

NZ Battery Project Technical Reference Group Meeting

28 April 2022



Today's programme

No	Time	Item	Lead
1.	9.30am – 9.40am	Welcome / Karakia and Agenda overview	Adrian Macey and Hoani Langsbury
2.	9.40am – 10.00am	Project overview and upcoming milestones	Andrew Millar
3.	Part 1: 10.00am to 10.50am	Pumped hydro at Lake Onslow <ul style="list-style-type: none"> • Presentation follow by discussion on the selection of preferred pumped hydro design options 	Adrian Tweeddale and Te Rōpū Matatau
4.	10.50am – 11.00am	Tea/Coffee break - 10 mins	
5.	Part 2: 11.00am – 12.00pm	Pumped hydro at Lake Onslow (Cont.) <ul style="list-style-type: none"> • Continue discussion 	Adrian Tweeddale
6.	12.00pm – 12.30pm	Lunch - 30mins	
7.	Part 1: 12.30pm – 2.00pm	Update on Workstream 2 (other hydro) and 3 (non-hydro options) <ul style="list-style-type: none"> • Overview of the latest desktop reports and their findings, followed by discussion 	Malcolm Schenkel and Bridget Moon
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10.	2.30pm – 3.25pm	What conclusions can we draw from our modelling?	Conrad Edwards
11.	3.25pm – 3.30pm	Wrap up and next step and closing Karakia	Adrian Macey and Hoani Langsbury

A wide-angle landscape photograph showing a large, calm blue lake in the middle ground, surrounded by rolling hills and mountains under a blue sky with scattered clouds. The foreground is dominated by dry, golden-brown grasses and a light-colored dirt path.

NZ Battery Project Workstream update

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Workstream 1 - Lake Onslow Pumped Hydro – Progress



- Te Rōpū Matatau has identified several design considerations for a pumped hydro scheme at Lake Onslow, and is in the process of analysing which combinations of design elements are most feasible.
- Received several reports in final stages from DOC's environmental values, Aukaha's cultural values report and NIWA's, Cawthron's base lake ecology assessment summaries.
- Transpower will soon provide a draft report on the transmission and resilience implications of a pumped hydro scheme.
- New and revised energy system modelling for Lake Onslow (**Conrad to talk to this later in the day**)
- **Next slide for the GI work underway.**

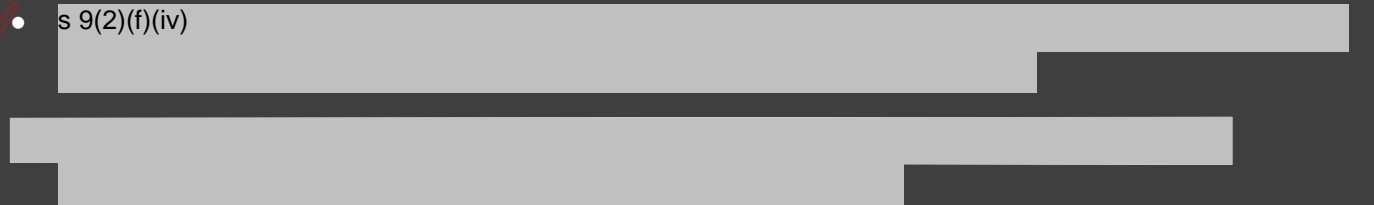


Workstream 1 – Geotechnical investigation fieldwork

s 9(2)(a)

- Cromwell-based Speight Drilling has commenced the Geotechnical programme on the 14 April. Te Rūnanga o Ōtākou conducted a blessing.

- s 9(2)(f)(iv)



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Workstream 3 - Non hydro options - Progress



- NZ Battery team and external reviewers provided feedback on WSP report.
- We paused further work to ensure that Task 1 was completed to the highest quality and conclusions were robust to questions raised through the review.
- WSP has responded to the review and provided a revised draft. It's recommendations for further work are largely unchanged.
- Looking to finalise that report this week after minor follow-up suggestions.
- Task 2 kicking off again, with a view to ensuring it makes a maximum contribution to the indicative business case.

Workstream 4 – Market integration - Progress



- We have received results of our Stochastic Dual Dynamic Programming (SDDP) modelling for Lake Onslow v. counterfactual and for resilience.
- John Culy has also completed modelling for Lake Onslow and provided preliminary results for non-hydro technologies.
- Transpower has reported on likely stability constraints affecting Lake Onslow operation, and transmission implications.
- s 9(2)(a) has reported on operational considerations for large scale pumped hydro.

Conrad will talk to this workstream later in the day

Stakeholder update



- We attended a joint Minister's meeting on March 11 with the Minister of Energy and Resources, Minister of Conservation and the Minister for the Environment. This purpose of this meeting was to provide an update on the NZ Battery Project and provide information on the projects cross-portfolio interactions.
- We have been engaging with landowners, key stakeholders and the Teviot Valley community on geotechnical fieldwork:
 - Several engagements leading to access agreements with landowners
 - Met with Central Otago District Council and the Teviot Valley Community Board in March to give a project update
 - Engaged ahead of geotechnical work being advertised on the MBIE website via e-news bulletin and advertised in the Otago Daily Times.
 - Attended a cultural induction for the geotechnical contractors on site at Lake Onslow, followed by a site blessing by Te Rūnanga o Ōtākou as the geotechnical programme commenced.
- We had conversations with Contact Energy in April on Lake Onslow and non-hydro options
- We will be continuing our business case work with Treasury, Te Waihanga (NZ Infrastructure Commission) and Electricity Authority to identify and discuss the potential funding and financing options around the operational governance for the NZ Battery Project.
- We are planning to facilitate a national ENGO workshop in May to provide an update on the NZ Battery Project.

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Purpose



Purpose of this session

- To update you on the next steps for the Lake Onslow environmental, geotechnical and environmental investigation work that is underway with Te Rōpū Matatau (TRM) , including key design parameters.

What we want from you

- This is for your information, but please provide feedback or observations.

Next steps from here

- The Project team are working with TRM to explore different pumped hydro design options for Lake Onslow and review the current detailed geological fieldwork plan options.



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Te Rōpū Matatau & NZ Battery Project

Lake Onslow update
on design options

Options sorting

Sorting principles outcomes

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DRAFT

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PO Box 37525, Parnell 1151, Auckland, New Zealand

Objectives

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- Buy-in to decision making process
- Narrow down dam decisions, decoupled from alignment/lower intake decisions
- s 9(2)(f)(iv) [REDACTED]

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Recap

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Main reservoir storage/Onslow dam

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Key decisions

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Intake decision review

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Detailed views of additional structures for intermediate type

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Tea and Coffee Break



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Boffa Miskell



Thank you

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Lunch Break



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**Workstream 2 – Other hydro &
other pumped hydro options**
Discuss findings from Stantec report

Purpose

Purpose of this session

- Get TRG feedback on the Stantec desktop assessment report

What we want from you

- To discuss your views on the Stantec report findings

Next steps from here

- To discuss



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Tea and Coffee Break





Workstream 3 – Non hydro options
Discuss recommendations from
WSP report

Purpose

Purpose of this session

- Get TRG view on takeaways from W3 work to date

What we want from you

- To discuss your views

Next steps from here

- Continue with non-hydro investigation

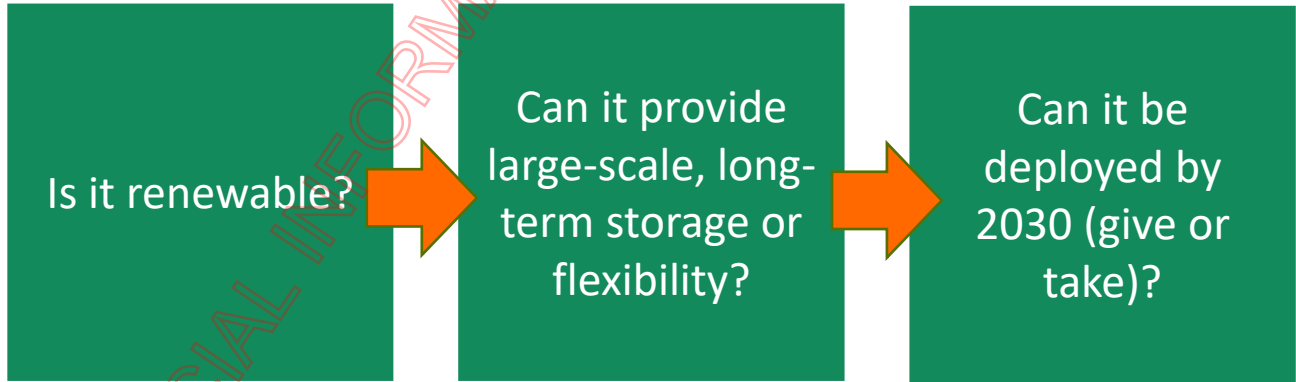
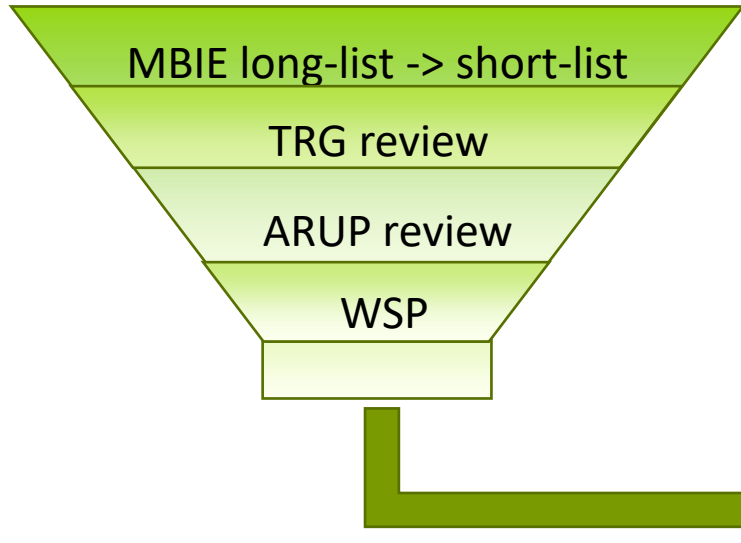
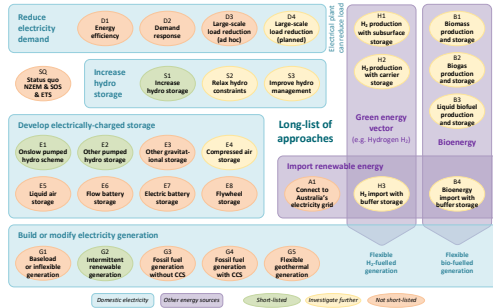


Key takeaways on other tech

- 3 technology options that may be able to solve problem by 2030 (+/-)
- There isn't an easy or obvious alternative
- Worth continuing work



3 technology options that may be able to solve problem by 2030 (+/-)



- Biomass – maybe and/or biofuel
- Geothermal that can flex
- Hydrogen / ammonia production & storage

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Market integration Workstream 4

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Purpose

Purpose of this session

- Overview of key modelling results that provide evidence for our emerging advice

What we want from you

- Please provide feedback or observations on where we should and how we could strengthen our evidence

Next steps from here

- Arrange TRG 'off-line' session on the detail of key modelling results



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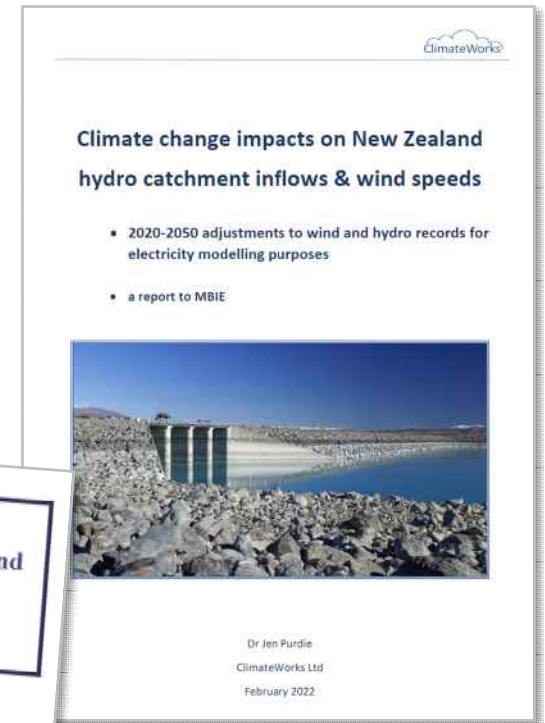
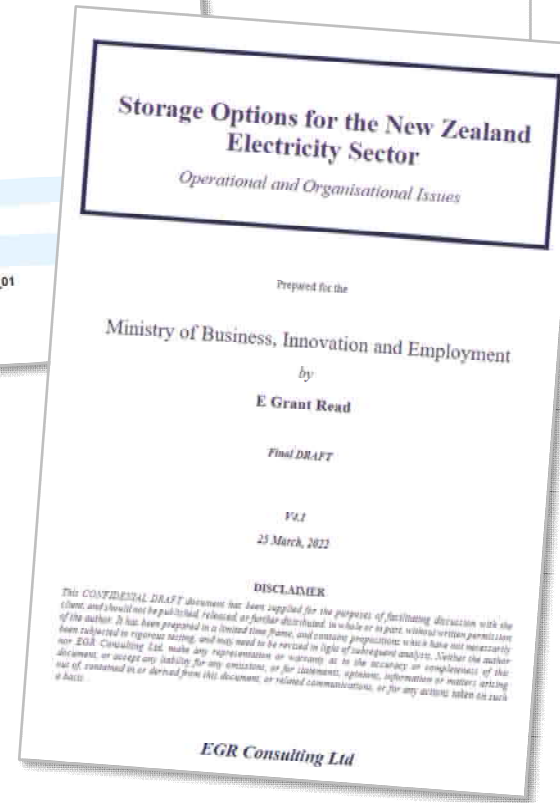
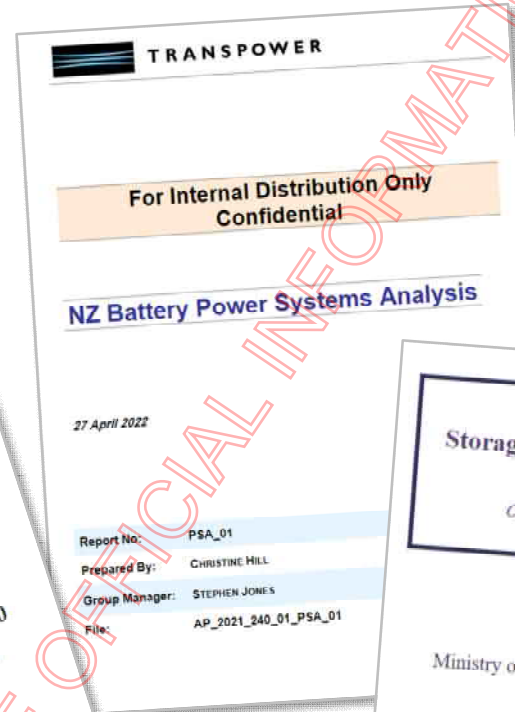
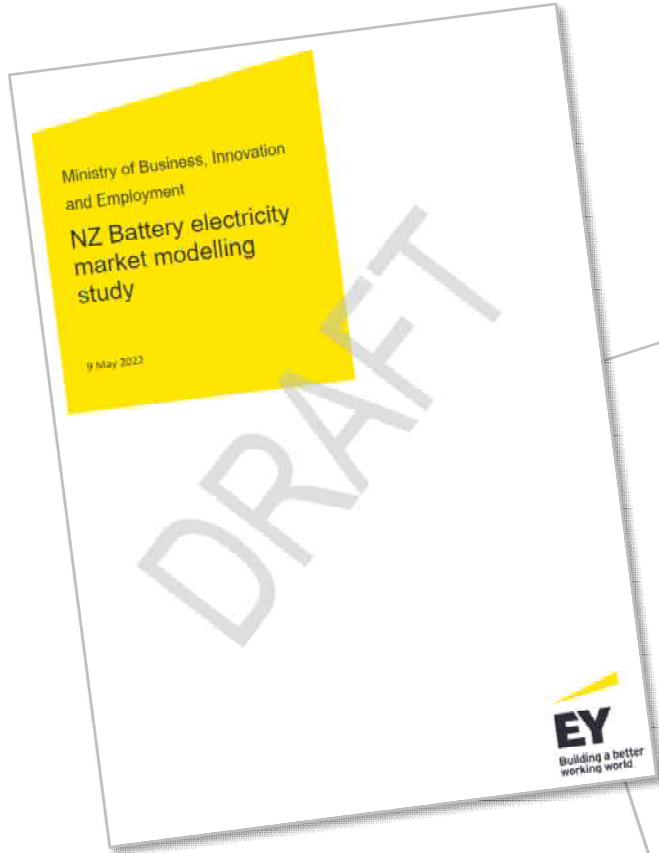
NZ Battery Project

Summary of economic findings

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Workstream 4 reports to date



The dry year problem will change over time

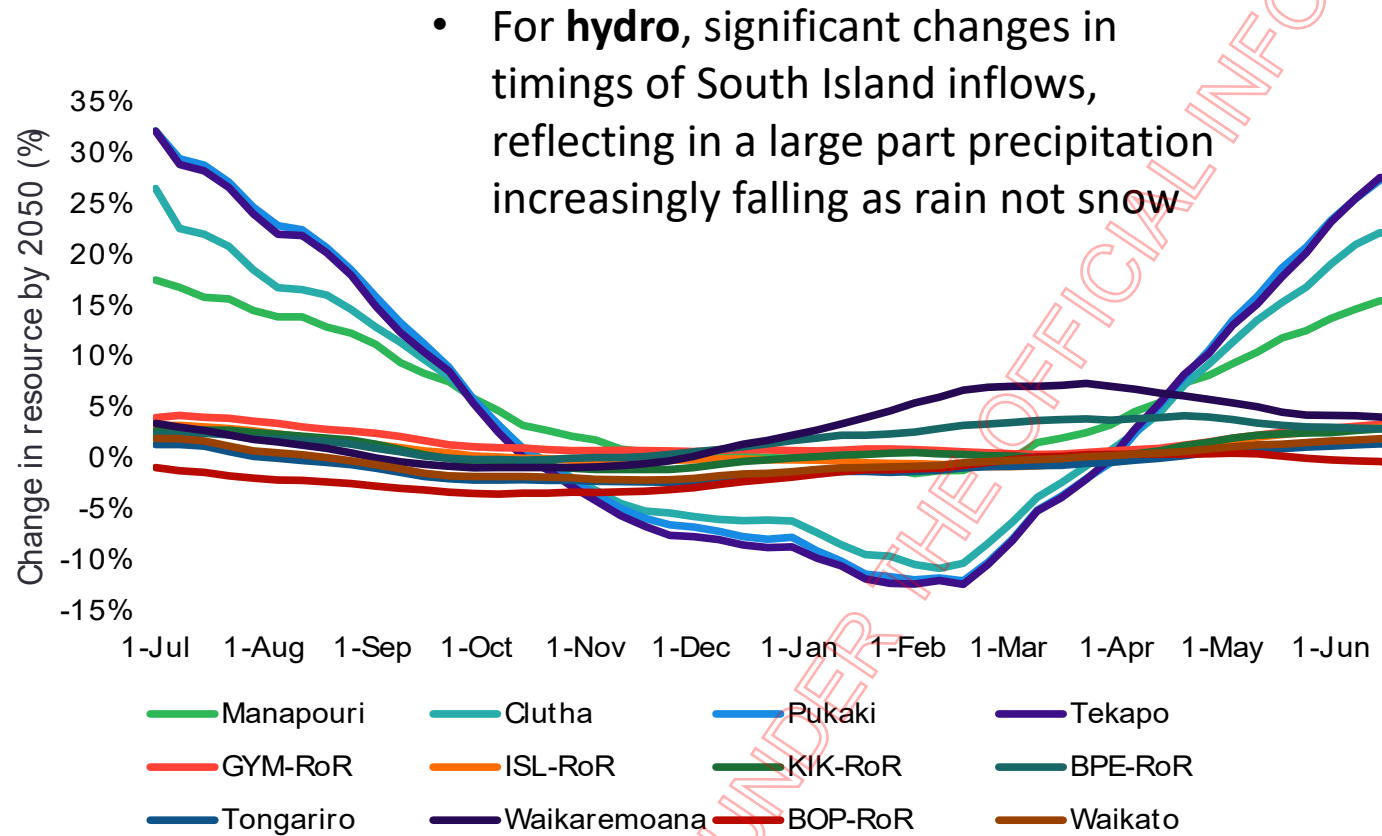
- Our mandate is to find solutions to the dry year problem, with 100pc renewable generation.
- The dry year energy gap is about 3-5 TWh
- Climate change will slightly ease the seasonal effects, but the problem will persist.
- Emerging problem of intermittency from wind and solar generation – prolonged calm and cloudy periods as we build **more** wind and solar generation.

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Climate change impacts on inflows ~2050

- We engaged s 9(2)(a) of ClimateWorks to document and provide the work she conducted for Meridian, with Meridian's permission



- For **hydro**, significant changes in timings of South Island inflows, reflecting in a large part precipitation increasingly falling as rain not snow

- For **wind**, similar size variations are predicted, but averaged across the country the variation is close to zero, so second order impacts only
- For **solar**, no detectable trend
- More confidence in direction of changes, less confidence in their timing
- The combined changes reduce the seasonal energy imbalance about 10% from 6.3 TWh to 5.7 TWh because of higher inflows being shifted into the winter

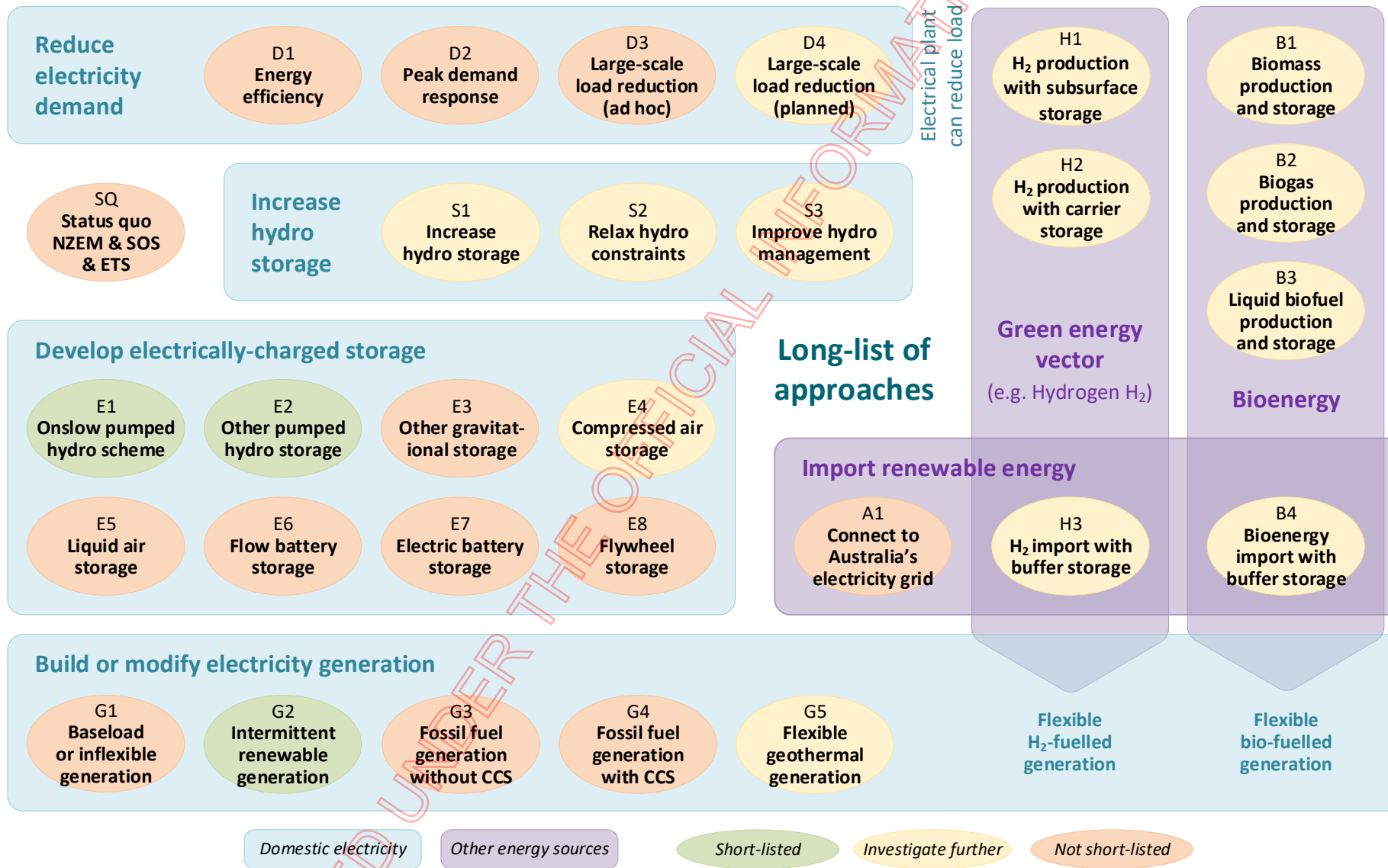
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Pumped hydro seems the only single-point solution



Lake Onslow out-performs

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What about the 'alternative technologies'?

- WSP has identified potential alternatives and Culy has modelled 'starting-point' solutions
- Indications so far are likely optimistic, but to be refined with further work:

- s 9(2)(f)(iv) [Redacted]

[Redacted]

[Redacted]

- We're also reflecting on potential of s 9(2)(f)(iv) [Redacted]

- May need to be part of a s 9(2)(f)(iv) [Redacted]

- s 9(2)(f)(iv) [Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

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A large NZ Battery is necessary to get to 100pc renewable generation

- To assess the system benefits of building an NZ Battery, like pumped hydro at Lake Onslow, we need to develop a counterfactual.

s 9(2)(f)(iv)

• [REDACTED]

[REDACTED]

[REDACTED]

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Pumped hydro at Lake Onslow will deliver system benefits

- Compared to our counterfactual, pumped hydro at Lake Onslow reduces the need to build other plant, s 9(2)(f)(iv)
- The benefits rise over time, as demand grows
- And the benefits are larger, with a larger storage lake
- It will also have a positive cashflow s 9(2)(f)(iv)
- The Net Present Value depends heavily on the benefits, capital costs, and the discount rate.

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Economic benefits

s 9(2)(f)(iv)

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A pumped hydro scheme will use the full lake capacity, and can operate straight away

- Pumped hydro at Lake Onslow will use electricity to pump and store water for later generation.
- As soon as the dead storage is filled, there will be water available for generation if the market demanded it.
- We expect that it would use the full range of its storage capacity – sometimes pumping for long periods at a time when electricity is abundant – sometimes generating continuously to supply the market.

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Onslow 'filling'

- Lake Onslow can operate as soon as the dead-storage (the volume of the lake below the turbine inlet) is filled
- Then, it will pump and generate according to its water value which depends on storage in Onslow and other reservoirs, and (through possible future inflows) time of year
- The storage trajectory for Lake Onslow 'filling' once operational will vary considerably with inflows, as illustrated here (from SDDP runs)
- Clearly, predicting 'period of fill' and 'cost of fill' is problematic

s 9(2)(f)(iv)



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Thank you.

Questions?

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Technical Reference Group Agenda

Date:	Tuesday 12 July 2022
Time::	08.30am – 2.30pm
Location:	KPMG Offices, Wellington – Online via teams
Facilitator	Adrian Macey
Members:	Cristiano Marantes, George Hooper, Isla Day (online), Allan Miller, Raymond Gunn, Hoani Langsbury (online), Mike Howat, Stephen Batstone
NZ Battery Project team:	David Darby, Susan Hall, Adrian Tweeddale, John Hancock, Carl Walrond, Malcolm Schenkel, Conrad Edwards, Bridget Moon, Daniel Wright, Sam Treceno, Jodi Percy
Apologies:	Amanda Larsson

Agenda

No	Time	Item	Lead
1.	09.00am – 09.10am	Welcome / Karakia and Agenda overview	Adrian Macey and Hoani Langsbury
2.	09.10am – 10.00am	Workstream updates and achievements	Adrian Tweeddale
3.	10.00am – 10.45am	Ecology at Lake Onslow	NIWA
4.	10.45am – 11.15am	Tea/Coffee break - 30 mins	
5.	11.15am – 11.30am	Cabinet update and the process to take us to the end of the year key decision point	Susan Hall
6.	11.30am – 12.30pm	Presentation from EY on Indicative Business Case process and options for TRG input	EY
7.	12.30pm – 1.15pm	Lunch – 45 mins	
8.	1.15pm – 2.10pm	Gaps analysis – making sure we have identified the questions that will need to be answered at the end of the year (facilitated discussion)	Daniel Wright
9.	2.10pm – 2.20pm	Forward agenda for the remaining meetings for the year	Susan Hall
10.	2.20pm – 2.30pm	Wrap up and closing Karakia	Adrian Macey and Hoani Langsbury