage technology is inadequate to support the utilisation of hydrogen in the

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		electricity grid and the construction of separate infrastructure such as dedicated hydrogen pipelines between producers and offtakers would also be prohibitively expensive.
Certificate schemes for Renewable Hydrogen Target for electricity generation in the SWIS		
6	Do you believe a renewable hydrogen electricity generation certificate-based scheme represents an efficient and effective means to deliver a Renewable Hydrogen Target for electricity generation in the SWIS? Please explain your answer.	As noted in previous responses, we believe that the use of hydrogen for electricity production has fundamental flaws, and therefore any schemes that encourage it will be a material destruction of taxpayer funds. The government should provide incentives to where hydrogen has its uses in manufacturing of hydrogen-based products in WA.
7	What are some other approaches which could be considered alongside a renewable hydrogen electricity generation certificate objectives or outcomes sought?	As noted above, CarbonTP believes that electricity generation using hydrogen should not be incentivised.
Liable entities		
8	Is the proposed approach of certification, deemed liability and	

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		facilities have achieved FID or been accompanied by a legally binding offtake

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