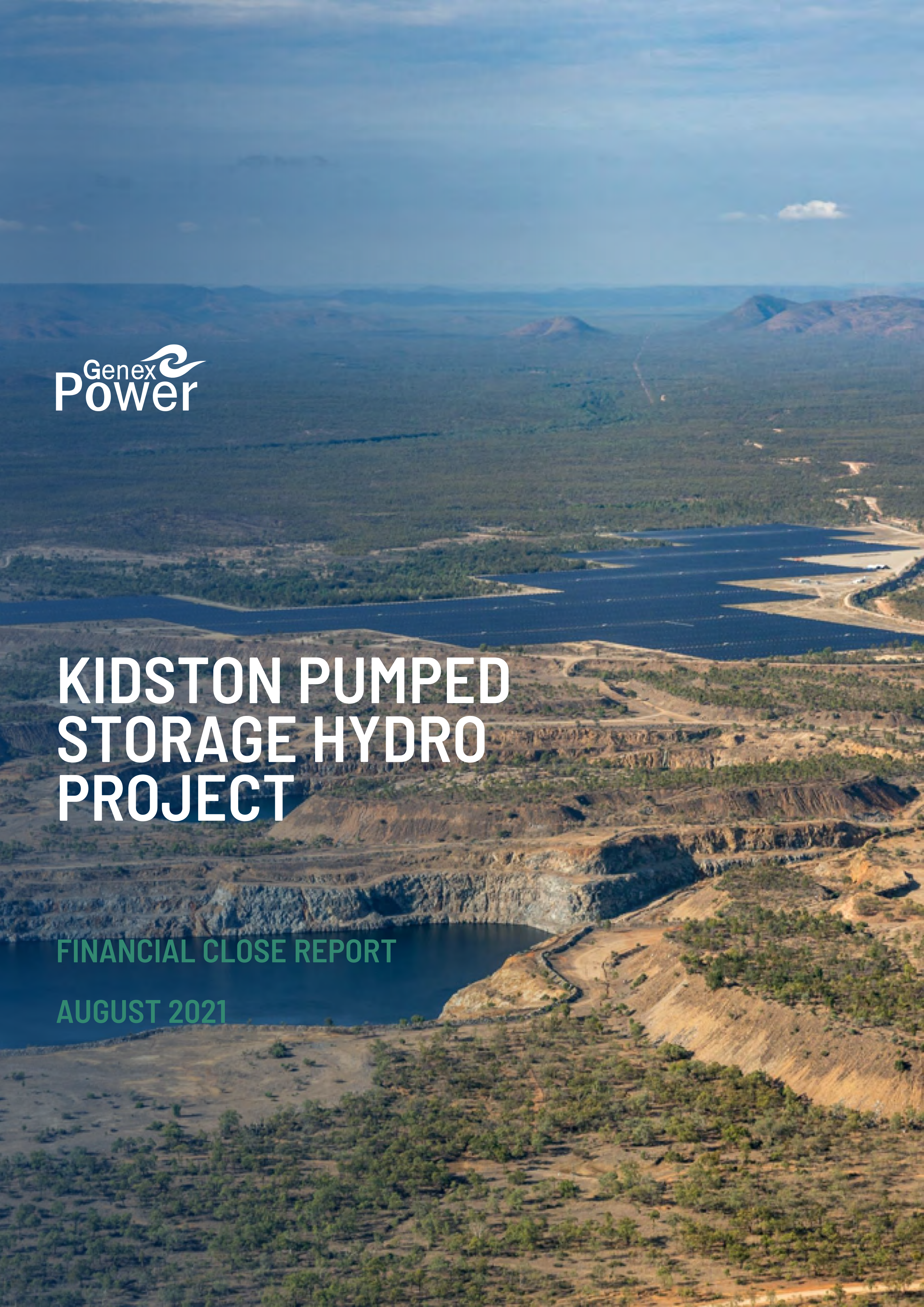

KIDSTON PUMPED STORAGE HYDRO PROJECT

FINANCIAL CLOSE REPORT

AUGUST 2021

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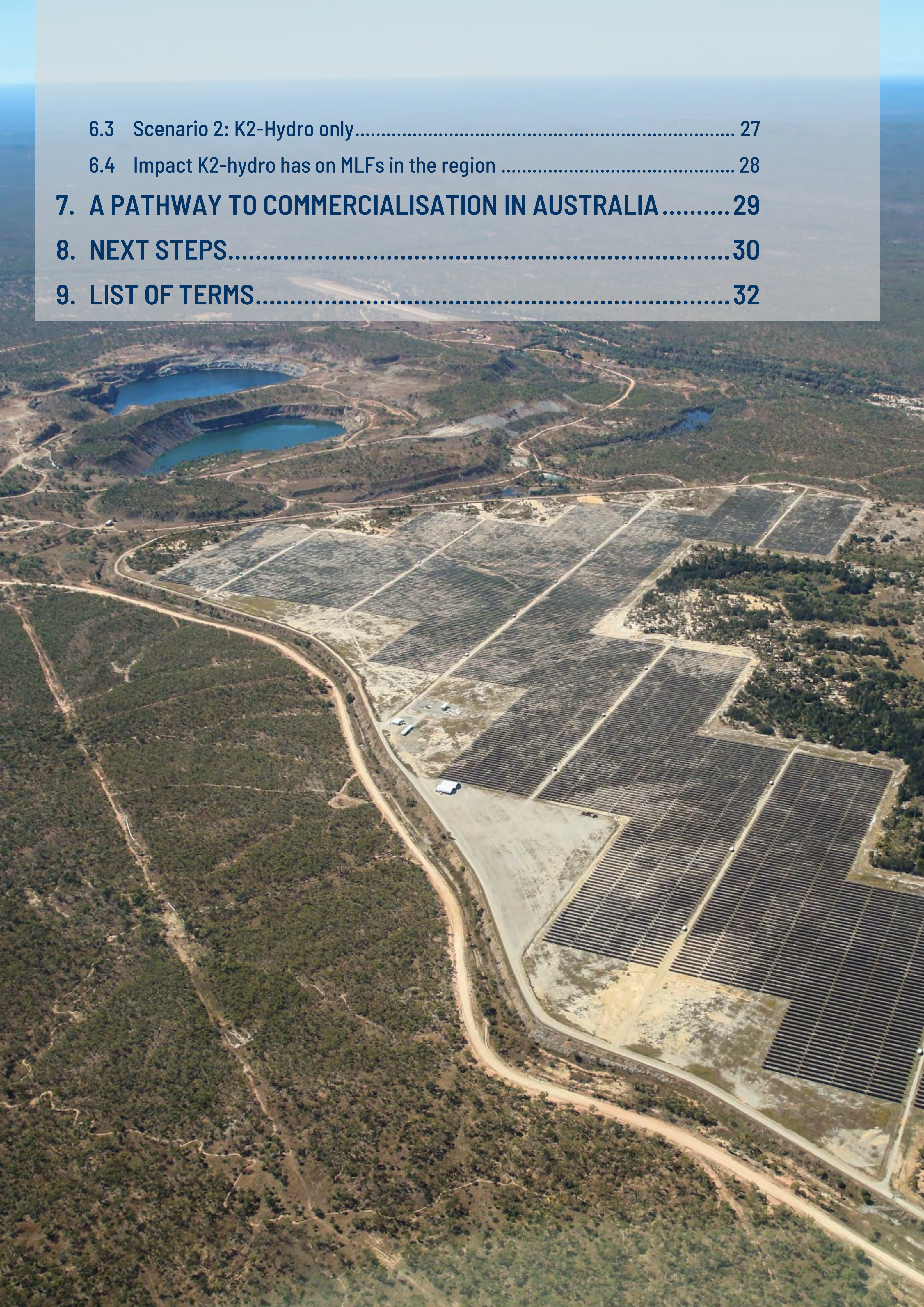

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Disclaimer

This project received funding from ARENA as part of ARENA's Advancing Renewables Program. The views expressed herein are not necessarily the views of the Australian Government, and the Australian Government does not accept responsibility for any information or advice contained herein.

1. EXECUTIVE SUMMARY

Genex Power Limited (**Genex**, **Company** or **Owner**) is the 100% owner and developer of the Kidston Clean Energy Hub, located in North Queensland (the **Kidston Hub**). Stage 1 of the Kidston Hub was completed in the form of the 50MW Stage 1 solar farm, which was energised in November 2017. Stage 2 of the Kidston Hub is the 250MW Pumped Storage Hydro Project (**K2-Hydro** or **Project**) which is currently under construction, having reached financial close in May 2021. A further Stage 3 of the Kidston Hub, being a wind project of approximately 150MW, is currently in feasibility stages along with a potential co-located solar farm of up to 270MW. This report is focused on the feasibility, development and financing activities for K2-Hydro as part of the ARENA Knowledge Sharing program.

The Project is located at the former Kidston Gold Mine, which closed in 2001, and represents a world first re-use of a historical gold mine site for energy storage. The Project has been designed for a nameplate capacity of 250MW and will be capable of storing and dispatching a minimum of 1,870MWh per generation cycle, with an asset life well in excess of 60 years. The total Project capital expenditure is $775.5M, which is financed through a combination of debt financing from the Northern Australia Infrastructure Facility (**NAIF**), a non-recoupable grant from the Australian Renewable Energy Agency (**ARENA**) and equity from the Project owner.

The Project and the associated infrastructure, including a new 186km 275kV transmission line, will create over 800 new job opportunities during the construction phase which will occur over a 3.75-year period, with operations set to commence in late 2024.

In addition to the $47M non-recoupable Project grant, ARENA has provided continual support for the development of the Project, having provided $4M in loan funding for the completion of the Feasibility Study in 2015/2016 in addition to providing up to $5M in loan funding for pre-financial close activities. ARENA forgave this loan funding as at financial close of the Project in May 2021.

The purpose of this Report is to provide a basis for future commercial development of pumped storage hydro technology in Australia, through detailing the Project specifications and lessons learned through the feasibility, development and financing activities for the Project up to financial close.

2. PROJECT SUMMARY

2.1 Background and context of project

The former Kidston Gold Mine (**KGM**) is located in North Queensland approximately 280km north west of Townsville. The mine was constructed and operated by Placer Dome Inc. from 1981 through to its eventual closure in 2001. Genex acquired the KGM from Barrick Gold in June 2014 with the principal intent of redeveloping the site as a clean energy hub including a pumped storage hydro power station. Entura was engaged to undertake a detailed feasibility study for the Project in 2015-2016 and following further optimisation by Mott Macdonald in 2017 the current configuration of K2-Hydro was established; namely a 250MW pumped storage generation facility utilising the two existing mining voids (as upper and lower reservoirs) to store up to 8 hours of energy.

Kidston is located in one of the highest solar irradiation zones in Australia. With the support of ARENA, the first stage 50MW Solar Project (**KS1**) was constructed on the former mine's tailings storage facility and is in commercial operation. KS1 is connected to the National Electricity Market (**NEM**) via the existing 132kV distribution line owned by Ergon Energy. However, for the Project and the further stage 3 solar and wind developments, a new 186km transmission line is being developed from Kidston to a new substation at Mt Fox, on the existing 275kV transmission network between Ross and Chalumbin.

K2-Hydro represents a unique undertaking to repurpose an abandoned gold mine to develop a large-scale energy storage facility based on mature technology which will play a key role in the transition of the national electricity system away from reliance on fossil fuels. The Project is the first of its kind globally, will be the first pumped storage hydro project in the NEM in over 40 years and the first owned and developed by a private operator.

K2-Hydro provides much needed system security and stability to the Queensland electricity network. One of the main challenges Australia, and particularly Queensland, is facing is the exponential growth of intermittent renewables (wind and solar) which are not supported by reliable flexible capacity to ensure the continued stability of the electricity network. As this growth increases and existing baseload power generators (such as coal fired power stations) begin to be decommissioned, the security of the network becomes increasingly threatened. Pumped Storage Hydro (**PSH**) provides a viable technology for 'firming up' intermittent renewables, in turn ensuring continued network security. The Project itself will play a key role in this transition of the electricity system, offering up to 8hrs of storage, large capacity and a long life having been modelled to operate for over 60 years. Further, the Project provides a range of ancillary services which will work to play a crucial role in securing the grid. These ancillary services include inertia, frequency support and system restart capabilities.

Since Genex commenced developing K2-Hydro, a number of other PSH schemes have been proposed for development around the country. The successful development of the K2-Hydro project will no doubt provide a vital boost to the establishment of further PSH projects in the NEM and will further demonstrate the potential for abandoned mine sites to be repurposed for such use, adding vital economic input to remote locations and rural towns which may otherwise suffer significant socio-economic decline.

2.2 Technology review

The Project will consist of two x 125MW fixed-speed reversible Francis pump turbine/generators, supplied by tier-one international electromechanical equipment supplier Andritz Hydro GmbH (**ANDRITZ**). The two units will be housed in an underground powerhouse cavern, with concrete-lined pressure tunnels connecting the cavern to the upper and lower reservoirs.

2.3 Key operating parameters

The technical parameters for the Project are summarised in the table below:

Table 1:Overview of the Kidston Pumped Storage Hydro Total Costs

KEY OPERATING PARAMETERS	VALUE
Nameplate capacity:	250MW
Turbine type:	Reversible Francis (vertical axis)
Full pumping cycle:	6.0 hours (continuously from MOL to FSL) at nameplate capacity
Full generation cycle:	6.0 hours (continuously from FSL to MOL) at nameplate capacity
Total storage capacity:	1,500 MWh at nameplate capacity, 1,870 MWh guaranteed for ~8 hours
Ratio of pumping to generation cycle time:	1.00x
Maximum generation output (at HV terminals):	250MW
Minimum generation output (at HV terminals):	83.5MW
Maximum pump draw (at HV terminals):	325MW
Minimum pump draw (at HV terminals):	150MW
Maximum generation net water head:	223m
Minimum generation net water head:	167m
Net head ratio:	1.33
Net cyclical efficiency:	80.00%

2.4 Technology choice (including alternatives)

PSH is the most abundant form of energy storage technology in the world, initially developed over 100 years ago and now comprising more than 97% of all energy storage capacity globally. For long term storage applications, PSH compares favourably to alternative storage technologies (such as battery storage, solar thermal electricity, flywheel, and compressed air) principally due to its ability to be developed on a large scale, its long asset life (>60 years, vs. 10-30 years for other technologies) and its associated cost efficiencies.

For the physical conditions at the KGM, the consulting engineers determined that the most technically appropriate and economic PSH technology was the reversible Francis pump-generator turbine.

Consideration was given to both ‘fixed-speed’ and ‘variable-speed’ variants. Fixed-speed technology was selected for the Project due to its ability to provide ‘real inertia’, delivering much needed ancillary benefits to the electricity network (particularly in such a remote location), and the comparative reliability and cost efficiencies associated with fixed-speed units.

2.5 Key counterparties

Project Sponsor: Genex

Genex is a power generation development company listed on the Australian Securities Exchange. The Company is focused on innovative clean energy generation and electricity storage solutions. The Company has a development pipeline of up to 400MW of renewable energy generation and storage projects within its portfolio, underpinned by the 720MW Kidston Renewable Energy Hub in far-north Queensland. In addition, the Company has developed the 50MW Jemalong Solar Project, located near Forbes in NSW, which commenced operation in 2020 and is developing the 50MW Bouldercombe Battery Project near Rockhampton, in Queensland.

Strategic Investor in Genex – Electric Power Development Co. LTD (**J-POWER**)

J-POWER is a Japanese public utility company listed on the Tokyo Stock Exchange with a market capitalisation of approximately JPY 399Bn (as of 31 March 2020, A$6.0 billion). J-POWER owns 17.4GW of power generation assets such as hydroelectric, coal-fired, and wind power in Japan. It is the largest provider of coal-fired power, and the second largest provider of hydroelectric and wind power in Japan. J-POWER also owns and maintains a nationwide network of distribution facilities covering over 2,400km of transmission lines.

Outside of Japan, J-POWER has pursued a strategy of applying the knowledge and technical capabilities developed through its domestic operations to actively seek out and develop commercial power generation projects overseas. As of 31 March 2020, it had 34 facilities in operation in five countries, representing a combined generation capacity of 22.7 GW (6.9 GW net capacity).

J-POWER has supported the Project through a strategic investment in Genex, whereby J-POWER has taken a 10% interest in Genex shares through an investment of $25M concurrent with financial close for the Project. The proceeds of the J-POWER funding have been applied to Genex’s equity contribution to the Project capital cost.

K2-Hydro Offtaker – EnergyAustralia

EnergyAustralia provides gas and electricity to 2.4 million residential and business customer accounts in Victoria, New South Wales, the Australian Capital Territory, South Australia and Queensland. The company supplies customers with energy from wholesale markets and its own fleet of power stations and renewable energy sources. EnergyAustralia has provided its support for the development of the Project through the provision of a binding Energy Storage Services Agreement for a period of up to 30 years.

Senior Lender: NAIF

NAIF is a Commonwealth entity established to encourage and complement private sector investment in economic infrastructure that benefits northern Australia. NAIF has shown its support for the development of the Project through the provision of a long-term $610M debt facility via the State of Queensland.

Grant provider: ARENA

ARENA was established by the Australian Government to make renewable energy technologies more competitive and increase the support of renewable energy in Australia. ARENA has supported the Project via a $47M non-recoupable project grant. ARENA has also provided the support needed for the development of the Project through the provision of up to $9M in funding which includes $4M in loan funding for the completion of the Feasibility Study in addition to providing up to $5M in loan funding for pre-financial close activities. This loan funding was forgiven at the date of financial close of the Project. ARENA invests in renewable energy projects across the innovation chain and is committed to sharing knowledge and lessons learned from its portfolio and information about renewable energy.

EPC Contractor: McConnell Dowell/John Holland Joint Venture (**MDJH**)

McConnell Dowell (**MD**) is a major infrastructure construction company having particular capability in underground and hydro power construction, with over 3,500 employees and professional engineering and construction teams in Australia, New Zealand, Asia and the Middle East. Owned by publicly-listed South African company Aveng Ltd, MD is focused on three key sectors, being; infrastructure, resources and commercial developments.

John Holland (**JH**), a subsidiary of one of the world's largest infrastructure construction companies (China Communications Construction Co Ltd), is one of the largest EPC companies in Australia offering services across a wide range of sectors from power and energy to tunnelling and water infrastructure. MD and JH have formed a joint venture for the engineering, procurement and construction component of K2-Hydro.

Electromechanical Equipment Supplier: ANDRITZ

ANDRITZ is one of the leading global suppliers of electromechanical equipment for hydropower plants, with over 175 years of experience, and more than 31,000 turbines installed for over 430,000MW of combined capacity. ANDRITZ has been selected as the Original Equipment Manufacturer (**OEM**) supplier for the Project and will be a nominated sub-contractor to the EPC Contractor joint venture.

Transmission Network Service Provider: Powerlink

Powerlink is an electricity transmission system operator owned by the Queensland State Government. Genex signed a Generator Connection and Access Agreement with Powerlink to build, own and operate the necessary infrastructure to connect the Project to the NEM.

<u>Connection Assets Infrastructure – Beon Energy Solutions Pty Ltd (**Beon**)</u>

Beon delivers large-scale renewable power generation including solar, wind and energy storage solutions across Australia. Beon has been appointed to deliver and develop the connection assets infrastructure at Kidston under a Design and Construct Contract (**D&C Contract**).

<u>Owner's Engineer: Entura</u>

Entura is the consulting arm of Hydro Tasmania and one of the world's most experienced specialist power and water consulting firms, with more than 100 years of experience in the development, operation and maintenance of renewable energy and water infrastructure projects. Entura has been appointed as the Owner's Engineer for K2-Hydro, having completed the initial detailed feasibility study in 2015/2016 in addition to providing ongoing support for the Project and for Genex.

2.6 Design (including size and basis)

The Project has been sized for a nameplate capacity of 250MW and will be capable of storing and dispatching 1,870MWh per generation cycle. The Project will utilise the two existing mining pit voids, with the Wises Pit acting as the upper reservoir and the Eldridge Pit acting as the lower reservoir. The key elements of the design are detailed further below:

<u>Underground Powerhouse (EPC Scope)</u>

The underground powerhouse will be accessed via a 1.5 km decline portal from RL 490m to RL 291m. The cavern itself will be 17.5m wide, 90m long and 45m high at its deepest point. The powerhouse cavern will host the electromechanical equipment, including the two 275kV Step Up transformers which will be located in a separate adit connected to the cavern for fire suppression. The cavern fit-out will contain several floors constructed using pre-fabricated steel structures, with the pump-turbines and generators themselves being contained in a mass concrete casing. Emergency evacuation from the powerhouse cavern will be via the cable shaft to the surface, with a separate parallel ventilation shaft providing ventilation to the underground areas.

The electromechanical equipment shall principally comprise:

- 2 x125MW reversible pump-turbines units – which generate electricity through the flow of water through the power station or consume energy from the 275kV transmission line when pumping;
- 2 x Main Inlet Valves – which provide isolation for the pump-turbines upstream;
- 2 x Draft Tube Gates – which provide isolation for the pump-turbines on the downstream side;
- 2 x 275kV Step Up transformers; and
- Control room and ancillary equipment.

The electromechanical equipment is being manufactured by ANDRITZ under a sub-contract with the EPC Contractor, which will be delivered in several components and installed on site by the EPC Contractor.

Waterways (EPC Scope)

Two concrete lined vertical pressure tunnels (251m vertical drop) will connect the upper reservoir to the underground generation powerhouse via a 'glory hole' type structure. Two further concrete lined horizontal pressure tunnels (340m in length) will connect the powerhouse to the lower reservoir. The waterways will also contain steel lining and reinforcement in and around the power station for added support.

The waterways and powerhouse configuration are such that K2-Hydro will have a maximum gross water head of 222.6m.

Wises Dam Design (EPC Scope)

The feasibility of the Project has considered a number of configurations for the two reservoirs. The final design is based upon utilising the existing water bodies to create the pumped storage scheme. The Wises Pit (upper reservoir) is currently a shallow but broad body of water, based upon the previous open pit being filled with waste rock from mining out the Eldridge Pit (lower reservoir) The Eldridge Pit is currently a deep pit (320m depth) which holds the majority of the total 27 GL of water within the scheme, and is therefore the logical option for the lower reservoir.

The design has therefore focused upon broadening and reinforcing the walls of the Wises Pit to create a large, relatively shallow dam to house the water volume. The Wises Dam will be developed using existing waste rock dumps within the site to minimise capital cost and utilise the existing resources available within the site. The Wises Dam will also feature a HDPE liner as a cost-effective seal.

As the dam is developed, the water within Eldridge Pit will be progressively pumped to the Wises Pit. A limited scope of works is required to ready the largely dewatered Eldridge Pit for the scheme, including tailrace portal works and some rock support works.

Surface Infrastructure (D&C Scope)

The EPC Scope shall extend to the K2-Hydro gantries where the high voltage cables will terminate at the K2-Hydro switching station. The surface infrastructure works will be undertaken by Beon under the D&C Contract, and shall comprise:

- A 275kV switching station near the top of the cable shaft to receive the high voltage cables from underground;
- A new 275kV substation to be located in the western part of the site, which will receive the 275kV transmission line connection from Powerlink (see below) (**Kidston Substation**);
- Connecting 275kV infrastructure from the switching station to the new substation; and
- A 22kV ancillary power supply and transformer from the existing Ergon Energy substation (which connects KS1) to the underground power station.

Transmission Line (Powerlink Scope)

As noted, the Project requires a new 275kV connection to the NEM which shall be undertaken by Powerlink under the Generator Connection and Access Agreement. This scope shall comprise:

- A new 275kV substation at Mt Fox, between Ross and Chalumbin on the main Powerlink transmission network (**Mt Fox Substation**); and
- A new 186km 275kV single circuit twin phosphorous transmission line from the Kidston Substation to the Mt Fox Substation.

Importantly, the transmission line shall have excess capacity above that required for the Project, which will allow for the Stage 3 developments at Kidston and underpin the Clean Energy Hub.

Figure 1: K2-Hydro - tailrace tunnel

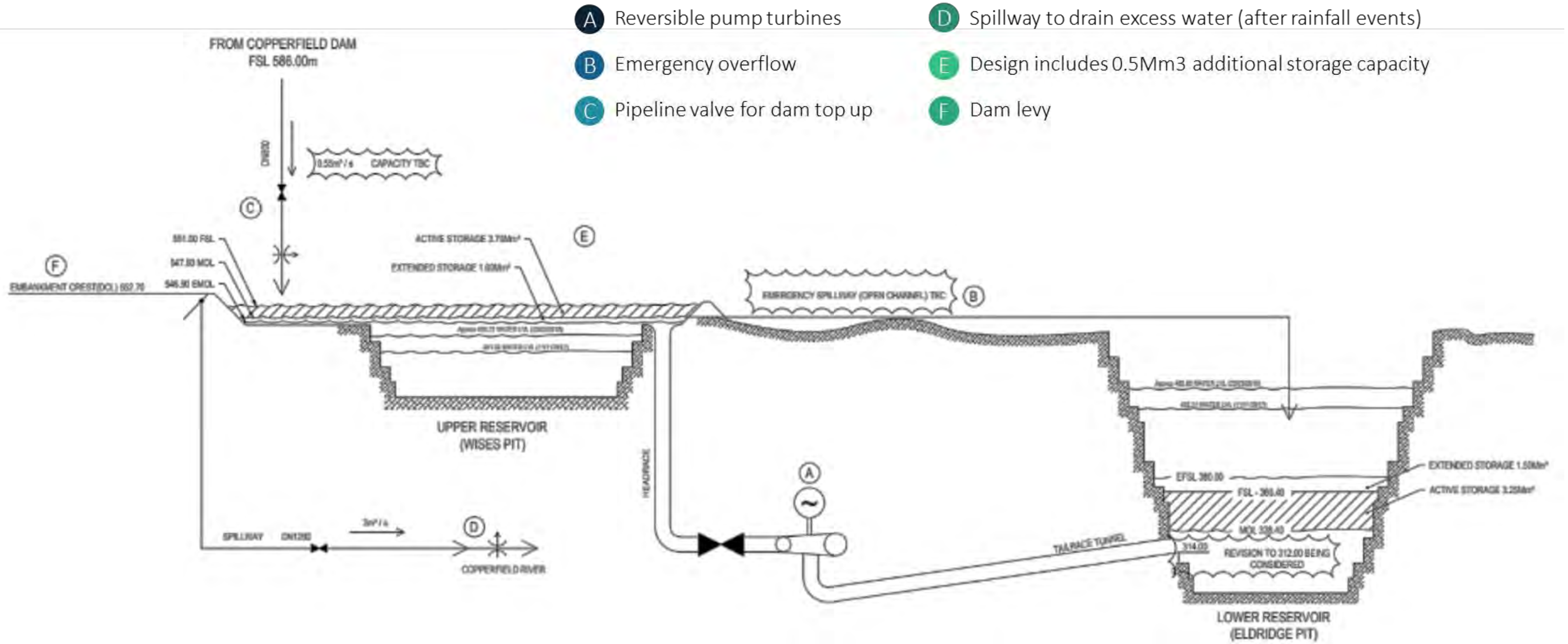
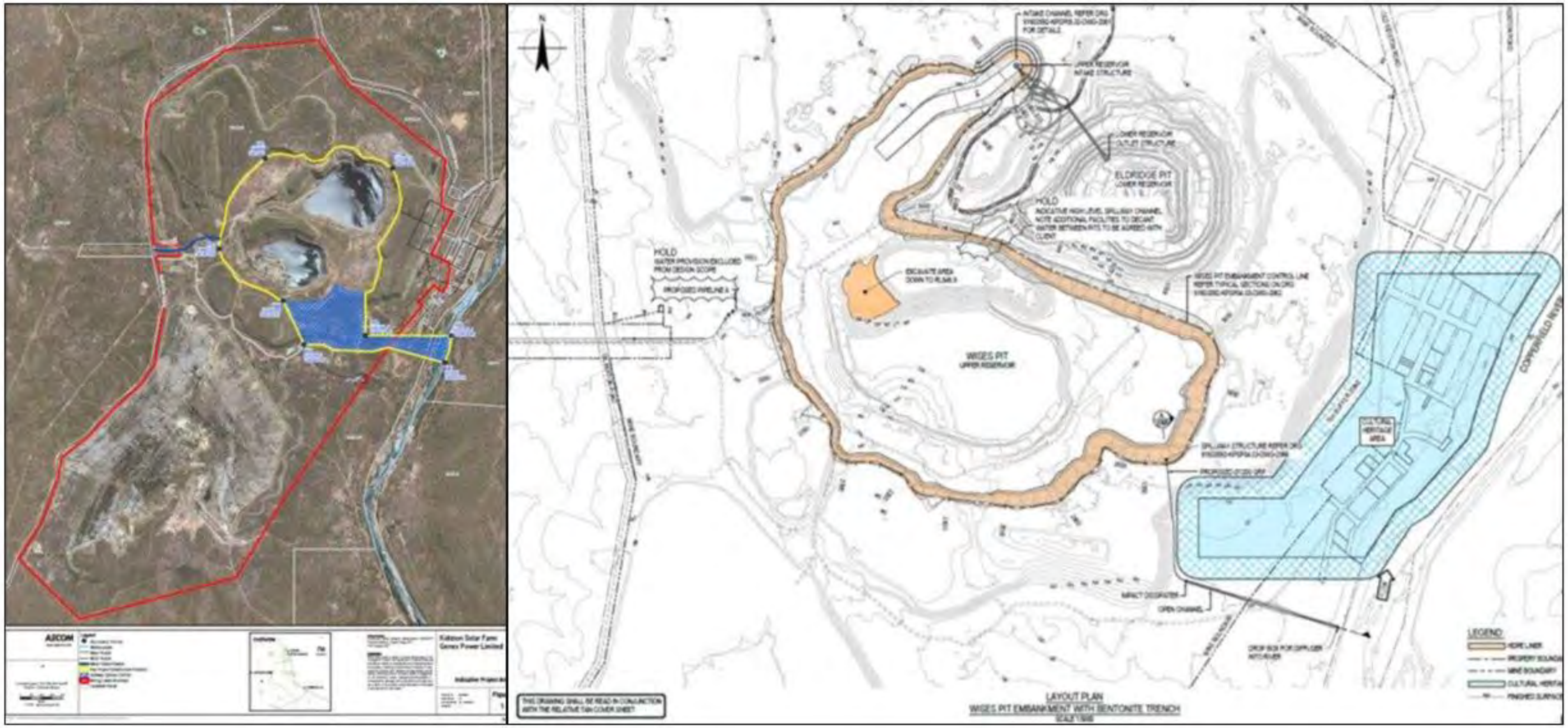


Figure 2: K2-Hydro - site map



3. PROJECT CAPITAL COSTING

3.1 Total project costs

The Project has a total development cost of $775.5M. This amount includes the core Project Engineering, Procurement and Construction (**EPC**) cost, the Project's contribution towards the capital cost of the new 186km transmission line from Kidston to Mount Fox, the surface connection assets at Kidston, other costs associated with the construction program for the Project and also costs associated with the financing. A breakdown of the capital costs is shown in the table below.

Table 2: Overview of the Kidston Pumped Storage Hydro Total Costs

CATEGORY	PRICE ($M)	PERCENTAGE
EPC Price	$478.2	62%
Transmission	$110.9	14%
Connection Assets	$25.9	3%
Other Costs	$79.1	10%
Contingency & Finance Costs	$81.4	10%
TOTAL Project cost	$775.5	100%

The total Project cost of $775.5M is funded from the following sources:

- $118.5M equity contribution from the Project Owner;
- $610M long term debt facility from NAIF; and
- $47M funding from ARENA by way of a non-recoupable grant.

3.2 Cost comparison with other PSH projects

The estimated total construction cost (EPC price) for the Project is ~$1.9M/MW of installed capacity, or on a total cost (excluding contingency and finance costs) is ~$2.8M/MW. In terms of storage capacity, the Project costs $256k/MWh (construction cost) or $371k/MWh (total cost).

As the Project is the first of its kind constructed in Australia in 40 years, the only observable comparisons are with other PSH projects under development. However, the usefulness of such comparisons is difficult to assess, on the basis that the experience with the Project is that the estimated capital cost significantly increased as it moved from feasibility, to development and ultimately construction stage. This is a result of a number of factors observed during the Project's development, namely:

- The ability for design consultants to accurately price a construction contract is limited, particularly in the absence of suitable reference project data in Australia;

- The final allocation of risk to a counterparty under an EPC contract invariably results in a price premium to the estimated labour and materials costs;
- The time it takes for development (5 years from the feasibility stage, in the Project's case) results in pricing increases due to CPI, as well as the general price pressures in the Australian construction industry; and
- The Project was costed and financed during the COVID-19 pandemic.

Notwithstanding the above, we note the following key observations when comparing the costs of the Project to other PSH projects:

- Lower civil construction cost compared to other projects, owing to the relatively short distance of waterways between the reservoirs and the use of the existing mine voids as the upper and lower reservoirs themselves;
- The requirement for construction of a new 186km transmission line adds significant capital cost to the Project (refer to Table 2) compared with those located closer to the main transmission network; and
- The Project is located remotely in Australia which adds cost for transportation of equipment and attracting a skilled workforce to the region.

3.3 EPC price costs categories

The total EPC cost is $478.2M which makes up a significant portion of the total capital cost of the Project (62%). The EPC contract with MDJH is a fully-wrapped contract for the engineering, procurement and construction of the Project. As such, the contract of services required MDJH to procure all supplies for the Project, including the electromechanical equipment package from ANDRITZ as a nominated subcontractor.

Table 3: Overview of EPC costs

CATEGORY	PRICE ($M)	PERCENTAGE
Staff costs and overheads	$120.4	25%
Civil works	$182.7	38%
Equipment/generator sets & BoP	$142	30%
Engineering	$33.1	7%
Total EPC Price	$478.2	100%

3.4 Lessons learnt from EPC pricing & contracting

Background to EPC Contracting – the ECI Process

The Project is the first PSH project to be developed in 40 years in Australia and is the first PSH project to be developed from an abandoned gold mine. In 2018 following several unsolicited proposals and a short tender process, due to the complex nature of the Project and Genex's financing capability, the Company chose to form a joint venture between MD and JH (**MDJH JV**) as the preferred EPC Contractor to build the Project under an 'early contractor involvement' (**ECI**) process. There were several lessons the Company learnt during this process that should be highlighted to assist the efficient development of future PSH projects.

Due to the size and complexity of the Project, it was necessary to form a joint venture between two EPC Contractors to develop the Project. The Company originally approached MD to be the sole EPC Contractor for K2-Hydro however, MD stressed the need to have another contractor share the risk and provide complementary skills and experience to the construction of the Project. MD initially partnered with Downer EDI Ltd (**Downer**), and in 2017 they were awarded ECI contractor status for the K2-Hydro EPC Contract. In January 2018, Downer was replaced by JH to form the final joint venture.

Potential for cost reductions or cost cuts

During the ECI process, the Project went through a number of design iterations and considered several optional configurations for the final Project design. A strict lens was applied to ensure that only the most cost effective project items which ensured a safe and reliable operation without excessive expenditure were considered in the final design. A number of these were not selected due to the excessive cost associated with their inclusion, combined with the long term design and/or operational efficiencies associated with their inclusion. A list of the significant items which were considered, together with an explanation of the basis for their inclusion or exclusion in the final Project design, is set out in the table below:

Table 4: Project design breakdown

ITEM	INCLUDED IN FINAL DESIGN	BASIS FOR INCLUSION/EXCLUSION
Trash racks	Yes	While as a remote site with a secure perimeter the risk of wildlife/large objects being caught in the intake/tailrace structures is very low, it was deemed that due to the nominal cost these were included in the final design as the consequence to the powerhouse is significant.
Isolation gates – intake structure	No	The purpose of this feature was to be able to dewater one intake shaft/tailrace tunnel for maintenance, while the other remained operational. Also, to provide for secondary means of isolation upstream and downstream of the pump-turbine units during maintenance. As maintenance and inspection will be undertaken by remote operated vehicle (ROV), and the shafts dewatered on an infrequent basis (which has been allowed for in the Project operating budget), as well as the excessive cost of this item, it was not selected.
Isolation gates – tailrace portal	No	
Waterway lining fully reinforced	No	The rationale for this item was to reduce permeability of the concrete lined waterways, while also being required to facilitate the isolation gates noted above (due to the pressure of the dewatered waterways). This was not selected due to the integrity of the rock structures within

		which the Project is located, as well as the excessive cost of this item.
Dam height buffer	Yes	The Project design dam height includes a buffer of 3.5m above full supply level, to provide additional storage during wet weather events and accommodate wave freeboard. This is higher than the buffer retained during the initial dam approval, but was considered prudent by Genex and its consultants.
Spillway between pits	No	The rationale was to provide an emergency overflow in Wises Dam in the event that the pumps were not able to be switched off. This is countered by the design of the scheme meaning the water level in the lower reservoir would cause the pumps to automatically cease working before the Wises Dam is overfilled or run out of water in the lower reservoir before upper reservoir overflows. Thus this was concluded to be a redundant feature.
Elevator	No	This was considered unnecessary due to the primary access being via the construction decline, and emergency access via the cable shaft.
Boat ramp	Yes	A boat ramp was selected to enable easy access to the Wises Dam waterway for inspection of the HDPE liner, and to remove any debris from the upper reservoir.
Fencing of roads around Wises Dam	No	This was not selected on the basis that the site is fully fenced and accessed via a secure gate, and therefore there was only limited traffic on site from the O&M Provider.
Access road to lower reservoir	No	This would be to access the lower reservoir to facilitate the periodic inspection of the tailrace waterways (once dewatered). Genex considered the cost of this to be excessive given the frequency of such inspections (given ROVs would be deployed more frequently), and instead proposes to access the waterway on such infrequent occasions via helicopter.

On the basis of the above, Genex does not believe there are obvious areas for further cost reduction having been through an extensive exercise with the EPC Contractor to finalise the design to ensure it is fit for purpose for the Project's long term operation, while ensuring unnecessary features are excluded.

Lessons Learned from ECI

a) Open book process

For reasons provided above, the decision was taken to appoint a joint venture of two leading Australian contractors, with complementary skills and relevant experience of multi-disciplinary construction projects of this type, as ECI Contractor. A key advantage of this ECI process was that Genex, its technical advisers, the ECI Contractor JV and their design consultants, could work collaboratively to optimize the basic design concepts and to develop the EPC cost estimate on a fully open book basis.

At the outset of the ECI process the configuration was as follows:

- EPC Contractor – McConnell Dowell / Downer EDI JV;
- Contractor's Design Consultants – Norconsult (Hydro), GHD (Dams); and
- Owner's Consultant – Mott MacDonald.

During the ECI process Genex and the other parties were able to work together towards a best for project outcome, which involved sharing and testing ideas for design, contractual structures, scope of supply and cost components on an open book basis. This resulted in an optimized structure, which at the conclusion of the ECI process was as follows:

- EPC Contractor – McConnell Dowell / John Holland JV;
- Contractor's Design Consultants – Mott MacDonald (Hydro), GHD (Dams); and
- Owner's Consultant – Entura.

b) Lack of price competition.

A pumped storage hydro project is a complex undertaking, and comprises two distinct categories of work – firstly, the design and supply of specialised electro-mechanical equipment, and secondly, the equally specialised civil construction and installation works at site. The challenge for Genex was to find the best combination of supplier and contractor, on the right terms and at the right price. The approach adopted was for Genex to engage a prospective EPC Contractor JV under an ECI arrangement, and jointly to run a tender process to select the supplier of specialised pumped hydro equipment. The process was run successfully in early 2018, and ANDRITZ was appointed as preferred equipment supplier and prospective nominated subcontractor to the MDJH JV.

Whilst competitive pricing was assured for the key equipment supply through this tender process, such competitive tension was not available to the Project for the balance of the EPC works. However, this lack of price competition was largely mitigated by the open book process, pre-agreement on the contingency and profit margins in the EPC Contactor's pricing, and the close familiarity of Genex personnel with the estimating tools and risk and opportunity philosophies of the selected contractors.

c) Counterparty Relationships

The ECI process ran for most of 2018, during which time Genex and the various parties listed above were able to develop close working relationships both at a corporate and personal level. These relationships were an important contribution to the Project overcoming various obstacles and delays before eventually reaching FID and financial close in early 2021.

The Project Director of the EPC Contractor JV was appointed in 2018, and he together with senior personnel from the EPC Contractor, Genex, the various design consultants and ANDRITZ has been working on the Project continuously since then. These robust relationships which were formed in common cause over the past 3.5 years will certainly play an important role in what is hoped will be a successful Project delivery over the next four years.

d) <u>External Stakeholder Involvement</u>

Several modifications were made to the EPC design and scope throughout the development process due to the number of stakeholders involved in the Project, and the level of design moving from feasibility to 10% complete as the basis for the EPC scope. The design was also influenced by external counterparties as part of the financing due diligence process, including EnergyAustralia as offtaker and user of the facility (and initially as prospective co-owner), J-POWER as strategic investor and both NAIF and ARENA as financiers to the Project. The ECI provided the basis for this design scope to evolve, however there were also significant time and cost delays to the overall financing as the scope was considered, refined, and costed to suit the needs of all counterparties. While the final design and scope is an optimal outcome for the Project, the ability to limit the input of external stakeholders in the ECI process would save both time and cost in the Project scope development.

4. APPROACH TO O&M AND FORECAST COSTS

4.1 Overview of O&M arrangement

Genex has appointed ANDRITZ as the Operation and Maintenance Provider (**O&M Provider**) for the Project following completion of the construction phase. ANDRITZ is the OEM for the electromechanical equipment for the Project. ANDRITZ is positioned as a global leader in after-sale assistance of supplied equipment and offers engineering, fabrication and assembly services geared at continuous improvement of the equipment. As part of the O&M scope, ANDRITZ services include: 24/7 remote monitoring, technical assistance and annual operations and maintenance assessment/optimisation.

While ANDRITZ is responsible for the daily maintenance of the Project, EnergyAustralia, as the offtaker, will be responsible for dispatching the Project into the NEM. EnergyAustralia shall perform the remote operation of the Project in accordance with AEMO's requirements and the limits of the OEM's technical parameters which will be monitored by ANDRITZ via its onsite staff and its 24/7 remote monitoring team. ANDRITZ shall ultimately be responsible for ensuring the plant is available for dispatch in accordance with its availability guarantee, while EnergyAustralia will receive the available plant capacity (following scheduled and unscheduled maintenance) and commit the necessary capacity to the market.

4.2 Resourcing of O&M services

The O&M services have been divided into two parts: onsite resources and remote resources. The onsite resources include the Plant Manager who will be the main contact for the onshore scope and activities. They will be responsible for the entire onsite management of the O&M agreement. The remote services will involve the Asset Manager who will be the main contact for the Offshore scope and activities. They will manage the 24/7 monitoring activities, the system engineering activities and the data analytic activities. Their role is the ensure the seamless integration between the onsite and remote activities. The 24/7 monitoring of the plant signals and the plant system engineering activities will be performed from the ANDRITZ GCC (Global Control Centre) facility by operators who will communicate plant deviations with staff onsite such to correct such deviations.

Finally, ANDRITZ is utilising its proprietary DiOMera™ technology platform at the Project. The digital platform monitors the operational parameters of the Project and documents the performance via key performance indicators. This new technology utilises a list of defined signals and applies trend-monitoring algorithms to support early detection and forecasting of of potential future defects. This digital platform will work to increase plant reliability which will have a positive impact on the Project's availability for dispatch by EnergyAustralia.

4.3 Approach to availability guarantee

The primary interface of the O&M agreement with the Project economics and offtake arrangements relates to the availability guarantee. The Project generates its revenue by selling the availability of the plant to operate in generation, pumping or synchronous condenser mode – irrespective of whether it is actually operated in a specific period or not. The focus in concluding the O&M agreement was therefore to maximise the availability of the plant, to maximise its revenue generating potential.

The arrangement with ANDRITZ provides for a guaranteed level of availability for the term of the O&M agreement. This includes provision for scheduled and unscheduled maintenance in accordance with the long-term maintenance protocol for the plant. The O&M agreement provides for liquidated damages if ANDRITZ fails to meet its availability guarantee for a given year, which is in turn passed on to the offtaker. Inversely ANDRITZ is accredited the surplus time by banking it for future use if it exceeds the availability guarantee for a given year.

The long-term plant availability has been predicted by applying the appropriate maintenance philosophies, reference to actual data and review of industrial benchmarking. ANDRITZ have predicted years 11-20 of plant availability will be similar to years 1 to 10, once again with the application of the appropriate maintenance philosophies. While there are numerous maintenance philosophies to apply to PSH projects, ANDRITZ have applied the "Total Predictive Maintenance Philosophies" which are recommended by industry standards. These philosophies have been integrated into the ANDRITZ DiOmera™ technology platform.

4.4 Approach to long term maintenance activities

The following items will be replaced/upgraded as part of the long -term maintenance activities:

- Control System;
- Generator/Turbine and
- Main Isolation Device.

On the basis that these activities are known, and for the benefit of the long-term owners and users of the plant, the Project receives relief under the availability guarantee in the ESSA to undertake these major maintenance works. Further detail of these works is provided below.

Control System

The Control System (run using Windows Operating System) will be upgraded after 5-10 years of the plant control equipment on a periodic 10-year basis to ensure the operating technology is kept up to date with technological developments. As this is a system upgrade, it will be undertaken with existing scheduled maintenance activities.

Generator

After 20-25 years if operation, based on condition of the generator, a general half lifetime overhaul of the generator is recommended. The half lifetime overhaul of the generator comprises disassembly works, lifting of the rotor, diagnosis and revision of main components, reassembly and commissioning.

Turbine

Similar to the generator, a half lifetime overhaul for the turbine of the Project is recommended to ensure the Project operates safely and at full capacity for 60+ years. The overhaul consists of the following:

- Fingerprint testing;

- Disassembly of unit including lifting out of the turbine runner;
- Revision of turbine embedded parts, main turbine components, runner, dewatering system as well as auxiliary equipment;
- Supply and installation of new turbine instrumentation; and
- Re-assembly and re-commissioning of the unit.

Main Isolation Device

After 20-25 years, the structural and functional integrity of the main waterway isolation devices (the Main Inlet Valves (**MIV**) and the Draft Tube Gate Valves) will need to be inspected and any repairs undertaken. These waterway isolation devices are the only safety devices to isolate and protect the power plant from flooding and hence are a key part of the long term maintenance plans for the plant. Removal of the MIV is also essential to assess the upstream maintenance seals and assess the structural stability.

5. OFFTAKE & MERCHANT MARKET MODELLING

5.1 Approach to offtake

As part of negotiations with the Project's lender, NAIF, it was established early that the Project was best placed to maximise debt financing through securing a long-term offtake arrangement. Genex therefore undertook a significant market engagement process to procure a long-term offtake arrangement for the Project, which involved a mix of large gentailers, retailers and generation companies.

This process established the value drivers for the Project – namely its flexibility and ability to operate in several different markets (energy generation, consumption and FCAS). It was therefore determined early on that to maximise its revenue potential, the process had to consider selling 100% of the operating rights to the Project to a single user, rather than seeking to 'carve up' its various capabilities among different parties.

The structure of the offtake therefore focused on a long-term tolling style arrangement, whereby the Project is made available to its offtake partner and receives a fixed revenue payment linked to the ongoing availability of the plant to operate.

The offtake process for the Project ran at various times from 2017 to late 2019, following which Genex sought to conclude negotiations with EnergyAustralia for the binding ESSA, which was signed in late March 2020. During this period, in order to assess the valuation of various offtake offers received from this process, Genex undertook its own market modelling to assess the net revenue generation potential of the Project over the concerned period.

5.2 Summary of offtake arrangements

In March 2020, the Company signed a Binding ESSA with EnergyAustralia. The ESSA is for a term of up to 30 years, with an initial 10 years and two options (at EnergyAustralia's election) to extend for a further 10 years each. Following exercise of both of these options and at the expiry of the 30-year term, EnergyAustralia will be given the opportunity to acquire the Company's shareholding in K2-Hydro for a fixed cash payment. Full operational and dispatch responsibility will be passed onto EnergyAustralia (including P&L responsibility) in exchange for a fixed annual rental payment which escalates over the term. EnergyAustralia will take marginal loss factor (**MLF**) and constraint risk and acts as Financially Responsible Market Participant for the Project.

5.3 Lessons learnt from offtake negotiations

The key lesson learned from the offtake process was one which ultimately resulted in the structure of the final ESSA. That is, that the value proposition of the plant is its ability to operate flexibly. While PSH developers may be encouraged to sell different parts of the plant (eg. the ability to generate in certain peak periods of the day, or provide services for inertia, or network support services), the ability for the plant to be operated flexibly across all of these markets in order to maximise revenue, was a key value driver in negotiating the offtake price. As such, the final ESSA was based upon EnergyAustralia having full dispatch rights for the entire plant.

Secondly, Genex believes it was able to capture additional value through contracting with a large gentailer. This is because a smaller, less diverse user is typically pricing the plant offtake on the basis solely of its P&L.

However, a large diverse gentailer with a large retail book is able to price the offtake on the basis of its portfolio, in particular in supporting the exposure of its retail book to wholesale market price fluctuations. Genex believes it was able to capture some of this portfolio value from EnergyAustralia in the offtake price under the ESSA.

The objective of the offtake process was to manage the market risk of the Project to facilitate the project financing for the Project. Due to the cost and scale of the Project, it was determined early on that a high level of gearing would be required to support the Project economics. As such, the offtake has been structured as a relatively fixed, annuity style payment, over the long term. This gives lenders certainty, protects the Project from market fluctuations and ultimately supports a highly geared structure with a long term revenue stream.

5.4 Market modelling for the Project

The Project is the first PSH project to be developed in Australia for 40 years which meant a significant effort was required by Genex to understand the value drivers for the Project, to support the offtake negotiations. To this end, Genex commissioned complex and in-depth market modelling to assist with these negotiations, while parties involved in the offtake process also commissioned their own internal and external revenue modelling activities.

The energy market is extremely volatile with energy prices changing on a 5-minute basis (but only settled on a 30-minute basis), determined by the supply and demand in the market. The Project also has a lifecycle of more than 60 years, meaning it was important to understand the long term revenue profile. Genex ultimately appointed Baringa to undertake revenue modelling for the Project. Baringa utilised its proprietary central case model for the National Electricity Market to 2050, which is based on a number of inputs including:

- Scenario inputs: policy, fuel prices, technology costs, demand, behind the meter deployment and plant retirement;
- Detailed plant level database (from AEMO) which includes installed capacity, efficiencies, operating costs and operating constraints;
- Investment decision model for new build;
- Cross-regional interconnector capacity; and
- Detailed hourly wind and solar profiles.

The outcome of these inputs was to deliver a market model to 2050 which comprised the following outputs:

- Half-hourly wholesale prices by region;
- Generation schedules;
- Generation average weighted prices;
- Asset energy revenues and gross margins;

- Carbon emissions; and
- Interconnector flows (imports/exports).

The technical capabilities of the Project were then input into the market model to forecast the total net revenues earned by the Project from generating, pumping, and participating in frequency control ancillary services (**FCAS**) markets. In addition, Genex and Baringa developed a methodology for valuing insurance products which may be sold by the plant in the form of $300 cap contracts.

The output of this was a revenue forecast to 2050, which supported the offtake negotiations. Over the forecast period, the capacity factor of the Project varies significantly as the Project adapts to changes in the market conditions (including thermal plant retirements, the introduction of new storage technologies etc.). The outputs of the Baringa modelling show that the capacity factor for the Project starts at over 30% in 2024, before gradually falling to around 20% in the mid-2030s.

6. OVERVIEW OF MLF MODELLING FOR THE PROJECT

6.1 Background

AEMO publishes forward-looking marginal loss factors (**MLFs**) for each generation and load connection point annually. MLF for each generation connection point represents the marginal losses in electrical power flow between the connection point and the Regional Reference Node (**RRN**) for that region. A MLF less than 1.0 signals that increases in the power flow from the connection point to RNN would in turn increase losses in the network, whereas an MLF greater than 1.0 signals the opposite.

There is an increase in new renewable energy capacity at the periphery of the transmission network, which runs along the east coast of Australia. In these areas, the renewable resource is attractive to project developers, however, the network is generally weaker as it is remote from the major demand centres. The power generated from these generators must travel large distances to feed load centres which incurs losses and results in that generator within the region having a lower MLF.

In 2018, the Company commissioned a study to assess the impact of the Project on MLFs in the region. The assessment was modelled under two scenarios:

- Scenario 1: with K2-Hydro and a co-located, large scale solar farm of 270MW; and
- Scenario 2: with K2-Hydro only.

The results of this study are further discussed in this section.

6.2 Scenario 1: K2-Hydro and associated solar farm

In this scenario, there is a declining trend in MLFs over the period as there is an increase in local generation from wind and solar which flows south to the RRN. This increase in generation flow is due to retirement of thermal generators in central Queensland and New South Wales. In the early years, the difference between the net generation and net load MLF is greater than in the later years (i.e., they narrow in later years).

In scenario 1, in the early years, pumping of the Project (load) would typically occur through the night from midnight onwards, when MLF is high. The MLF is high during this time as there is less generation flowing out of North Queensland. On the other hand, net generation is occurring during the middle of the day when the MLF is lower which therefore results in a lower generation MLF than load MLF.

However, in the later years, pumping typically shifted from overnight to the middle of the day in order to take advantage of large amounts of solar generation available in the region. The MLFs are therefore significantly lower in the middle of the day due to the high amount of export from North Queensland. K2-Hydro generation during these years would occur during the day and in the evening peak when MLFs are still low. This results in net generation and load MLFs converging over time.

6.3 Scenario 2: K2-Hydro only

In this scenario, the net generation MLF is approximately 0.05 higher than scenario 1, however, this difference reduces over the study horizon while the net load MLFs are similar in both scenarios.

In scenario 2, the MLF is on average higher in the middle of the day when compared to scenario 1. This is due to less daytime generation out of Mt Fox towards the RRN due to lower generation i.e., no generation from the associated solar farm. The average time-of-day net load is also higher in scenario 2 because there is no co-located solar generation to offset the pumping load.

6.4 Impact K2-hydro has on MLFs in the region

As part of the study, the consultant assessed the difference in MLF for a nominal wind and solar farm for the following five years: 2021-22, 2023-24, 2028-29, 2035-36 and 2039-40, at three connection points in North Queensland with and without K2-Hydro in operation. The key areas of interest for renewable development were the following connection points:

- Woree 275kV;
- Chalumbin 275kV; and
- Ross 275kV.

The study produced MLFs for a nominal wind and solar farm at these three connection points in North Queensland. In doing so, the study considered two scenarios (both of which did not include any generation from an associated solar farm at Kidston):

- With K2-Hydro operating; and
- Without K2-Hydro operating.

The MLF for a nominal solar farm is higher with the Project installed in all years at all three connection points. From 2021-22 to 2028-29, the Project's pumping shifts from overnight to midday when solar generation is at its peak. This increased daytime pumping provides a load to the network which decreases southerly flows out of North Queensland during those periods in the scenario with the Project installed. However, in 2028-29 to 2039-40 there is a slight decrease in the difference in solar MLFs between the two scenarios. This decrease is assumed to be because of the introduction of additional new entrant large-scale solar facilities in North Queensland which lowers midday MLFs.

There is a minor difference in the MLF for a nominal wind farm between the two scenarios at all three connection points. Overall, the MLF is slightly higher with the Project installed because K2-Hydro acts as a net load due to losses in the operational cyclic efficiency. However, the difference in wind MLF between the two scenarios is minor compared to that of the solar MLF due to the generation profile of a wind farm. Unlike solar, which can only generate during the day, the average time-of-day generation profile for a wind farm is generally flat and as a result, wind MLFs are less affected by the net impact of the Project generating and pumping.

7. A PATHWAY TO COMMERCIALISATION IN AUSTRALIA

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8. NEXT STEPS

With notice to proceed being given to the EPC Contractor on 28 April 2021, construction has now formally begun at the Kidston site. During the remainder of 2021, the EPC Contractor will be completing the final detailed design associated with the Project and commence mobilization of the workforce to site. Major works during 2021 are primarily associated with the main access tunnel, portal works and stabilization of the pit wall above the portal.

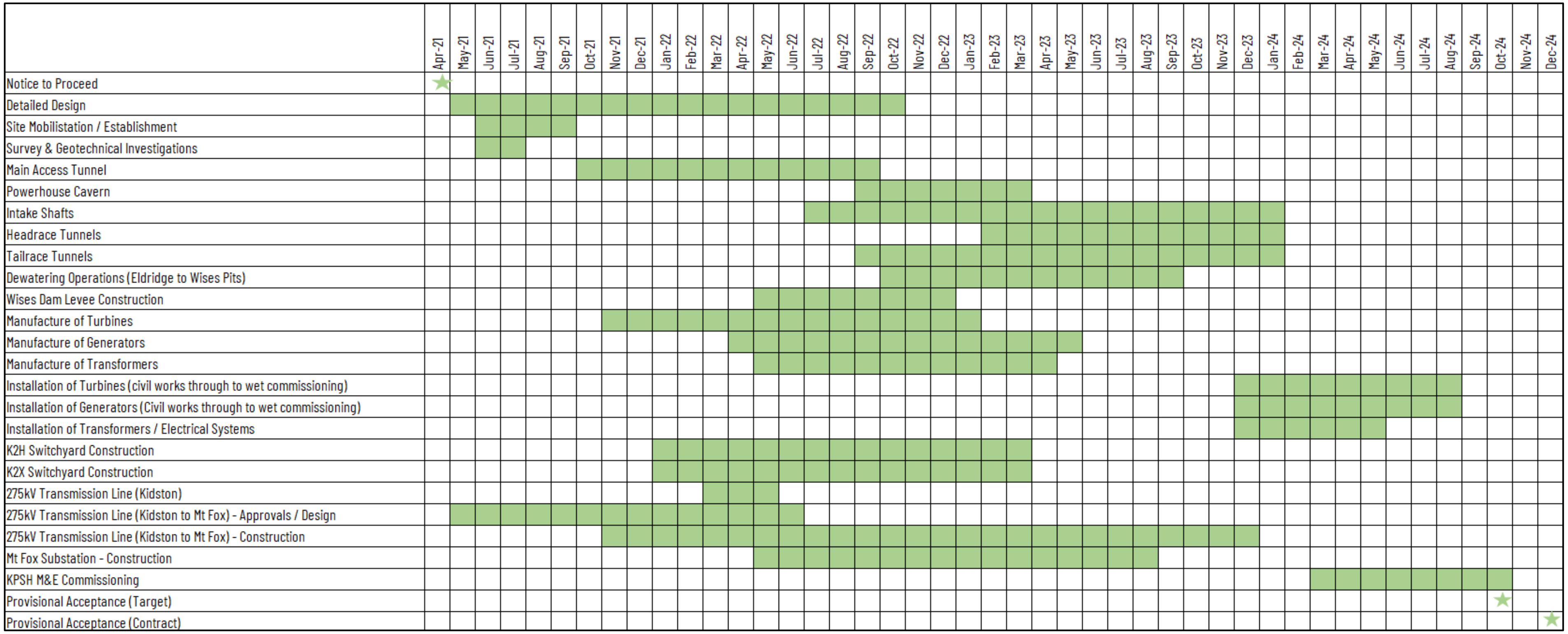
Dewatering operations, which involve dewatering both the upper and lower pits is to commence in earnest in 2022 (albeit some early works have commenced at the date of this report following a significant wet season). Parallel to this piece of work, the upper pit (Wises Dam) will undergo a significant expansion to increase the overall surface area, in turn increasing the quantity of water it can store. Finally, during next year, commencement of works associated with the intake tunnels and powerhouse cavern will begin.

Between 2023-2024, the final works will be completed to support Project commissioning in 2H CY2024. The two 125MW reversible pump-turbines as well as transformers will arrive at the Kidston site. Installation of these two major pieces of equipment will signal the beginning of operations for the Project.

Please find a summary of the current program schedule in Figure 3.

Genex will continue to keep the public informed of the construction progress via its ASX and media platforms, as well as future ARENA Knowledge Sharing initiatives.

Figure 3: Current program schedule (K2-Hydro)



9. LIST OF TERMS

TERM	DEFINITION
Genex	Genex Power Limited
Owner	Genex Power Limited
Company	Genex Power Limited
Kidston Hub	The location made up of KS1, K2-Hydro, K2-Solar and K3-Wind
K2-Hydro	250MW Kidston Pumped Storage Hydro Project
Project	250MW Kidston Pumped Storage Hydro Project
ARENA	Australian Renewable Energy Agency
NAIF	The Northern Australia Infrastructure Facility
KGM	Kidston Gold Mine
KS1	50MW Kidston Solar One Project
NEM	National Electricity Market
PSH	Pumped Storage Hydro
ANDRITZ	Andritz Hydro GmbH
J-POWER	Electric Power Development Co. LTD
MDJH	McConnell Dowell/John Holland
MD	McConnell Dowell
JH	John Holland
OEM	Original Equipment Manufacturer
BEON	Beon Energy Solutions Pty Ltd
D&C Contract	Design and Construct Contract
Kidston Substation	275kV substation at Kidston
EPC	Engineering, Procurement and Construction
Mt Fox Substation	275kV substation at Mt Fox
MDJH JV	McConnell Dowell/John Holland Joint Venture
ECI	Early Contractor Involvement
Downer	Downer EDI Ltd
O&M	Operations and Maintenance
MIV	Main Inlet Valves
FCAS	Frequency Control Ancillary Services
MLF	Marginal Loss Factor
RRN	Regional Reference Node