

# EWEC Portfolio Evolution 2023 - 2035

January 2023

# Agenda



## Introduction

### Statement of Future Capacity Requirements

- Power
- Water

### Program Plan

### Procurement Process

# EWEC plays a key role in defining the future capacity requirements and developing a program plan for the power and water sector



Demand  
forecasting



System and  
operational  
planning



Capacity  
Procurement



Fuel  
Procurement



Contract  
management,  
payment &  
settlement



Scheduling, dispatch  
& transmission  
system operation

## Demand forecasting

- Detailed **hourly power and daily water demand forecast for the next 20 years**
- Demand projected on a **sectoral basis**
- Foundational part of EWEC's mandate as it is used as the primary basis for **generation planning, fuel and commercial agreements, system operational planning**

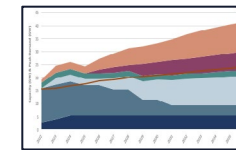
## Statement of Future Capacity Requirements (SOFCR)

- Produced every year, covers a **15-year planning horizon**
- Identifies the optimal **new capacity by technology and year**
- **PLEXOS** is used to plan capacity at the lowest possible total system cost
- Considers a number of **sensitivities around** power and water system **supply-demand** fundamentals
- Assesses **initiatives, projects & future developments** that **impact the overall cost of the sector**

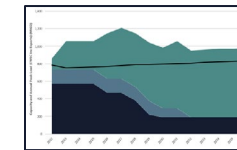
## Program Plan

- SOFCR **recommendations are consolidated into a program plan**
- **The plan is comprised of a schedule of new projects** that specifies **technology type, size, timing and location**
- **It provides clarity to TRANSCO on system / capacity expansion** to support and integrate with transmission planning

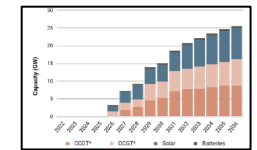
### Example Output



Projections of optimal  
power generation  
capacity by technology



Projections of optimal  
water desalination  
capacity by technology



Projections of Optimal  
Power Generation  
Expansion



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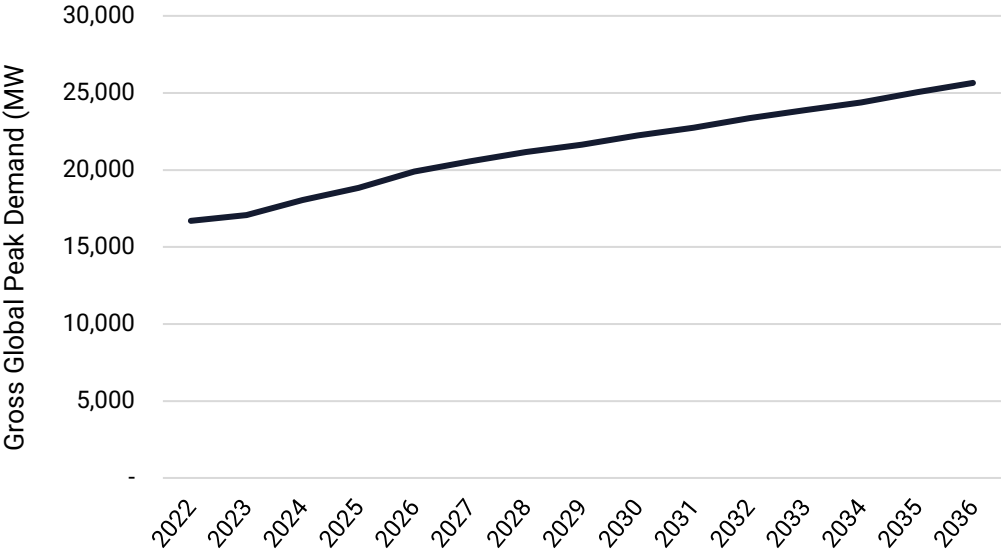
# Peak power demand is expected to increase by 30% between 2022 and 2029, requiring additional generation capacity



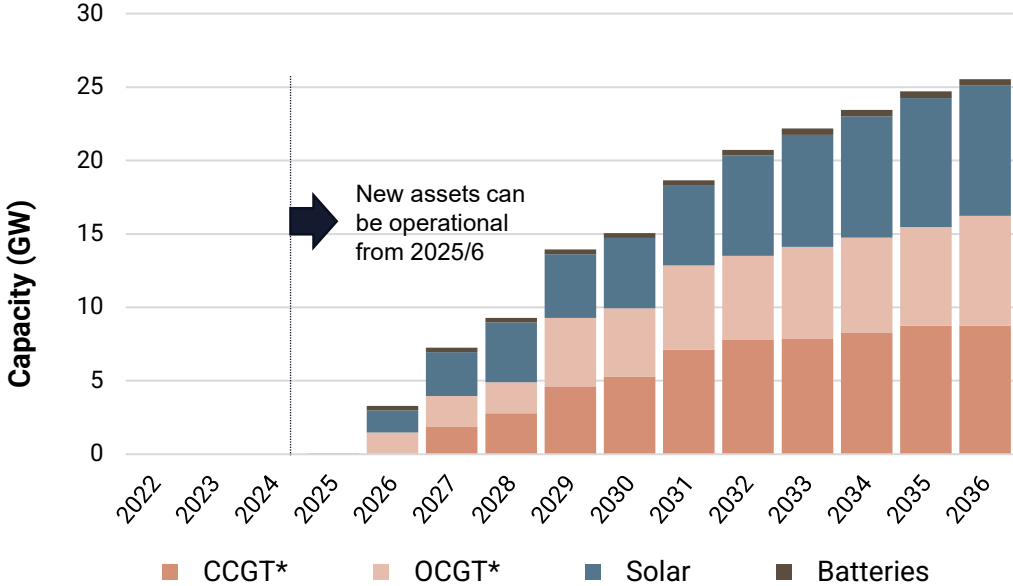
Higher peak demand requires additional thermal and solar generation capacity along with batteries to enhance system reliability

- Thermal: Significant gas capacity (~3.9GW) needed in 2026 and 2027 to replace expired PPAs
- Solar: An additional ~5GW of solar PV is recommended by 2030 (Total 7.3GW installed)
- Batteries: 300MW of batteries configured for reserve provision needed by 2026 to enhance system reliability

Peak demand forecast - Week 7 2022 - 2036



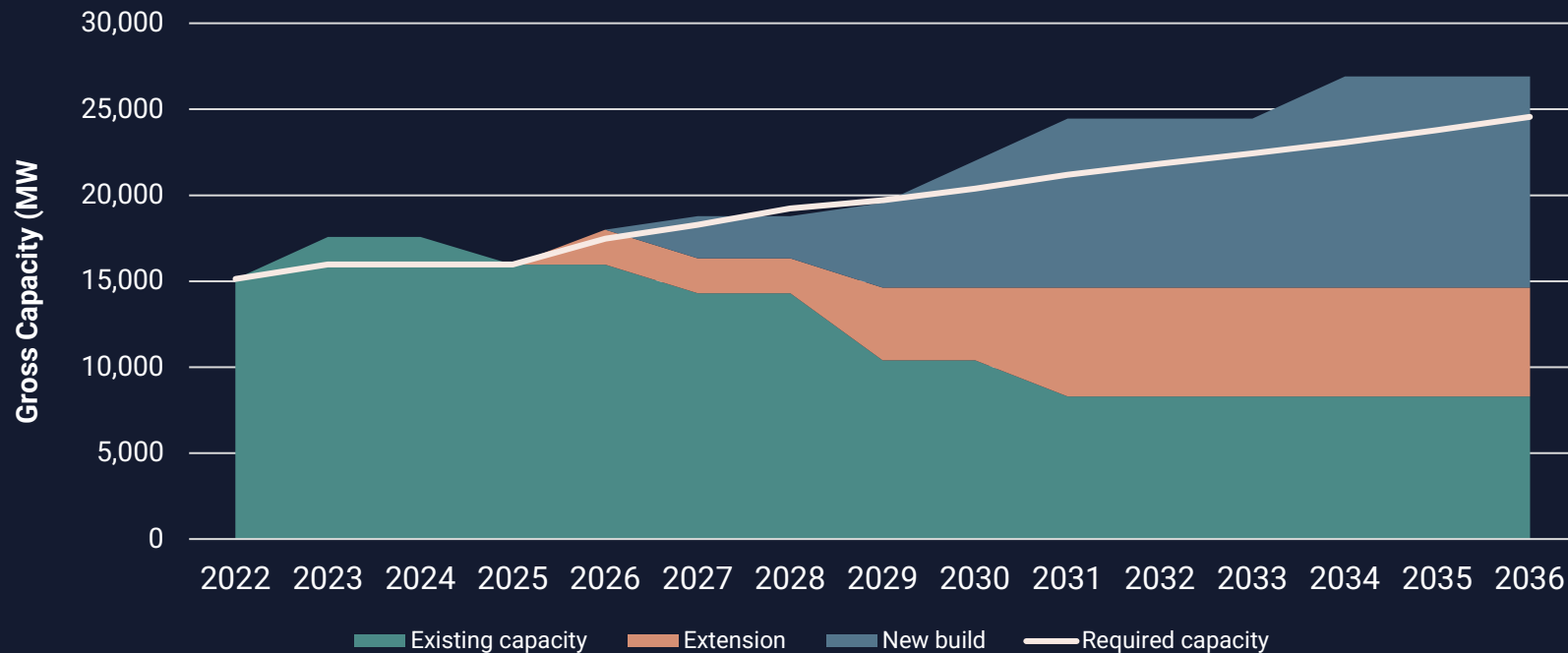
Base Case<sup>1</sup> Capacity Projection, EWEC + EWE (GW – Gross Capacity)



<sup>1</sup>The base case excludes committed capacity (Al Dhafra at 1,500MW and F3 at 2,457MW).  
\* CCGT and OCGT could be new build or contract extension

Additional thermal capacity required will be attained through a combination of plant reconfiguration /extensions and procuring new gas capacity

**Consolidated plan for thermal plant retirement, extension and new build**



- ~7 GW of thermal generation will reach **contract** expiry between 2025 – 2030
- 16.3 GW of additional thermal capacity is required by 2036 which could be fulfilled by
  - **Plant Reconfiguration and Contract extension of up to 6.3 GW** (Shuweihat S1, Taweelah A1, B2, B3, F2) by 2031
  - **New CCGT or OCGT plants** providing ~12 GW is required by 2036
- If **gas price increases to market price by 2027 – 28** when LNG export terminal becomes available, PV + storage will be cost competitive with gas generation even at today's prices in the UAE
- **Due to the lead time** required to build new capacity, **decisions will need to be made quickly** regarding
  - extending expiring contracts of existing assets
  - new gas turbine capacity
- **Lead to build** new CCGT – 5 Years
- **Lead to build** new OCGT – 4 Years

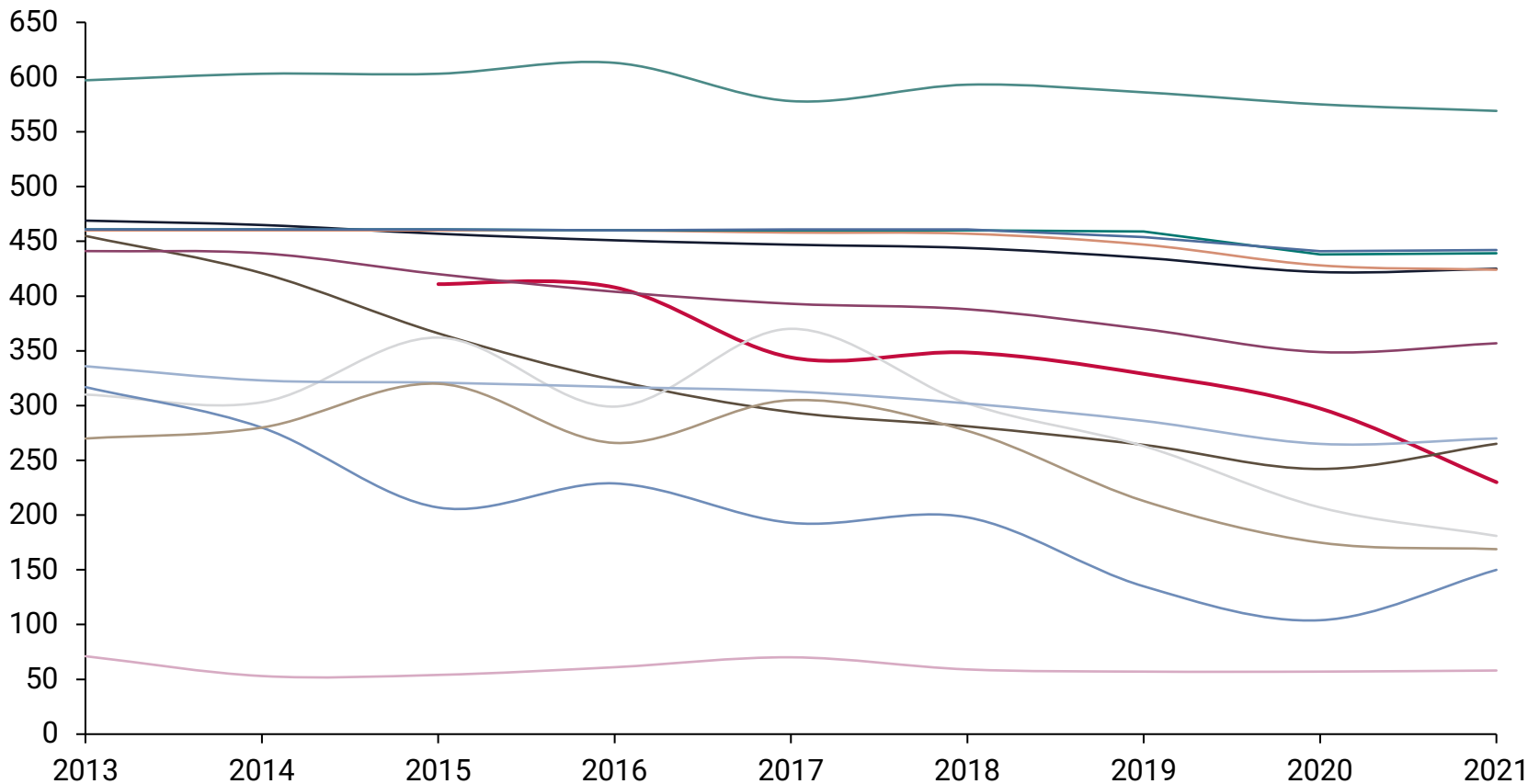
Thermal Plants Required	Potential Location	Capacity (MW)	Investment Decision	COD
Extend Shuweihat S1		2026	2024	2026
Extend Taweelah A1 as OCGT		800	2027	2029
Extend Taweelah B2 as OCGT		357	2027	2029
Extend Taweelah B3		1041	2027	2029
F2 (Extended)		2114	2029	2031
1st New GT	TAW C	2457	2022	2027
2nd New GT	Sweiha	2457	2024	2029
3rd New GT	ICAD (New)	2457	2025	2030
4th New GT	Mirfa II (New)	2457	2026	2031
5th New GT	Mina Saqr (New)	2457	2029	2034

**THERMAL** **SOLAR** **BESS**

# Global carbon intensity in grams of CO<sub>2</sub> per kilowatt hour of electricity produced - 2021



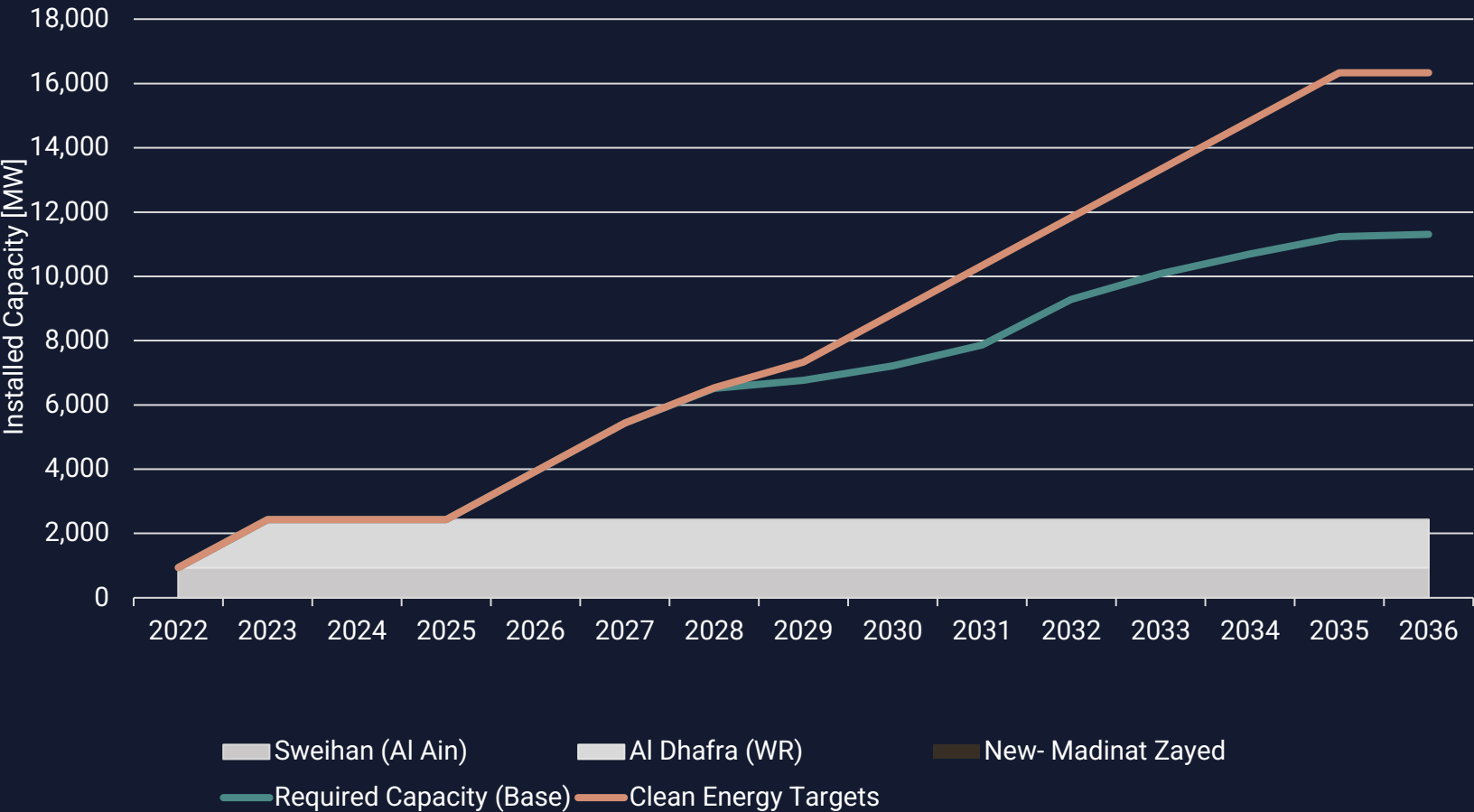
## 2021 Carbon Intensity (gCO<sub>2</sub>)



Source: Our World in Data, BP Statistical Review of World Energy, Ember Global Electricity Review (2022), Ember European Electricity Review (2022)

# A significant amount of solar PV capacity is recommended from 2025 onwards

**Optimal Development of Solar-PV Capacity for Base Case and Clean Energy Targets (2022 - 2036)**

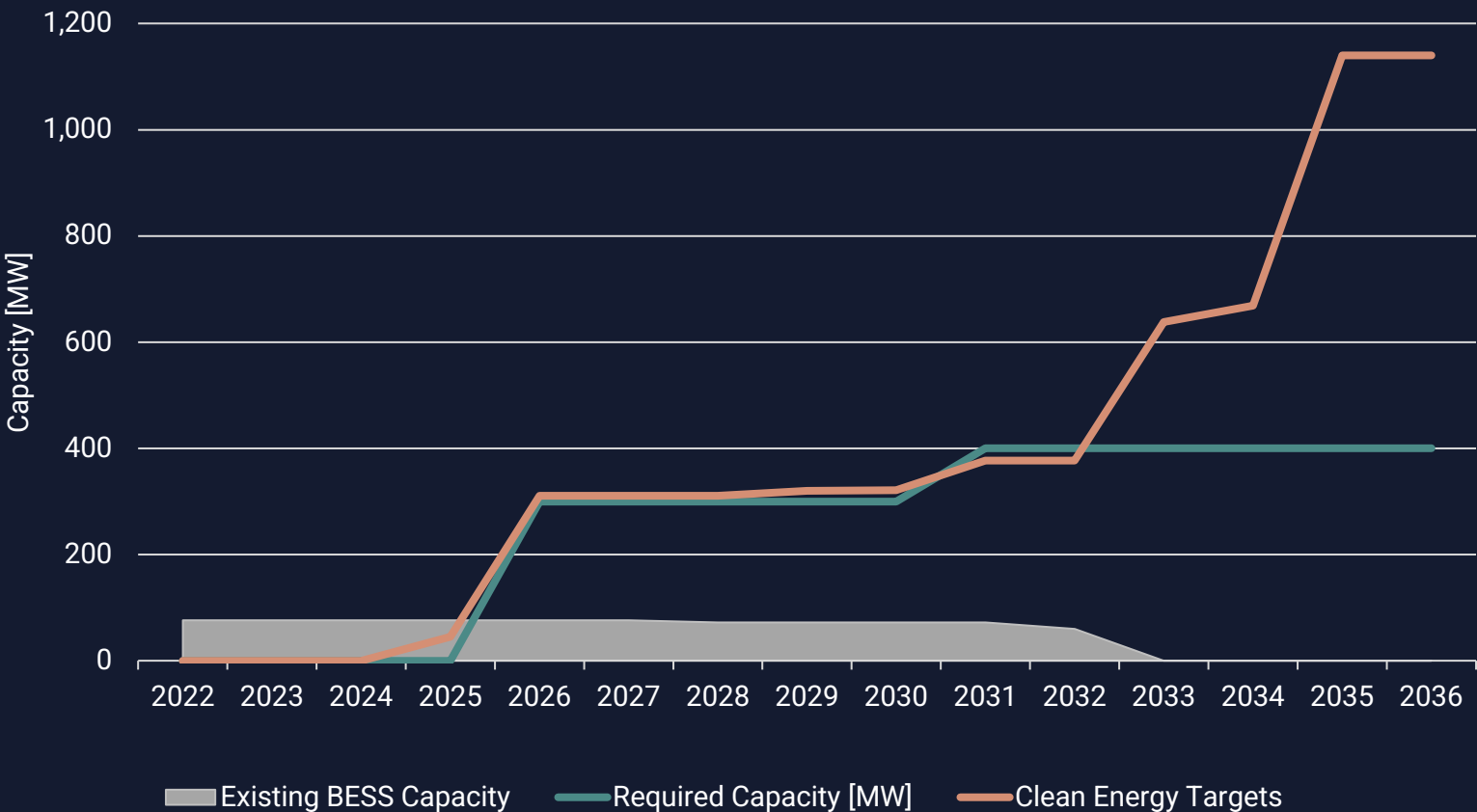


- By 2030, the recommended optimal new solar-PV capacity is c.4.5 - 6GW. Including the two committed projects at Sweihan PV and PV2 (Al Dhafra) the total solar-PV capacity will reach 7.2 - 8.5GW
- By 2036, following recent commitment to new Clean Energy Targets significantly more Solar-PV capacity is recommended bringing the total to between 16-20 GW
- New Solar-PV capacity is recommended as soon as possible (assumed by 2026), with further additional Solar-PV capacity entering service in subsequent years



# Over 300 MW of batteries are required from 2026 to enhance system reliability

BESS Capacity and New BESS Capacity Requirement with Clean Energy Targets  
(2022 - 2036)

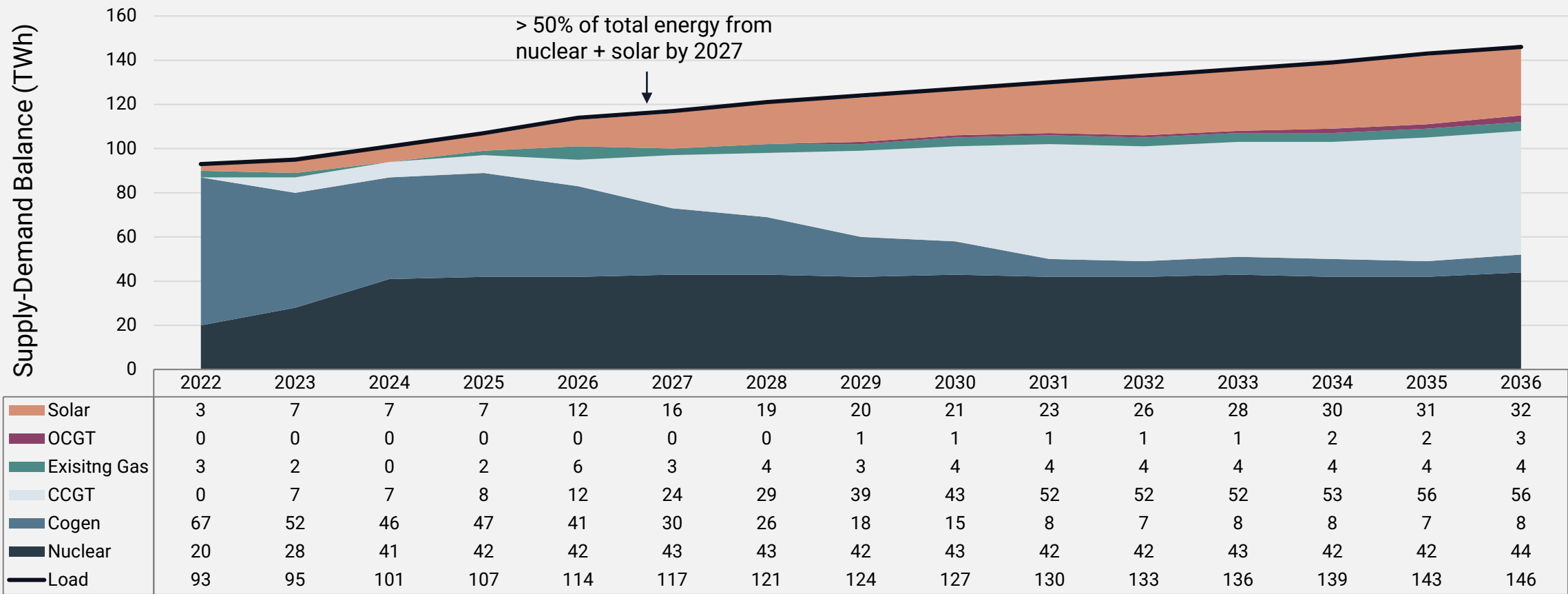


- Battery Energy Storage Systems (BESS) are recommended to provide **primary and secondary reserves**. They provide system cost savings by enabling a higher penetration of low-cost solar PV
- Batteries become **essential for system security** following the commissioning of all 4 nuclear reactors at Barakah and the resulting decline in dispatch of gas generation

While energy demand increases, by 2027, over 50% of total energy will be produced from nuclear and solar requiring the capability to operate at close to 100% clean energy output at times



Energy Mix by Technology type (TWh)



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- **Water**

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# Peak water demand is expected to increase to 805 MIGD by 2029, requiring additional RO capacity



The reduction in demand from 2022 to 2023 is primarily due to a reduction in exports to Etihad Water & Electricity (EWE), associated with the commissioning of their own RO plant at the end of 2021

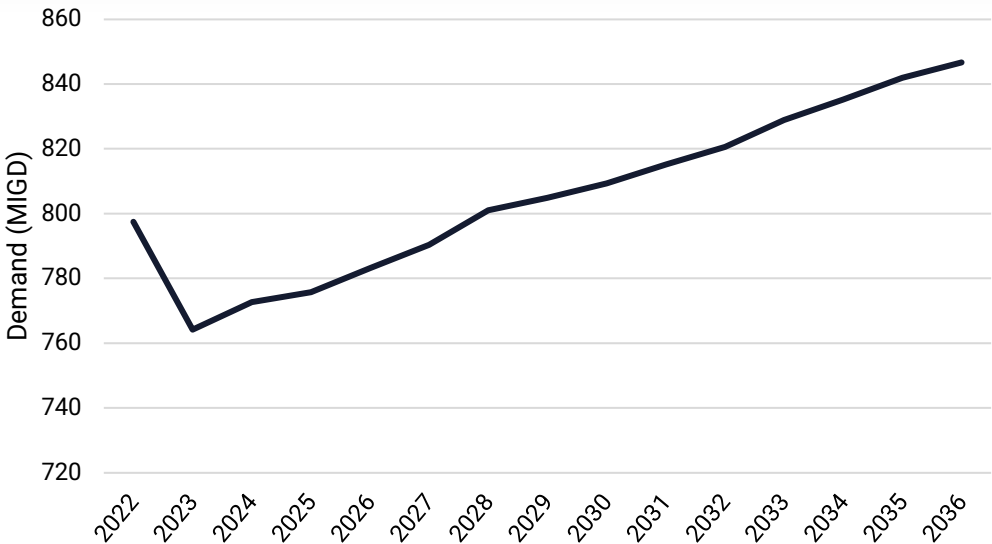


If Liwa farms demand is confirmed, around 100 MIGD of additional RO capacity will be required

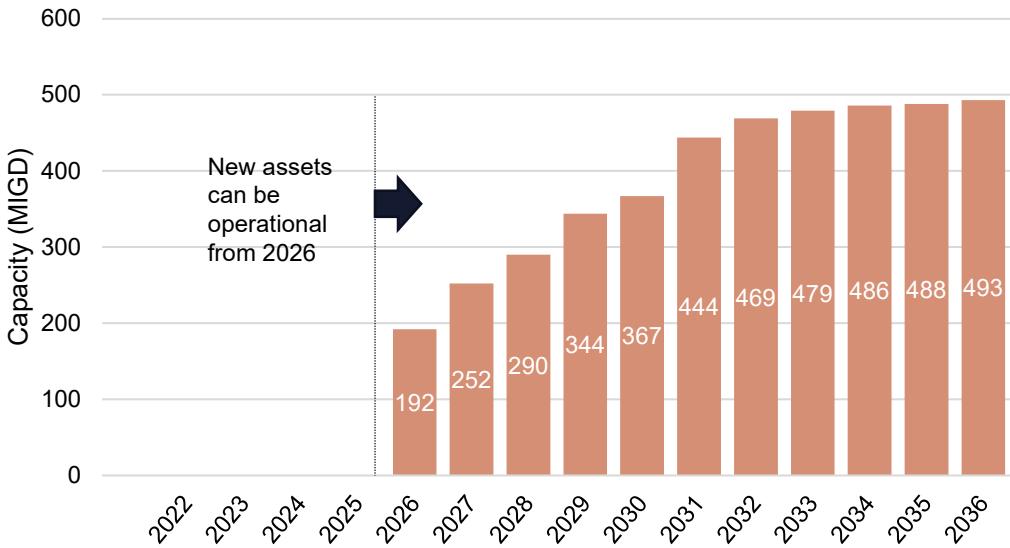


Mitigations to address winter operability issues have been implemented but challenges remain prior to further decoupling / RO addition

Water demand forecast - Week 7 2022 - 2036



Base Case<sup>1</sup> New RO Capacity Projection

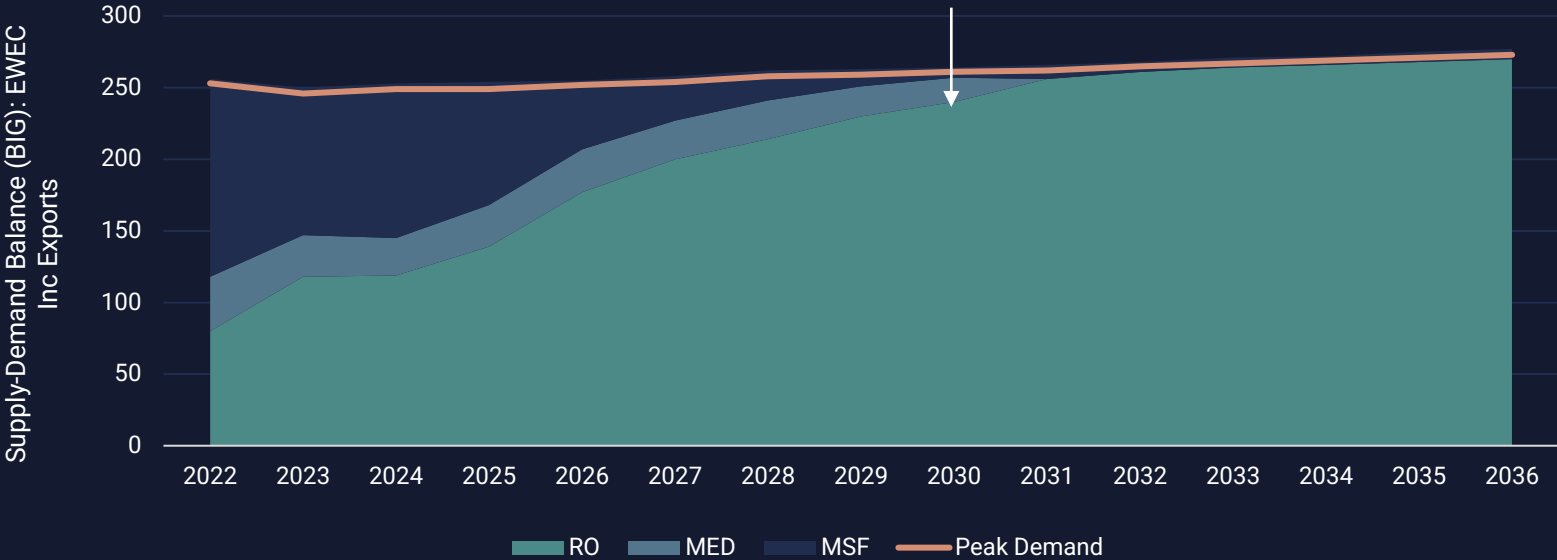


<sup>1</sup> New RO measure excludes committed capacity (Taw RO - 200 MIGD).

Over 90% of water demand by 2030 will be served by RO capacity to reduce overall sector costs

### Water Production by Technology (Billion IG)

By 2030 over 90% of water demand is served by RO Capacity



- **Increase in RO capacity is recommended from ~15% in 2022 to ~65% in 2029**
- This is primarily driven by **RO's significant cost advantage** over existing cogeneration assets. The unit cost of water from new RO is about one-third of the current average system cost of water production
- **No system cost or operability benefit is observed by extending any thermal desalination capacity** beyond its current contract
- Should demand from **Liwa farms be confirmed this leads to an additional 100 MIGD of RO capacity** being recommended bringing forward the base case capacity development plan in order to accommodate the additional demand
- **6 new RO projects** with a total capacity of 490 MIGD recommended between 2026 – 2034
- **Lead time** to build new RO plant – 5 years

RO Plants Required	Potential Location	Capacity (MIGD)	Investment Decision	COD
New RO 1	Mirfa M2	120	2022	2026
New RO 2	Shuweiha S4	70	2022	2026
New RO 3	Hudayriyat RO	50	2022	2027
New RO 4	Saadiyat RO	50	2022	2027
New RO 5	Site to be determined	150	2026	2031
New RO 6	Site to be determined	50	2029	2034



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New capacity, spanning across all technology categories, is required to cost-effectively satisfy security of supply obligations over the period until 2036

ID	Project	Description	Capacity [MW]	Required Year	Lead Time [Years]	Decision Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
GTE	S1 (Extended)	Extend Shuweihat S1	2,026	2026	2	2024															
GTE	TAW A1 (Extended)	Extended A1 as OCGT	800	2029	2	2027															
GTE	TAW B2,3 (Extended)	Extend B2 & B3	1,398	2029	2	2027															
GTE	F2 (Extended)	Extend B3	2,114	2031	2	2029															
GT	New Gen 1	New CCGT/OCGT - Sweihan	2,457	2027	5	2022															
GT	New Gen 2 [TAW C]	New CCGT - Taweelah C	2,457	2029	5	2024															
GT	New Gen 3	New CCGT/OCGT – ICAD	2,457	2030	5	2025															
GT	New Gen 4	New CCGT/OCGT - Mirfa II	2,457	2033	5	2028															
GT	New Gen 5	New CCGT/OCGT – Mina Saqr	2,457	2036	5	2031															
PV	New-Ajban PV (Al Ajban Area)	New Solar PV – Ajban	1,500	2026	4	2022															
PV	New- Al Ain Region (Abu Hiraybah Area)	New Solar PV - Al Ain Region (Abu Hiraybah Area)	1,500	2027	4	2023															
PV	New- Dhafra 2 site (Adjacent Dhafra 1 PV)	New Solar PV - Dhafra 2 site (Adjacent Dhafra 1 PV)	1,000	2031	4	2027															
PV	New- Al Dhafra Region (Dhafra South Area)	New Solar PV - Al Dhafra Region (Dhafra South Area)	1,500	2028	4	2024															
PV	New- Al Ain Region (Sweihan area)	New Solar PV - Al Ain Region (Sweihan area)	1,500	2032	4	2028															
PV	New- Um Al Quwain Solar PV	New Solar PV - Um Al Quwain	1,500	2033	4	2029															
RO	Mirfa M2 [New]	New RO - Mirfa M2	120	2026	5	2022															
RO	Shuweihat S4 [New]	New RO - Shuweihat S4	70	2026	5	2022															
RO	Hudayriyat RO [New]	New RO – Hudayriyat	50	2027	5	2022															
RO	Saadiyat RO [New]	New RO – Saadiyat	50	2027	5	2022															
RO	New RO 1 [New]	New RO 5 – Site to be determined	150	2031	5	2026															
RO	New RO 2 [New]	New RO 6 – Site to be determined	50	2034	5	2029															
BESS	New BESS1: Ruwais	New BESS - Ruwais 400.220kV Grid Station	200	2026	3	2023															
BESS	New BESS2: Madinat Zayed A	New BESS - Madinat Zayed Grid Station – A	100	2026	3	2023															
BESS	New BESS2: Madinat Zayed B	New BESS - Madinat Zayed Grid Station – B	150	2030	3	2027															
BESS	New BESS3: TBA	New BESS 4 – Site to be determined	125	2033	3	2030															

Number of active projects per year

6 9 12 13 14 12 10 11 9 8 5 4 1 1 1





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