



**Underground Pumped Hydro Energy Storage Project (UPHES SRG)  
Stakeholder Reference Group**

**MINUTES**

**Meeting 1: Inception and Welcome**

<b>Date</b>	20/07/2021	
<b>Time</b>	4.00pm – 5.06pm	
<b>Venue</b>	Online due to COVID-19 precautions	
<b>Independent Chair</b>	Abigail Goldberg	Chair and Director, GoldbergBlaise
<b>Invitees</b>	Ms Robyn Charlton Mr Ray Robinson Mr Trevor James Mr Anthony Margetts Mr Iwan Davies (interim) Mr Glenn Bunny	Newstan-Awaba CCC & Lake Macquarie Sustainable Neighbourhoods Alliance Myuna CCC Mandalong CCC & Mandalong MCA DPIE - Mine Safety DPIE - Planning, Industry and Environment Lake Macquarie City Council
<b>Observers</b>	Mr Ryan Skinner Mr Tim Couchman	NSW Emerging Energy Program ARENA
<b>In attendance</b>	Matthew Fellowes Donna Dryden	Banpu Energy Australia Banpu Energy Australia
<b>Apologies</b>	Representative TBA  Iwan Davies	Centennial Northern Holdings Aboriginal Cultural Heritage Committee  Interim representative, DPIE

<b>Agenda item</b>	<b>Action</b>	
1.0	<p><b>Welcome and introductions</b> The Chair provided an Acknowledgement of Country, welcomed participants and facilitated round-table introductions.</p> <p><b>Declaration of pecuniary interests</b> In introducing themselves, participants outlined their key memberships / interests. The Chair noted that none of these were pecuniary in nature, moreover these roles were complementary to the project and SRG rather than conflicting.</p>	Participants to update the Chair either inter-session or at the meeting should any issues of conflict of interest, perceived or actual, arise.
2.0	<p><b>Overview of the project</b> An overview of the project was provided by Matt Fellowes, who outlined the project history as well as the current approach methodology, and anticipated timing. A PPT overview of the project, as presented by Matt, is attached to the Minutes.</p>	

3.0	<p><b>Roles and responsibilities of the SRG</b></p> <p>The Chair outlined the roles and responsibilities of the SRG in relation to the Terms of Reference and Code of Conduct, which were provided ahead of the meeting.</p>											
4.0	<p><b>Terms of Reference / Code of Conduct</b></p> <p>The Chair invited questions or comments on the Terms of Reference and Code of Conduct. Participants accepted the Terms and Code without query.</p>											
5.0	<p><b>Approach to interaction and feedback</b></p> <p>The Chair highlighted the intent for meetings to be collegiate and interactive, and noted that questions would be encouraged. The potential also exists to include agenda items relevant to the project at the request of participants. Participants welcomed this approach.</p>											
6.0	<p><b>Roadmap for meetings going forward</b></p> <p>Matt Fellowes noted the roadmap for meetings going forward as below:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; padding: 5px;">Meeting 1 – 20 July 2021</td> <td style="padding: 5px;"> <ul style="list-style-type: none"> <li>• Inception meeting and introduction of stakeholders</li> <li>• Introduction to the project</li> <li>• Understand role and purpose of the SRG, agree schedule of meetings</li> </ul> </td> </tr> <tr> <td style="padding: 5px;">Meeting 2 - October 2021 (exact date TBC)</td> <td style="padding: 5px;"> <ul style="list-style-type: none"> <li>• Update on University of Newcastle research program                             <ul style="list-style-type: none"> <li>○ Goaf consolidation, permeability and porosity</li> <li>○ Water chemistry analysis</li> </ul> </li> <li>• Update on WHSE, geotechnical, regulatory and planning assessments</li> </ul> </td> </tr> <tr> <td style="padding: 5px;">Meeting 3 - January 2022 (exact date TBC)</td> <td style="padding: 5px;"> <ul style="list-style-type: none"> <li>• Summary of conclusion of Stage 1 Research Program – Technical Viability</li> <li>• Update on Pilot Trial Progress – potential underground visit at Newstan Colliery</li> </ul> </td> </tr> <tr> <td style="padding: 5px;">Meeting 4 - April 2022 (exact date TBC)</td> <td style="padding: 5px;"> <ul style="list-style-type: none"> <li>• Update on Pilot Trial Progress – potential underground visit at Newstan Colliery</li> <li>• Update on appraisal of opportunities for Centennial Lake Macquarie assets</li> </ul> </td> </tr> <tr> <td style="padding: 5px;">Meeting 5 - July 2022 (exact date TBC)</td> <td style="padding: 5px;"> <ul style="list-style-type: none"> <li>• Summary of conclusion of Pilot Trial and Options Study</li> <li>• (Conclusion of ARENA Funding)</li> <li>• Decision regarding the future of the SRG</li> </ul> </td> </tr> </table>	Meeting 1 – 20 July 2021	<ul style="list-style-type: none"> <li>• Inception meeting and introduction of stakeholders</li> <li>• Introduction to the project</li> <li>• Understand role and purpose of the SRG, agree schedule of meetings</li> </ul>	Meeting 2 - October 2021 (exact date TBC)	<ul style="list-style-type: none"> <li>• Update on University of Newcastle research program                             <ul style="list-style-type: none"> <li>○ Goaf consolidation, permeability and porosity</li> <li>○ Water chemistry analysis</li> </ul> </li> <li>• Update on WHSE, geotechnical, regulatory and planning assessments</li> </ul>	Meeting 3 - January 2022 (exact date TBC)	<ul style="list-style-type: none"> <li>• Summary of conclusion of Stage 1 Research Program – Technical Viability</li> <li>• Update on Pilot Trial Progress – potential underground visit at Newstan Colliery</li> </ul>	Meeting 4 - April 2022 (exact date TBC)	<ul style="list-style-type: none"> <li>• Update on Pilot Trial Progress – potential underground visit at Newstan Colliery</li> <li>• Update on appraisal of opportunities for Centennial Lake Macquarie assets</li> </ul>	Meeting 5 - July 2022 (exact date TBC)	<ul style="list-style-type: none"> <li>• Summary of conclusion of Pilot Trial and Options Study</li> <li>• (Conclusion of ARENA Funding)</li> <li>• Decision regarding the future of the SRG</li> </ul>	
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7.0	<p><b>Questions</b></p> <p>Participants sought advice on what material would be able to be made public. The project team undertook to look into this and revert, noting that the project deeds may have restrictive clauses in place.</p>	<p>Project team to consider what material is able to be made public. A Ppt presentation has been attached to the Minutes following advice.</p>										

# BANPU ENERGY

## AUSTRALIA

8.0	<b>Next meeting</b> The timing for the next meeting will be advised by email.  The meeting closed at 5:06pm.	Chair to advise participants of timing for next meeting by email.
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**BANPUENERGY**  
AUSTRALIA

**Underground Pumped Hydro Energy Storage (UPHES)  
Stakeholder Reference Group  
Inception Meeting – 20 July 2021**



## Project Proudly Funded by:



The views expressed within this document are those of Banpu Energy Australia and do not necessarily represent views of the other funding partners



# Presentation content

Who is Banpu Energy Australia

What is Pumped Hydro Energy Storage

Our Project



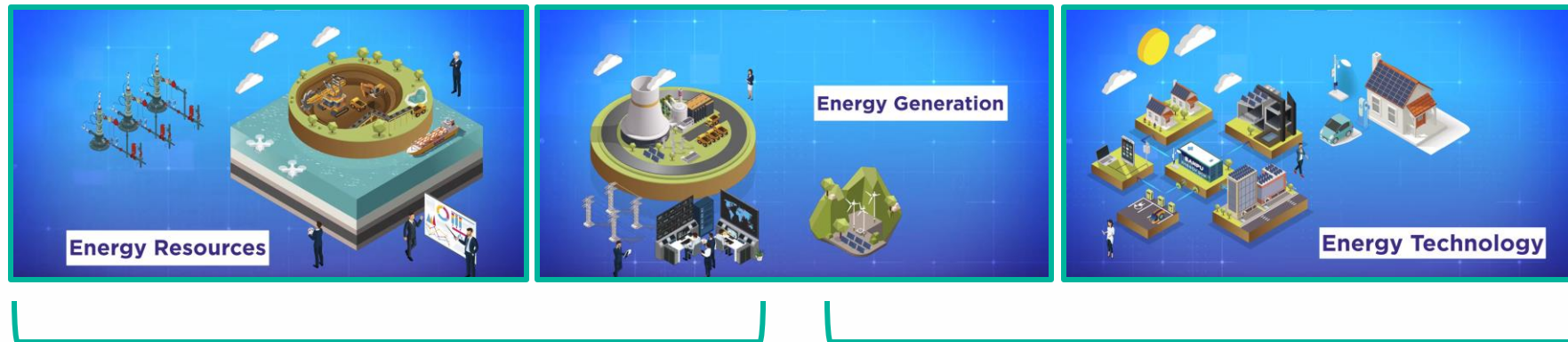
# Banpu Energy Australia



# Our Parent Company



International Versatile Energy Provider with 3 Core Groups of Businesses



Over 2.7 GW current generation  
Expanding to 5.3 GW by 2025

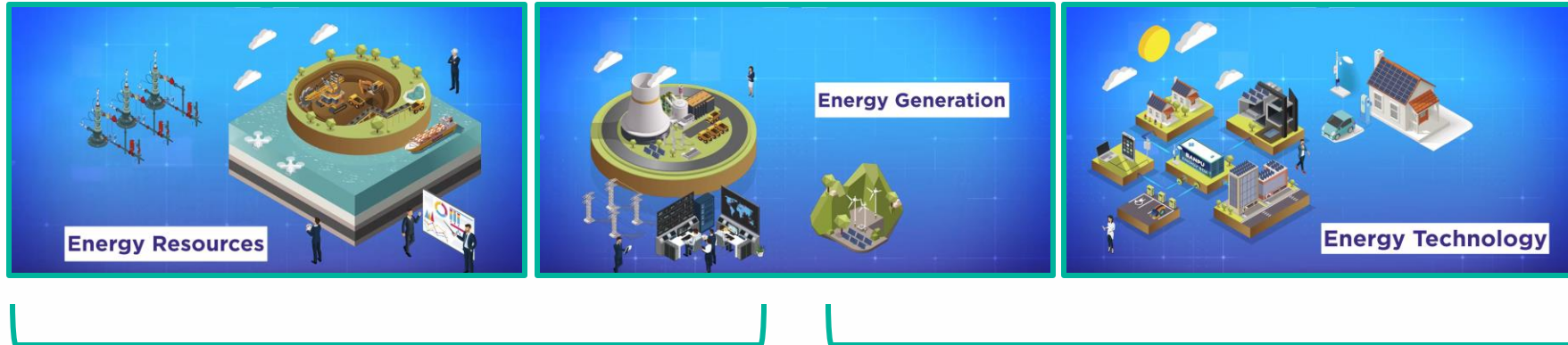


OVER 906 MW COMMITTED OF CLEAN ENERGY IN ASIA PACIFIC (as of Q4 2020)  
657 MW of solar farm and wind  
249 MW of solar-rooftop and solar floating

As an integrated energy solutions company, Banpu continues to explore new business opportunities through its **Greener & Smarter** strategy to deliver **Smarter Energy for Sustainability**



# BANPU in Australia



**CENTENNIAL**



**BANPU ENERGY AUSTRALIA**

→ **NSW leading supplier of coal-fired energy**



Solar



Rooftop Solar



Wind



UGPHERS



Coal Mine Waste Gas



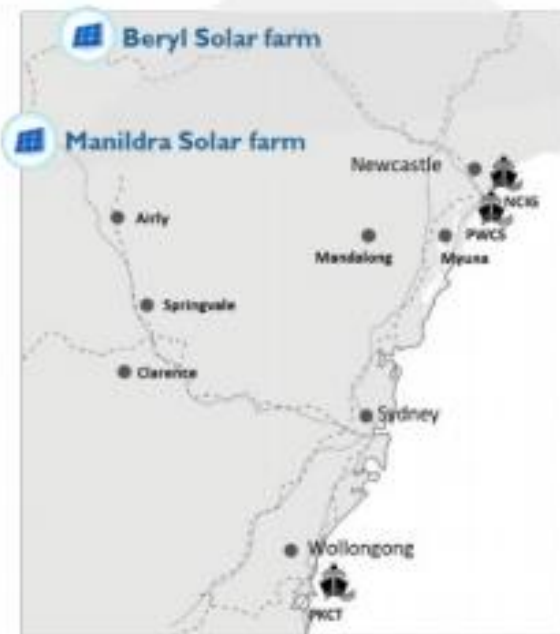
Energy Monitoring



Energy Management & Control



Energy Analysis & Forecast



<b>Capacity</b>	87 MWac / 110.9 MWdc
<b>Location</b>	New South Wales, Australia
<b>PV module</b>	LONGi
<b>Inverter</b>	Ingeteam
<b>COD</b>	June 2019
<b>Average Capacity Factor</b>	21%
<b>Offtaker</b>	83% of capacity under L-T contracts with industrial users



<b>Capacity</b>	46.7 MWac / 55.9 MWdc
<b>Location</b>	New South Wales, Australia
<b>PV module</b>	First Solar
<b>Inverter</b>	SMA Solar
<b>COD</b>	December 2018
<b>Average Capacity Factor</b>	23%
<b>Offtaker</b>	100% of capacity under L-T contract with energy retailer

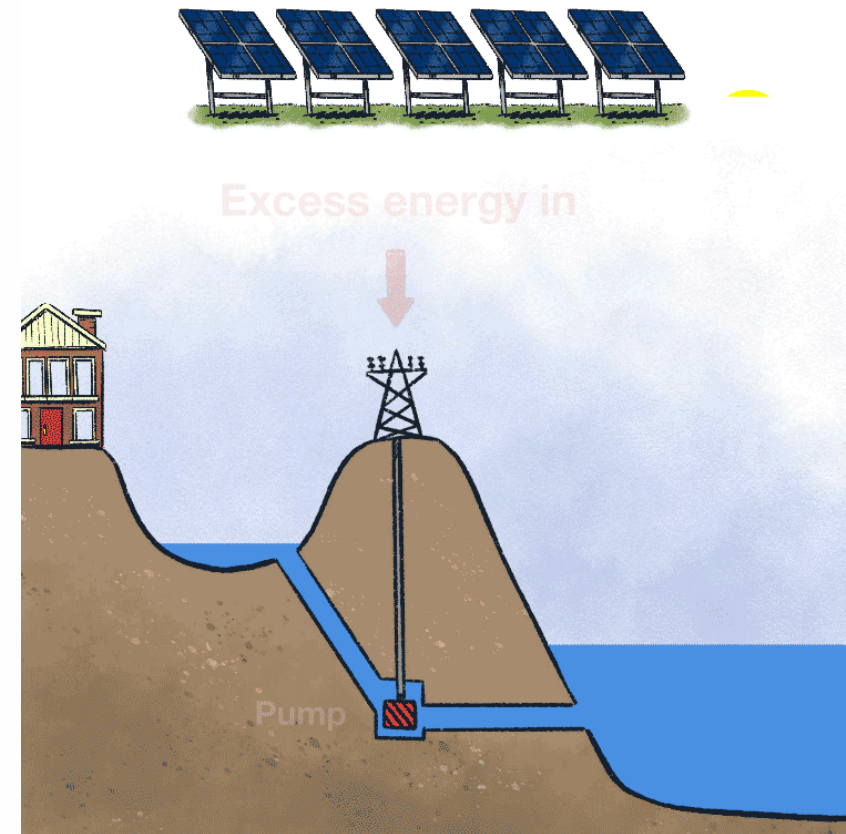


# Pumped Hydro Energy Storage



# What is Pumped Hydro Energy Storage

- It is using water as a battery
- If water is stored in a dam at the top of a hill it can store energy
- On releasing that water, it can be passed through a turbine to produce electricity
- If the water is then captured in a dam at the bottom of the hill, it can be pumped back up the hill again to create stored energy for use at a later time
- This concept is called pumped hydro energy storage (PHES)



# Our Project



# Brief History of Concept Development

2017

## Concept Workshop with SMEC

Behind The Meter (BTM) project of between 2–5 MW capacity & introduced to ARENA Internal Question – is it possible to scale that concept up for post mining?

2019

## Funding Applications to NSW Emerging Energy Program (NSW EEP)

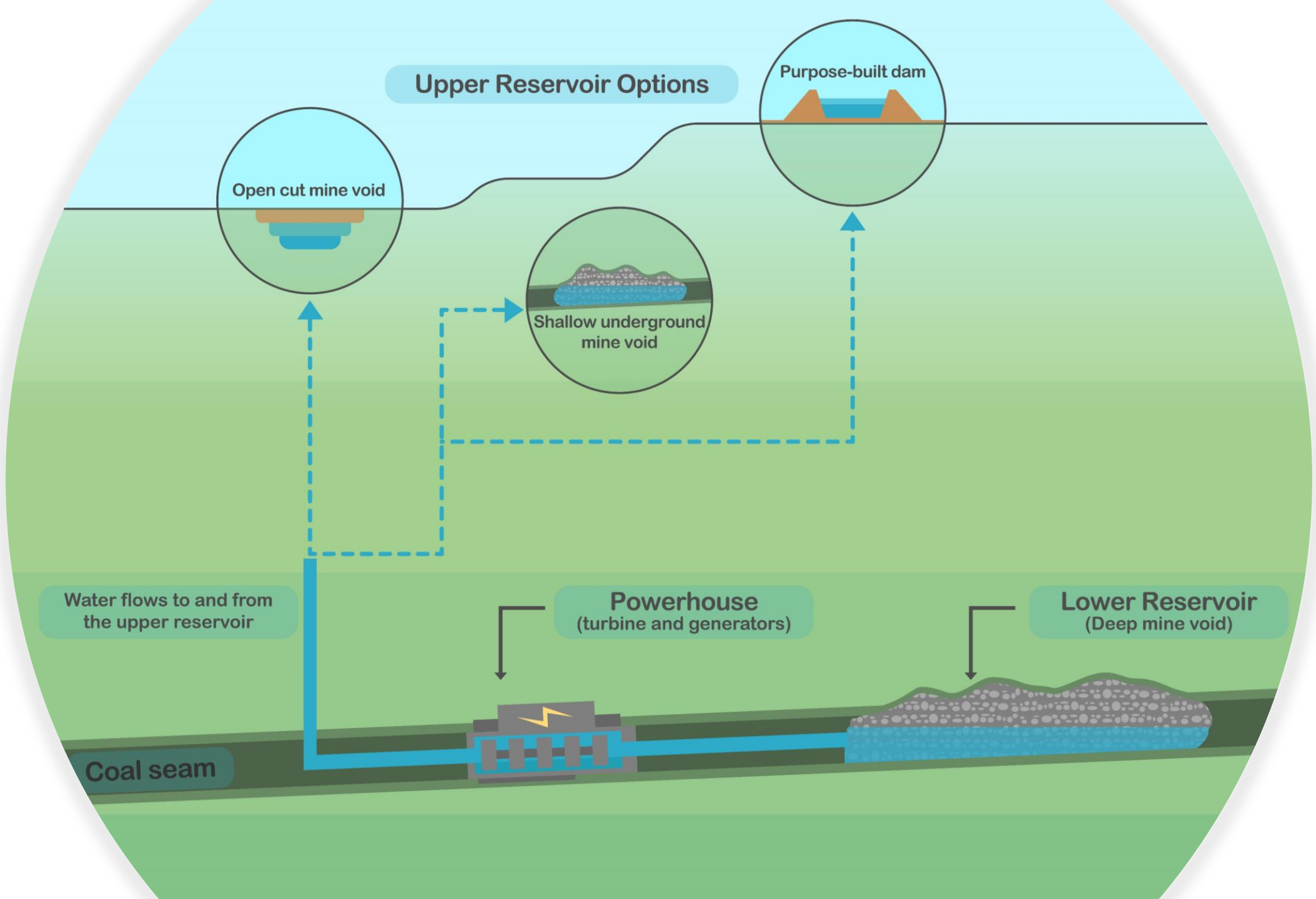
Newstan applied for funding assistance to build an 8.5 MW (BTM) Pumped Hydro Energy Storage System & the Project is introduced to the Newstan CCC.  
Advanced to Stage 2, as one of 21 successful submissions across 6 different Renewable Energy technologies – ultimately unsuccessful

2020

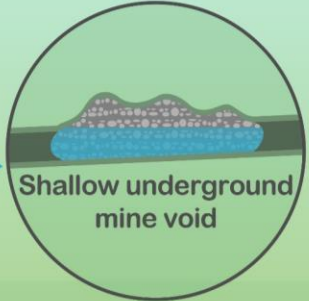
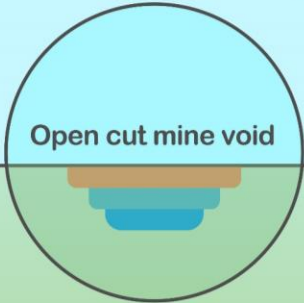
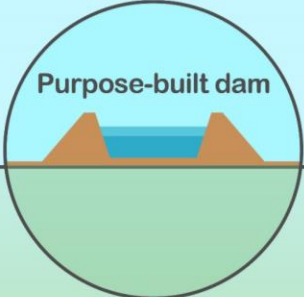
## Funding Applications Re-Scope and Success

The Project was re-scoped under the Pre-investment stream  
A research Project generic to all underground coal mining received co-funding from both ARENA and NSW EEP to advance investigation of the concept viability





**Upper Reservoir Options**



Water flows to and from the upper reservoir

**Powerhouse**  
(turbine and generators)

**Lower Reservoir**  
(Deep mine void)

**Coal seam**

# Stage 1: Laboratory studies & model scale-up

## Proof of concept confirmation

### 1. Goaf consolidation

- Will the goaf rocks squash and reconsolidate when flooded

### 2. Goaf permeability and porosity

- How much water can the rock matrix hold and how resistive is it

### 3. Water chemistry analysis

- What minerals will be released over time

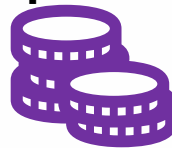
### 4. Assessments on pillar stability, mine subsidence, roadway support requirements etc

### 5. Risk assessments on practicably operating a pumped hydro facility within a coal mine



**12 months**

*(Complete December 21)*



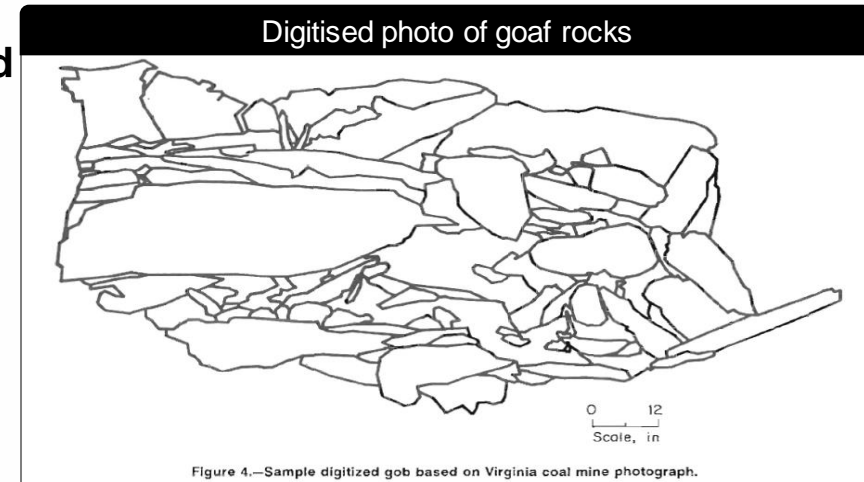
**\$1.685m**

*(Stage cost)*



**\$750k**

*(Funding request)*



Stage 1: Proof of concept confirmation

Stage 2: Pilot trials

Stage 3: EA and planning approval

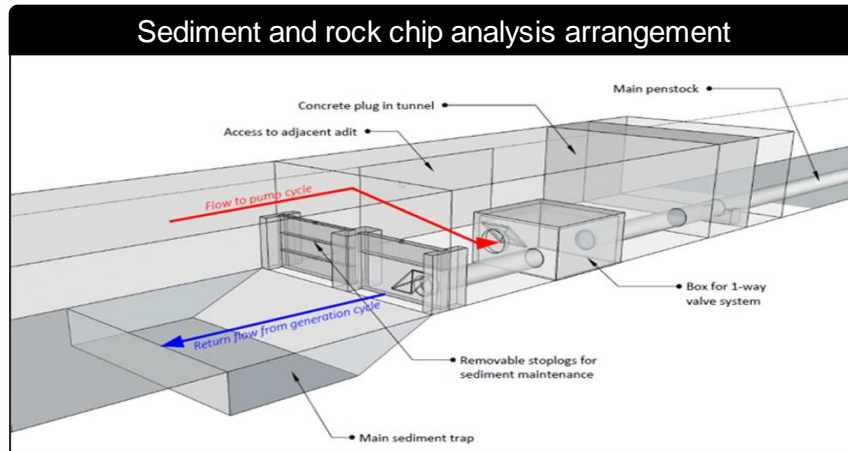


# Stage 2:

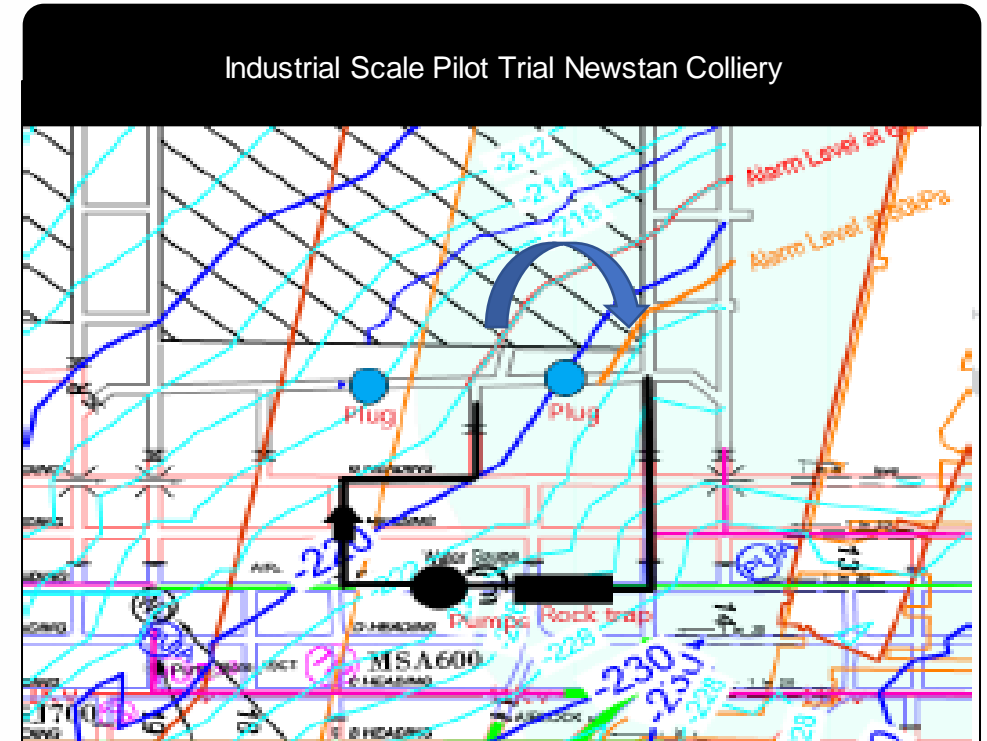
## Pilot trials & options study

### 1. Simulate pumping in and out of a goaf

- Confirm university findings
- Test water velocity v sediment and rock chip transport
- Re-open a sealed goaf
- Install penstock through bulkheads

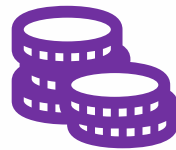


Purpose: Pump / turbine design and materials / coatings and linings



**15 months**

(Complete Jun 22)



**\$2.2m (+\$0.37m)**

(Stage cost)



**\$1.0m (+\$0.12m)**

(Funding request)

Stage 1: Proof of concept confirmation

Stage 2: Pilot trials + options study

Stage 3: EA and planning approval

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AUSTRALIA



# Roadmap

Meeting No.	Content
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