



Big-T Pumped Hydropower & Battery Energy Storage Project

Lake Cressbrook, Queensland



PROJECT STATUS REPORT
August 2022



GE Renewable Energy

PROJECT SUMMARY

The Big-T is a 400MW x 10 hour (maximum annual volume of 1.4TWh), grid connected, 'turkey's nest' style hydropower energy storage project situated at Lake Cressbrook, Crows Nest in Queensland.

The Big-T recently expanded the project scope to include a Battery Energy Storage System (BESS) of notionally 200MWh. The inclusion of the BESS will provide a 'worlds first' combination of short duration technology (BESS) with medium duration technology (pumped hydro).

The combination of the two technologies will enable the Project to deliver all the of future grid system requirements of grid response, network frequency (grid stability), inertia, renewable firming, and energy at duration.

The Big-T is situated in the State of Queensland's Renewable Energy Zone 8 (REZ8).

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The Big-T is one of the 12 shortlisted proponents of the Federal Government Underwriting New Investments Scheme (UNGI).

[READ MORE](#)

An aerial photograph of a large dam and reservoir in a lush green valley. The dam is a long, curved concrete structure with a road on top. The reservoir is a large body of water in the background. The surrounding landscape is covered in dense green trees and rolling hills.

PROJECT SUMMARY

BE Power and GE Renewable Energy are co-development partners in the investigation, development, construction, and operation of the Big-T Pumped Hydro Energy Storage (PHES) Project and the BESS Project.

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ABOUT BE POWER

BE Power Group is a multi-faceted energy company that develops, constructs and operates power plants, with more than \$4.5bn of projects under development. BE Power also undertakes electricity trading and retailing activities.

ABOUT GE RENEWABLE ENERGY

GE Renewable Energy is a \$15bn business which combines one of the broadest portfolios in the renewable energy industry including onshore and offshore wind, blades, hydro, storage, utility-scale solar, and grid solutions as well as hybrid renewables and digital services offerings.

PROJECT SUMMARY

The Big-T is in the process of assessment by the Queensland Office of the Coordinator General for a 'coordinated project' declaration.

The Big-T is currently completing a Bankable Feasibility Study (BFS) with Final Investment Decision (FID) scheduled for Quarter 4 2023 and commercial operations targeted for Quarter 1 2027.

The Big-T's role is to participate in the decentralisation of the National Electricity Market (NEM) as an enabler of the build-out of asynchronous renewable power generation (principally solar and wind) to replace the NEM's fleet of aging baseload coal generation power plants and to assist the Queensland Government in achieving its target of 50% renewable energy generation by 2030.















The NEM Regulator, Australian Energy Market Operator (AEMO) 2022 Integrated System Plan (ISP), p.10 states:

"45 GW / 640 GWh (gigawatt hours) of storage, in all forms. The most pressing need in the next decade (beyond what is already committed) is for dispatchable batteries, pumped hydro or viable alternative storage to manage daily variations in the fast-growing solar and wind output."

[SEE THE PLAN](#)

Technical Partners

BE Power and GE have assembled a team of partners with deep technical and commercial experience.

| TECHNICAL PARTNER | ROLE | TECHNICAL PARTNER | ROLE |
|---|--|--|--|
|  | Lead developer |  | Water advisor |
|  | Co-development Partner (PHES & BESS) |  | Project financial model and market modelling |
|  | Owner of the power hall land/grid access, land & project water rights |  | Energy Market modelling |
|  | Engineering lead, BFS preparation, project environmental approvals |  | Legal advisor |
|  | GPS & grid inter-connection engineer |  | Indigenous & cultural heritage advisor |
|  | Geotechnical advisor & EIS Author |  | Stakeholder engagement & communication advisor |
|  | Early Contractor Involvement (ECI) and Engineering, Procurement & Construction (EPC) contractor. |  | Environmental Consultant |

Project Overview

POWER PLANT

400MW x 10 hour per day Pumped Hydro Energy Storage (PHES) project situated at Lake Cressbrook, and within the **Queensland Southern Renewable Energy Zone** (AEMO Renewable Energy Zone 8 (REZ8)).

The recent inclusion of the **BESS 200MWh x 1 hour per day** situated at the BE Power switchyard land site. is currently under a separate development feasibility and approvals pathway for integration into the PHES at completion.

FEDERAL GOVERNMENT

The Project is a shortlisted proponent of the **Federal Government Underwriting New Generation Investment (UNGI)** Program.

DEVELOPMENT CAPITAL

Development capital estimated at **A\$1-1.1bn**. Approximately **50-60%** of the development capital is local content.

PROJECT CRITICAL SUCCESS FACTORS (PHES only)

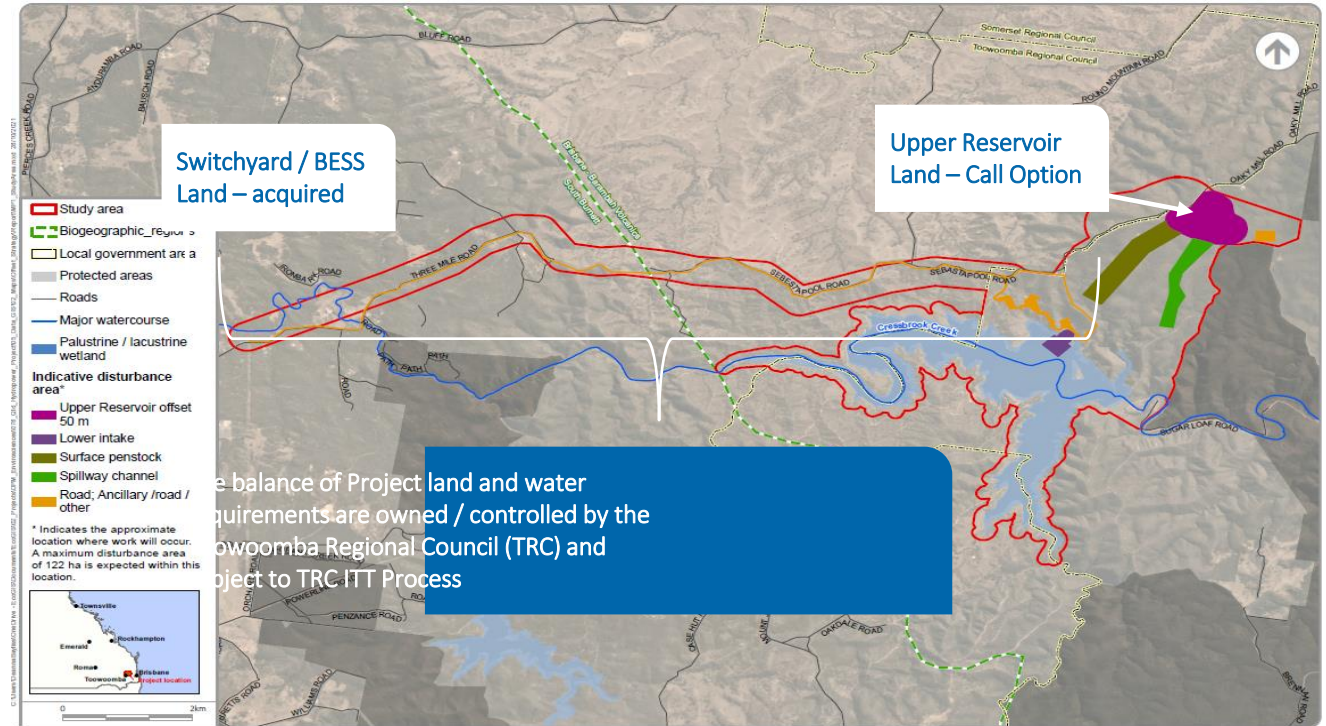
The Project has six **critical success factors** which place Big-T as **one of the lowest cost PHES projects under development** in Australia.

| PHES CRITICAL SUCCESS FACTORS | BIG-T PROJECT ATTRIBUTES |
|---|---|
| 1. Head (height differential between the upper and lower reservoir) | 260m head delivers a high efficiency power plant |
| 2. Upper and lower reservoirs in close proximity | 2.1km |
| 3. Short grid interconnection traverse | 13km along an existing public road 'right-of-way' |
| 4. Suitable geology | Geotechnical studies confirm suitable geology |
| 5. Strong grid connection | The project connection point required no upgrades and low Marginal Loss Factors (MLF) |
| 6. Located near a high electricity load centre | The Project is domiciled in the SE Queensland Load Centre |

Project Overview, Project Land and Water Access

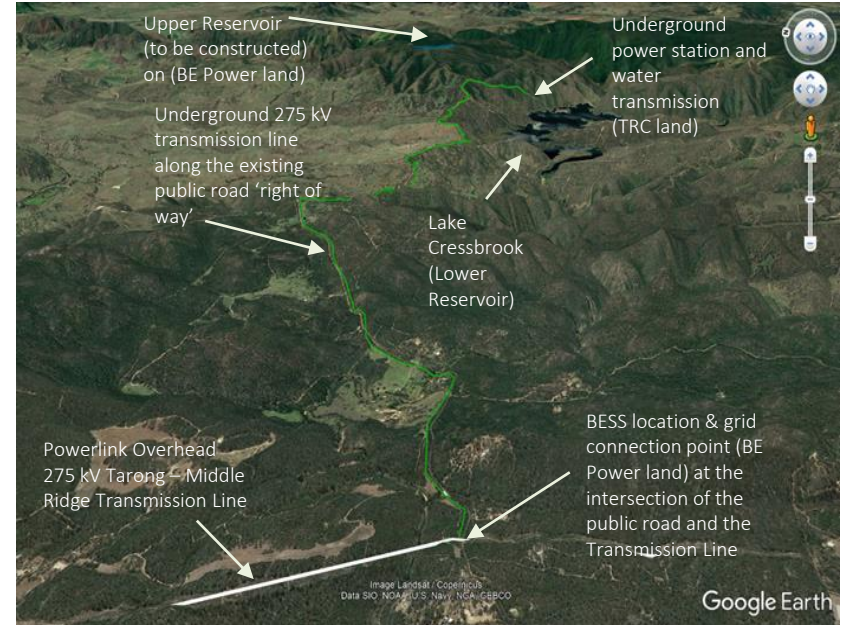
The Project consists of :

- The construction of a ~60ha (~7gl) upper reservoir on BE Power private land.
- Underground power station, waterways and associated HV infrastructure.
- Grid inter-connection along the existing public road & constructed underground connecting to the Tarong-Middle Ridge 275Kva line.
- The switching station is situated on BE Power privately owned land.
- BE Power has acquired all private land requirements for the Project (excluding any off-set land requirements).



Location and Energy Metrics (PHES only)

| KEY SPECIFICATION | DESCRIPTION |
|---|--|
| Location | 45km north-east of Toowoomba, QLD |
| Estimated Project cost¹ | ~\$1.0-\$1.1bn (excludes BESS) |
| Estimated construction date | 1 Dec 2023 |
| Commissioning date | 1 Dec 2026 |
| Node | QLD |
| Generation capacity | 400 MW |
| Pumping capacity | 440 MW |
| Storage duration | 10 hours |
| Max annual energy capacity (Nominal) | 1.4TWh |
| Round trip efficiency | ~77% |
| Turbine | Fixed Speed Reversible |
| Gen start time (Pumping to Turbine & Standing to Turbine)) | ~ 98 Seconds (pumping) & 30 seconds (standing) |
| Transmission connection point | Tarong – Middle Ridge 275kV line (line 831) |



SITE SPECIFIC INFRASTRUCTURE

¹ Entura and BE Power BIG-T Constructions costs @ 30Jun2021 including EPC, Design and approvals, connection/transmission, development costs and contingency. NB: Excludes construction financing costs subject to debt/equity and UNGI structure.

Project Activities and Status (PHES only)

Preliminary design has been completed and BE Power is working to complete the Bankable Feasibility Study.

| ACTIVITY | STATUS |
|---|--|
| Project design | <p>Preliminary Project Design and geotechnical studies completed and Bankable Feasibility Study (BFS) is underway (due for finalisation at the end of calendar year 2022).</p> <p>The Design Parameters we have implemented to minimise the environmental and visual impact of the Project include:</p> <ul style="list-style-type: none">• relocation of the upper reservoir to private regrowth farmland that is of lower ecological value and situated outside the Lake Cressbrook water catchment• Power Station and associated waterways are situated underground• grid connection transmission lines are situated underground and within the existing public road easement. |
| Lake Cressbrook specific Design Parameters | <p>A focus of the Design has been to adhere to the TRC requirements of maintaining water security and quality with nil interference to TRC operations. BE Power received the TRC Technical Requirements during March 2022.</p> |
| Land requirements | <p>BE Power has purchased the required private land for the Project (except for off-set land – to be determined). The balance of the land required is subject to the TRC Land Tender Process (in progress).</p> |
| Grid connection | <p>Grid connection studies and grid access agreements are in progress with Yurika and Powerlink. The grid connection Assumption Book has been tabled to Powerlink with the grid connection process ~40% complete. Yurika has completed the grid interconnection preliminary design (Including the BESS).</p> |

Project Activities and Status (cont.)

Critical inputs to the BFS, EIS, Grid Connection and Project Approvals are in progress.

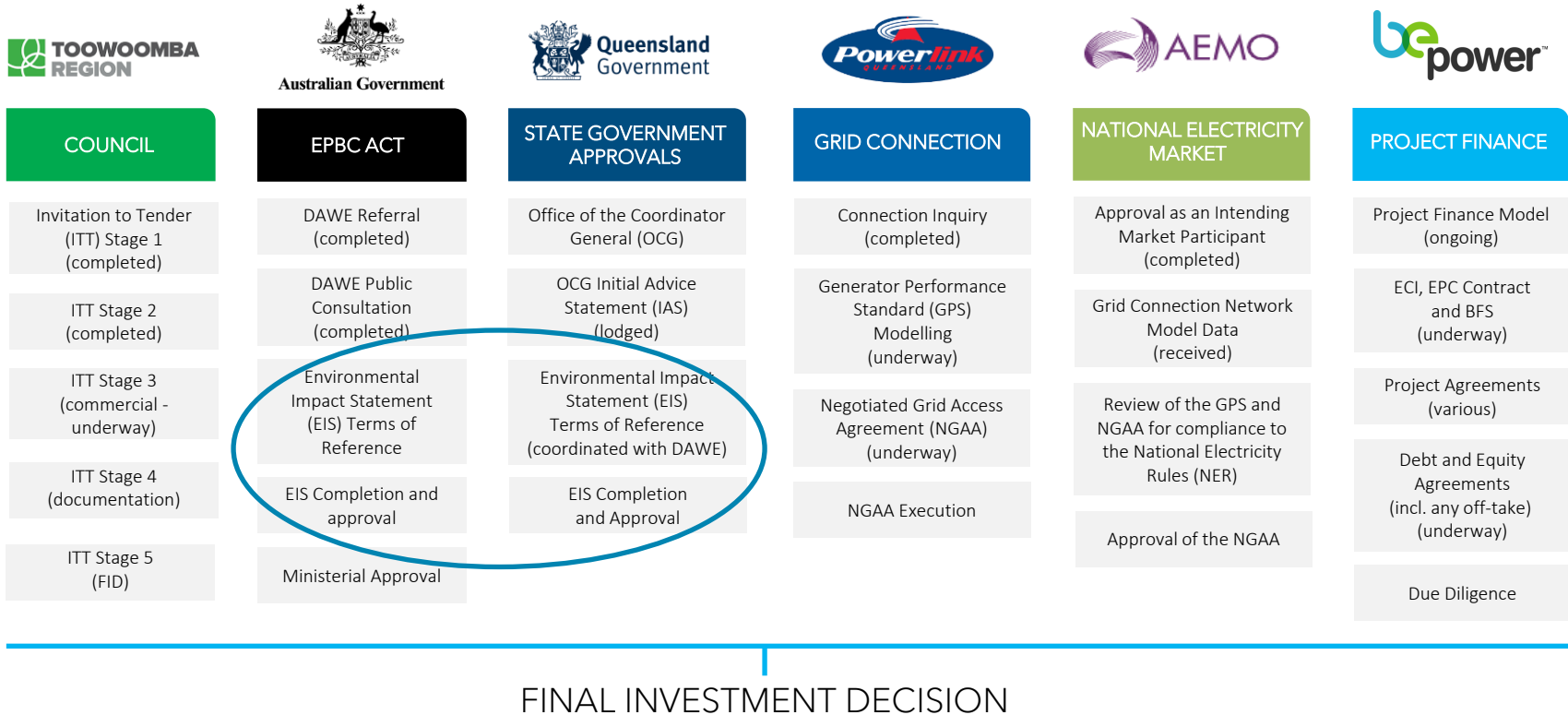
| ACTIVITY | STATUS |
|---|---|
| Bankable Feasibility Study (BFS) | The BFS is underway – it is approximately 1/3 complete and has recently recommenced post completion of the Stage 1 geotechnical studies with finalisation scheduled for Q1 calendar year 2023. |
| Geotechnical Study | The geotechnical study for the BFS has been completed. Stage 2 Geotechnical Study permit secured. The Stage 2 study will be undertaken as a component of reference design for the purpose of the Engineering, Procurement and Construction (EPC) price and formulation. |
| Water Quality Assessment | Water quality baseline studies continue. |
| TRC ITT | The Project is currently progressing the TRC ITT Stage 3 (Commercial Proposal Stage). |
| Environmental Approvals | The Federal Government Environmental Protection and Biodiversity Conservation Act (EPBC) referral has been lodged with the Federal Department of Agriculture, Water and Environment (DAWE). Compilation of the Environmental Impact Statement (EIS) has commenced with WSP. |
| Other Approvals | The Project Initial Advice Statement (IAS) has been submitted to the Queensland Office of the Coordinator General (OCG) for the Project to be assessed and declared 'coordinated'. |
| Construction | The Project has awarded Bechtel the Early Contractor Involvement (ECI) and the EPC contract(s). |
| Inclusion of the BESS | BE Power recently added a BESS of notionally 200MWhx 1 hour capacity at the switchyard land site (Three Mile Road). Engineering, design, and feasibility of this component of the project is currently under assessment. Pending completion of these studies the BESS is being developed under a separate development pathway to the Big-T. |

Communications and Stakeholder Engagement

The TRC approved Communication & Stakeholder Engagement Strategy continues to be implemented with monthly reports furnished to the TRC.

| ACTIVITY | STATUS |
|-------------------------------------|---|
| General Community Engagement | In summary, all engagement with the community, business, and business groups with respect to the Project has been positive. |
| Koala's | <ul style="list-style-type: none">Wildlife Rescue, Rehabilitation and Education Association (WRREA) has been offered a licence to occupy the BE Power 314 Three Mile road property as a office and wildlife rehabilitation centre.BE Power provided support to the WRREA to apply for grant funding.Powerlink has provided BE Power with a contract for easement (Tarong-Middle Ridge) co-use for the purpose of planting, maintaining, and harvesting koala fodder. |
| Local Content | Numerous inquiries by local business for participation in the Project. Further engagement to be facilitated now that the EPC contractor has been appointed. |
| Indigenous Engagement | Preliminary engagement undertaken. The relevant indigenous body (Western Wakka Wakka) has requested further engagement once the Project has secured the permits and approvals. |
| State Government Departments | Site visit for relevant State & Federal departmental representatives has been organised. TRC & SRC will be invited to attend. |

Project Approvals Process Map



Community Benefits

The Big-T provides significant short and long-term benefits to the Toowoomba Region and Queenslanders.

| BENEFIT | DESCRIPTION |
|---|---|
| Jobs | 350-500 jobs during construction (3.5 years) and 15-35 permanent jobs (excluding operational maintenance contracting). |
| Regional Council constituent benefits | BE Power's objective is to provide immediate and ongoing benefits to the Toowoomba Regional Council (TRC), Somerset Regional Council (SRC) and the community. A Commercial Proposal developed by BE Power was tabled to the TRC in May 2021 for comment and consideration, as a component of the TRC ITT Process. AS a component of the TRC ITT Stage 3, the TRC Commercial Proposal is to be agreed, |
| Renewable energy generation | The Project has the capacity to power the equivalent of 288,000 homes . |
| Facilitation of renewable development in the Darling Downs | The Project is an enabler for the build-out of new solar and wind projects in REZ8. AEMO estimates REZ8 has hosting capacity of 3,000-5000 MW of renewable projects built in conjunction with 250-600MW of medium depth storage . |
| Queensland Renewable Energy Target (RET) | The Project will assist the Queensland Government to achieve its target of 50% renewables by 2030 . |
| Electricity price savings to Queenslanders | GE Market Benefit Modelling , based on historical electricity prices across 2019-2021, estimates the Project would have delivered average price savings to Queensland electricity consumers of \$500m per annum . |

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