

Quarterly investment report: Large-scale renewable generation and storage

Q4 2024





About this report

The Clean Energy Council's quarterly investment report tracks utility-scale projects from the financial investment commitment stage through to the completion and operation of the plant.

The financial investment commitment stage – in which projects receive agreement for access to debt and equity, based on the necessary project development and connection approvals and contracting arrangements being in place – is considered a crucial lead indicator for new capacity build. Once projects have received a financial investment commitment, they are considered likely to proceed.

The Clean Energy Council is aware that, variations exist in development stage definitions across the industry, and as such the Clean Energy Council's data may differ from other datasets for the same period. It should also be noted that the Clean Energy Council's project data is retrospective, and so is subject to change depending on updated public information.

Investment figures for specific projects and quarterly/annual totals within the report are expressed in nominal terms (not adjusted for inflation). When a chart references investment trends beyond 12 months, it is expressed in real terms to adjust for inflation. The base month used with a CPI value of 100 is September 2017, and is drawn from the Australian Bureau of Statistic's [Monthly Consumer Price Index Indicator](#).

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Clean Energy Council

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Highlights

- A strong finish to 2024, with seven new large-scale renewable energy projects, representing 1,598 MW of new generation capacity being financially committed.
- This quarterly result is in line with the pace required for Australia to maintain its timely transition to a grid powered by clean energy, in the face of ageing and increasingly unreliable coal fired power stations
- Over the course of 2024, investment was greenlit on 4,346 MW of new generation capacity, worth over \$9 billion in capital value, representing the best annual investment figures since 2018.
- Q4 saw 870 MW / 1,936 MWh worth of storage projects reach financial commitment.
- 2024 was another outstanding year for energy storage, with 4,029 MW / 11,348 MWh of new projects committed over the year, and 870 MW / 1,936 MWh of new energy storage committed in Q4.
- After being a successful recipient of the first round of the Capacity Investment Scheme (CIS) tenders in December, the Goulburn River Solar Farm contributed 585 MW of newly financially committed generation capacity for Q4.

New generation projects continue steady growth

Seven renewable energy generation projects totalling 1,589 MW achieved financial close in Q4. Quarters three and four were the first time new generation projects reaching financial commitment surpassed 1 GW in consecutive quarters since 2021.

The largest of these projects was New South Wales' Goulburn River Solar Farm with a capacity of 585 MW. Queensland's Wambo Wind Farm Stages 1 & 2, with capacities of 252 and 254 MW respectively, were the next largest. Both of these projects had already begun construction prior to receiving financial close in December. The rolling 12-month quarterly average for capacity of financially committed generation projects has passed 1 GW for the first time since Q3 2021, now revised to 1,086 MW.

From an investment perspective, Q4 recorded \$2.4 billion* worth of financially committed large-scale renewable energy generation projects. The largest single share of this investment was the Goulburn River Solar Farm with a value of \$880 million. High investment throughout the year has meant the newly revised rolling 12-month quarterly average for investment of financially committed renewable generation projects reached \$2 billion. This is the first time it has reached this level since Q2 2019.

While this is a positive quarterly result, this level of capacity is required each quarter to meet the federal government's target of 82 per cent renewable energy generation by 2030. With a range of 6-7 GW of new generation renewable energy needing to be committed annually, an average of at least 1.5 GW of new generation projects need to be committed each quarter to meet this target, highlighting the need of policy focus to address key barriers to investment including planning and environmental assessment processes, transmission build and grid connection, and Renewable Energy Zone strategic planning and engagement.

Construction commenced for three generation projects, worth 598 MW of capacity. This was largely due to the aforementioned Goulburn River Solar Farm with a capacity size of 585 MW. This is 34 per cent lower than the updated rolling 12-month quarterly average of 911 MW of generation projects which have commenced construction. 22 generation projects worth 3,644 MW of capacity commenced construction in 2024 with an investment value of \$6.8 billion.

Storage continues as a reliable focus of investment

Large-scale energy storage remained steady in the final quarter of 2024, with five projects representing 870 MW (capacity) / 1,936 MWh (energy output), reaching financial commitment. The largest of these projects was the nearly three-hour Woolooga Battery Energy Storage System in Queensland with a size of 222 MW / 640 MWh. By state, Queensland had the largest share of financially committed storage projects in both capacity (370 MW) and energy (936 MWh).

Of these five projects, four are hybrid storage assets, meaning they are combined with some other form of generation – such as storage and solar, or storage and wind.

The average combined capacity / energy of these hybrid projects was 174 MW / 387 MWh respectively for Q4.

25 storage projects worth 4,029 MW / 11,348 MWh reached financial commitment in 2024, slightly lower than the record of 4,663 MW / 11,509 MWh set in 2023. Total investment for these projects reached at least \$3.9 billion for the year.

Meanwhile five storage projects, all of which were battery energy storage systems, commenced construction this quarter, totalling 867 MW / 2,475 MWh. Of these projects, three are attached to an accompanying generation project.

Milestones reached for commissioned storage projects

One renewable generation project, New South Wales' Rye Park Wind Farm, was commissioned in Q4 2024, worth 396 (MW) of new capacity. Ten generation projects were commissioned in 2024, with a combined total of 1,054 MW. This is reflective of the challenges projects have been facing in reaching financial close in recent years, with few opportunities for projects to progress towards the final stages of the pipeline.

Two storage projects were commissioned in Q4 2024 worth 419 MW / 1,277 MWh. This is the first time commissioned storage projects have passed the 1 GWh mark in a single quarter.

*Total investment figures mentioned are most likely higher, as not all projects provide publicly available capital investment data

CEC definitions

Financial commitment: publicly available information stating that a project's financing agreements have been signed, and the owner can begin drawing on the financing to commence work on the project. Typically this aligns with execution of connection agreement and generator performance standards with the relevant network service provider and AEMO.

Under construction: publicly available information that a project has started construction work.

Commissioned: publicly available information that a project is fully completed and operational (a project that is currently operational but not commissioned falls under the category under construction).

Q4 2024

Project tracker

Generation and storage projects reaching financial commitment or commencing construction

Name	Owner	Type	State	MW (MWh)
Generation				
Carwarp Energy Park	Recurrent Energy	Solar	VIC	171
Goulburn River Solar Farm	Lightsource BP	Solar	NSW	585
Hay Solar Farm	Cleanpeak Energy	Solar	NSW	8
Horsham Renewable Energy Park	State Electricity Commission	Solar	VIC	119
King Rocks Wind Farm	Synergy	Onshore wind	WA	105
Orange Community Renewable Energy Park	EDPR Australia	Hybrid (solar, battery)	NSW	5 (5)
Warradarge Wind Farm - Stage 2	Bright Energy Investments	Onshore wind	WA	103
Storage				
Blue Grass Solar Farm Battery Energy Storage System	X-Elio	Battery	QLD	148 (296)
Bungama Battery Energy Storage System	AMP Energy	Battery	SA	150 (300)
Eraring Battery Energy Storage System - Stage 2	Origin Energy	Battery	NSW	240 (1,030)
Horsham Renewable Energy Park Battery Energy Storage System	State Electricity Commission	Battery	VIC	100 (200)
Williamsdale Battery Energy Storage System	Ekus Energy	Battery	ACT	250 (500)
Woolooga Solar Farm Battery Energy Storage System	Lightsource BP	Battery	QLD	222 (640)

Generation and storage projects reaching commissioning

Name	Owner	Type	State	MW (MWh)
Generation				
Rye Park Wind Farm	Tilt Renewables	Onshore wind	NSW	396
Storage				
Collie Battery - Stage 1	Neoen	Battery	WA	219 (877)
Rangebank Battery Energy Storage System	Shell Australia	Battery	VIC	200 (400)

View our [project tracker](#) for further details on all projects.

Note: Projects which have reached multiple stages in the same quarter have only been included in the latest stage.



Project pipeline

There are currently 88 renewable electricity generation projects which have either reached financial commitment or are under construction, representing 13,187 MW of capacity in the pipeline. There are also 52 committed storage projects currently in the development, equivalent to 10,531 MW / 26,285 MWh in capacity / energy output.

Since 2017, 223 generation and storage projects have been commissioned, representing 17,019 MW of installed electricity generation capacity and 2,112 MW / 3,669 MWh of energy storage.

A breakdown of all projects currently in financial commitment or under construction stages across the states and territories is shown below.

Current generation and storage projects either in financial commitment or under construction, by state

State	Project count	Total project capital investment (\$M)	Generation project capacity (MW)	Storage project capacity (MW)	Storage project energy output (MWh)
ACT	2	471	-	350	600
NSW	33	8,064	3,749	3,135	7,720
NT	5	102	45	41	39
QLD	29	10,030	4,460	2,945	6,686
SA	15	1,450	620	997	2,264
TAS	-	-	-	-	-
VIC	29	8,887	3,270	1,736	4,327
WA	27	6,807	1,044	1,328	4,649
TOTAL	140	35,810	13,187	10,532	26,285

Current onshore wind projects either in financial commitment or under construction

State	Project count	Total project capital investment (\$M)	Generation project capacity (MW)
ACT	-	-	-
NSW	3	1,172	617
NT	-	-	-
QLD	8	6,071	2,882
SA	1	435	412
TAS	-	-	-
VIC	4	4,359	1,648
WA	3	1,113	284
TOTAL	19	13,150	5,843

Current solar projects either in financial commitment or under construction

State	Project count	Total project capital investment (\$M)	Generation project capacity (MW)
ACT	-	-	-
NSW	16	3,701	3,047
NT	3	49	45
QLD	7	930	1,152
SA	6	384	208
TAS	-	-	-
VIC	16	2,055	1,617
WA	3	862	312
TOTAL	51	7,981	6,381

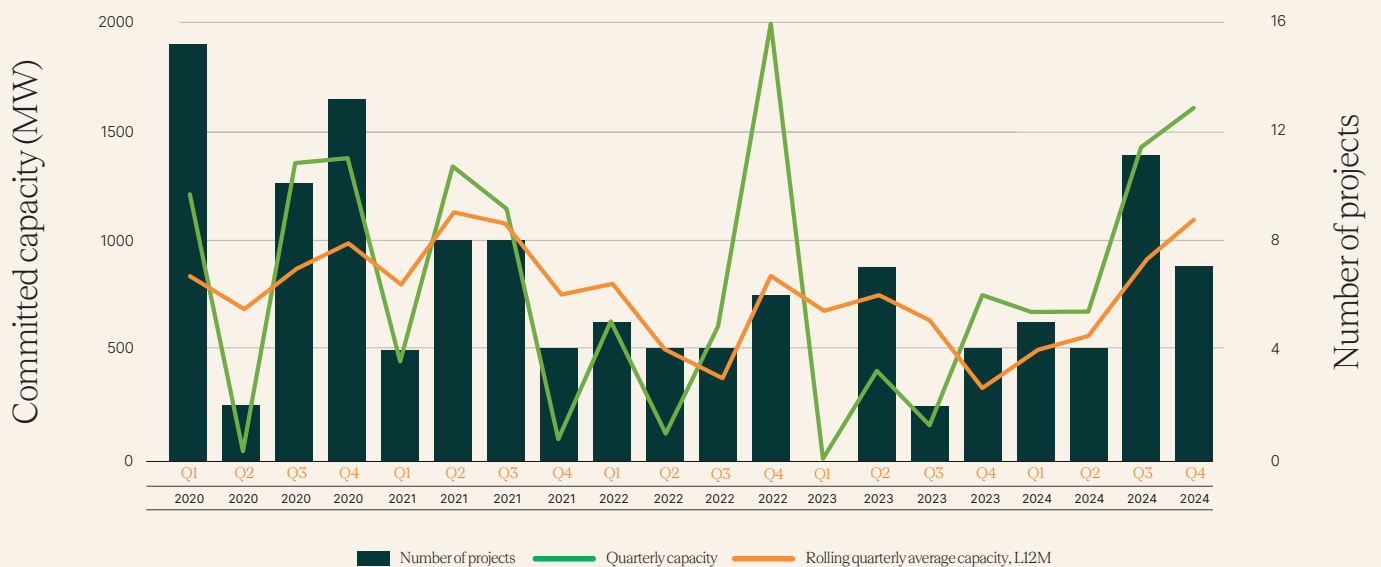
Generation projects

Quarterly generation project performance

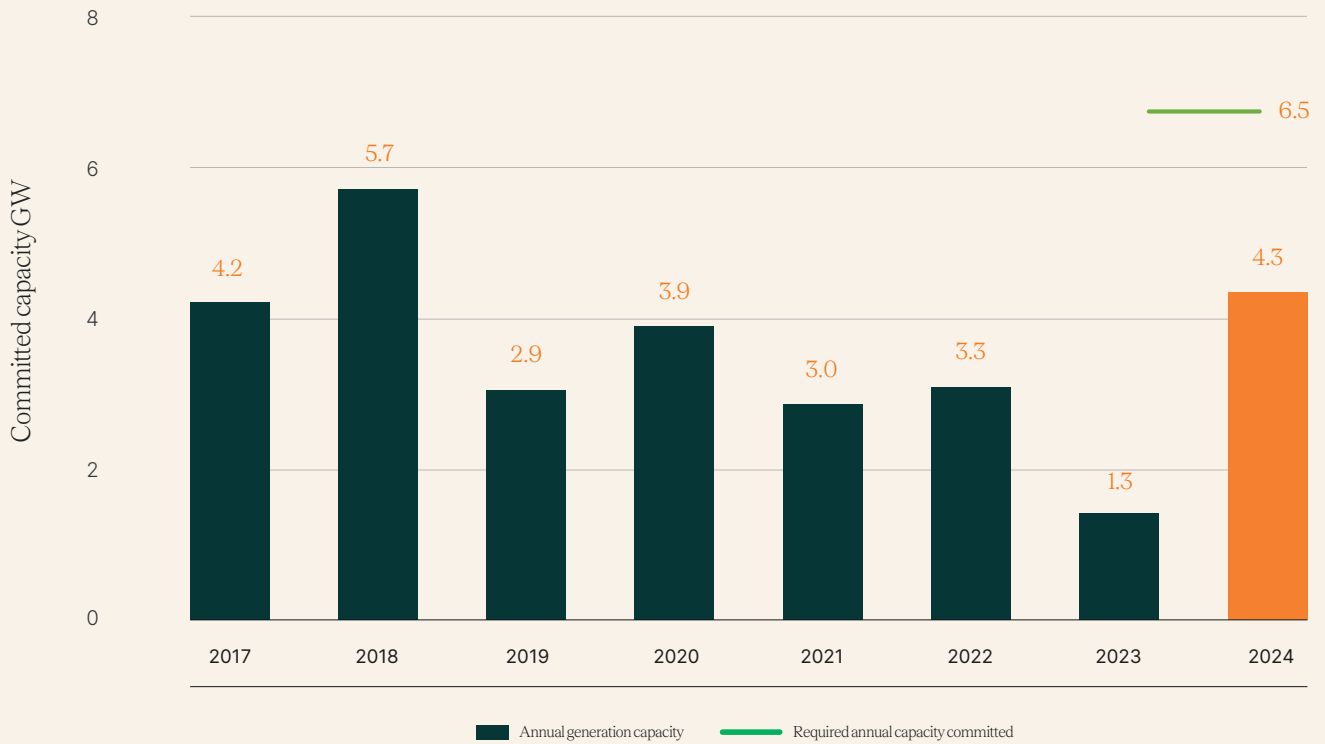
After being a recipient of the first round of the Capacity Investment Scheme (CIS) tenders in December, the Goulburn River Solar Farm contributed over a third of the newly financially committed generation capacity for Q4. The 12-month rolling quarterly average for generation projects rose by 46 per cent to 1,589 MW, up from 1,086 MW in the previous quarter.

The total generation capacity of newly financed generation projects in 2024 reached 4,346 MW, more than triple the total amount seen in 2023.

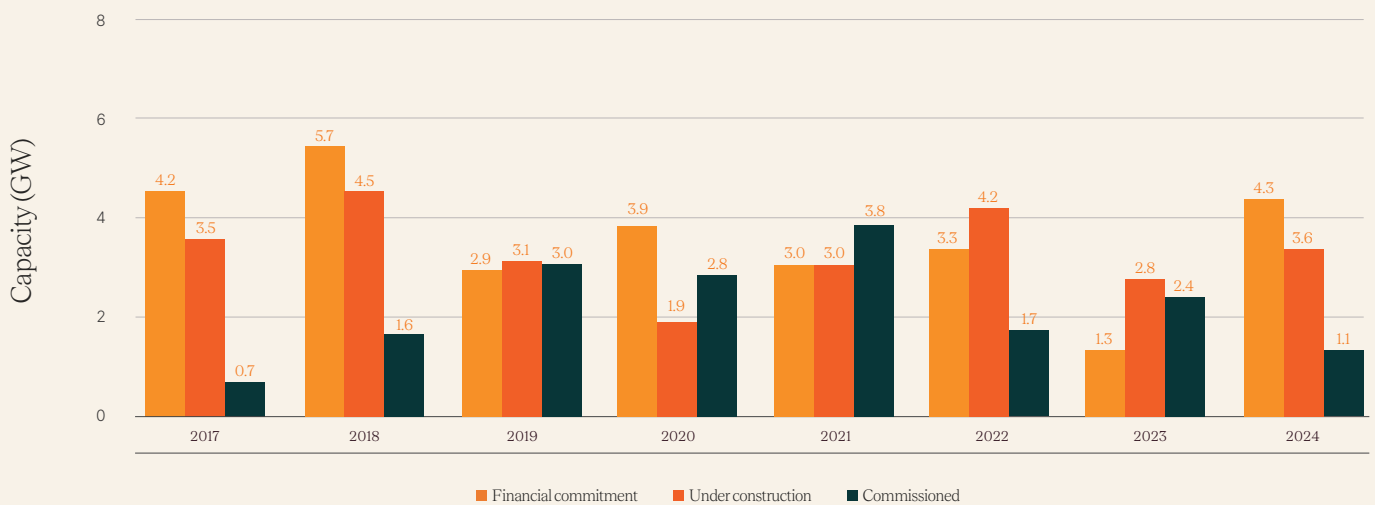
Financially committed generation projects and capacity, quarterly MW



Total capacity of financially committed generation projects, annual GW



Total capacity of generation projects by development status, annual GW



Generation projects by development stage reached, Q4

	Financially committed	Under construction	Commissioned
Q4 results			
Projects	6	3	1
Total capacity	1,589 MW	598 MW	396 MW

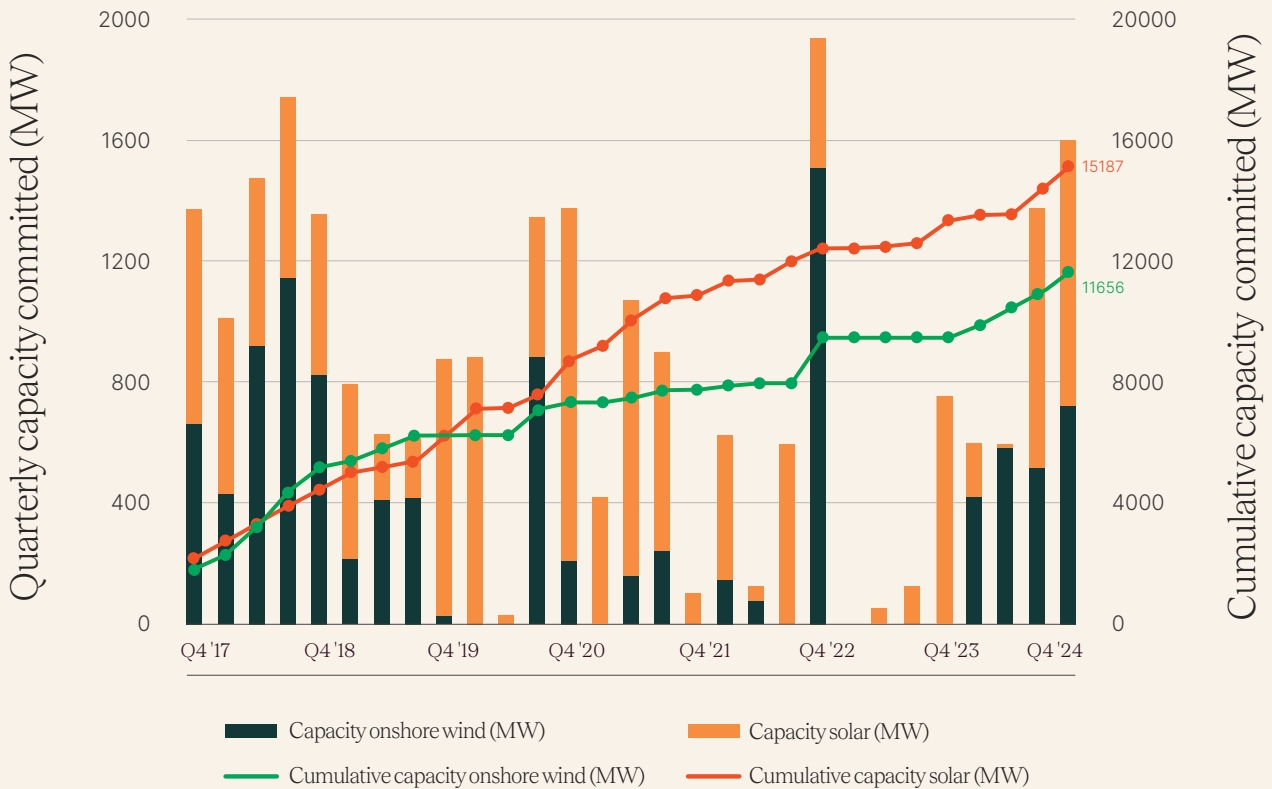
Note - Projects which reach multiple stages have been included in each stage

Solar and onshore wind capacity

Onshore wind bounced back in 2024 with a total of 2,218 MW reaching financial commitment. This was a welcome result after 2023 saw no onshore wind projects reach financial commitment. Meanwhile, investment commitments were greenlit for 1,918 MW of large-scale solar capacity in

2024, compared to 1,314 MW in 2023. Onshore wind and utility-scale solar have reached financial commitment on 11,656 and 15,187 MW worth of capacity respectively since 2017.

Cumulative capacity of financially committed wind and solar projects, quarter MW



Wind and solar are natural complements in terms of operation, and a balanced mix of both technology types supports more stable operation of the power system. It is also key to keeping costs down for consumers.

It is critical that specific issues impacting wind investment, such as technical connection issues and planning and environment considerations, continue to be addressed in order to maintain and accelerate this upward growth trajectory for both forms of technology.

Generation project investment

New large-scale renewable energy generation projects achieving financial commitment reached \$2.4 billion in Q4. Over one third of this investment value came from the \$880 million Goulburn River Solar Farm. The quarter total is 5 per cent higher than the newly revised rolling 12-month quarterly average for investment of generation projects, which is now over \$2.2 billion. This is the first time since 2019 that quarterly average investment has surpassed \$2 billion for financially committed generation projects, in nominal terms.

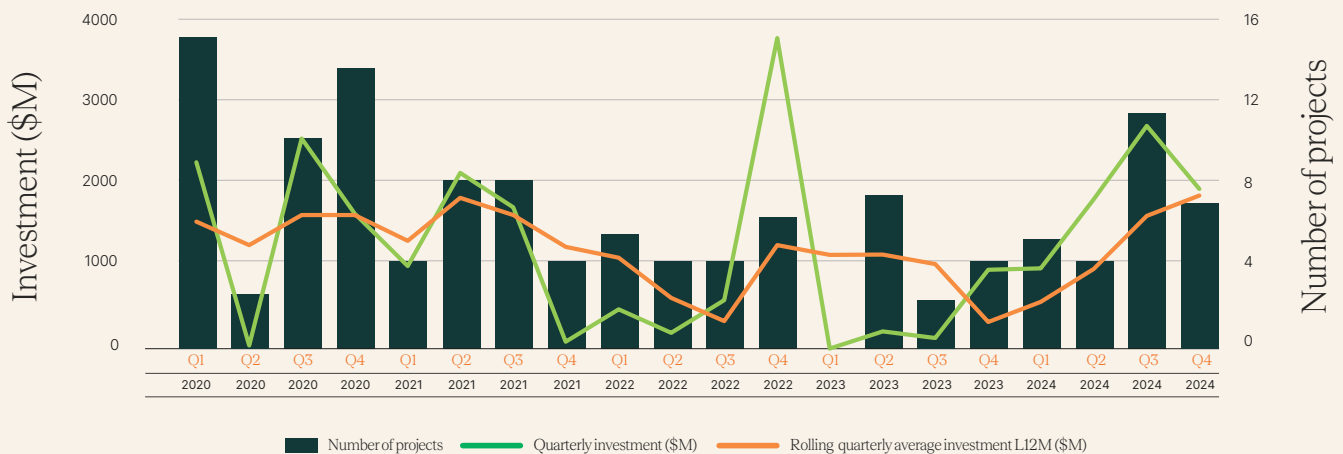
In 2024 there was \$9 billion of investment in financially committed renewable generation projects – the highest annual result seen since 2018 in nominal terms. This was a strong result after the \$1.5 billion of investment seen in 2023.

Onshore wind made up the bulk of investment with just short of \$6 billion financially committed.

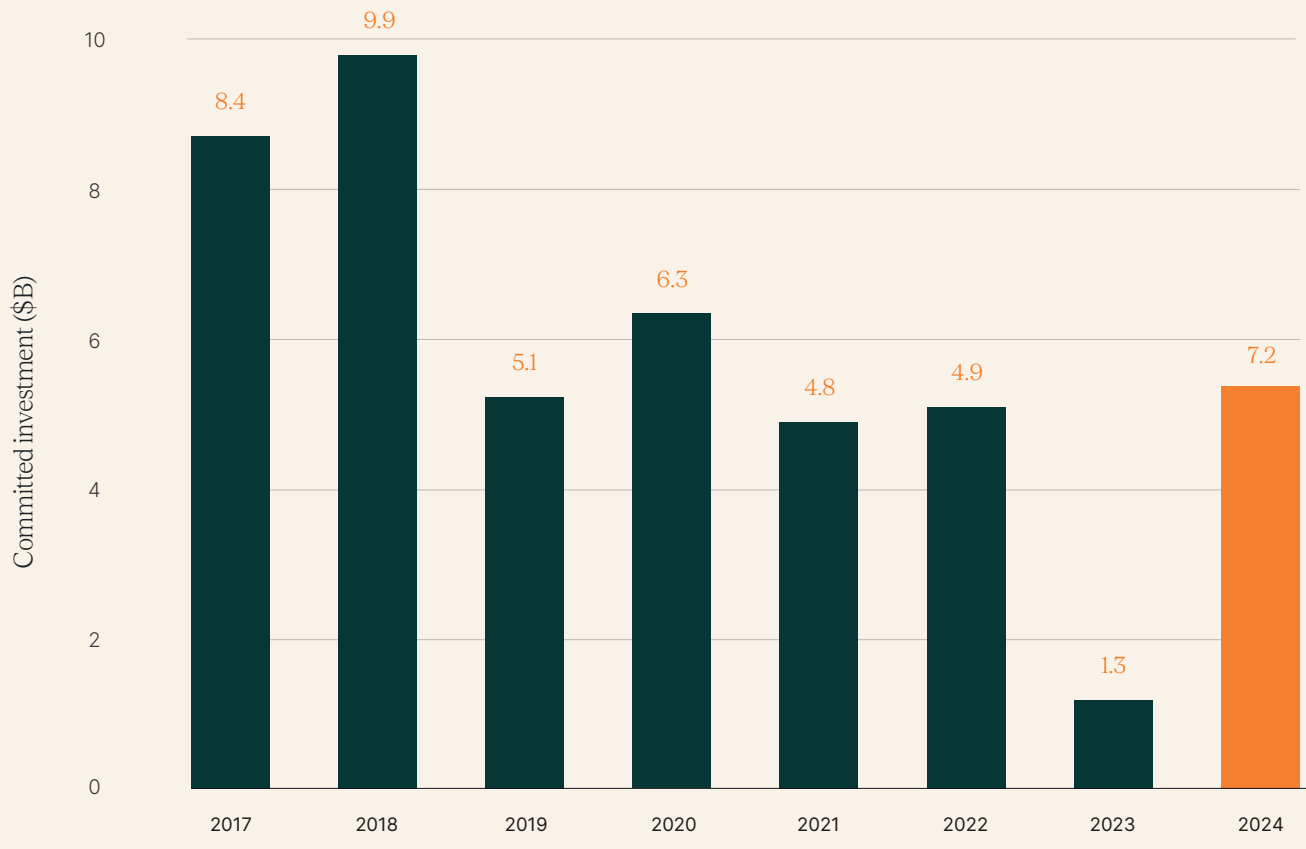
By state, Victoria had the highest share of financially committed generation investment at \$2.8 billion. This was closely followed by Queensland with \$2.2 billion.

The below graphs are expressed in real investment values to better reflect trends over time, with 2017 as the base year.

Financially committed generation projects real investment, quarterly \$AUD (million)



Total real investment of financially committed generation projects, annual \$AUD (billion)



Breakdown of generation project nominal investment by development stage reached, Q4

	Financially committed	Under construction	Commissioned
Q4 investment	\$2.4 billion	\$887 million	\$700 million

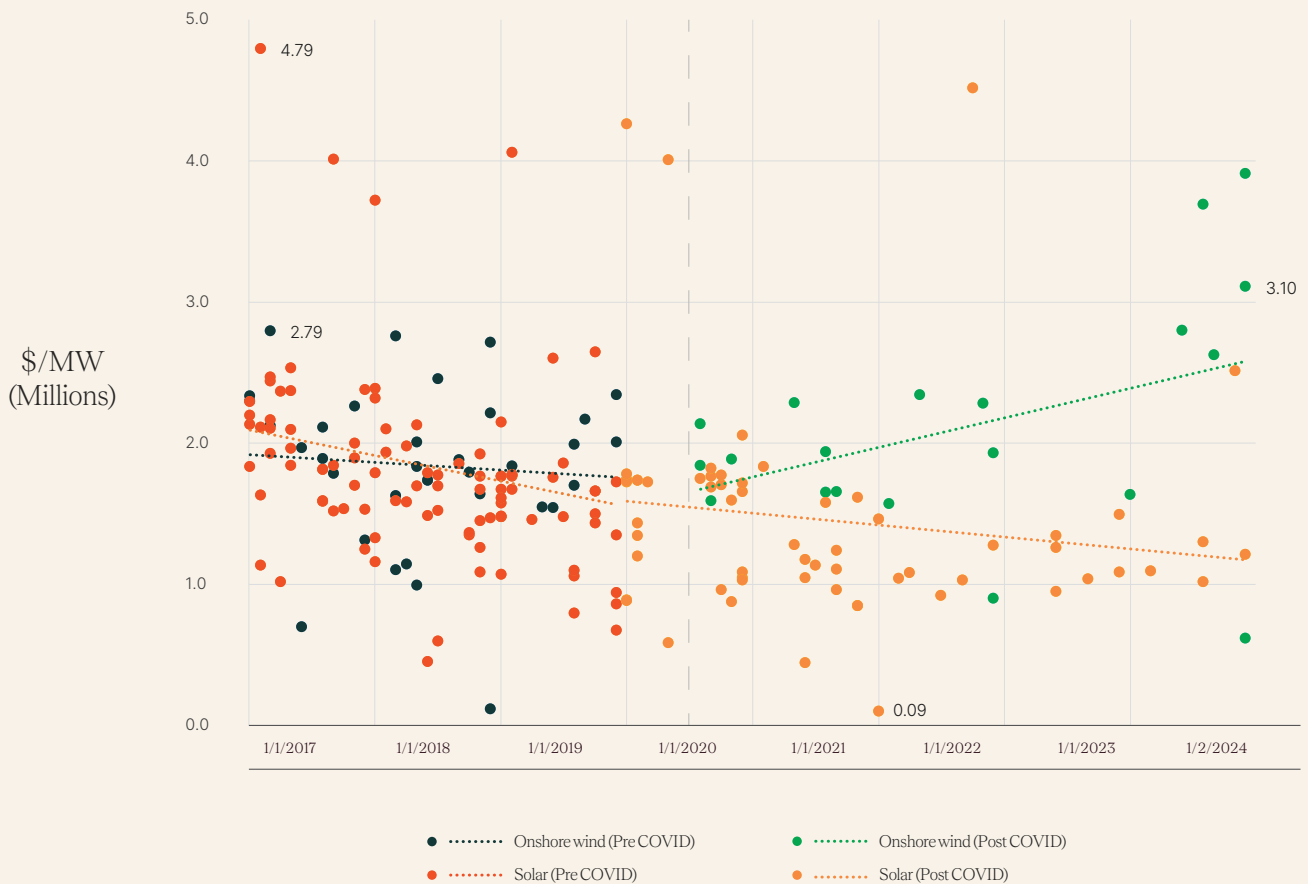
Note - Projects which reach multiple stages have been included in each stage

Generation project capital investment spend per MW

The below chart shows the relationship between the change in capital investment required for each MW of capacity of generation projects over time. Expressed in millions of dollars, all solar and onshore wind projects that reached financial commitment from 2017 onwards have been included to view the trend over time. It is typically expected that as technologies and project delivery systems mature, costs will decrease, and while this is reflected in utility PV and its downward trend, onshore wind has seen an increase since 2020.

There are a wide range of reasons explaining the increasing costs associated with onshore wind projects, led by higher commodity (particularly steel) and equipment prices, transportation and labour costs as a result of constrained supply chains throughout the pandemic and following the Russian invasion of Ukraine.

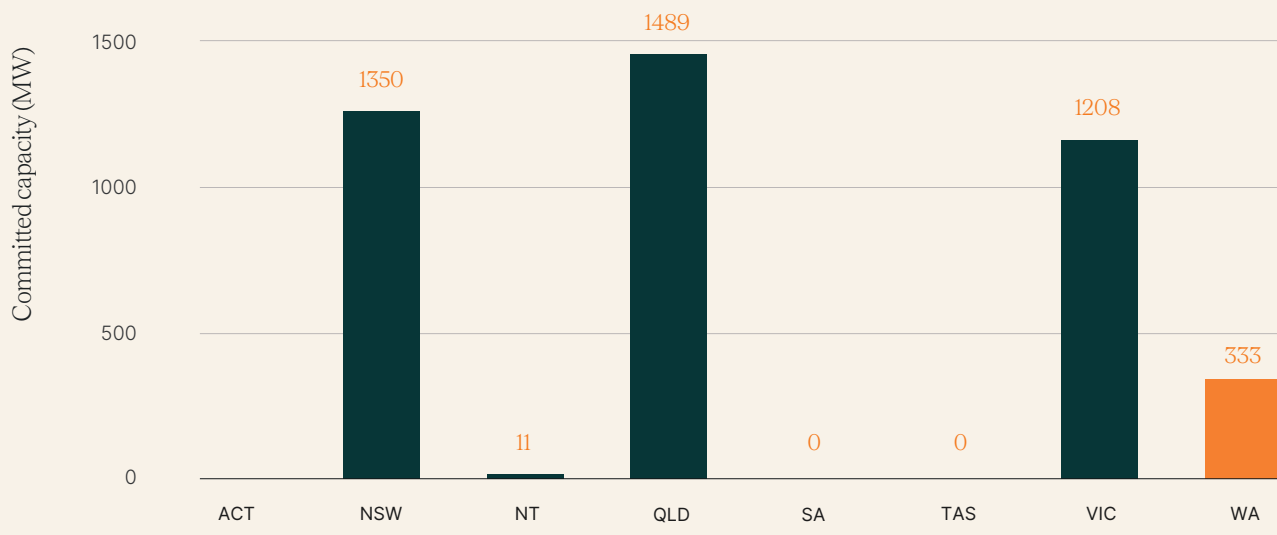
\$/MW for wind and large-scale solar projects, real \$AUD



Note – The chart above shows \$/MW values expressed in millions of dollar (AUD). It is expressed in real terms, using monthly CPI values extracted from the ABS, with September 2017 as the base month. The months of January 2017 – August 2017 use CPI values with an assumed annual inflation growth of 2.5%.

Generation projects by state

Total capacity of projects financially committed in 2024 by state, annual MW



Project completion time by state

On average across Australia, it takes solar projects six fewer months than wind projects to progress from financial commitment through to the final commissioned stage.

South Australia leads all states when it comes to average time from financial commitment to commissioning for all

technology types. Western Australia is the only state with a sufficient sample size for hybrid projects to be included in the data, where it takes 14 months to progress from financial commitment to commissioning.

Project completion time – from financial commitment to commissioning

State	Solar	Onshore wind	Battery	Hybrid
VIC	18	26	19	N/A
NSW	20	30	N/A	N/A
QLD	23	N/A	N/A	N/A
SA	17	21	17	N/A
WA	20	N/A	28	14
Total average by tech:	20	26	21	14

Notes - Average based on solar, onshore wind and storage projects that have reached commission since 2017.

The stated timeframe excludes the project development phases (e.g. Project design, planning & environmental assessments etc.) prior to Financial Commitment.

Each technology type needs to have at least five commissioned projects in a state for the average to be included.

Energy storage projects

Battery energy storage systems (BESS)

Large-scale battery projects have had another strong quarter, with five new battery systems totalling 870 MW (capacity) / 1,936 MWh (energy generation) reaching financial commitment in Q4. However, the rolling 12-month quarterly average for new battery project energy generation fell from the record set last year by 22 per cent to a revised value of 2,837 MWh. The average duration of these five projects was 2.2 hours.

The largest battery reaching financial commitment for the quarter was Queensland's Woolooga Battery Energy Storage System with a size of 222 MW / 640 MWh, and duration just shy of three hours. Queensland had the most projects reaching financial commitment with three, while the Australian Capital Territory, South Australia and Victoria all had one each.

Of these projects, three commenced construction in the same quarter, and overall there were five projects reaching this stage, totalling 867 MW / 2,475 MWh.

Records were broken for battery project capacity reaching commissioning. Two projects reached this final stage: Victoria's Rangelbank BESS (100 MW / 200 MWh), and Western Australia's Collie Battery – Stage 1 (219 MW / 877 MWh). With a combined quarterly total of 419 MW / 1,277 MWh, this was the first time over 1 GWh worth of battery projects had been commissioned in a single quarter. This is a direct result of the strong volume of battery projects reaching financial commitment for the past two years. As a result, the rolling 12-month quarterly average generation of commissioned storage projects reached 419 MWh, a new record.

Battery energy storage system projects by development stage reached, Q4

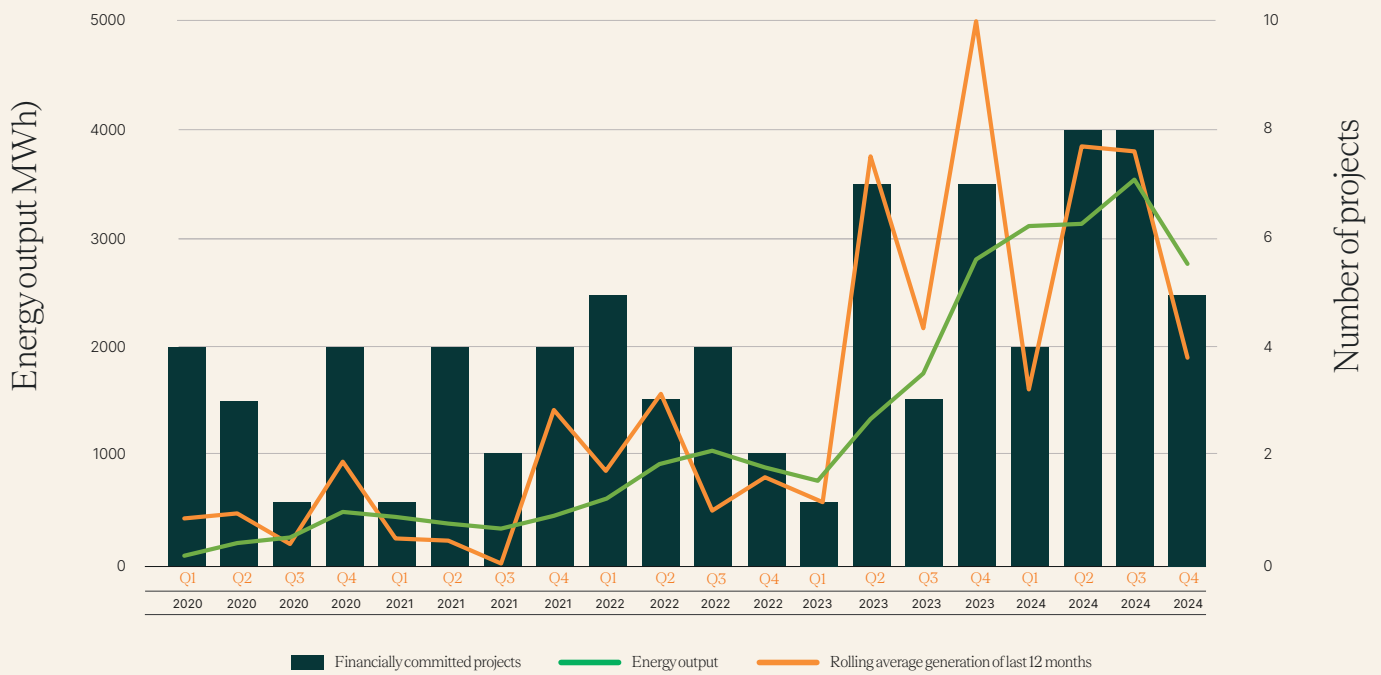
Battery Storage	Financially committed	Under construction	Commissioned
Project count	5	5	2
Project capacity	870 MW	867 MW	419 MW
Q4 results			
Project energy output	1,936 MWh	2,475 MWh	1,277 MWh
Project investment	\$400 million	\$857 million	\$1.1 billion

Notes - Includes hybrid projects with a storage component

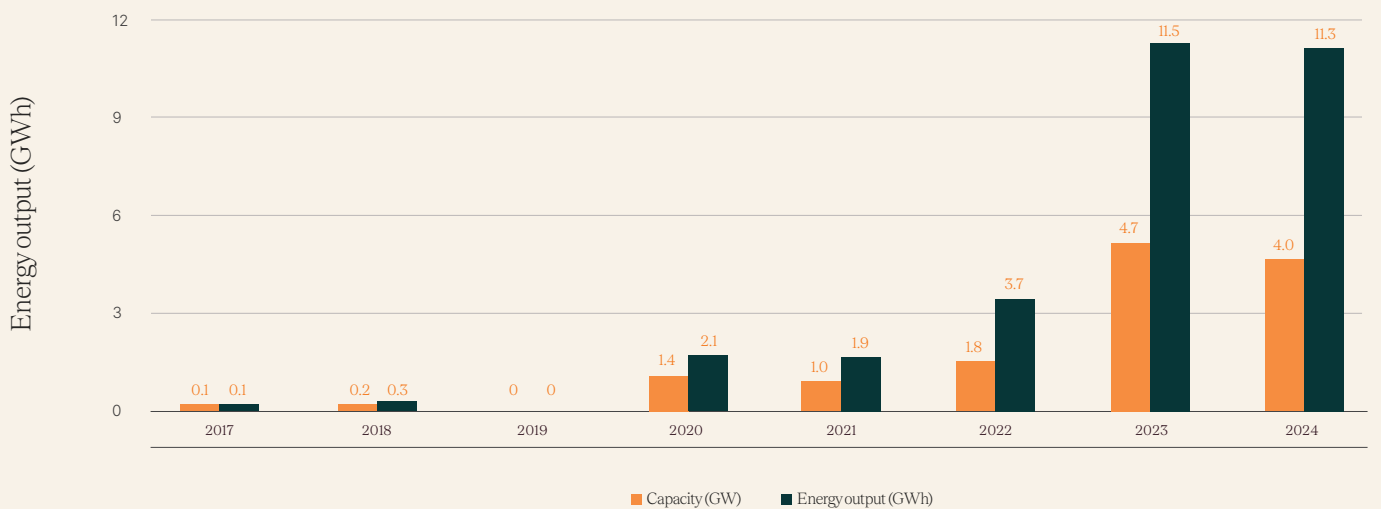
Projects which reach multiple stages have been included in each stage

Project investment is underrepresented as not all projects have publicly available information

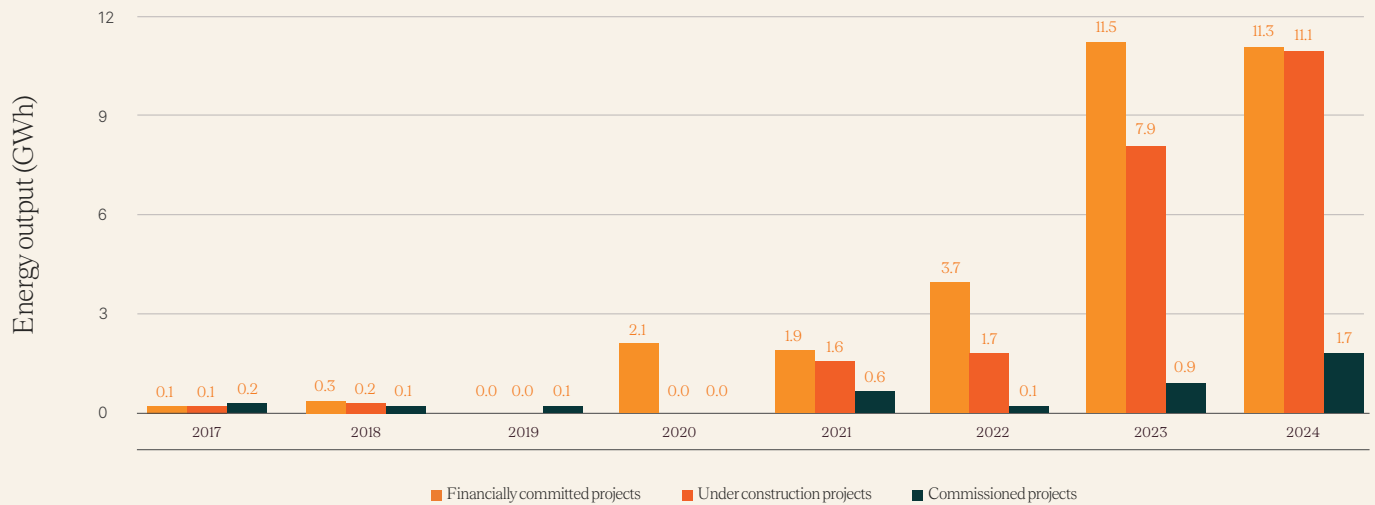
Financially committed storage projects by energy output, quarterly MWh



Total capacity (GW) and energy output (GWh) of financially committed storage projects, annual



Total storage project energy output by development stage, annual GWh



Commissioned battery energy storage system projects by year

Commissioned energy BESS projects

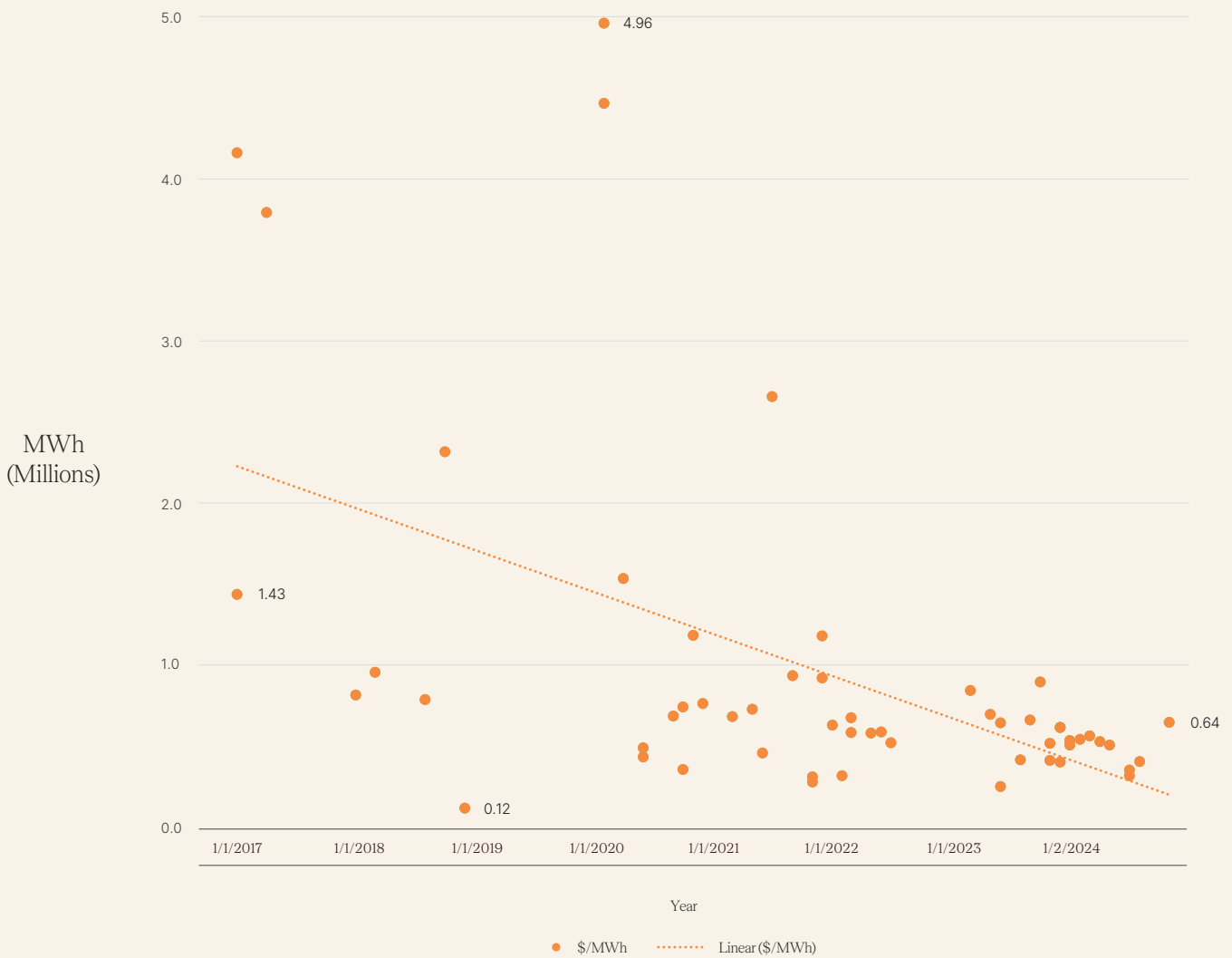
	2017	2018	2019	2020	2021	2022	2023	2024
Number of projects	1	3	3	1	4	4	8	5
Investment (AUD \$M)	90	129	72	42	353	87	960	1,325
MW	150	90	130	13	426	69	724	619
Average MW	150	30	43	13	107	17	91	124
MWh	194	115	135	4	647	101	947	1,677
Average MWh	194	38	45	4	162	25	118	335
Average storage duration (hours)	1.3	1.3	1.0	0.3	1.5	1.5	1.3	2.7

Battery energy storage system project capital investment spend per MWh

The below chart shows the relationship between the change in capital investment required for each MWh of energy for battery energy storage system projects over time. Expressed

in millions of dollars, all battery energy storage system projects which reached financial commitment from 2017 onwards have been included to view the trend over time. The chart below indicates battery energy storage system costs have fallen as they move towards higher energy (MWh) levels.

Chart 14. \$/MWh of storage projects, real \$AUD



Long duration energy storage (LDES)

Long duration energy storage (LDES) is a general term that refers to a wide range of energy storage technologies which are typically held to provide energy output in excess of 8 hours at maximum rated power, and may exhibit a range of other characteristics, such as asynchronous capability, cycling capability and the ability to help manage seasonal energy shortfalls. In this report, the LDES projects captured are large pumped hydro energy projects; however, there are a number of other types of LDES projects currently in development,

and these will be captured in future reports, once they reach financial commitment.

While there were no pumped hydro projects which reached financial close in Q4, there are currently two projects across Australia which are currently under construction. A table summarising these projects is provided below:

Project name	State	Owner	Capacity (MW)	Energy generation (MWh)	Duration
Goat Hill Pumped Storage Hydro Project	South Australia	Altura Group	230	1,840	8
Kidston Pumped Storage Hydro Project	Queensland	Genex Power	250	2,000	8
Snowy 2.0	New South Wales	Snowy Hydro	2000	350,000	175

Hybrid projects

Hybrid projects are becoming more prevalent, with systems consisting of solar and storage, wind and storage, solar and pumped hydro (PHES), or a combination of these. Across the nation, there are 57 projects at various stages of development. Most of these projects are solar and storage systems. Eight projects offer energy output durations in excess of two-hours, including a solar + pumped hydro energy storage project with a duration of eight hours.

Project breakdown of hybrid projects

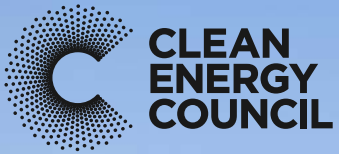
	Solar + Battery	Solar + PHES	Wind + Storage	Wind + Solar + Battery
Generation component	Solar capacity (MW)	4208	-	1267
	Wind capacity (MW)	-	-	2046
	PHES (MW)	-	50	-
Storage component	Capacity (MW)	2095	250	992
	Energy (MWh)	3807	2000	1888
Average duration (hrs)	1.8	8.0	1.6	1.9
Total number of projects	36	1	8	12
Total build cost (\$AUD billion)	\$6.4	0.9	2.3	2.5

Some of the largest hybrid projects are in New South Wales, predominantly solar and storage systems, and South Australia, which are predominantly wind, storage and wind, and solar and storage. When storage is attached to solar systems, the assets tend to have a larger capacity compared to wind and storage hybrid systems.

Hybrid project capacity breakdown by state and type, MW

Types of storage projects by state





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