



## ARDENT UNDERGROUND HYDROGEN STORAGE

27<sup>th</sup> April 2022

NSW Government

Department of Planning

### RE State Significant Infrastructure: - Kurri Kurri Lateral Pipeline and Pipeline Storage Facility

To Whom it May Concern

Ardent Underground tenders this submission to the NSW Government to voice its concerns over the proposed Pipeline Storage to be constructed downstream of the compressor station as part of the above-mentioned State Significant Project. APA propose to install 25 km of 42" steel high pressure pipeline to contain natural gas at 15.3 MPa, the pipeline shall be shallow buried on the site, to store up to 70 TJ of Natural Gas to support the Kurri Kurri Power Project (ref APA Project Update 19 October 2021). We believe this pipeline storage proposal represents a high risk to the environment, operational safety and most importantly does not consider the future potential to store zero carbon hydrogen. One of the key elements associated with the Kurri Kurri Power project is its ability to consume hydrogen in turbines that are required to be to be hydrogen compatible. We understand and appreciate the need for energy storage given the operation of the turbines as peaking units. However Ardent Underground believes there is a safer, more cost effective and environmentally responsible solution that would also provide 100% hydrogen compatibility, supporting the near-term transition to a green hydrogen asset.

The steel pipeline storage system proposed is particularly vulnerable to hydrogen attack, it is manufactured from high tensile steel tubes that are welded together. In concert with stress, atomic hydrogen interacts with metallurgical defects to activate embrittlement, resulting in reduced ductility and fracture resistance rendering the pipeline storage system only compatible with very low blends of hydrogen in Natural Gas at reduced pressure. Conversely the Ardent Underground Hydrogen Storage System is constructed using large diameter vertical shafts excavated deep underground which are compatible with both Natural Gas storage and 100% Hydrogen meaning that the storage can be built today to store Natural Gas and can transition to 100% Hydrogen (or any blend) in the future. Some of the key advantages of such a system are listed below.

**Hydrogen Compatible** - One of the key elements of the Kurri Kurri Power project is that it is intended to use zero carbon hydrogen as its fuel sources once this becomes available and cost competitive. Advancements in electrolyser technology and availability of renewable energy are pushing the cost green hydrogen lower promising to be competitive with alternatives within this decade. The steel Pipeline Storage proposed cannot store significant concentrations of hydrogen at high pressure. As we transition to a low carbon future (which we note the Kurri Kurri Power Project only exists to support) this storage facility will become redundant in a very short time horizon. The Ardent Underground System safely transfers the high pressure forces of compressed gas to the surrounding rock strata significantly reducing the stress in the liner so that the liner can be manufactured from a low cost hydrogen compatible material and is not at risk of embrittlement.

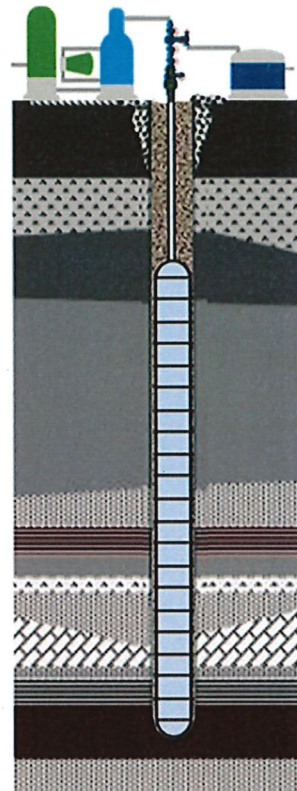
*The missing link to a green hydrogen future*



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**Inherently Safer** - Most incidents involving pressure containing vessels occur as a result of interference with the pipeline and related appurtenances. This means that shallow buried high pressure pipes are particularly vulnerable to impact damage from excavations, vandalism, vehicle impact or even terrorism. A large exclusion zone is typically included to reduce the risk of these incidents occurring as well as the consequences. The Ardent Underground system safely locks the stored energy deep underground in purpose built shafts that cannot be breached by interference. The absence of air (oxygen) and ignition sources ensures that the storage cannot detonate or deflagrate. The Ardent system only requires a very small exclusion zone which is envisaged to remain within the area assigned to the compressor station.

**Environmental** - The proposed 25km long pipeline storage shall have a significant impact on the local environment. The route is alongside wetlands that contain biodiversity that is at risk as well as many other Key Issues as detailed in the Planning SEAR's, and further requirements from the Planning Department dated 17<sup>th</sup> February 2022 and the Department of Agriculture Water and the Environment dated 8<sup>th</sup> February 2022. The alternative vertical shaft construction storage could be constructed using 1 or more large vertical shafts significantly reducing the land space required and the environmental impact. In addition, this system would release the land area proposed for future uses that would otherwise be reserved by the pipeline storage infrastructure.



**Value for Money** - estimates which have been confirmed by independent consultants indicate material capital and maintenance savings for the vertical shaft storage over the pipeline storage; this does not include the cost to acquire, maintain and secure the significant parcel of land needed for the pipeline storage.

**Community** the vertical storage system will improve community amenity freeing up the natural environment, it will deliver significantly less disturbance to the natural environment whilst also delivering an immeasurable improvement to risk profile of the facility.

We strongly urge the department to seriously consider the vertical gas storage alternative as it offers a solution that cannot be matched by the default pipeline construction proposed by APA. Further details of the vertical shaft storage can be located on the website [www.ardentunderground.com](http://www.ardentunderground.com)

Yours Sincerely

David Bentley

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