The Role of Utilities in Demand-Side Management for Solar Integration (2025)

1. How utilities are supporting DSM programmes today

Region	Utility / Programme	2024-25 Highlights	Purpose for Solar
UK	National Energy System Operator's Demand Flexibility Service (DFS)	• Extended to year-round operation from Nov 2024 • 2.6 million premises enlisted ~7 GWh peak-time demand reduced so far Energy Saving Trust	Frees evening capacity so midday solar can flow unhindered, lowering curtailment risk.
	Octopus Energy "Saving Sessions"	700,000 customers shifted 1.86 GWh during 13 events — the UK's largest consumer-flex trial Octopus Energy	Demonstrates gigawatt-scale demand that can be moved to sunny, low-carbon periods.
Abu Dhabi	Dept. of Energy & EWEC DSM & Energy Rationalisation Strategy 2030	Regulations updated in 2025; annual savings AED 1.3bn (≈US$ 350m) by cutting peak demand Aletihad	Reduces grid stress so new 1.5 GW Al Ajban solar plant can dispatch more energy.
	Demand Response Pilot → Phase 2 (2025)	2024 pilot delivered "remarkable outcomes"; phase-2 to begin in 2025 to expand long-term DR market Economy Middle East	Creates flexible load blocks to match midday PV surplus.
Australia	AEMO Demand-Side Response portfolio	On 20 Jan 2025 heatwave, high temperatures led to record-breaking electricity demand, with approximately 126 MW of demand-side response activated during the peak period Australian Energy Market Operator	Avoided expensive gas dispatch and allowed continued rooftop-PV export.
	SA Power Networks Demand Flexibility (2025-30)	AU$ 6.7m capex to target flexible residential loads e.g. hot-water & EV charging SA Power Networks	Soaks up daytime "solar-spill" when low demand risks export curtailment.
	PLUS ES Solar Soaking Trial (South Australia)	Shifted tens of MW of electric-hot-water to midday-solar windows; time-of-use tariffs proved effective UNSW Sydney	Re-aligns demand with rooftop-solar peaks, cutting curtailment.

The DFS started in late 2022 and encouraged people to lower their energy use during peak times over the winter months. From November 2024, the DFS has been extended to run all year round.

Over 2.6 million homes and businesses have taken part in previous years. This has saved an estimated 7,000MWh of electricity at peak times – enough to power the lighting in 54,000 homes for a year.

High temperatures on 20 January 2025 resulted in a new maximum operational demand record of 4,486 MW and underlying maximum demand record of 5,385 MW. During the operational demand peak, gas was the largest contributor with 2,526 MW (56.3%), with renewables contributing 573 MW (12.9%). Approximately 126 MW of demand side response was activated through various market and contractual mechanisms.

Sources:

- Energy Saving Trust
- Octopus Energy
- Aletihad
- Economy Middle East
- Australian Energy Market Operator
- SA Power Networks
- UNSW Sydney

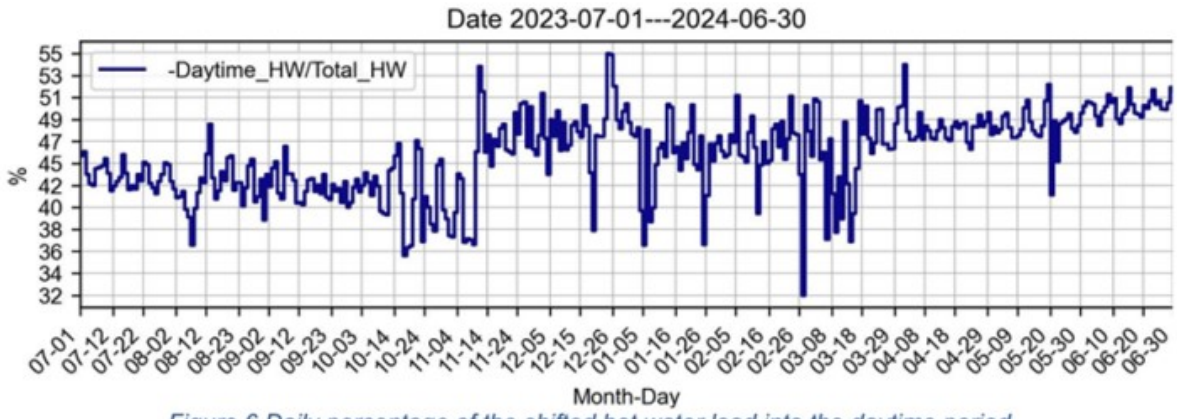
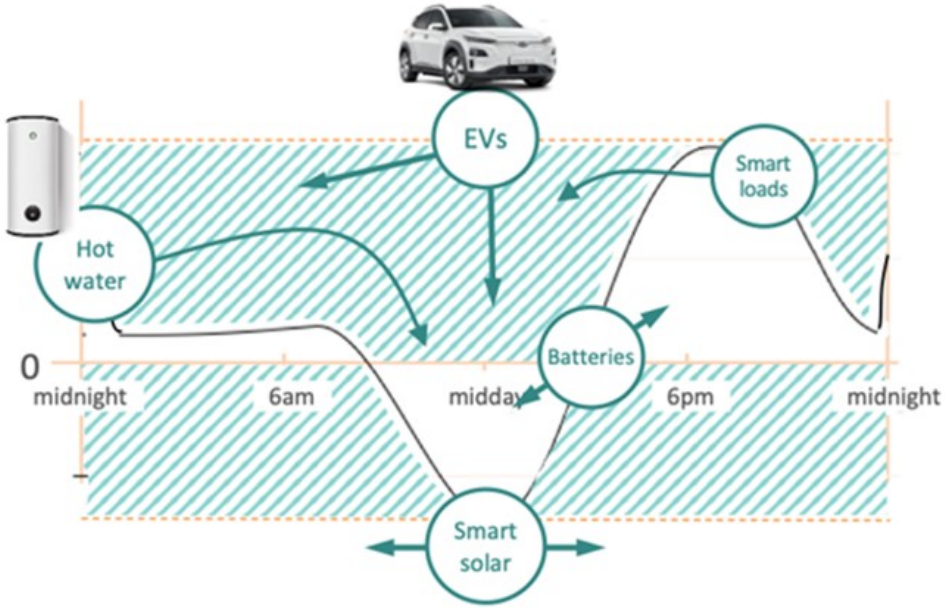


Figure 6 Daily percentage of the shifted hot water load into the daytime period

Hot Water and EV Load Shifting to soak up solar and avoid peak demands



2. Optimising solar-energy usage through DSM

- **Dynamic time-of-use tariffs** (UK DFS, SA trials) pay consumers to move consumption to the solar "shoulder" hours. Energy Saving Trust
- **Automated device orchestration** (smart-hot-water, EV chargers, heat-pumps) proved scalable to >100 MW fleets in AU & UK pilots. Octopus Energy
- **Aggregated flexibility markets**: EWEC's 2025 tenders will procure DR as a firm resource, creating a revenue stack for smart-building aggregators. Abu Dhabi Department of Energy

3. Strategies that maximise solar integration via DSM

Strategy	Example	Impact
"Solar-soaking" midday load shifting	South Australia hot-water trial	Cut spring PV curtailment events by 40% during trial weeks. Arena
Consumer reward platforms	Octopus "Saving Sessions" app	Delivered 1.86 GWh flexible demand during winter 2022-23 Octopus Energy
Industrial peak-shaving	Abu Dhabi DSM regulations include new industrial-efficiency mandate	Greatly reduces future generation/transmission capex. Abu Dhabi Department of Energy
Flexible Trading Arrangements (FTAs)	AEMO 2025 Issues Paper	Will let DER owners trade behind-the-meter flexibility directly in the wholesale market via new settlement metering. Australian Energy Market Operator

Sources:

- Arena
- Octopus Energy
- Abu Dhabi Department of Energy
- Australian Energy Market Operator

4. Collaboration between utilities & consumers

- **Digital engagement** – UK DFS sends "24-hour ahead" SMS/app alerts; provider participation rates exceeded 80% during early ≥£3/kWh test events NESO
- **Real-time data sharing** – DEWA's Distribution Network Smart Centre integrates AMI, rooftop-PV (Shams Dubai) and EV charger data for in real time to improve dispatch visibility DEWA

Key challenges

- **Multi-party coordination** – UK ESO must aggregate bids from 30+ suppliers within six hours for each DFS event. Octopus Energy

- **Solar oversupply risk** – AEMO warns SA-VIC-QLD-NSW could face blackouts from *too much* rooftop solar without more flexible demand or batteries. **The Guardian**
- **Consumer trust & governance** – Ofgem's 2023 call for input emphasised ease, safeguards, and engagement to unlock mass-market DSR. **Ofgem**

6. Utilities' role in enabling smart-grid solutions

- **Advanced Metering Infrastructure (AMI)** – With around 30 million smart meters rolling out, the UK begins full half-hourly settlement from April 2025, a cornerstone for DFS scaling. **Energy Manager Magazine**, **Professional Energy**, **Ofgem**
- **DER Management Systems (DERMS)** – Abu Dhabi Phase-2 DR will target expansion across new sectors and participants via platform-enabled automation – building toward 200 MW by 2030, potentially even up to 1 GW. **Abu Dhabi Department of Energy**
- **Flexible Trading Platforms** – AEMO's FTAs introduce behind-the-meter "price-responsive" connection points, allowing direct wholesale bidding. **Australian Energy Market Operator**

Expert Q&A

Q1. What regulatory or policy support is essential for successful DSM implementation?

UK: Mandating market-wide half-hourly settlement, establishing foundationfor flexibility services like DFS (Ofgem, 2023). **Ofgem**

Abu Dhabi: Demand-Side Management Regulations (2025) legally oblige large energy consumers to participate when called, under the DSM & Energy Rationalisation Strategy 2030. **Abu Dhabi Department of Energy**

Australia: National Electricity Rules amendment for Flexible Trading Arrangements (consultation 2025) to introduce type 8/9 metering and Secondary Settlement Points, enabling behind-the-meter flexible loads (e.g. batteries, EVs, solar) to directly trade in wholesale markets. **Australian Energy Market Operator**

Q2. Are there challenges in coordinating DSM between utilities, consumers & grid operators?

Yes – UK DFS requires same-day bid coordination from 30+ providers (**OctopusEnergy**), Australia faces misaligned incentives across retailers/network operators (**Arena**), for Abu

Dhabi the current DSM regulations do not yet outline consumer consent mechanisms or data/privacy protections for remote dispatch, posing a risk to uptake and trust (Emirates News Agency).

Q3. How is DSM integrated into long-term planning for distributed solar & storage growth?

AEMO incorporates 2 GW of responsive demand in its 2025-35 Integrated System Plan (Australian Energy Market Operator); *EWEC* treats DR as an "avoided capacity investment" in its long-term electricity planning (Amaeya Media); *UK ESO* forecasts multi-gigawatt demand-side flexibility as essential to integrating a large renewables fleet by 2030 (NESO).

Q4. Examples of DSM programmes that mitigated solar curtailment or peak demand?

- South-Australia hot-water "solar-soaking" shifted ~45% of daily hot-water load into midday solar periods, helping utilize excess PV and reduce curtailment. Arena
- UK Saving Sessions displaced nearly 2 GWh of peak demand during winter 22/23, freeing capacity for wind & solar. Current
- Abu Dhabi's DR Phase Two targets 200 MW of DR capacity by 2030, with pilot initiatives designed to help defer infrastructure upgrades. Energy News

Q5. How are utilities leveraging DSM to support solar grid integration?

By **monetising flexibility** (DFS pay-per-kWh), **automating device control** (AMI + DERMS), and **embedding DR targets** into resource-adequacy planning (AEMO, EWEC). These steps reduce both curtailment and fossil-back-up needs, accelerating solar adoption.

Key Takeaways

1. **Flexibility pays:** Real-world programmes now compensate customers £3–£6 per kWh shifted, proving that DSM can scale economically.

2. **Regulation matters:** Mandatory participation rules (Abu Dhabi) or half-hourly settlement (UK) unlock the business case.

3. **Technology is ready:** Smart meters, dynamic tariffs and cloud DERMS can orchestrate >100 MW blocks today.

4. **Solar + DSM is synergistic:** Each gigawatt of responsive load can enable 1–2 GW of extra solar with minimal curtailment.

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