VAST

Nasdaq: VSTE

Investor Presentation

December 2023



Summary

Next Gen Technology

- Vast has developed the **next generation of concentrated solar thermal power system** (CSP v3.0)
- Modular tower modality and sodium-based heat transfer technology deliver a design that **increases geographical applicability, reliability and efficiency**, while **reducing complexity, cost and construction time**
- System provides competitive, dispatchable and carbon-free:
  - Power for on- and off-grid applications
  - Energy storage
  - Process heat
  - Green fuels (e.g., solar methanol, eSAF, among others)

Proven Success

- Technology proven through **5 years of piloting prototypes**
- Technology de-risked through **grid-synchronized demonstration plant** which operated for nearly 3 years
- Technology supported by **multiple non-dilutive government grants** supporting technology evolution (Australia, Germany, US)
- Senior and experienced team has a demonstrated **track record of successful project development**

Market Opportunity

- The IEA forecasts deployment of up to **430 GW of new CSP capacity globally by 2050** for on-grid applications alone[1]
- Vast has a **multi-GW global pipeline** of potential CSP projects and **230 MW of projects under development** as of February 2023
- Off-grid applications, green fuel production and process heat could reach more than 1 TW by 2050[2]
- Up to **AUD215 million of funding committed** by the Australian and German governments to Vast projects
- Inflation Reduction Act is expected to materially **improve project economics** and **accelerate US deployment** through the 30+% ITC

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1. Based on IEA's Net Zero Emissions by 2050 forecast
2. As Prepared by a Top Tier International Management Consulting Firm

Next Generation Vast CSP v3.0

Low-cost dispatchable, carbon-free power and heat in sun-belt locations

Concentrate



Reflect and concentrate the sun's rays onto solar receivers

Capture



Capture the sun's heat in sodium

Store



Efficiently transfer heat to molten salt for high density storage

Use the stored heat to:

- **Generate 24/7 power**
- **Provide process heat**
- **Produce green fuels**

CSP Key Features

- Carbon-free, dispatchable power and heat
- Low cost technology for sun-belt countries
- Highly efficient system with minimal losses
- Integrated energy storage – thermal battery that charges itself with daylight
- Power + heat unlocks efficient green fuel production
- Low-risk supply chain – glass, steel, concrete

Vast CSP v3.0 – a Differentiated, Proprietary and Superior Evolution of a Well-Established Technology







Criteria	Parabolic Trough CSP v1.0	Central Tower CSP v2.0	Vast CSP v3.0
Levelized Cost of Energy			
Project Scalability			
Storage Efficiency			
Power Cycle Efficiency			
Ease of Permitting			
Ease of Design			
Ease of Construction			
O&M Simplicity			

Source: Top Tier International Management Consulting Firm, NREL.

Vast's CSP v3.0 System – The Next-Generation of CSP

Collection

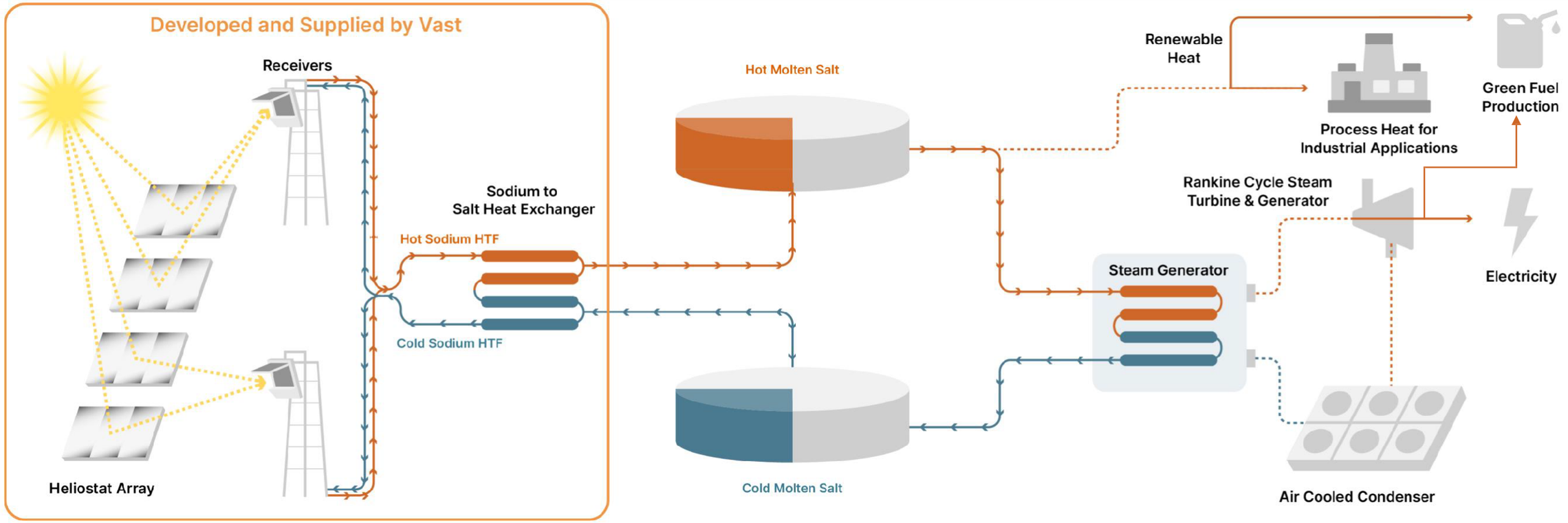
- Solar energy is captured in modular tower arrays, each comprising up to 2,500 heliostats (mirrors) and a solar receiver
- Vast software precisely orients the heliostats to maximize concentrated sunlight capture

Storage

- Solar energy is absorbed and transferred by the sodium heat transfer fluid (HTF) to the molten salt thermal energy storage system (TESS)
- Using sodium as HTF enables modularity, higher temperature operation and provides stability to the temperature profile

Generation

- The steam generation system converts heat stored in hot tanks into steam to drive a turbine and generate electricity
- Alternatively, heat from the tanks can be used directly in industrial applications or for green fuel production



Vast's Technology is Proven

Technology proven through long duration field testing at multiple sites

Heliostat Prototyping and Testing — 2009 - 2010

Modular Array Prototyping and Testing — 2010 - 2011

Solar Receiver Prototyping and Testing — 2011 - 2014

1.1MW Sun-to-Grid Demonstration Plant Located Near Forbes, Australia — 2014 - 2020

Utility Scale Project Development — 2018 - 2019

Marulan 1

- First heliostat generations
- Exploratory manufacturing techniques
- Optical refinement

Marulan 2

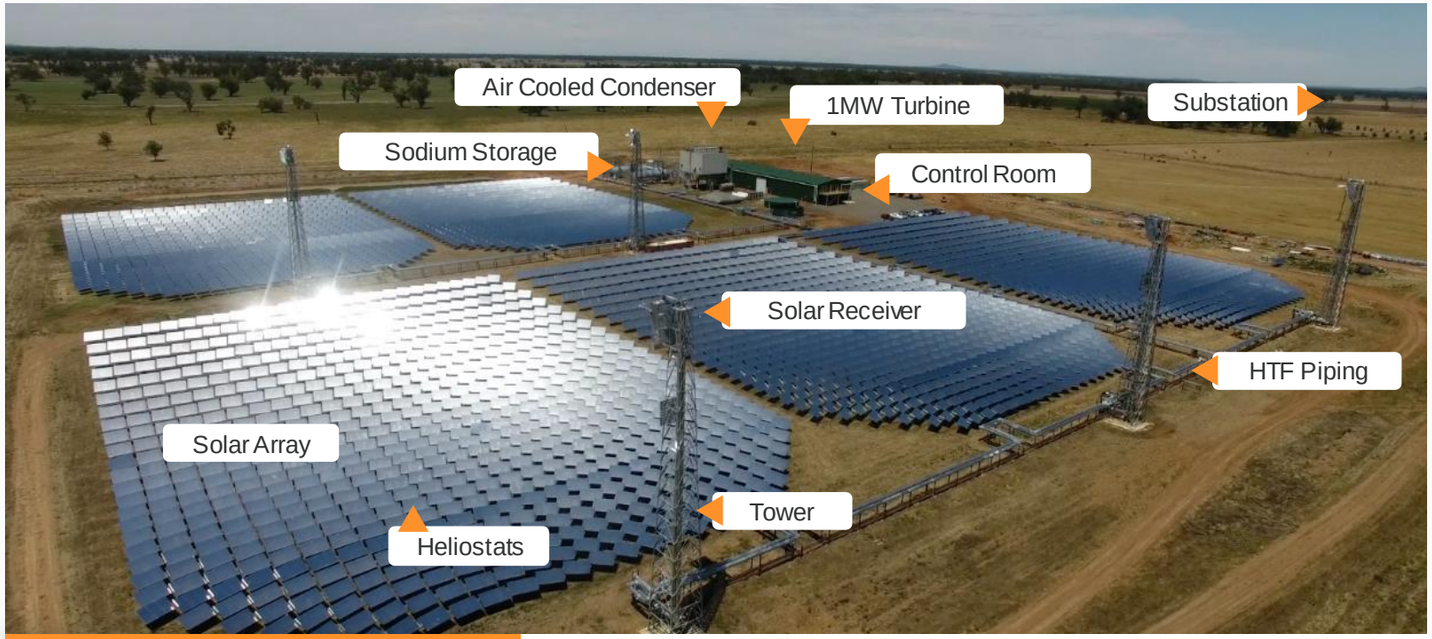
- Next generations of heliostats
- Optimal heliostat layouts
- Field comms and operations

Back Station

- Water receivers
- Sodium receivers to unlock modularity
- Sodium operations

Objectives Met

5 years of prototyping and testing components leading to a successful grid-synchronized demonstration plant



Received International Energy Agency's SolarPACES 2019 Technical Innovation Award

- *Approximately 3,500 heliostats configured into 5 modular tower arrays*
- *Co-funded with ARENA*
- *Final-form plant first synchronized with Australian national grid January 2018*
- *Technology demonstrated, refined and validated*
- *Operability confirmed via operation for 32 months*
- *Technology scalability confirmed*

50MW Solar PV

- Development, permitting and grid connection secured
- Sold shovel-ready to Genex Limited
- Plant now built and generating

Project Sold

Vast Modular Tower Differentiation and Value Proposition

CSP v3.0 – molten sodium HTF enables modular tower design, unlocking benefits that drive down costs and de-risk operation

Cost Effective



Improved Optical Efficiency

Modular system requires a 10-20% smaller heliostat reflector area due to efficiency gained by proximity to the towers

Reduced Construction Time

Require less materials shorter construction time and 60% lower site prep costs

Smaller, Lower and Pre-Fabricated Towers

Smaller, lighter towers erected without specialist equipment

Hotter Temperatures

Higher operating temperatures deliver improved plant economics in both salt storage and turbine efficiency

Sodium HTF

Increases annual energy capture by improved transient operation and eliminates need for drainage tanks, outlet vessels or vents in the central tower

Flexible



Configurable

Modularity increases the ability to meet customer requirements for both power and heat

Improved Thermal Control

Delivers precise operating temperatures improving performance and reliability

Locational Flexibility

Multiple towers allow for more flexible and sensitive siting

Dynamic Operating

Dispatch may be altered to meet changes in grid circumstances

Online Maintenance

Unplanned maintenance can be performed while plant is operating which reduces downtime

Reliable



Multiple Towers and Receivers

No single point of failure risk (unlike a central tower design) results in less downtime and increases operational efficiency

HTF Stability and Control

Lower operational risk through better thermal process control

HTF Constantly Circulating

Receivers always online which eliminates daily risky pre-warming and start-up procedures and delivers 45 minutes per day of extra production time

Reduced Operating and Maintenance Risk

Safer and cheaper (requires no specialist equipment) to conduct maintenance on a smaller tower and receiver

Turbine Efficiency Improvement

1-2% turbine efficiency gains since higher temperature salt allows higher temperature steam

Vast is the only company positioned to drive down CSP costs by delivering the benefits of modular tower arrays

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Source: As Prepared by a Top Tier International Management Consulting Firm.

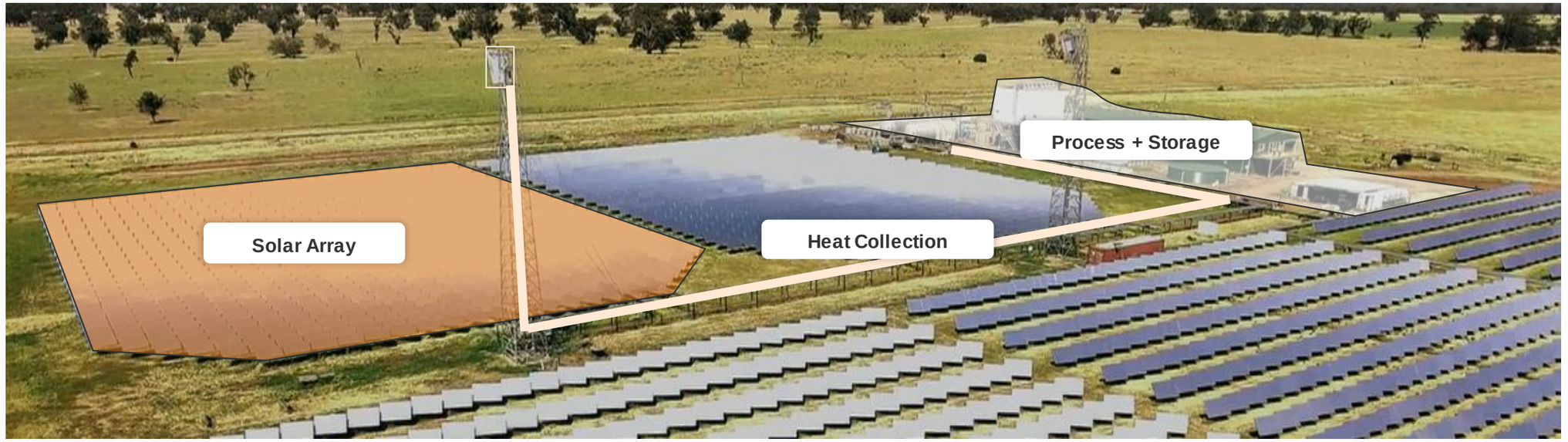
Proprietary and Differentiated Technology

- Vast is pursuing extensive IP protection in all relevant sun-belt countries
- Identification and protection of new IP is continuous and ongoing

Area	Type	Component
Technology	Patent Pending	Receiver
	Patent Pending	Thermal Receiver Controls
	Patent Pending	Heliostat Assembly
	Patent Pending	Heliostat Coupling

Area	Type	Component
Operations	Trade Secret	Construction and Operation of Heliostat Field
	Trade Secret	Heat Transfer Fluid
	Trade Secret	Plant Control
	Trade Secret	Plant Operation

Area	Type	Component
Design	Trade Secret	Heliostat Field
	Trade Secret	Receiver
	Trade Secret	Plant Design



- Solar Array
- Heat Collection
- Process + Storage

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CSP Solves Problems that Wind and Solar Photovoltaics (PV) Can't

It's Dispatchable

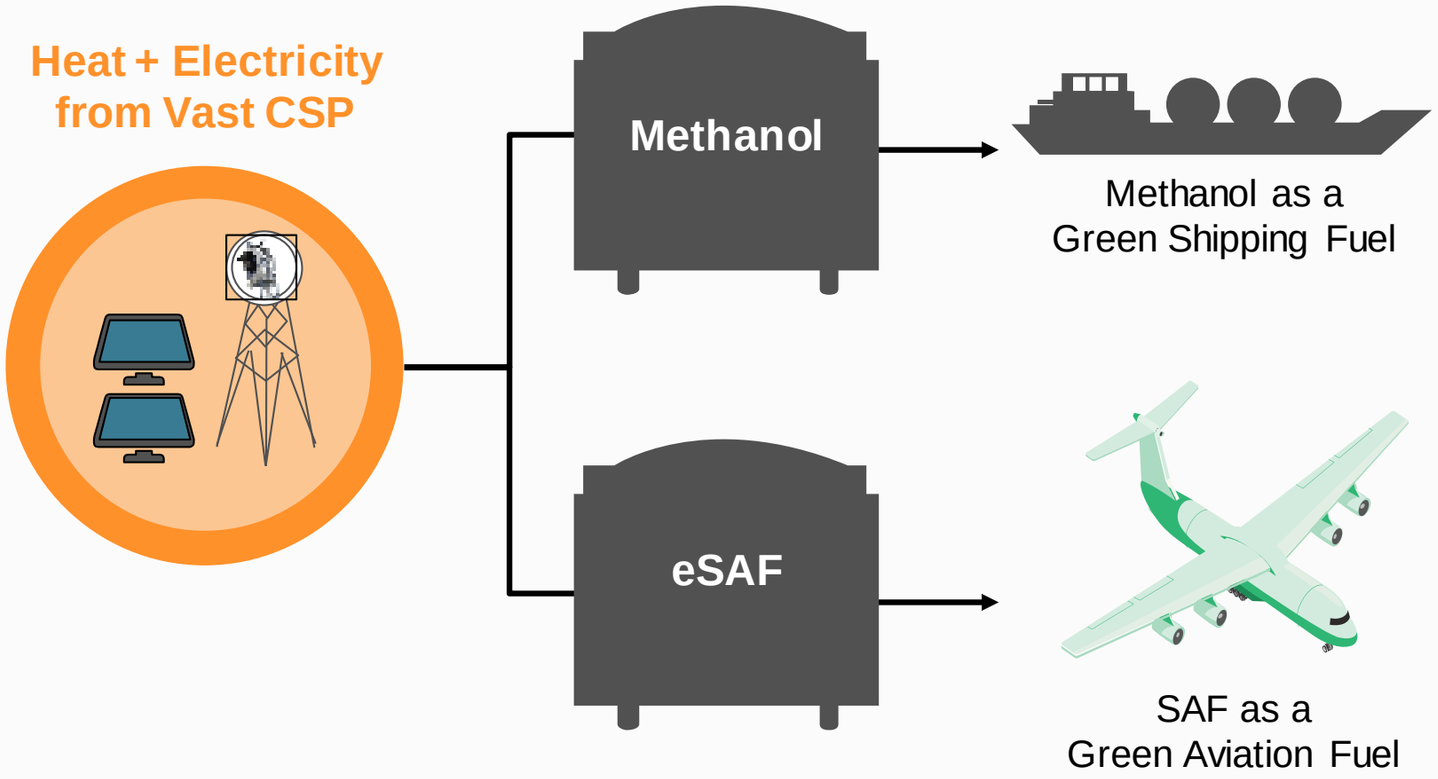
- Wind and Solar PV are intermittent generators
- Adding battery storage allows wind and solar PV to be dispatched, but only with limited duration (i.e., 2-4 hours), at a high cost and with significant trade-offs
- CSP provides efficient long-duration storage (i.e., 8-16 hours) which makes it comparable to traditional fossil generation

It Can Generate Process Heat

- Decarbonizing manufacturing is challenging because many industrial processes require heat that can only be efficiently generated by burning fossil fuels
- CSP can generate process heat equivalent to burning fossil fuels, allowing manufacturers to decarbonize
- Expands addressable market beyond power generation to heat for industrial purposes, or a mix of power and heat for production of green fuels such as hydrogen, methanol, sustainable aviation fuels and ammonia, among others

Vast CSP delivers Low Cost Primary Energy to Power Solar Refineries for Methanol and eSAF Production

- Biogenic fuels will meet initial demand but fall well short of ultimate requirements
- Heat + power from CSP should deliver significantly cheaper methanol and eSAF than electricity-only processes



Key Drivers

Energy Cost

- CSP's ability to supply **dispatchable electricity and low cost** heat unlocks the economics of processes that require energy in both forms
- CSP's **scalability drives cost down**

Return on Capital

- CSP's ability to supply **~80-90%[1] capacity factor** energy drives down contribution of capital to the fuel cost

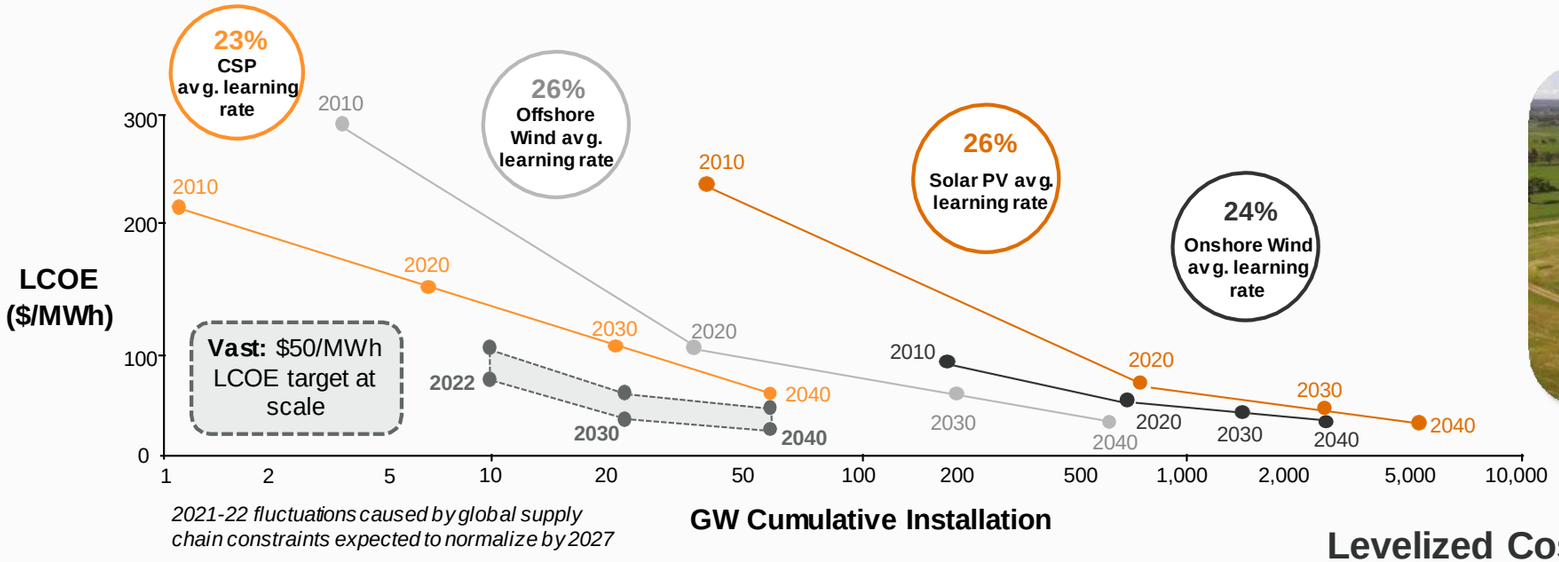
Government Support

- U.S. Inflation Reduction Act offers ~$600/T[2] of solar methanol for ten years
- Australian Government has recently announced the Hydrogen Headstart program[3]

1. 80-90% capacity factor may be achieved through hybridisation with PV or day/night operation of CSP
2. Impact of IRA calculated by internal modelling in consultation with 'Big 4' advisory firm
3. Refer to Risk Factors regarding Government Funding

Technology Economics: $50 / MWh LCOE Target at Scale

Levelized Cost of Energy Across Various Technologies[1]

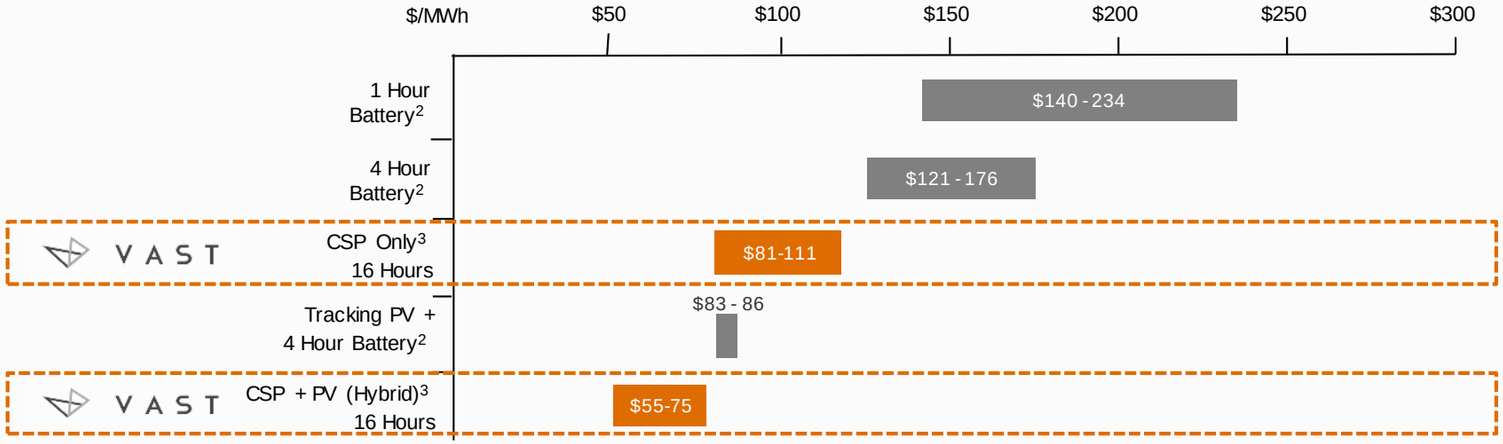


2021-22 fluctuations caused by global supply chain constraints expected to normalize by 2027



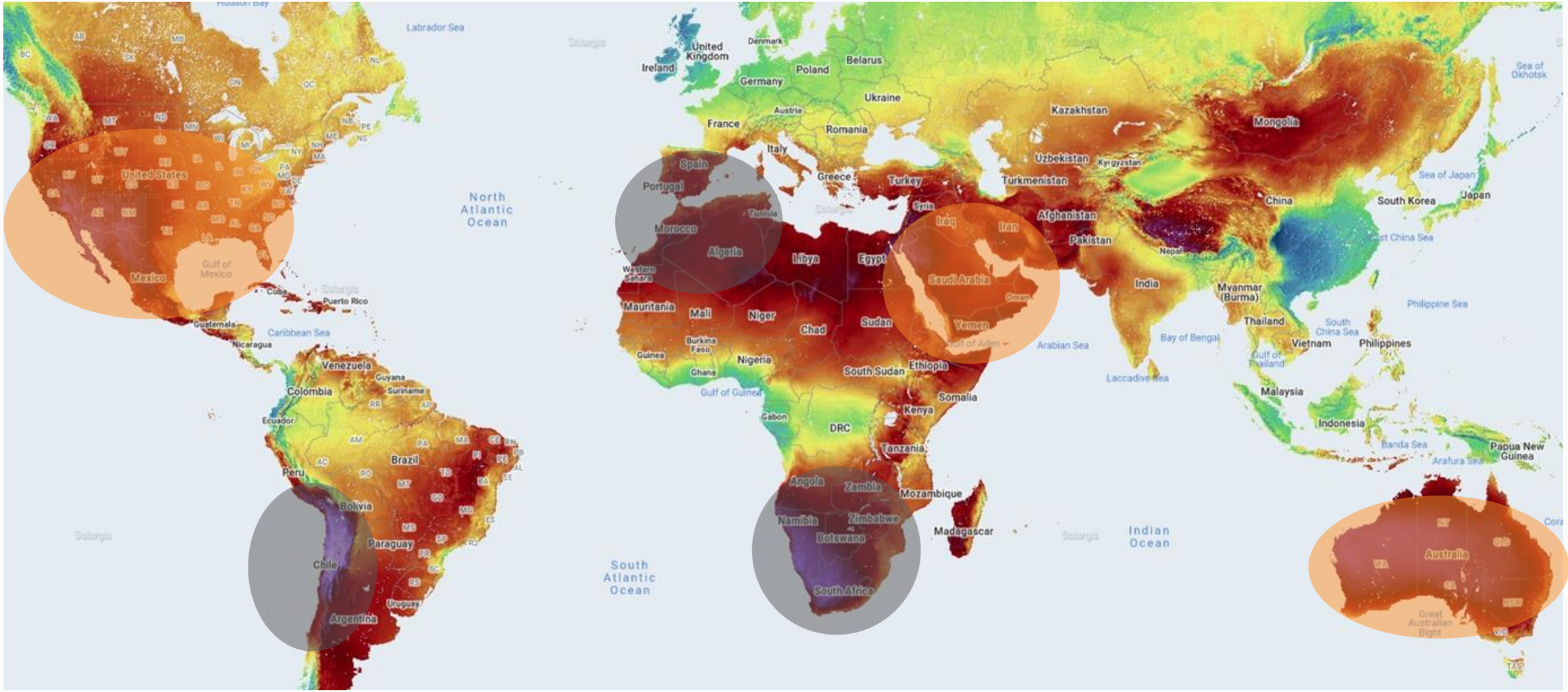


Levelized Cost of Energy: Comparison to Battery Storage



1. As Prepared by a Top Tier International Management Consulting Firm
2. BloombergNEF 2H 2022 LCOE Report, LCOE range based on Chile, Australia and the US for 2022
3. LCOE figures reflect range based on 100MW and 200MW illustrative Vast projects in Chile and US (Nevada)

Vast Pipeline – Target Geographies



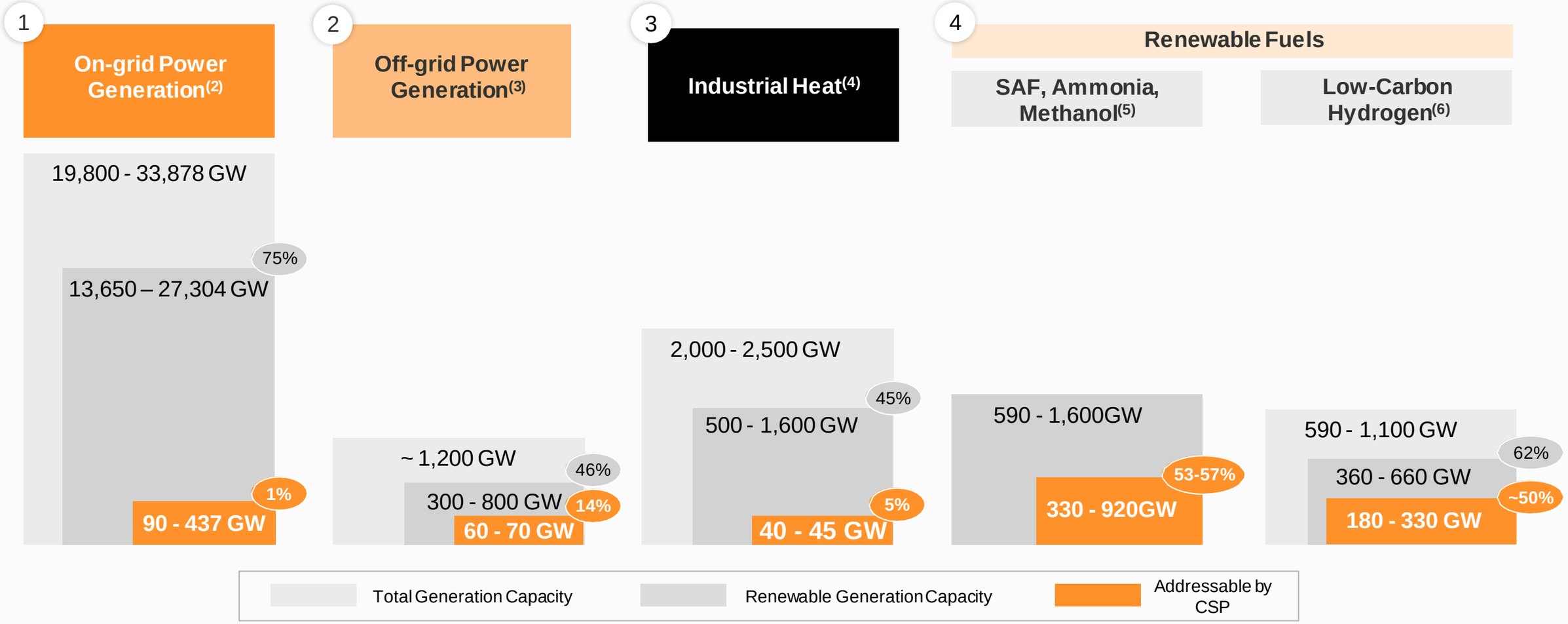
Source: SolarGIS; darkred and purple areas indicate higher potential output.

Focus Region

Secondary Region

Target Markets and Opportunity by 2050

Over $3.5 Trillion[1] in revenue potential by 2050, based on CSP total addressable market of 700 – 1,800 GW



Source: As Prepared by a Top Tier International Management Consulting Firm.

1. Based on the total CSP Capacity. Assumes an average plant size of 150MW and revenue per plant of $770 million (average of illustrative projects in Chile and the U.S.).
2. IEA Global Energy and Climate Model 2022.
3. IEA, IRENA Renewable Energy Statistics 2022 & Global Renewables Outlook, ARENA.
4. ARENA: Renewable Energy Options for Industrial Process Heat (2019), IRENA.
5. Excludes Total Generation Capacity (e.g., LNG, Low Sulfur Fuel Oil, etc.) because not considered "Renewable Fuels". Sources: IATA: Net zero 2050: sustainable aviation fuels, Maersk Mc-Kinney Moller Center: Position Paper Fuel Option Scenarios (2021), IRENA: Innovation Outlook Renewable Methanol (2021), Methanol Institute: An Emerging Marine Fuel (2021).
6. Assumes Synthetic SAF technology will only account for 3% of SAF market in 2030. Includes, blue, green, turquoise, orange and pink hydrogen. Sources: IEA, IRENA, COAG Energy Council, BNEF.

Vast's Business Model

Project Developer

- Key activities include:
  - Planning and permitting
  - Siting
  - Feasibility studies
  - Grid connection studies
  - Risk assessments
  - Budget assessments
- Identify and develop CSP projects with optionality for Vast to invest / co-invest, manage plants or retain ownership



OEM / Equipment Sales

- Sourcing and supplying solar arrays to project companies, including:
  - Heliostats
  - Receivers and towers
  - Sodium piping, pumps and tanks
  - Control systems
- Assembly and installation at project site, utilizing automated pop-up engineering facility



Operations & Maintenance (O&M)

- O&M and software support to projects that employ Vast technology
- Customers provided ongoing services including repairs, upgrades and general maintenance for an annual fee



Engineering, Procurement & Construction (EPC)

- In-house EPC capability to enhance the quality of projects and ensure the ability to deliver in key geographies



Primary Business Line

Near-Term Deployments

VS1 – Utility Scale Reference Plant	SM1 – Solar Methanol Demonstration Plant	Silicon Aurora 140MW Li-Ion BESS	VS2 – Baseload Solar Hybrid	VS3 – 150MW VS1 Expansion
2022 - 2025	2022 - 2026	2022 - 2023	2025 -	2025 -
Port Augusta			Mount Isa, Australia	Port Augusta Expansion
▸ Reference plant for Australian CSP ▸ 30MW CSP with 8 hours of dispatchable power overnight ▸ Feed into the National Electricity Market (NEM) other than ~10-20% for SM1 ▸ Up to AUD175 million of funding approved from the Australian government[1] ▸ Targeting FID in Q3 24 and Commercial Operation Date (COD) late 2026	▸ World-leading solar methanol demonstration with 20T/day capacity ▸ Solar Methanol Consortium comprised of quality German and Australian partners ▸ Strong offtake and investment interest from shipping and aviation companies ▸ AUD40 million announced funding from Australian and German governments ▸ Targeting FID in Q4 24 and first methanol in 2026	▸ 140MW / 140MWh Li-Ion battery ▸ Option for 2 hours duration ▸ Substation infrastructure shared with VS1 and SM1 ▸ Commercial development targeting shovel-ready and saleable by late 2023	▸ 50MW hybrid plant with CSP, PV, battery and gas ▸ 99.5%+ expected reliability ▸ Lowest cost generation option for Mount Isa ▸ 80% carbon-free continuous energy	▸ 150MW CSP plant built adjacent to VS1 and SM1 ▸ Exploring commercial offtake and financing opportunities ▸ Significant and growing industry demand for dispatchable renewable storage ▸ Shared O&M delivers economic benefit to VS1

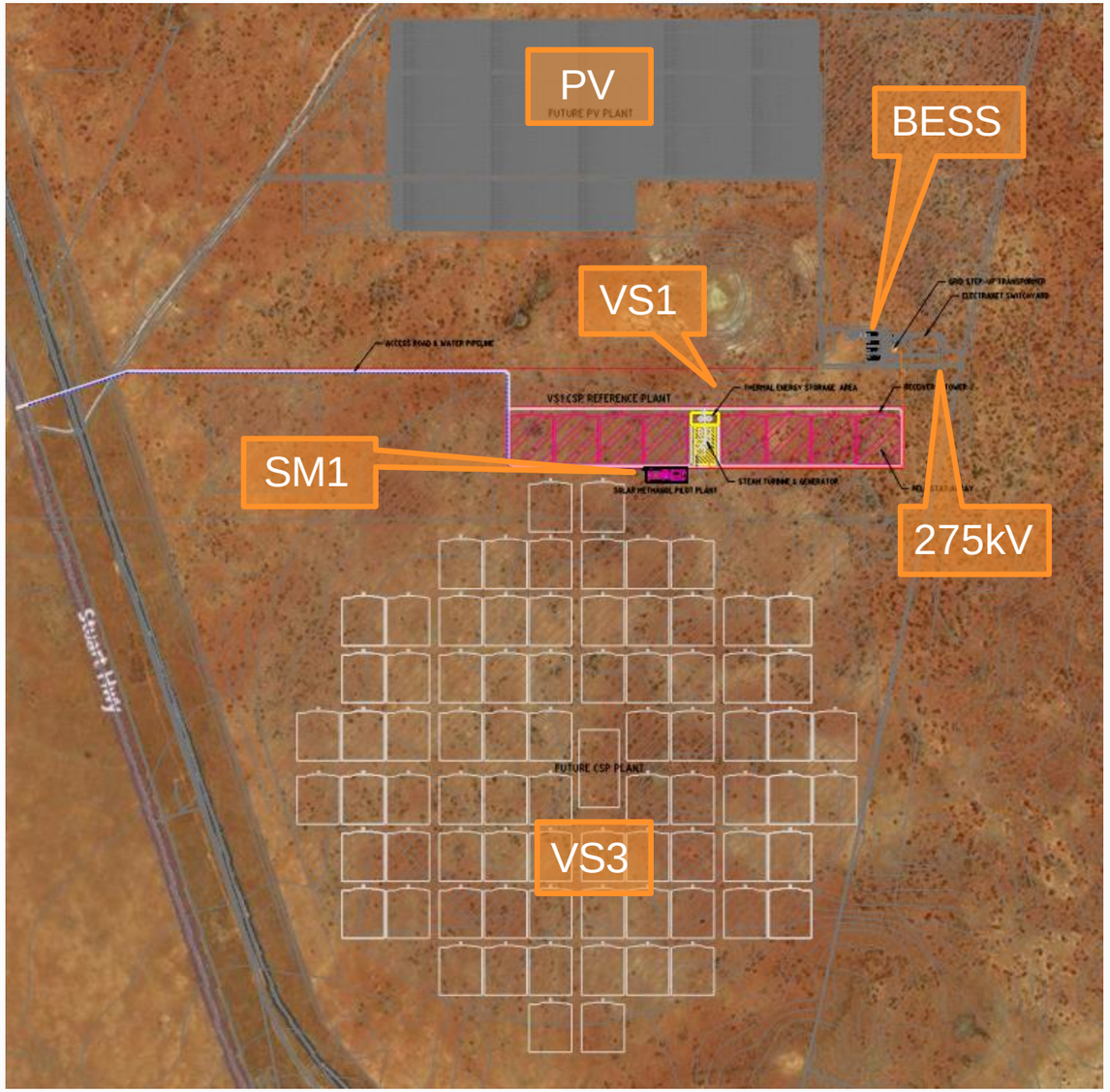
Project Development

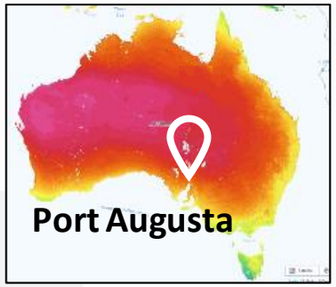
Ongoing Consulting Projects MARS CSIRO

1. Includes AUD110 million of concessional finance and AUD65 million of non-dilutive equity grant.

Aurora Precinct Overview

Located 20km north of Port Augusta, South Australia





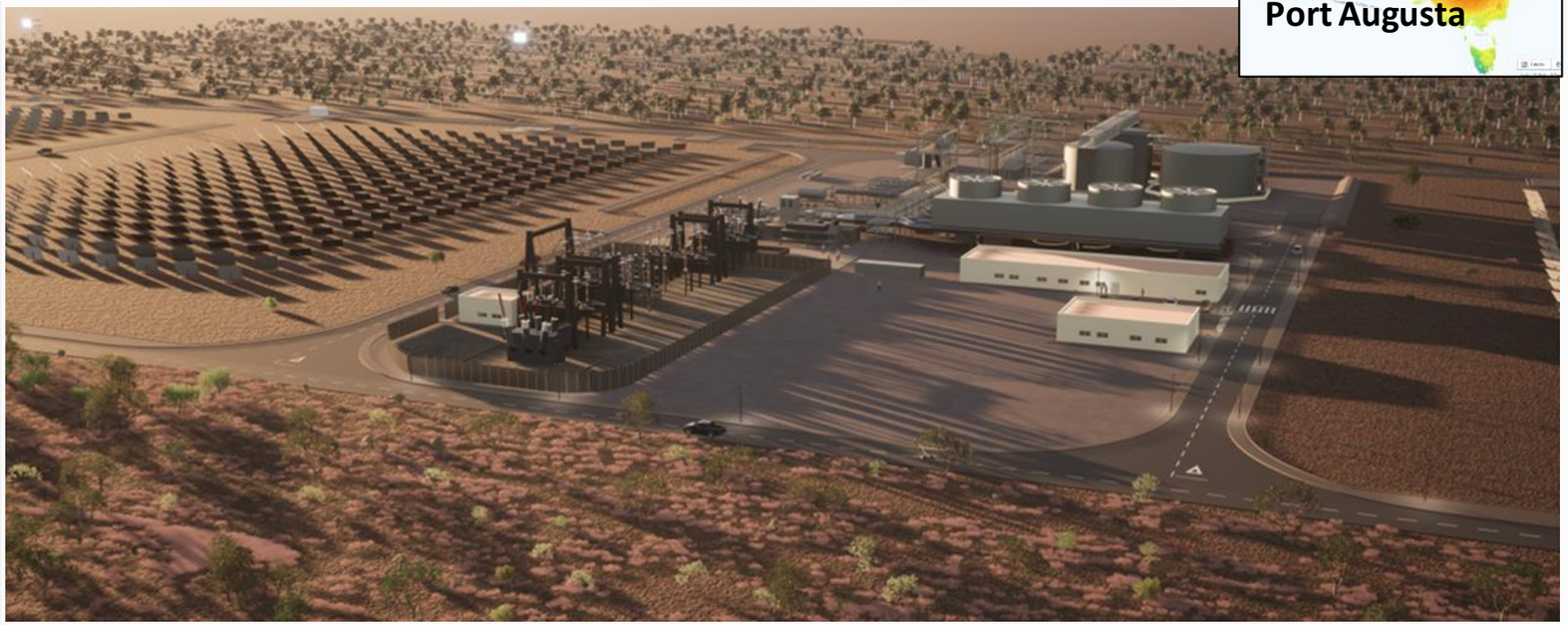
- 1,580ha site with 40 year tenure
- Staged development
  - VS1: 30MW CSP plant with 8 hours storage
  - SM1: 7,500 T/annum solar methanol plant
  - BESS: 140MW / 140MWh (50/50 with 1414 Limited)
  - VS3: 150MW CSP plant with 12+ hours storage
  - 70MW PV (50/50 with 1414 Limited)
- Project strengths
  - Community support
  - Political support
  - Strong grid
  - Located in region with high load demand

VS1 – 30MW Port Augusta CSP

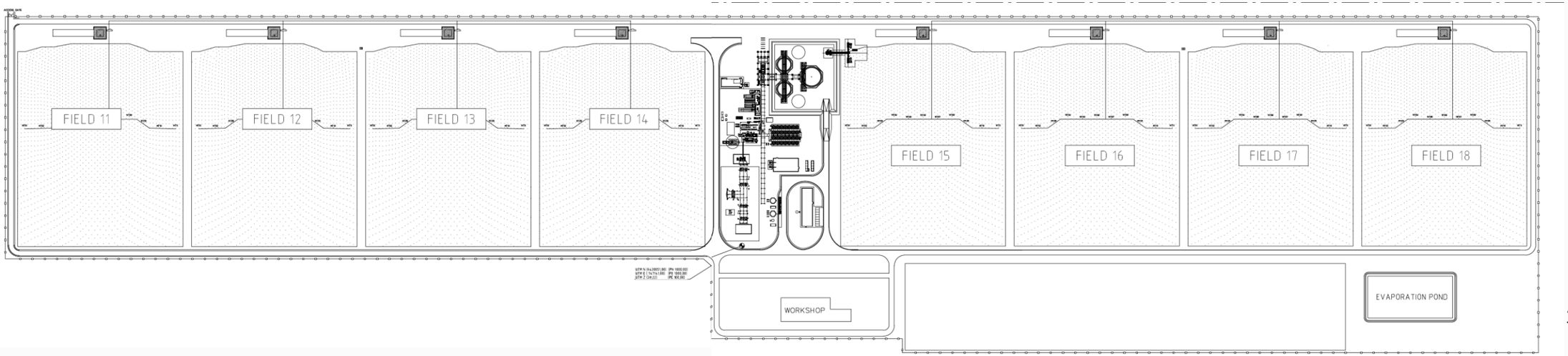
Dispatchable renewable energy on demand



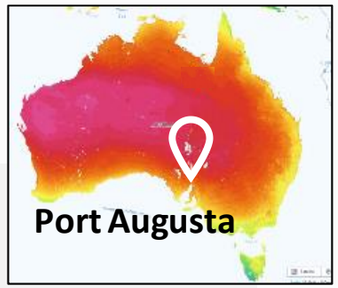
- Configuration
  - 8 solar fields, each with approximately 2,400 heliostats
  - 8 hours of thermal storage
  - 30MW steam turbine
  - Clutched generator => synchronous condenser functionality
- Target schedule
  - Final Investment Decision: Q3 2024
  - Commercial Operations: Q3 2026



Rendered image for illustrative purposes



SM1 – Vast Powered Solar Methanol 1 in Port Augusta



- Project overview
  - ~7,500 T/annum renewable methanol demonstration plant
  - Methanol to be used to decarbonize shipping
  - Conditionally awarded ~AUD40m through the German-Australian HyGATE funding program
- Plant configuration
  - VS1 supplies baseload heat + peak electricity, complementing grid-sourced electricity
  - CO_2 from Calix green lime point source
  - 10MW electrolyzer for H_2 production
  - 20 T/day methanol synthesis plant
- Target schedule
  - Project commencement: Q1 2024
  - Final Investment Decision: Q4 2024
  - Commercial operations : Q1 2027

- Consortium members
  - Global, highly specialized consortium
  - Blue chip equity partner
  - Vast is the principal energy supplier for the project

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calix

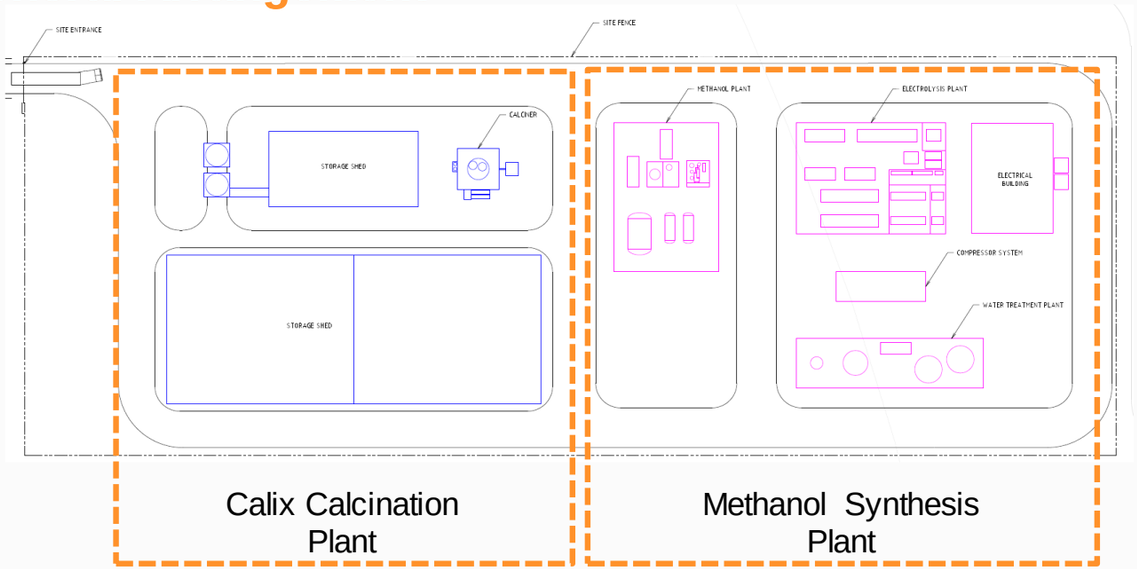
FICHTNER

ASTRI
Australian Solar Thermal Research Institute

CSIRO

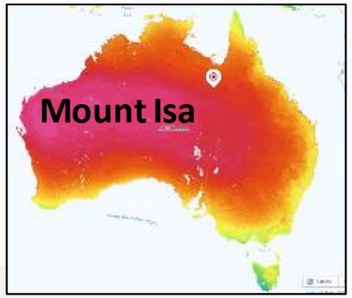
DLR

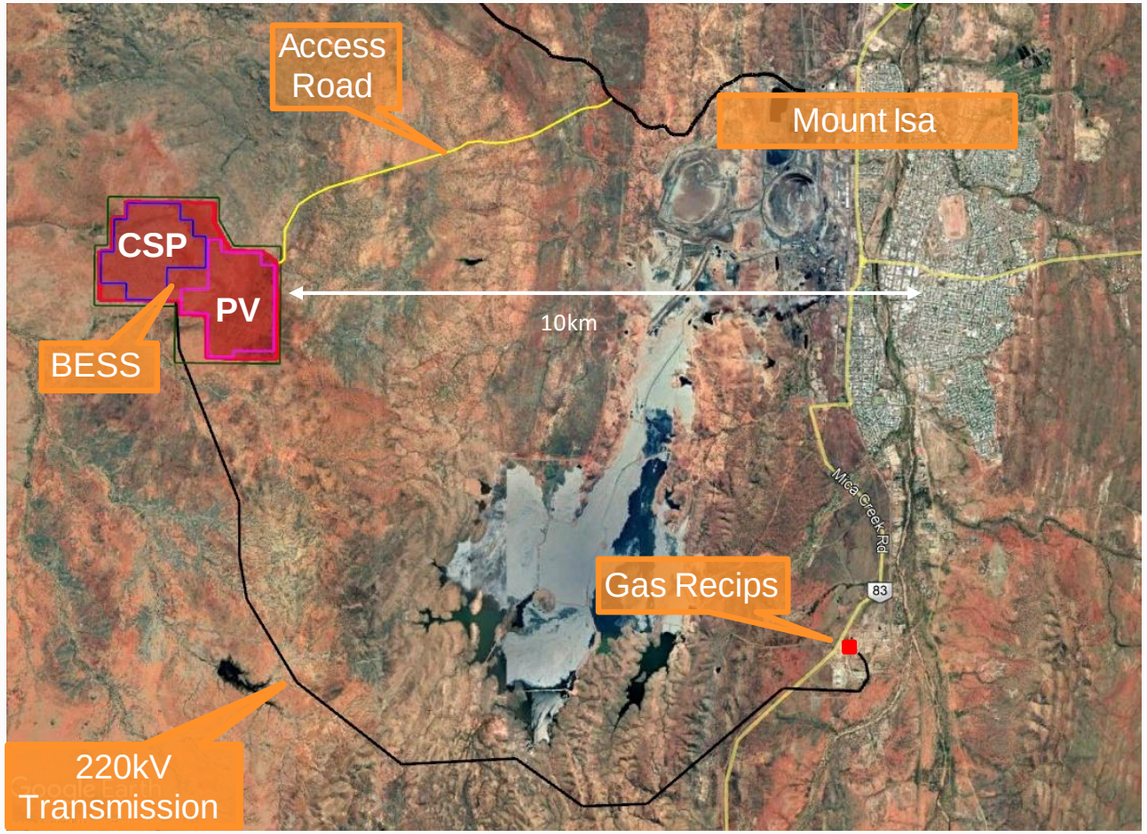
General Arrangement



VS2 – 50MW Mount Isa baseload solar hybrid

Continuous energy powering underground mining operations 24/7 with 99.5% reliability

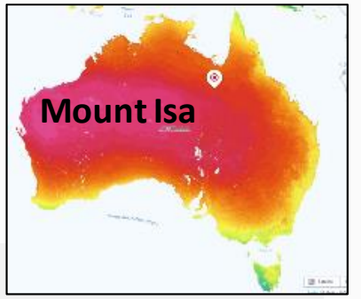




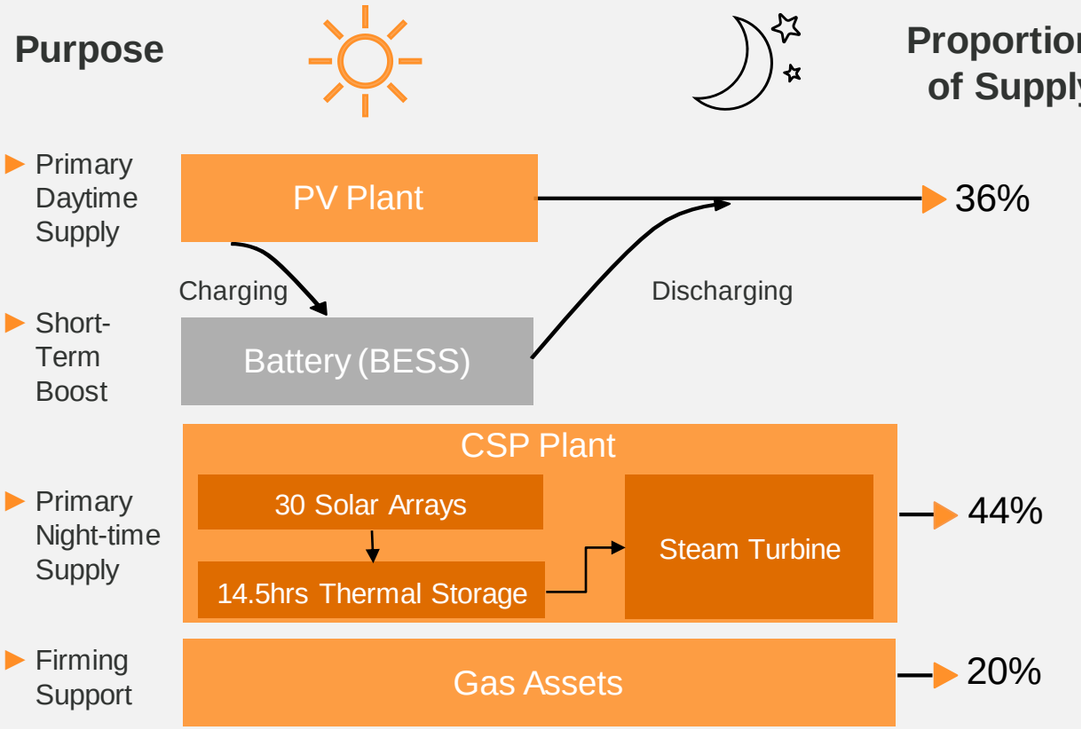
- 600ha site with 35+year option
- Hybrid configuration
  - CSP: 30 solar fields, each with 2,400 heliostats; 14.5 hours thermal storage; 54MW steam turbine
  - PV: 77MW / 60MWAC
  - BESS: 52MW / 14.6Wh
  - Gas Firming : 13 x 4.4MW reciprocating engines
- Project strengths
  - Islanded Grid
  - Large local loads
  - A minerals province of future facing commodities
    - Offtakers seeking high capacity factor renewable power

VS2 – 50MW Mount Isa baseload solar hybrid

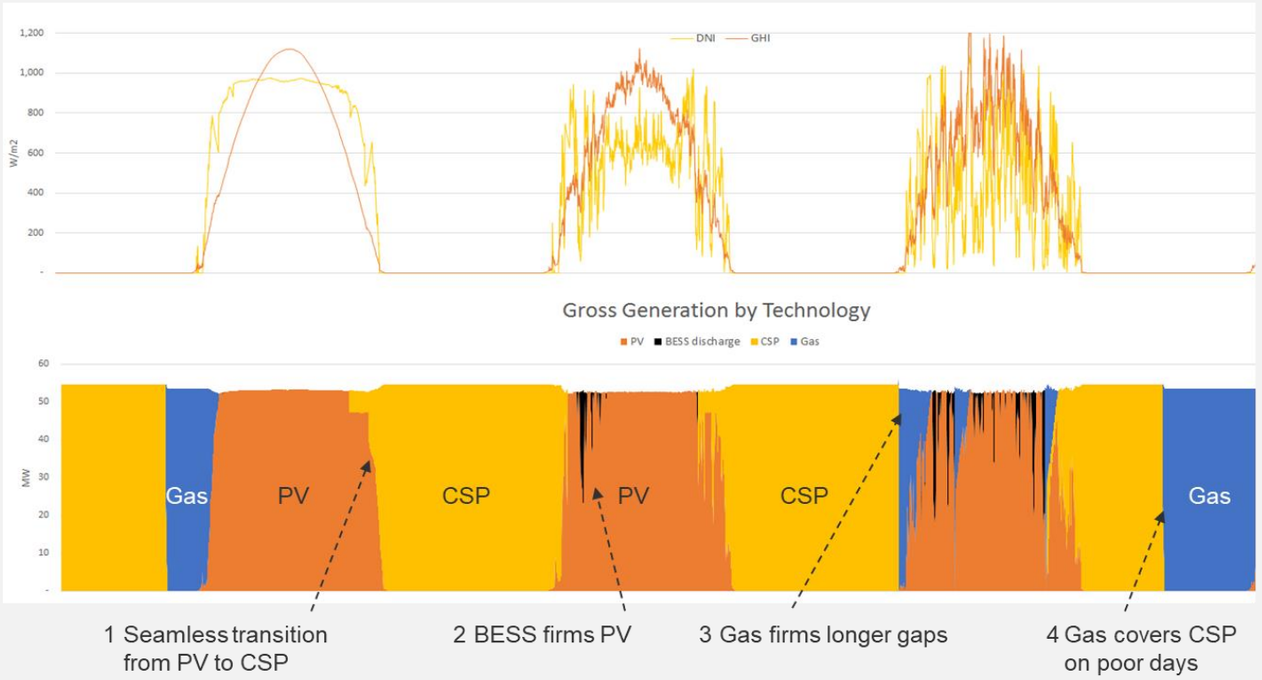
Continuous energy powering underground mining operations 24/7 with 99.5% reliability



Projected annualized performance optimized for lowest LCOE



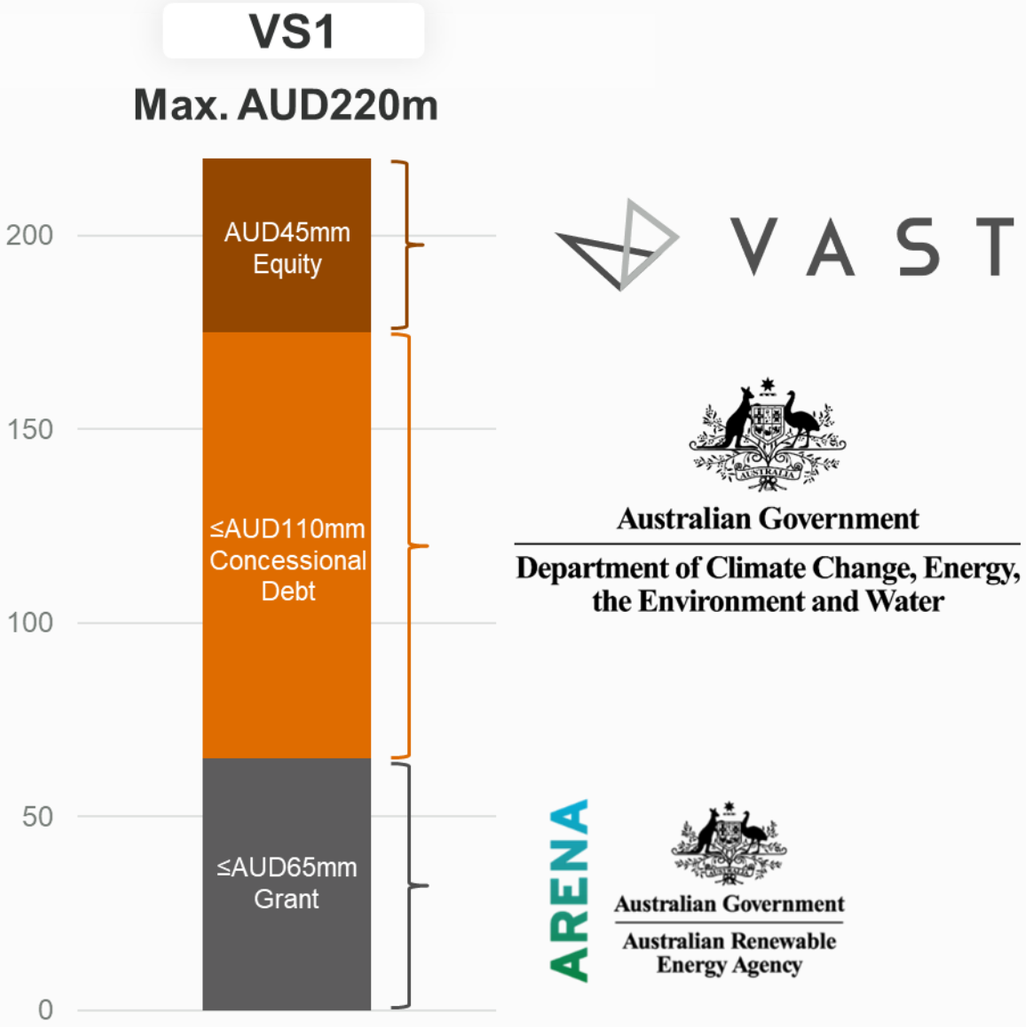
Baseload solar energy: an example three-day period in January[1]



1. P50 TMY at 1 minute resolution

Australian and German Government Support

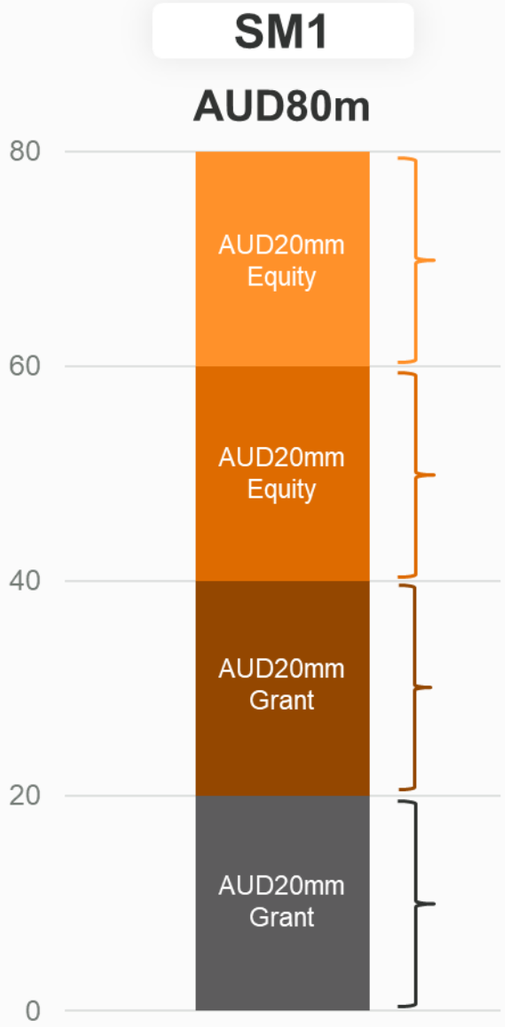
Australian and German governments have announced funding of **up to AUD215 million** for VS1 and SM1



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Australian Government
Department of Climate Change, Energy, the Environment and Water

ARENA
Australian Government
Australian Renewable Energy Agency



Australian Equity — *Under Negotiation*

MABANAFT — *Under Negotiation*

ARENA Australian Government Australian Renewable Energy Agency

ptj Projektträger Jülich Forschungszentrum Jülich

Illustrative Unit Economics: Sample 150 MW Projects

	Chile 150 MW[1]					US (Nevada) 150 MW[1]					Average Typical Project 150 MW[2]				
	T-1	T-2	COD	T+1	30-Year Life of Plant	T-1	T-2	COD	T+1	30-Year Life of Plant	T-1	T-2	COD	T+1	30-Year Life of Plant
Developer Fee (FID)	$14	-	-	-	$14	$17	-	-	-	$17	$16	-	-	-	$16
OEM (During Construction)	$158	$158	-	-	$316	$201	$201	-	-	$402	$180	$180	-	-	$360
O&M (Annual After COD)[3]	-	-	$9	$9	$347	-	-	$9	$9	$359	-	-	$9	$9	$353
Software Support Fee (Annual After COD)[3]	-	-	$1	$1	$41	-	-	$1	$1	$41	-	-	$1	$1	$41
Total Revenue	**$173**	**$158**	**$10**	**$10**	**$718**	**$218**	**$201**	**$10**	**$10**	**$818**	**$196**	**$180**	**$10**	**$10**	**$770**
Developer Fee (FID)	$9	-	-	-	$9	$11	-	-	-	$11	$10	-	-	-	$10
% Net Margin	*65%*	-	-	-	*65%*	*65%*	-	-	-	*65%*	*65%*	-	-	-	*65%*
OEM Margin	$32	$32	-	-	$63	$40	$40	-	-	$80	$36	$36	-	-	$72
% Net Margin	*20%*	*20%*	-	-	*20%*	*20%*	*20%*	-	-	*20%*	*20%*	*20%*	-	-	*20%*
O&M Margin	-	-	$2	$2	$87	-	-	$2	$2	$90	-	-	$2	$2	$88
% Net Margin	-	-	*25%*	*25%*	*25%*	-	-	*25%*	*25%*	*25%*	-	-	*25%*	*25%*	*25%*
Software Support Fee	-	-	$1	$1	$41	-	-	$1	$1	$41	-	-	$1	$1	$41
% Net Margin	-	-	*100%*	*100%*	*100%*	-	-	*100%*	*100%*	*100%*	-	-	*100%*	*100%*	*100%*
Total Net Margin	**$41**	**$32**	**$3**	**$3**	**$200**	**$51**	**$40**	**$3**	**$3**	**$222**	**$46**	**$36**	**$3**	**$3**	**$211**
% Margin	*24%*	*20%*	*33%*	*33%*	*28%*	*23%*	*20%*	*33%*	*33%*	*27%*	*24%*	*20%*	*33%*	*33%*	*27%*

Note: COD = Commercial Operation Date. T = Years from COD

1. Illustrative 150 MW Vast project economics are based on the average of a 100 MW and 200 MW illustrative project in the same geographic location
2. Illustrative Average Typical 150 MW Vast Project economics are based on the average of the 150 MW illustrative projects in Chile and the U.S. (Nevada)
3. Annual O&M Revenue and Software Support Fees are escalated by assumed inflation of 2.0% annually over the 30-year operating life of the plant and added as a simple sum

Strong Customers and Partners

Long-term relationships with an extensive network of partners that help deliver globally competitive products and technology

Supply Chain

cea
METAUX SPECIAUX
MONDRAGON ASSEMBLY
ZD
CONTRATOS Y DISEÑOS INDUSTRIALES S.A.
John Cockerill
DOOSAN Doosan Škoda Power
MARSH ALLIANCE
Masters & Young
KSB
SULZER
Machinebouw & Profileertechniek
SCHWARZE-ROBITEC
REIS ROBOTICS
EMERSON
SENSIA
QUEENSLAND PLASTICS
Osborn CONSULTING ENGINEERS
SAMSON
SUAVAL group
FENIKS
Natron Energy
cspservices concentrating solar power services
eltherm

Technology Development

sbp schlaich bergermann partner
NREL Transforming ENERGY
KIT Karlsruher Institut für Technologie
U.S. DEPARTMENT OF ENERGY
CONTRATOS Y DISEÑOS INDUSTRIALES S.A.
CSIRO
ASTRI Australian Solar Thermal Research Institute
John Cockerill
Australian National University
UNSW
QUT Queensland University of Technology

Leveraging Nabors' Capabilities to Accelerate Vast's Global Deployment

Agreements With Nabors

- Vast has entered into several agreements with Nabors:
  - Joint Development and Licensing Agreement to jointly develop technology to improve Vast's CSP systems by leveraging Nabors expertise in automation, robotics, remote operations, material science, among others
  - Shared Services Agreement with respect to various support functions
- Additionally, in December 2022 Vast entered into arrangements with companies within Nabors' venture platform:
  - Memorandum of Understanding between Vast and Sage Geosystems Inc. to evaluate opportunities to collaborate on future solar projects incorporating the Sage geothermal battery + storage technology, which allows for both storage and generation of energy from the earth's heat
  - Letter of intent between Vast and Natron Energy, Inc., a provider of sodium-ion battery products, to use revolutionary Natron batteries in projects using Vast's CSP technology
- Additional opportunities for partnership and collaboration include leveraging Nabors' global supply chain and operational footprint as well as its advanced engineering and engineering expertise, infrastructure resources, market knowledge, technology innovation / competencies and customer / vendor relationships

	Nabors' Capability	Vast Applicability
Strategic	**Automation & Robotics**	▪ Mirror cleaning ▪ Automated pop-up manufacturing
	Manufacturing & Facilities	▪ Global supply chain ▪ Global field and technical support
	Controls, Software & AI	▪ Mirror array controls ▪ Remote operations ▪ Fluid control systems
	Nabors Technology	▪ Material sciences ▪ Hydrogen
	Nabors Ventures	▪ Revolutionary battery tech (Natron) ▪ Baseload energy enhancer (Sage)
Scaling	**Commercial**	▪ Global relationships in key markets: U.S., Middle East and Latin America
	Technology Development	▪ Engineering capabilities ▪ IP procedures
	Maintenance Operations	▪ Remote control centers ▪ Continuous monitoring of field hardware
Public Readiness	**Accounting**	
	HR	
	IP Management	
	Multi-Jurisdictional Experience	
	Processes & Procedures	

Key Investment Highlights

- Potential to deliver low-cost, dispatchable renewable energy – the holy grail of clean energy
- Proprietary technology that addresses CSP's historical reliability and manufacturability issues
- Targets large addressable market
- Partnership with Nabors should accelerate deployment
- Attractive entry point provides for potential asymmetric risk / reward profile



VAST

Appendix

Vast Team – Experienced, Entrepreneurial



Craig Wood - Chief Executive Officer

- Joined Vast as CEO in 2015
- 23 years of leadership experience in corporate management and structured finance across the energy and technology sectors
- Previously served as CEO of Brownes Dairy and Director at Archer Capital
- Master of Science in Finance from the London Business School, Rhodes Scholar at the University of Oxford and Bachelor of Science in Mechanical Engineering from the University of Western Australia



Mark Smith - Chief Financial Officer

- Joined Vast as CFO in 2023
- Nearly 20 years of C-Level corporate management experience in the energy sector, including 15 years as a public company CFO
- Prior to corporate roles, held variety of investment banking roles with Bank of Montreal and Nesbitt Burns Securities
- Master of Business Administration from Oklahoma City University and Bachelor of Science in Petroleum Engineering from the University of Oklahoma



Kurt Drewes - Chief Technology Officer

- Joined Vast in 2017
- Over 15 years of experience in renewable and CSP technology in various project management roles at ACWA and Abengoa and as Head of Production Management at Novatec Solar
- Leading roles in many CSP projects including AWCA's NOOR 3 project and Abengoa's Khi Solar One project
- Master of Business Administration from the University of Capetown and Bachelor of Science from the University of Witswatersrand



Lachlan Roberts – General Manager IEP

- Joined Vast in 2021
- 24 years of experience in construction and project management in the energy, mining and infrastructure industries
- Previously served as a General Manager for Monadelphous Engineering overseeing over 1,000 contractors
- Master of Business Administration from the University of Melbourne and Bachelor of Mechanical Engineering from University of Western Australia



Christina Hall - Head of Finance

- Joined Vast in 2016
- 23 years of experience in accounting, financial and operational advisory
- Previously served as a Director in PwC's Corporate Advisory and Restructuring practice
- Registered with the Australian Institute of Chartered Accountants and the Australian Institute of Company Directors



Bruce Leslie - Head of Products

- Joined Vast in 2018
- 37 years of experience in engineering, multi-disciplinary technical projects and commercialization of engineering designs
- Over 15 years of experience in renewable energy
- Doctor of Mechanical Engineering from the University of Queensland and Master of Engineering Science from the University of Queensland



Simon Woods - Head of Transactions

- Joined Vast in 2021
- 27 years of experience in investing, banking and law with a focus on project and structured finance
- Previously served as an Investment Director at ARENA leading investments across renewable energy and enabling technologies
- CFA Charterholder and admitted as a solicitor in Queensland, England and Wales



Gilein Steensma - Head of International BD

- Joined Vast in 2021
- 36 years of business development experience across the energy sectors and specializing in the clean energy transition
- Previously served as VP Energy Transition at Worley and managing renewable energy projects including CSP and green hydrogen projects in Morocco, Chile, South Africa, Kuwait, UAE and Spain
- Doctor of Philosophy with the Colorado School of Mines and Master of Science from the University of Alaska Fairbanks



Alec Waugh - General Counsel

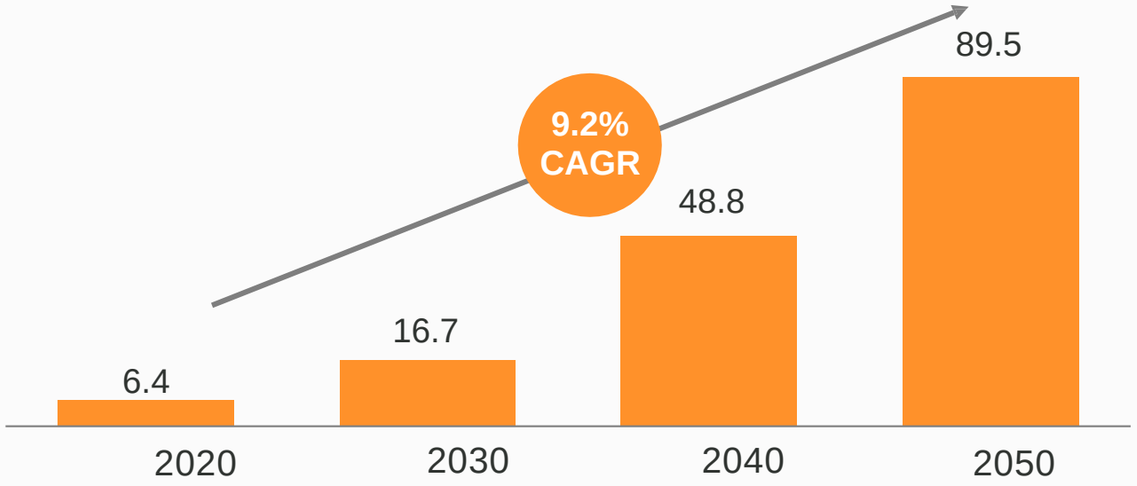
- Joined Vast in 2016
- 24 years of legal, commercial and intellectual property experience
- Previously served as legal counsel across a range of industries including agricultural services and manufacturing
- Diploma in Law (SAB) from Sydney University and admitted as a solicitor since 1997

Market Opportunity

On-Grid Opportunity

Low case–IEA Stated Policies Scenario (STEPS)

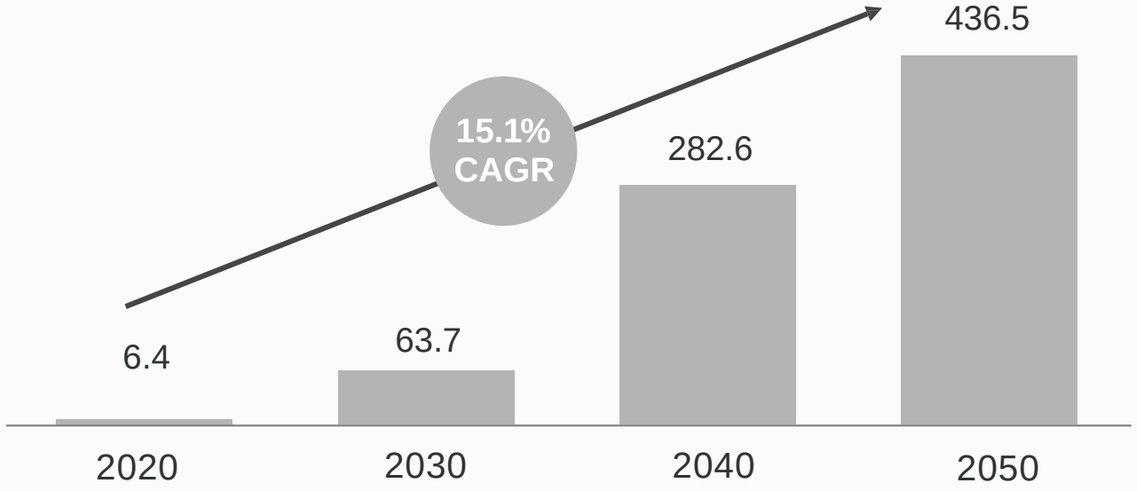
Global projected CSP capacity (in GW–IEA 2022)



Scenario description	Scenario assumes that only policies which have already been public stated, committed to and backed by funding & specific measures are implemented; this will lead to global targets for emission reductions being missed

High case–IEA Net Zero Emissions (NZE)

Global projected CSP capacity (in GW–IEA 2022)



Scenario description	Scenario implies the energy sector reaching net zero CO_2 emissions by 2050; this scenario also indicates achievement of UN Sustainable Development Goals and is consistent with limiting global temperature rise to 1.5ºC

On-grid CSP capacity expected to grow rapidly to 2050

IEA expects CSP deployments to grow between 13x to 62x today's deployments for on-grid applications only

Off-Grid Opportunity

Off-grid demand estimated to be 15 – 20 GW in 2030 and increasing at 6% CAGR

1. **Assumed CSP capacity** in 2030 of 15 – 20 GW and growing at 6% CAGR to 2050, based on historic growth rate of mine and main applicability of technology to mine sites with appropriate characteristics (e.g. sufficient energy requirement, solar irradiance, etc.)

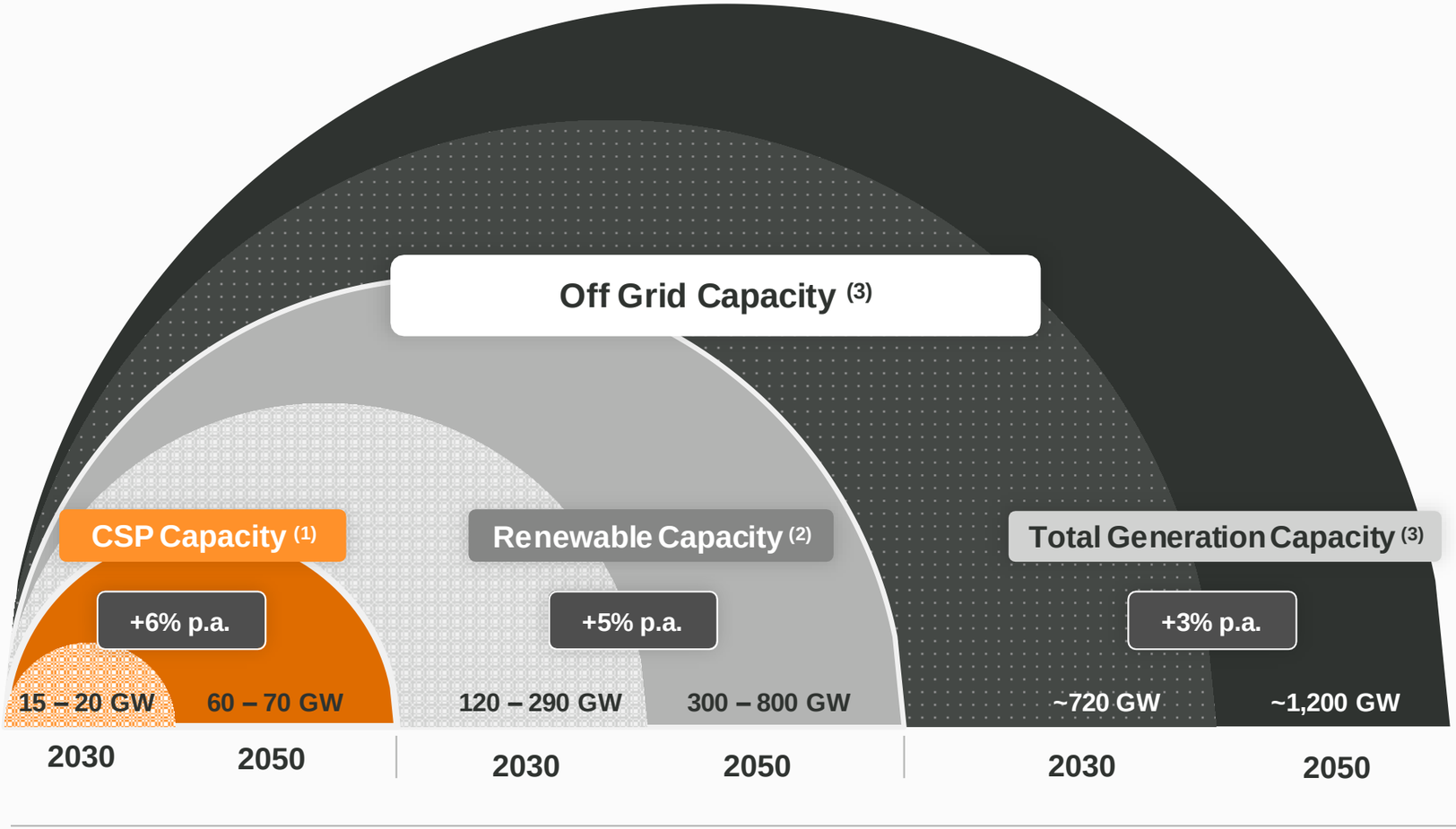
   CSP right to win based on ability to provide storage capacity for peaking & overnight loads

2. **Renewable off-grid capacity:** IRENA forecasts renewables to account for 40% of total in 2030, increasing to 66% by 2050 under net zero scenario, and 17% in 2030

   Expect an increasing use of renewable generation in order to increase electricity supply, improve reliability & reduce costs

3. **Total off-grid capacity** assumes approx. 6% of total on-grid (per ARENA)

   Growth in total generation lower than renewables due to increasing grid connections (e.g. in Sub-Saharan Africa, and Asia); however use of off grid power in mine sites & other industrials



Source: *IEA, ARENA, IRENA, Top Tier International Management Consulting Firm.*

Heat Generation Opportunity

CSP has strong potential to grow in heat production, with 10 – 40 GW addressable market in 2030 growing at 3% CAGR from 2030 to 2050

1. **CSP range** based on 4% of industrial processes requiring 240-400C heat (per IEA) and sites requiring >40MW power (7% of sites per ARENA) (Vast technology can reach 600C but can be extended to 750-800C)

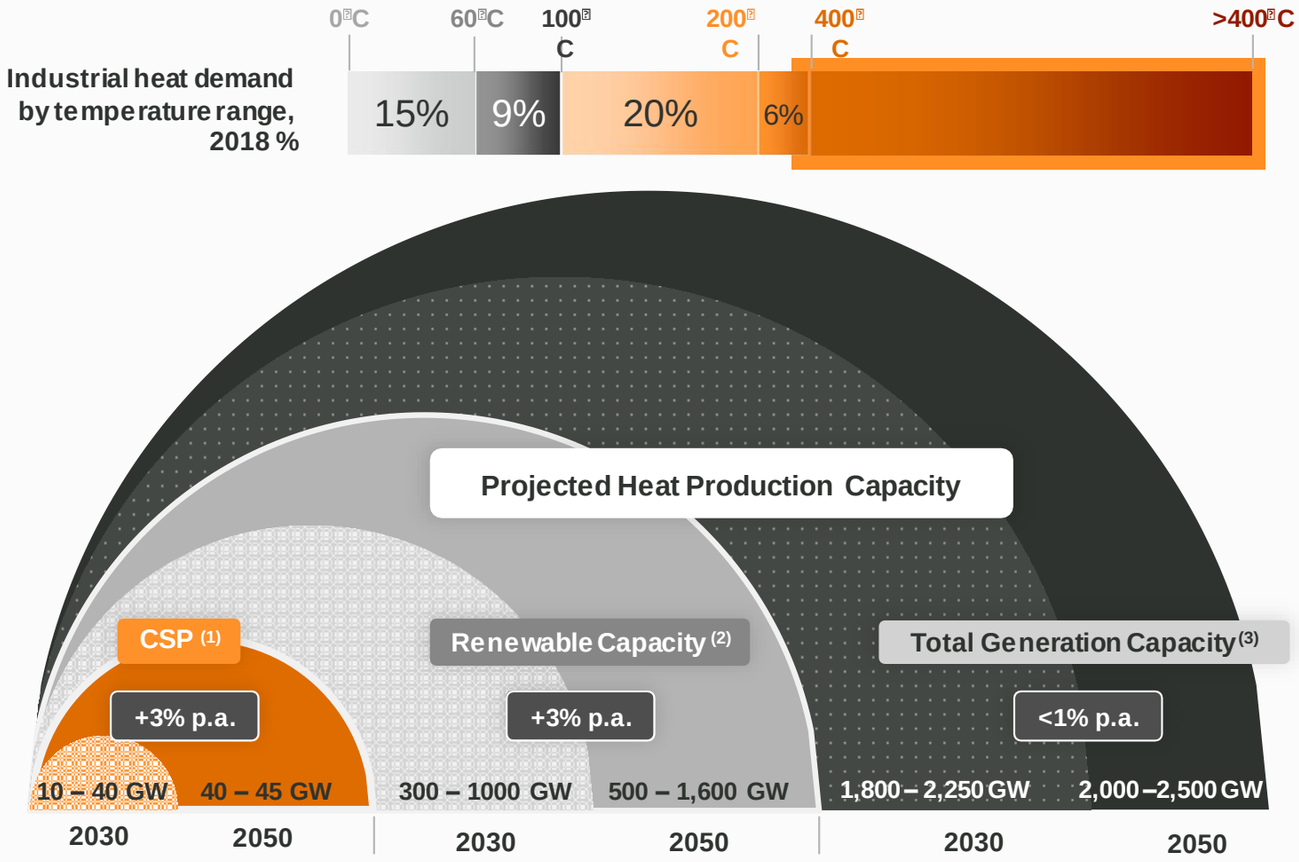
   CSP has a ~40% cost advantage vs. other renewable solutions (e.g., PV + heat; $14/GJ vs. $8-11/GJ for CSP), driving relatively higher CSP share

   Further given most sites are brownfield, harder to penetrate market

2. IRENA forecasts **renewables** to account for 40% of total in 2030 increasing to 66% by 2050 under net zero scenario, and 17% in 2030 and 25% under planned energy scenario

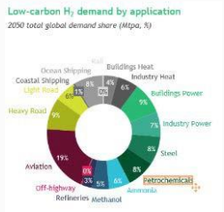
3. IRENA forecast for **total energy increases** from 134 EJ in 2030 to 131 EJ in 2050; reduction due to increased electrification over time

   Lower end based on ratio of (22x) total electricity used in industrial processes in priority countries vs. Australia (per ARENA 2019)



Source: *IEA, ARENA, IRENA, Top Tier International Management Consulting Firm*

Renewable Fuels Opportunity

	Key use case	Renewable volume		Key assumption for GW conversion	Estimated renewable market (GW)		Key assumption for CSP share of market	Est. suitable for CSP Market (GW)	
		2030	2050		2030	2050		2030	2050
SAF		Synthetic Fuel (non-bio) <1 Bn L	90 – 260 Bn L 2030 based on planned production, 2050 based on 20% and 50% SynFuel scenarios	• SAF energy density: 35 MJ / L • Process efficiency: 52.7% • Capacity factor: 58-96%	**1 - 3**	**200 - 940**	Assumes countries with sufficiently high solar irradiance for CSP have a share of Synthetic SAF production that is proportional to the amount of Aviation activity in their region: ~64%	**1 - 2**	**120 - 600**
Methanol		~7MT	~113MT Based on average of Methanol Institute and Maersk McKinney forecasts	• Methanol energy density: 6.2MWh / tonne • Methanol production process efficiency: 48 – 52% • Capacity factor: 58-96%	**9 - 17**	**120 - 220**	Assumes that priority countries suitable for CSP will produce methanol for the ships in their ports + ships in the top 10 largest ports in the world that can store fuel. (1) These ships account for ~47% total fuel consumption	**4 - 8**	**55 - 100**
Ammonia		~74MT	~185MT Based on average of IRENA and Maersk McKinney forecasts	• Energy required per tonne of Ammonia: 9.2 – 10 MWh • Capacity factor: 58-96% (assumes 8 – 11 hours of sunlight and CapEx invested for additional 6 – 12 hours of thermal storage and PV)	**80 – 150**	**270 – 460**	Assumes that priority countries suitable for CSP will produce methanol for the ships in their ports + ships in the top 10 largest ports in the world that can store fuel.(1) These ships account for ~47% total fuel consumption	**35 - 70**	**120 - 220**
Low-carbon Hydrogen		Green Hydrogen ~6MT	~73MT Low-carbon hydrogen based on stated policies. Green hydrogen shared based on IEA forecasts	• Green Hydrogen energy density: ~37MWh / tonne • Process efficiency: ~82% • Capacity factor: 58-96%	**25 - 50**	**360 - 660**	Lower end: (20%) assume same proportion will be captured as off-grid CPS power genreation Higher end: (59%) priority countries with high irradiance can produce green Hydrogen using CSP	**10 - 25**	**180 - 330**

Source: *As Prepared by a Top Tier International Management Consulting Firm. DNV GL, JP Morgan, IRENA, Maersk Mc-Kinney Moller Center, Methanol Institute, press articles, National Hydrogen Strategy; Irena; COAG Energy Council; BNEF; Wood Mackenzie; IEA Roadmap to Net Zero by 2050; IRENA World Energy Transitions Outlook: 1.5C Pathway; CEFC Australian hydrogen market study; Qantas 2022 Sustainability Report; U.S. Energy Information Administration*

(1) Top 10 ports are in China (already included in priority countries), Singapore, South Korea (Busan), and Netherlands (Rotterdam)