

# Cultana Pumped Hydro Project

## ARENA Final Report



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# 1 Project Details

## Activity Title

EnergyAustralia South Australian Pumped Hydro Energy Storage (PHES) Feasibility Study

## Activity Number

ARENA Funding Agreement Number G00894

## Recipient

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## Activity Participants

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Melbourne VIC 3000

## 2 Project Activity

The aim of the Activity was to determine the technical and economic feasibility of a seawater PHES plant located to the south-west of Port Augusta in South Australia.

The key deliverables of the Activity were:

- Documentation demonstrating the commercial position of the Activity;
- Evidence of the technical feasibility of the Activity; and
- Delivery of Knowledge Sharing Reports (a public and a private version)

The deliverables were delivered in two key milestones.

### 2.1 Milestone 1

Milestone 1 required the submission of all third party terms of engagement and contracts executed for the delivery of the Activity, including Arup and Melbourne Energy Institute.

This Milestone was achieved and was submitted to ARENA on 1 May 2017 and approved by ARENA on 3 May 2017.

### 2.2 Milestone 2

Milestone 2 required the submission of two Knowledge Sharing Reports: a Private Knowledge Sharing Report (as per Schedule 7 of the ARENA funding agreement) and Public Knowledge Sharing Report (as per Schedule 8 of the ARENA funding agreement).

Milestone 2 also required provision of all materials prepared by EA for the feasibility study and all third party materials commissioned for the feasibility study.

This Milestone was achieved and was submitted to ARENA on 31 August 2017 and approved by ARENA on 22 September 2017.

### 2.3 Achievement of Activity Outcomes

The feasibility study successfully delivered the outcomes of the Activity. The study has demonstrated that the Project is technically and economically feasible under a range of plausible scenarios and can address the market need for energy firming to facilitate the growth of renewable energy in South Australia.

This study has demonstrated that, subject to further detailed engineering design, the technical challenges in the application of PHES technology to seawater can be addressed. Secondly, based on the revenue streams identified, the Project has been found to be economically viable with a post-tax nominal rate of return of 8% to 12%, depending on a range of scenarios involving capital costs and revenue outcomes.

While the feasibility study findings demonstrate the technical and economic feasibility of the project, it is unique and still requires a large body of work to reduce uncertainty of both project revenues and costs.

Options for further analysis include:

- investigating an alternative project concept that may involve lower capital cost;
- further engineering work to improve accuracy on the project cost estimates;
- firming the revenue potential from energy market and ancillary market opportunities, including those arising from the implementation of the Finkel Review recommendations and the SA Government's Energy Plan; and
- the potential for government funding support.

The seawater pumped hydro storage technology could be deployed widely across Australia, especially where freshwater resources are limited, to support the growing share of renewable energy in the generation mix.

## 3 Knowledge Sharing

### 3.1 Knowledge Sharing Objectives

The Knowledge Sharing Objectives (KSO's) to support delivery of the project outcomes and the assessment of achievement of those objectives are tabled below:

<b>Knowledge Sharing Objective</b>	<b>Achievement of Knowledge Sharing Objective</b>
a) increased skills, capacity and knowledge in seawater PHES within Australia;	Prior to this study being undertaken, the only reference material was the original MEI/ARUP desktop study. Now Arup and EnergyAustralia have built up a large amount of skills, capacity and knowledge in seawater pumped hydro.
b) production and dissemination of information that advances seawater PHES through the Technology Readiness Levels (as defined by ARENA from time to time) towards commercialisation;	The consortium partners believe that through the publication of the public KSR that there is now sufficient information for any proponent to understand the issues involved in seawater PHES and how to address them through engineering, careful materials selection and design.
c) sharing of high quality research into seawater PHES which enhances Australia's world-class research position and/or addresses conditions specific to Australia;	There is limited deployment of seawater PHES, with Yanbaru being the only other project. Australia could become the only seawater PHES and therefore become a key research centre into the technology.
d) increased public awareness and understanding of seawater PHES;	Through the Knowledge Sharing Activities (described in section 3.2) the information contained in the KSR has been broadly disseminated.
e) increased understanding of roadblocks to seawater PHES and solutions to address them;	Please refer part (d). Information contained in Public KSR.
f) increased understanding of the challenges experienced when testing requirements for seawater PHES and approaches trialled to overcome them;	Please refer part (d). Information contained in Public KSR.

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Through the feasibility study, EnergyAustralia and its Consortium Partners have used their best endeavours to contribute to the advancement of pumped hydro energy storage (PHES) and broader energy sector's knowledge in PHES in the Australian context.

These KSO's were achieved largely via the information presented in the Knowledge Sharing Reports (both the private and public versions), which were the key deliverables of the feasibility study. The Public KSR is available here:

[https://www.energaustralia.com.au/sites/default/files/2017-09/Cultana%20Pumped%20Hydro%20Project%20\\_Public%20FINAL.pdf](https://www.energaustralia.com.au/sites/default/files/2017-09/Cultana%20Pumped%20Hydro%20Project%20_Public%20FINAL.pdf)

In addition to these Knowledge Sharing Reports, EnergyAustralia and its Consortium partners arranged briefing sessions for the Port Augusta community and local council, facilitated numerous presentations at industry conferences and participated in many media interviews. These are listed in section 3.3 below.

## 3.2 Knowledge Sharing Activities

### Public Events and Community Briefings

**Cultana Pumped Hydro Project Community Briefing**, Port Augusta, 10 August 2017. The project facilitated a Community Information Session in Port Augusta, which provided an opportunity for project partners to meet with the local community and key stakeholders to listen to their initial views on the project. A presentation was delivered and fact sheet was distributed at the event. A separate briefing for the Port Augusta Local Council was facilitated prior to the community briefing.

**Cultana Pumped Hydro Project Public Report Launch**, The University of Melbourne, 27 September 2017.

Melbourne Energy Institute hosted a launch of the Public Knowledge Sharing Report. The event provided an overview of the project and the key findings of the feasibility study. Presenters included EnergyAustralia (Julian Turecek), MEI (Roger Dargaville) and Arup (Paul Rasmussen).

**Cultana Pumped Hydro Project Community Briefing**, Port Augusta, 4 October 2017. The project facilitated a Community Information Session in Port Augusta, to provide the local community and key stakeholders with an update on the project and key findings of the feasibility study to listen to their initial views on the project. A presentation was delivered and fact sheet was distributed at the event.

### Presentations

**Australia Energy Storage Conference and Exhibition**, Sydney, 14 June 2017  
Details: <https://www.australianenergystorage.com.au/>

**Clean Energy Finance Corporation Presentation**, Melbourne, 14 June 2017  
Details: In-house presentation by Julian Turecek

**Clean Energy Council Pumped Hydro Roadshow**: Sydney, 16 June and Melbourne, 19 June 2017.  
Details: <https://www.cleanenergycouncil.org.au/events/upcoming-cec-events/pumped-hydro-roadshow.html>

**Alternate Technology Association**: Swinburne University, Melbourne, 16 August 2017.  
Details: <http://community.ata.org.au/branches/melbourne-branch/calendar/event/324/>

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**Power Grid Resilience Conference**, Melbourne, 22 August 2017  
Details: <https://powergridresilience.ipc.com.au/>

**Resources Conference and Trade Expo GMUSG**, Whyalla, 23 August 2017  
Details: <http://www.usgconference.com.au/>

**Pumped Hydro Energy Storage Conference**: Sydney, 29 August 2017  
Details: <https://www.informa.com.au/event/pumped-hydro-energy-storage-conference/>

**All Energy Conference - Cultana Pumped Hydro Project Presentation**, Melbourne, 11 October 2017  
Details: <http://www.all-energy.com.au/conference/Conference-Agenda2017>

## **Media**

**ABC North and West SA**, 3 April 2017

Interview with Head of Energy Assets, Julian Turecek to discuss the proposed pumped hydro project, providing insight into what's involved in the feasibility study and what's necessary for the project to proceed, the value in pumped hydro storage, how it functions, its generation potential and why the Spencer Gulf of South Australia.

**ABC 730 Report**, 13 April 2017

Television interview with Roger Dargaville on Cultana Pumped Hydro Project.

**ABC News**, 23 April 2017

Interview with Catherina Tanna and Melbourne Energy Institute Deputy Director, Roger Dargaville, covering the Federal Government's increased focus on the alternative storage technology of pumped hydro, paying particular attention to the proposed project. The interview was syndicated across the ABC news network in Melbourne, Sydney, Adelaide, Hobart and Canberra.

**Port Augusta Transcontinental**, 'Pumped hydro positivity', 16 August 2017

Local press coverage on the Port Augusta community information session featuring an interview with Julian Turecek.

**Southern Cross News**, Port Pirie, 11 August 2017

Local television coverage on the Port Augusta community information session featuring an interview with Julian Turecek.

**ABC North and West SA**, 4 August 2017

Radio interview to provide an update on the feasibility study and to restate how the pumped hydro storage project might function if it is to proceed.

**Southern Cross News, Port Pirie**, 5 October 2017

Local television coverage on the second Port Augusta community information session (feasibility report outcomes) featuring an interview with Julian Turecek.

**Port Augusta Transcontinental**, 'Port Augusta at the forefront once again', 11 October 2017

Local press coverage on the second Port Augusta community information session (feasibility report outcomes) featuring an interview with Julian Turecek.

**ABC North and West SA, 13 October 2017**

Radio interview with Julian Turecek detailing the outcome of the feasibility study, to advise next steps, and explain how the pumped hydro storage facility might function, if the project is to proceed.

**Other knowledge sharing channels**

**EnergyAustralia Cultana Pumped Hydro Project Website**

EnergyAustralia public webpage containing information about the Cultana Pumped Hydro Project, community information, links to key reports, presentations and fact sheets.

<https://www.energaustralia.com.au/about-us/energy-generation/energy-projects/pumped-hydro>

**EnergyAustralia Pumped Hydro Project Email**

EnergyAustralia manages a dedicated email address for public enquiries on the project.  
[pumpedhydro@energaustralia.com.au](mailto:pumpedhydro@energaustralia.com.au)

**EnergyAustralia Cultana Pumped Hydro Project Fact Sheet**

EnergyAustralia developed a public fact sheet with the key details of the project. This is available on the EnergyAustralia website and was distributed at the first Community Briefing session in August.

### **3.3 Effectiveness of Knowledge Sharing Activities**

Overall, the Cultana Pumped Hydro Project has been well received by all audience members. The project appears to have a very high level of support and/or acceptance, and even enthusiasm to see it go ahead.

**Government Stakeholders**

The Federal Government has welcomed the project as an innovative application of an otherwise mature and cost-effective storage technology that can help address the need for security and stability in the electricity grid. The Federal Government recognised that the results of the feasibility study were "a major breakthrough for South Australia."

The South Australian Government has welcomed the project and are keen to see it progress. In February, SA Energy Minister Tom Koutsantonis publicly said he welcomed the investigation of any proposal involving storage: "However, what was announced ... is a feasibility study so we have to wait for the results of that study to know whether the proposal is viable."

**Public Events and Community Briefings**

The launch of the public KSR at the University of Melbourne was a phenomenal success. Around 400 people attended and feedback indicated that there was a good balance between providing a comprehensive high level overview of the project, as well as technical information. The presentation gave the audience a good understanding for the project as a standalone, but also how it fits into the broader energy market discussion.

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Feedback from the community briefing sessions was positive and the community appreciated our commitment to come back and keep the community informed. A number of queries were raised by the community included regarding noise, night lighting, marine impacts/exclusions around the inlet/outlet, etc.) and they seem to have been largely reassured by the undertakings given that these issues will be further addressed in the next phase of the Project.

The key queries raised by local community and other stakeholder group mainly focus on the following topics:

- Approach for managing corrosion and treatment for salinity
- Potential environmental impacts, particularly effect on marine life
- Aesthetics of the design, particularly the powerhouse structure on the shoreline
- Proximity to Shack Road residents, specifically noise and night lighting concerns
- Employment opportunities during construction and operation
- Restrictions on channel access or exclusion zones around the inlet/outlet structure

EnergyAustralia is aware of these concerns and has publicly stated that it is committed to further addressing these issues in the next phase of the Project.

### **Media**

Overall the media coverage on Cultana pumped hydro during the feasibility study was of a positive sentiment. Each outlet took a slightly different approach, with the consistent element conveying outcomes of the feasibility assessment report and next steps involved.

## **3.4 Ongoing Knowledge Sharing**

As the project progresses, we will continue to work with the local community and proactively seek to engage stakeholders. When a decision is made to proceed or not to proceed to the next phase of feasibility, EnergyAustralia will make a public announcement and also return to Port Augusta to brief the community and advise next steps.

## **4 Project Update**

The findings of the feasibility study support progressing the Project. The Project is currently undertaking an internal review process, which is due to conclude in late November.

The main parcels of work required in the next phase are:

- detailed engineering design,
- a complete environmental impact assessment,
- securing land access arrangements,
- securing a grid connection, and
- securing revenue streams.

Based on current progress, and subject to passing EnergyAustralia's investment governance gates, the Cultana Pumped Hydro Project could be proposed to the EnergyAustralia Board for a final investment decision in 2019.