

Energy Smart Appliances Standards for Demand Side Response

PAS 1878 and 1879 standards and the Interoperable Demand Side Response (IDSR) programme



Department for
Energy Security
& Net Zero

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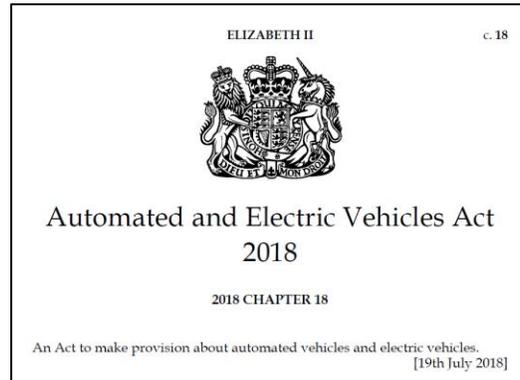


ESA standards development



Objectives

- Standardisation helps to **lower costs** and **promote innovation** in technologies, while **accelerating the uptake** of **secure and interoperable** smart products and services
- Develop **technical specifications** which could be referenced and required by **future regulations** and would enable certification
- Demonstrate **UK leadership** on the international stage, by promoting published standards for **international adoption**



Approach: Scope

Principles

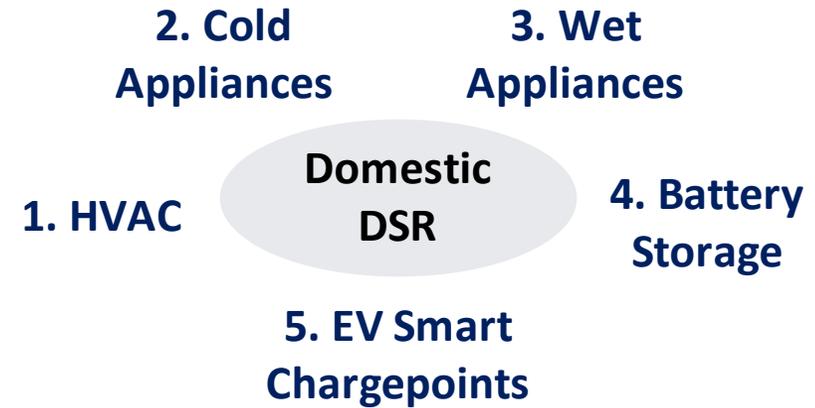
- **4 policy principles** underpin the standards, developed in consultation with industry stakeholders

Compatibility

- **Compatibility** with, but no mandate of, the GB Smart Metering system
- Alignment with **existing international** standards where **possible**

Innovation

- Specify only the **minimum requirements** to deliver DSR in line with 4 Policy Principles, which **allows innovation** on top



Policy Principles	
1. Interoperability	the ability of an ESA to work seamlessly across any DSR service operated by any system player.
2. Data privacy	the secure storing of data on the device or with any controlling party.
3. Grid-stability	the prevention of outages on the grid caused by erroneous operation of ESAs.
4. Cyber-security	the prevention of unauthorized access to an ESA by third-parties.

Approach: Process

British Standards Institution (BSI)

- A **standardised technical framework**, covering both **ESAs** and **DSR** for end-to-end system across **2 PASs**
- Developed in an **industry-led** process, with expert **Steering Groups** and a programme level Strategic Advisory Group
- Producing **PASs** (publicly available specification) in a **fast-track** standards process, which is **updated** every **2 years**



BSI ESA Programme

40+ Organisations (9 Trade Associations)

ABCB	Energy UK	Newcastle Uni (EV)
ADE	ESC	NG ESO
APPLiA	ESSAC	Ofgem
BEAMA	EVET	OVO/Kaluza
BSI Assurance	Flexitricity	Pearlstone Energy
Carbon Co-op	Geo	Samsung
CBI	Hive	Schneider Electric
Citizens Advice	HMG	SMMT
CPIN	Innovate UK (EV)	Sustainability First
CRED	Kiwipower	Tech UK
CSO Confidential	Landis+Gyr	UKAS
EDF Energy	Moixa	UKERC
ENA	NCSC	WPD

Also 120+ individuals on Invited Review Panel



PAS 1878 – some technical details



Definitions – DSRSP, CEM, ESA

DSR Service Provider (DSRSP)

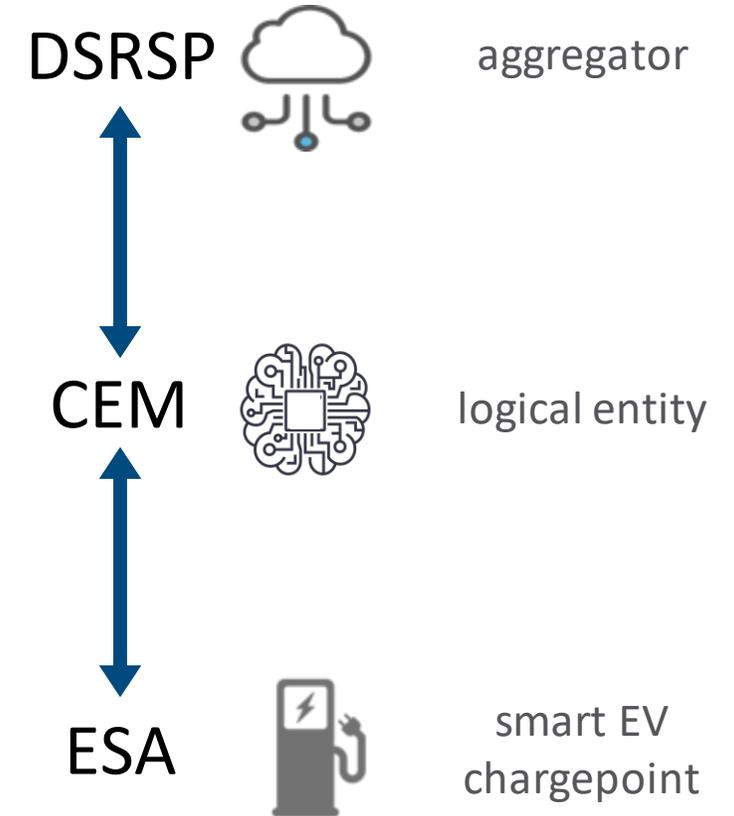
- An organization providing **demand-side related energy management services** to electricity system operators, electricity utilities and electricity generators

Consumer Energy Manager (CEM)

- A **logical entity**, that can be **physical or virtual**, which deals with **flexibility information** and requests
- **Translates** between the **DSRSP** and the **ESA**

Energy Smart Appliance (ESA)

- An internet **connected** device that can **modulate or shift** its **electricity** consumption in **response** to **signals**.



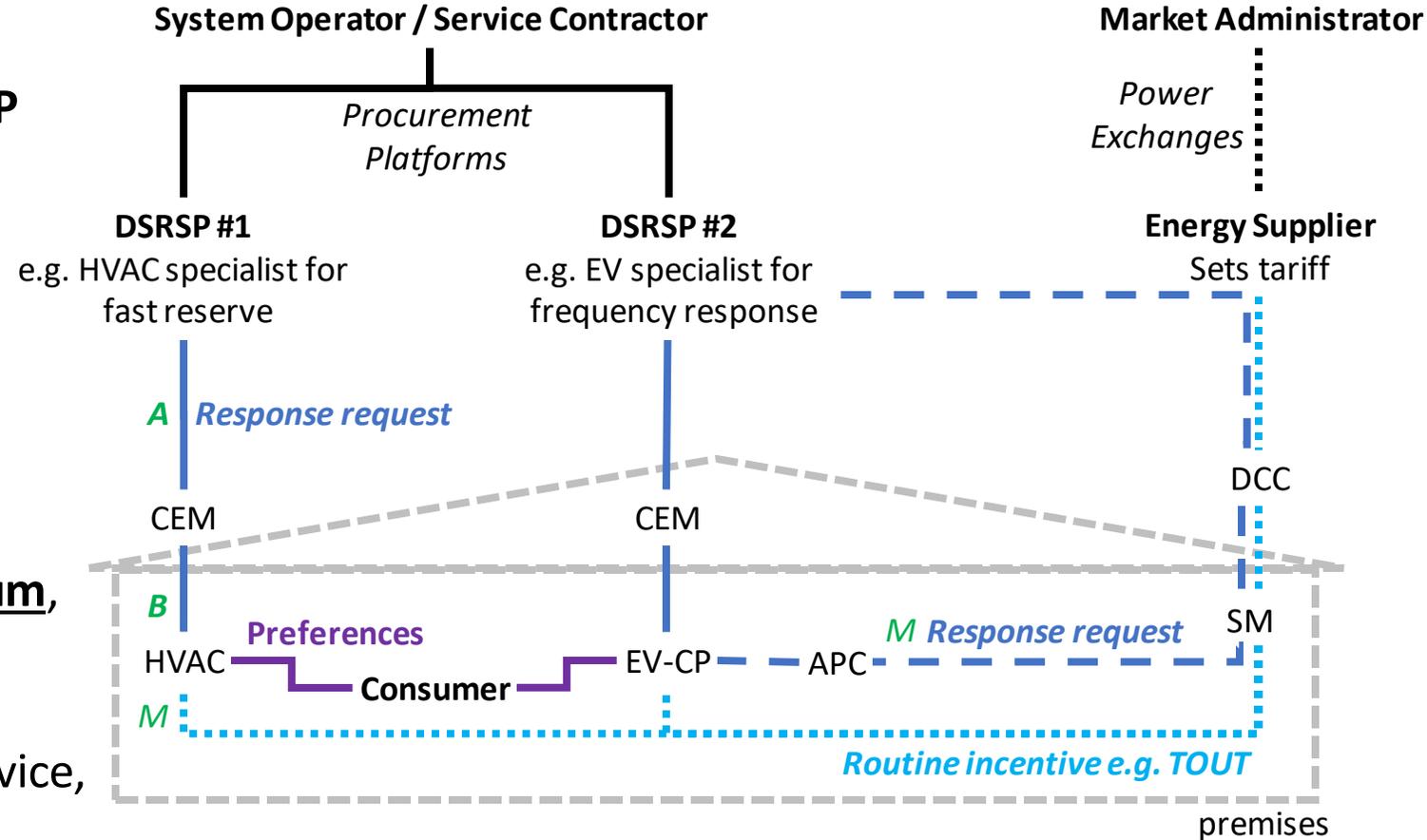
System Architecture – Part 2

3 interfaces:

- **A - Interoperable**, specified for any DSRSP
 - **OpenADR**
- **B – Proprietary**, can be ESA specific
 - e.g. can be **OCP** for EV-CP
- **M** - (optional) for GB Smart Metering

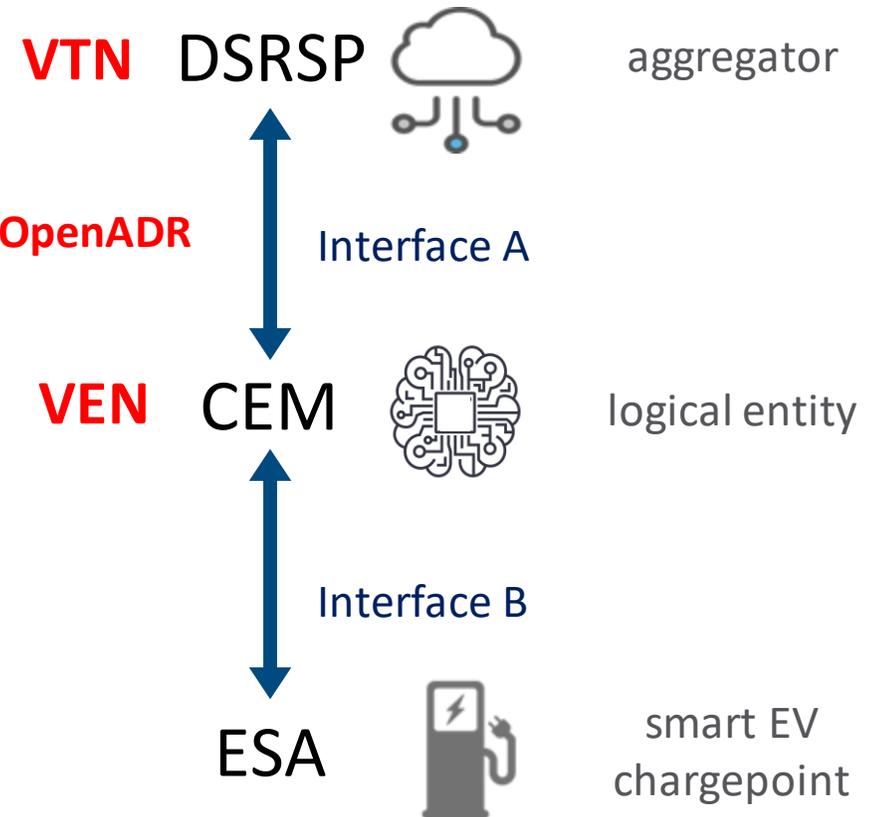
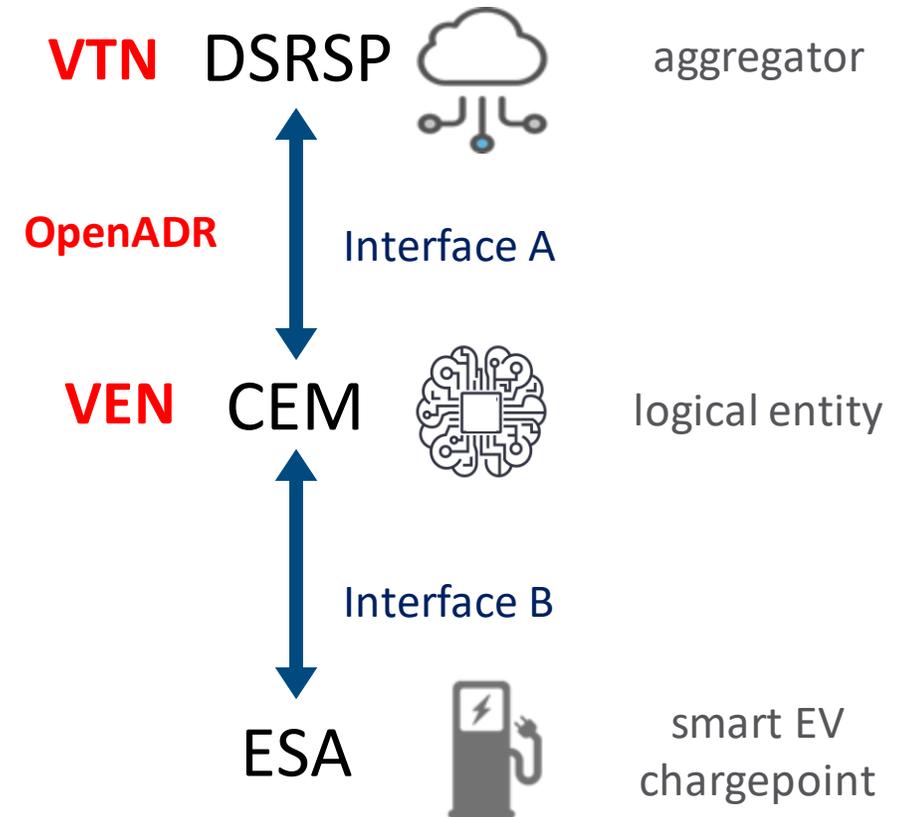
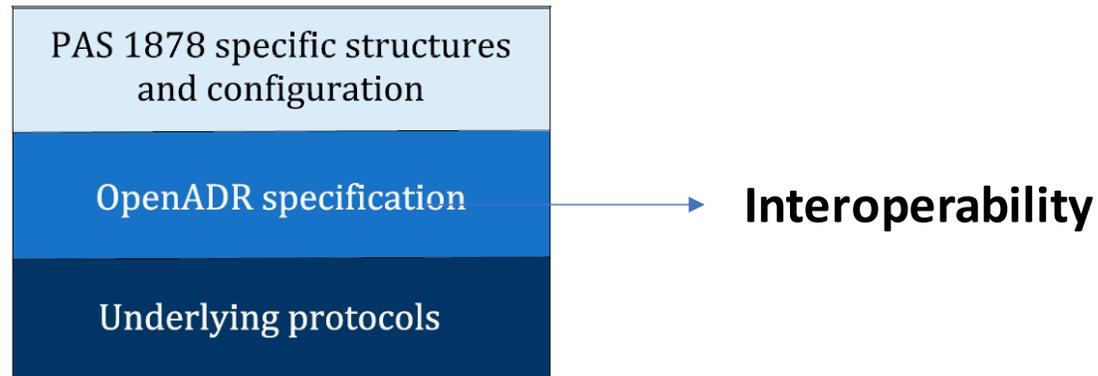
ESA must be **supplied with CEM** as a minimum, but this does **not restrict 3rd party** provided CEMs

User **subscribes individual ESAs** to a DSR service, allows **specialist DSRSPs** for specific ESAs



Interface A

- PAS 1878 mandates that any implementation of Interface A shall support the use of **OpenADR**
- The use of OpenADR guarantees interoperability and therefore **enables consumer choice**
- PAS 1878 provides a structure that is mapped on to the OpenADR protocol



System Operation – Part 1

A hierarchy of DSR operation is defined, with consumer preferences always respected:

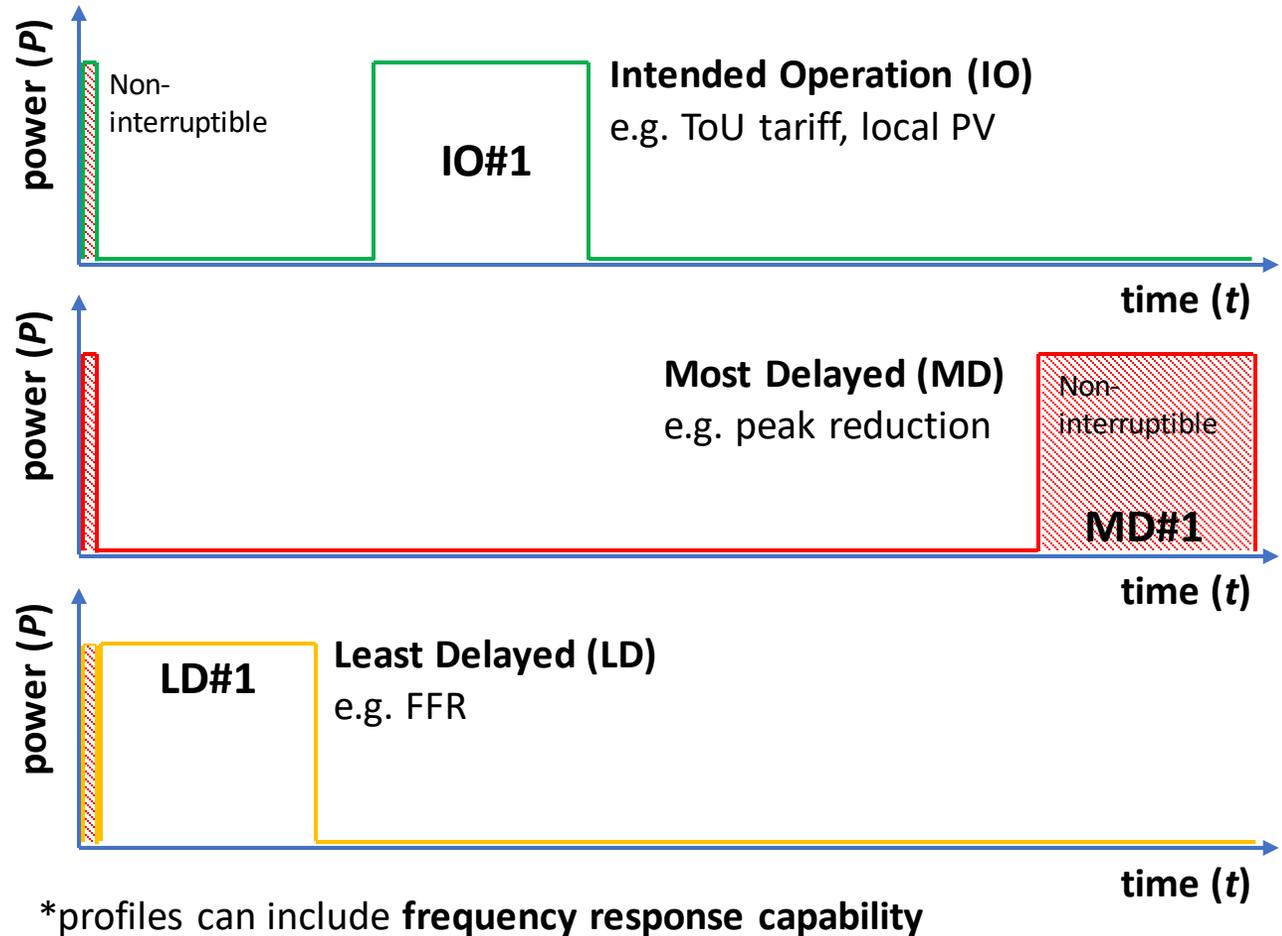
Higher Priority



- **Routine** Mode
This is **baseline** DSR operation
The ESA controls electricity consumption according to the **consumers wishes** and any **external incentives** e.g. TOUT or grid CO2 intensity
 - **Response** Mode
This **overrides** the baseline during a **response request**
The ESA controls electricity consumption according to the **consumers wishes** and **DSRSP's chosen flexibility option**, e.g. for frequency response
 - **Consumer** override Mode
Additional **manual override** (*note: their preferences are already built in*)
 - **Failsafe** protections Mode
- During a Response request, the DSRSP will **statistically request flexibility** from **~100,000 devices** which makes the system **more resilient** as some **non-response is expected**.

System Operation – Part 2

- A **ESA** creates flexibility offers as **power profiles (P vs T)**, based on **consumer preferences**, appliance operation and any external incentives.
- At a **minimum 3** power profiles:
 - (1) **Intended Operation (IO)**
 - Consumers preferences baseline
 - Runs in **Routine** mode
 - (2) **Most Delayed (MD)**
 - Consumers preferences with maximum delay
 - Option for **Response** mode
 - (3) **Least Delayed (LD)**
 - Consumers preferences with minimum delay
 - Option for **Response** mode
- The 3 profiles are **updated whenever their status changes** and sent to the DSRSP, so the **DSRSP keeps a live merit order** for response requests.

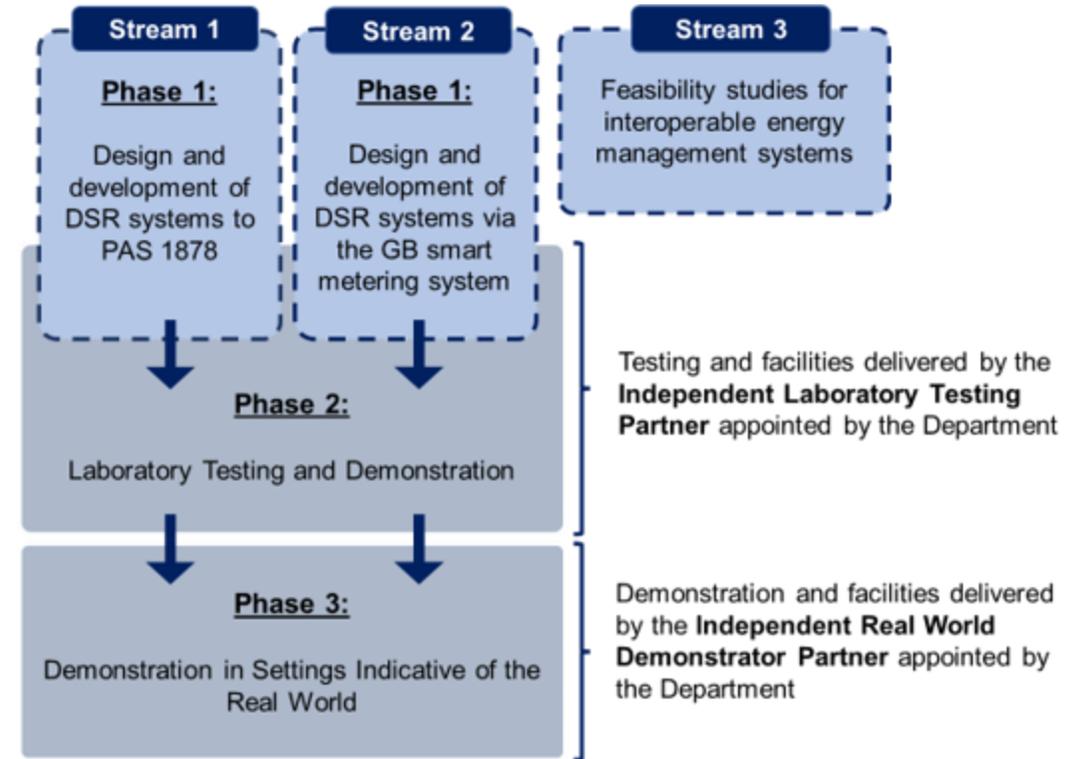


IDSR innovation programme



Interoperable Demand Side Response Programme

- Over **£12.8M funding**; **13 projects** including independent testing/demonstration partners
- **Development and demonstration** of energy smart appliances and systems for the delivery of interoperable demand side response:
 - PAS 1878/1879
 - GB Smart Metering System
- Providing **feedback** on PAS 1878
- Part of the up to £65m [Flexibility Innovation Programme](#) within the £1bn [Net Zero Innovation Portfolio](#)



<https://www.gov.uk/government/collections/interoperable-demand-side-response-programme>

Interoperable Demand Side Response Programme

Stream	Project name	Lead applicant	Partner Organisations
1	Energy Smart Heat Pump	Samsung Electronics UK	Passiv UK
1	Project DSRR	Green Energy Options	Vailant, EDF, GreenSync Pty Ltd, Smarter Grid Solutions Limited
1	PAS-DSRFlex	Landis + Gyr Ltd	
1	Zen Smart IDSR Interoperability	Systems Mechanics Limited	Ev.energy Limited, carbonTRACK UK Limited
1	IREF: Interoperable Residential Energy Flexibility	Centrica Business Solutions Ltd	Mixergy Ltd, Daikin Airconditioning Limited, Glen Dimplex UK Limited
1	Tomorrow's Homes Today	Voltalis UK	The Electric Heating Company Ltd, Dcbel



Interoperable Demand Side Response Programme

Stream	Project name	Lead applicant	Partner Organisations
2	Smart-DSRFlex	Landis + Gyr Ltd	
2	ChameleonFIP	Chameleon Technology (UK) Limited	
4	Laboratory testing	Engage Consulting Ltd	NMI, SMS
4	Demonstrations in Real World	Resillion	Quality Logic, ScottishPower, Power Networks, Demonstration Centre
3	OpenDSR for All	The Society for the Reduction of Carbon Limited	
3	Project Open IC	Green Energy Options Ltd	
3	Feasibility assessment to understand the different functional and technical options available to create interoperable domestic energy management system	Accenture UK	



Summary



The UK Government has sponsored the development of **PAS 1878** and **PAS 1879**

These create an end-to-end framework for domestic DSR

Interface A shall support the use of Open-ADR to enable interoperability

The UK Government has funded the **IDSR Programme** which is developing domestic DSR systems against PAS 1878 and PAS 1879

The findings from this programme will feedback into the next version of PAS 1878

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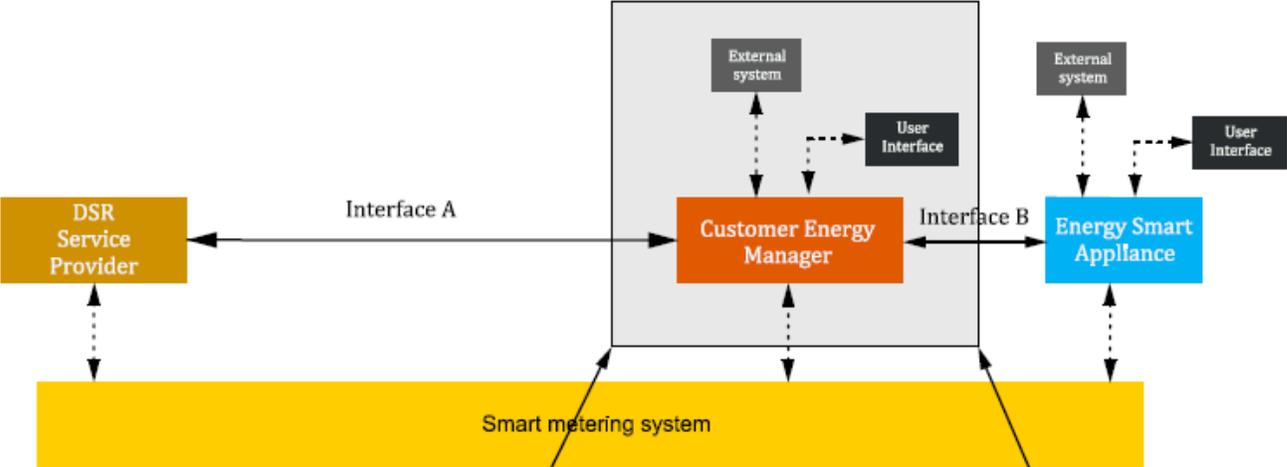
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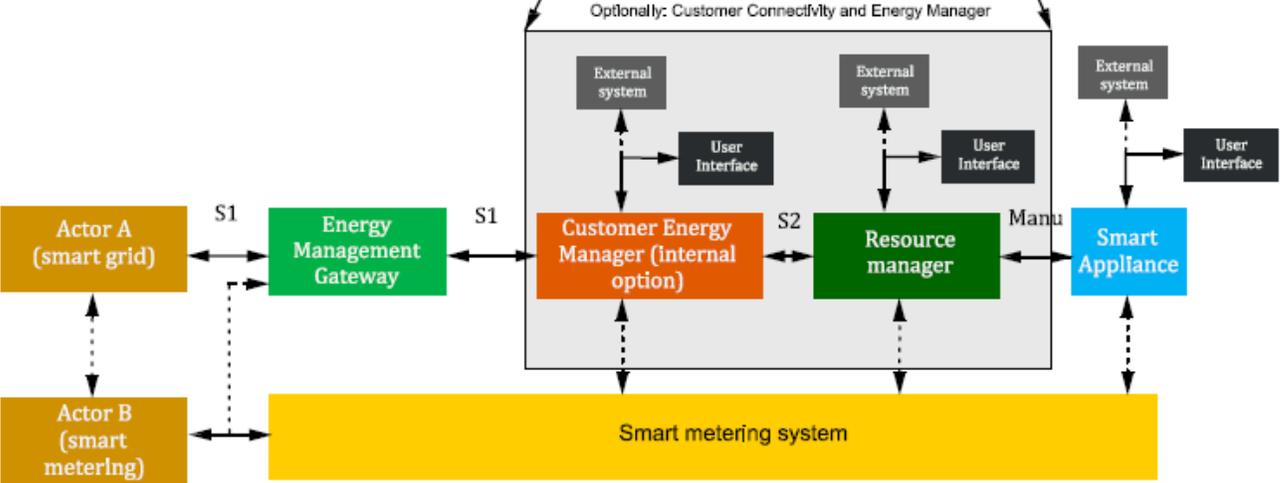
Annexes



Mapping of PAS 1878 and CENELEC/IEC functional architectures



PAS 1878 architecture



CENELEC and IEC architecture