PAS 1878 and 1879
Energy Smart Appliances for Demand Side Response

UK standards development with BSI

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1. Context - standards development
- objectives
- approach: scope / process / technical

2. Technical - ESAs and DSR
- definitions
- system architecture
- system operation
- worked example

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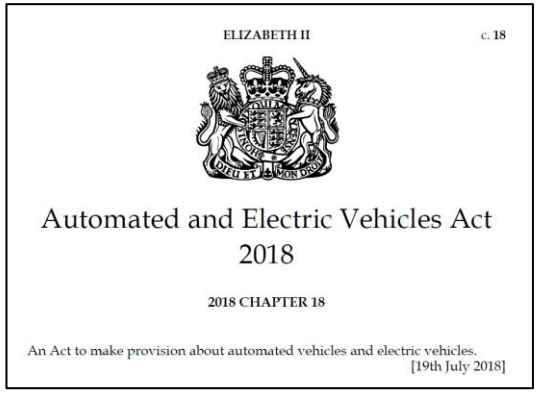
1. Context - standards development

- objectives
- approach: scope / process / technical

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**



ELIZABETH II c. 18

Automated and Electric Vehicles Act 2018

2018 CHAPTER 18

An Act to make provision about automated vehicles and electric vehicles.
[19th July 2018]

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Approach: Scope

Appliances

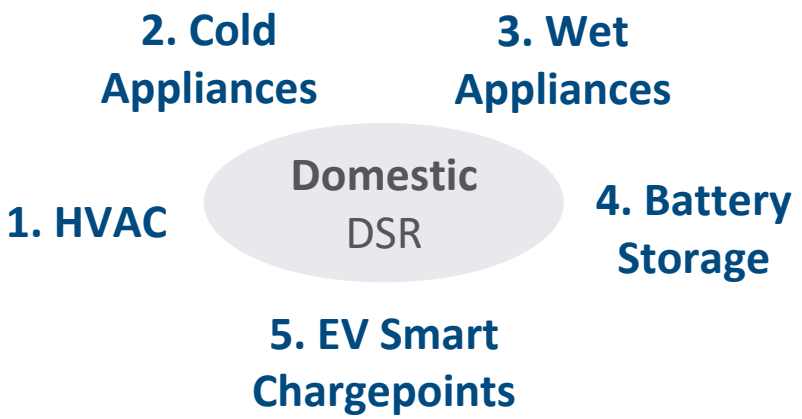
- The standards cover **5 appliance types**, most suitable for **domestic DSR**
  (Note: I&C DSR is out of scope)

Principles

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

Compatibility

- The standards are **compatible** with, but **don't mandate**, the **GB Smart Metering** system



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**

PAS 1878 Appliance-side: "**ESA specification for classification**"

PAS 1879 Grid-side: "**DSR framework for operation**"

Early 2021

Mid/Late 2020

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		

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Approach: Technical

Operational

- Specify **only the <u>minimum</u> requirements** to deliver DSR inline with 4 **Policy Principles**, which **allows innovation** on top
- Specify a **DSR framework**, with details for **called response services**, with handles for **other routine services** to be built on

Commercial

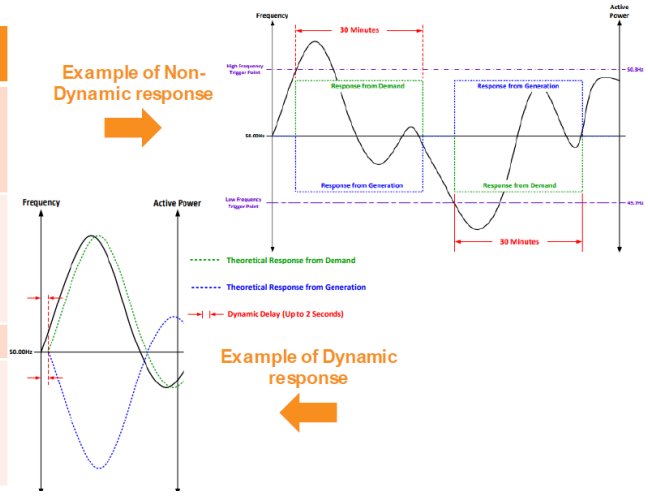
- Construct a **framework** to **enable revenue** streams (e.g. fast response times to enable high value DSR services like FFR) and **not restrict business models**

International

- Standards to **align** with **existing international** standards where **possible**
  *(Note: some of these are still **under development**)*

1.3 Frequency response speeds

FFR product type		Response speed	Length of response
Non-Dynamic – Secondary response is the only Non-Dynamic response currently procured.		Within 30 secs	30 mins
Dynamic – A Dynamic service can provide Primary, Secondary and High response, or Primary and Secondary only or High only.	Primary	Response required within 2 secs, with full response by 10 secs.	20 secs
	Secondary	Within 30 secs	30 mins
	High	Within 10 secs	Indefinitely unless otherwise agreed.



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2. Technical - ESAs and DSR

- definitions
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*(**Draft** PAS proposals)*

Definitions – DSRSP, CEM, ESA

DSR Service Provider (DSRSP)

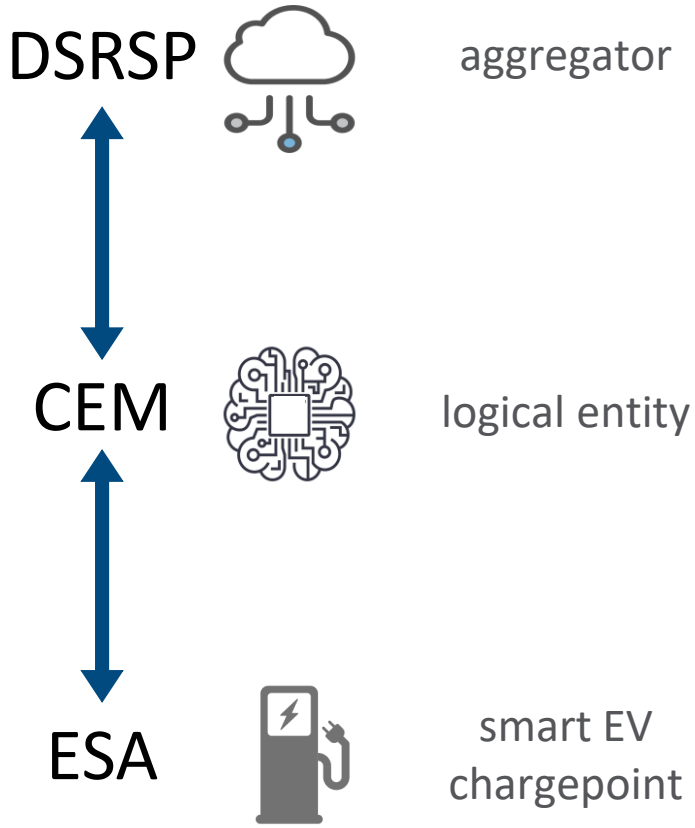
- An organization providing **demand-side** related **energy management services** to electricity system operators, electricity utilities and electricity generators

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 1

2 DSR service types:

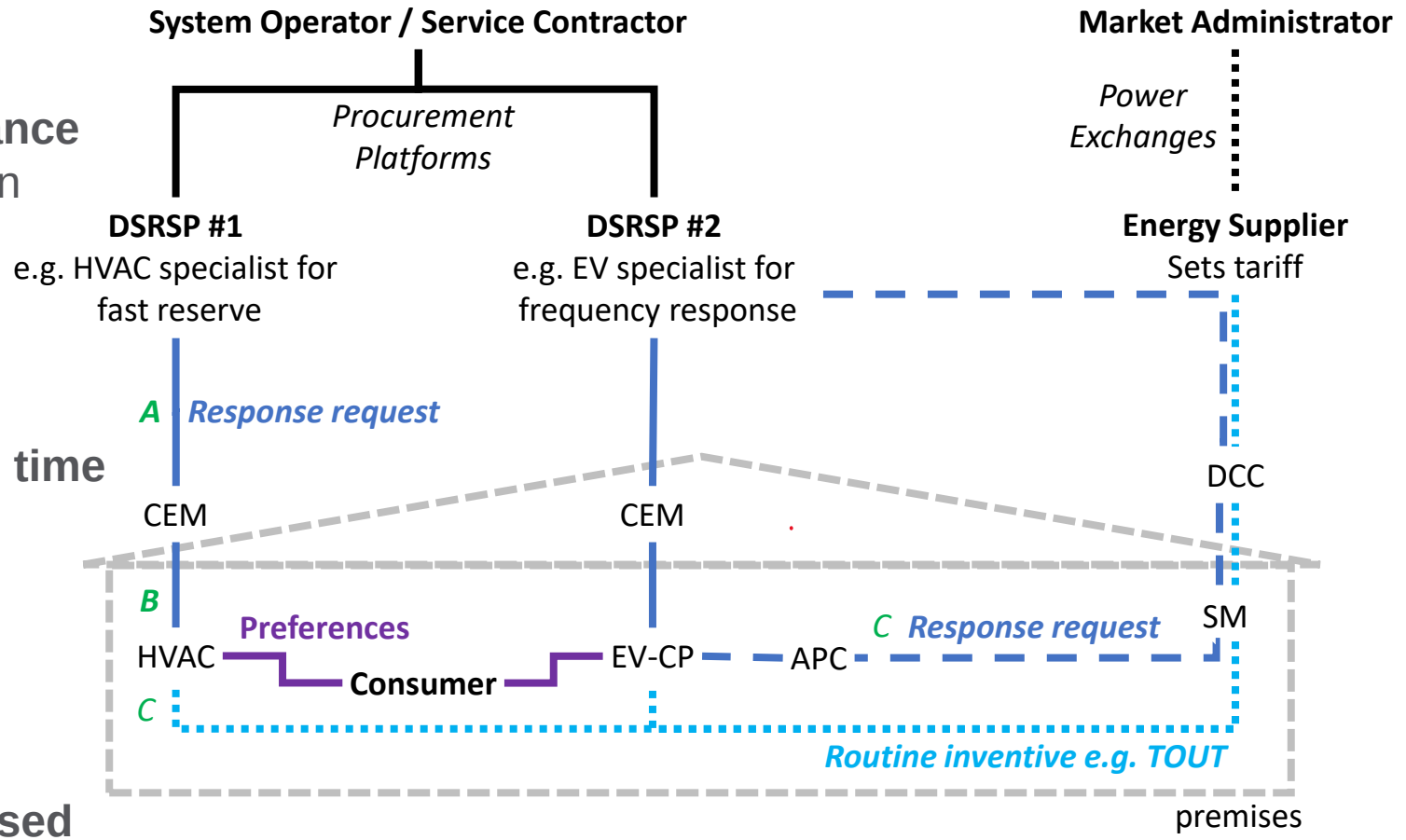
- **Routine** DSR
  Operate based on **incentives** set in **advance**
  Includes **consumer** preferences and often **multi-party market signals**

  e.g. TOUT incentive via **Supplier**

- **Response** DSR
  Operate based on **requests** made in **real time**
  Includes **consumer** preferences and often firm **bi-lateral contracts**

  e.g. grid FR request via **DSRSP**

PAS **specifies** how **response requests** are sent/received, but how **incentives are optimised** against is left to **innovation**



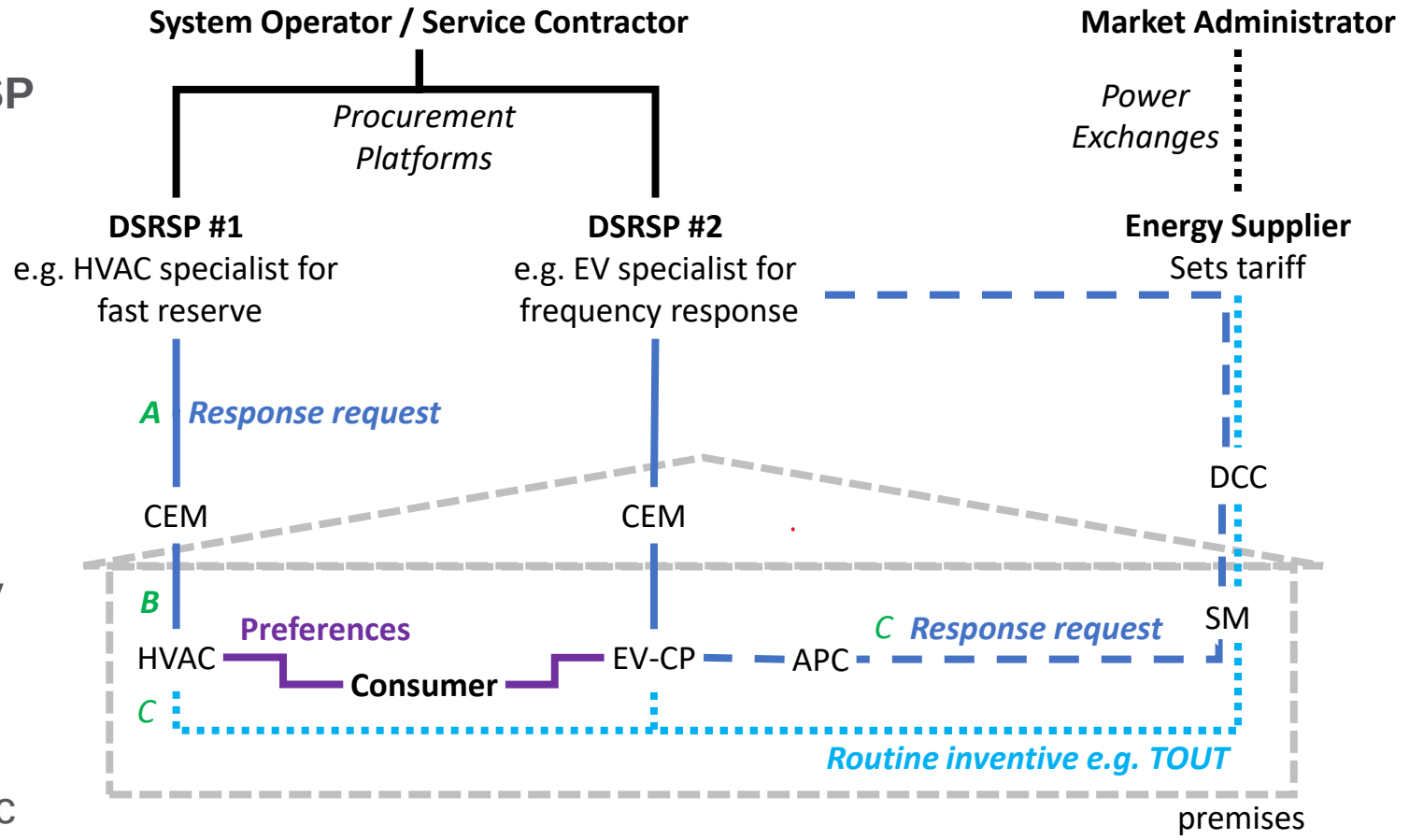
System Architecture – Part 2

3 interfaces:

- **A** - **Interoperable**, specified for **any DSRSP**
  - **OpenADR - EEBUS - DLMS/COSEM**
- **B** – **Proprietary**, can be ESA specific
  - e.g. can be **OCPP for EV-CP**
- C - (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



System Operation – Part 1

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

- **Routine** Mode
  - This is **baseline** DSR operation
  - The ESA controls electricity consumption according to the **consumers wishes** and any **external incentives** e.g. TOUT
- **Response** Mode
  - This **overrides** the baseline during a **response request**, unless the consumer **manually overrides** *(note: their **preferences** are **already** built in)*
  - The ESA controls electricity consumption according to the **consumers wishes** and **DSRSP's chosen flexibility option**, e.g. for frequency response

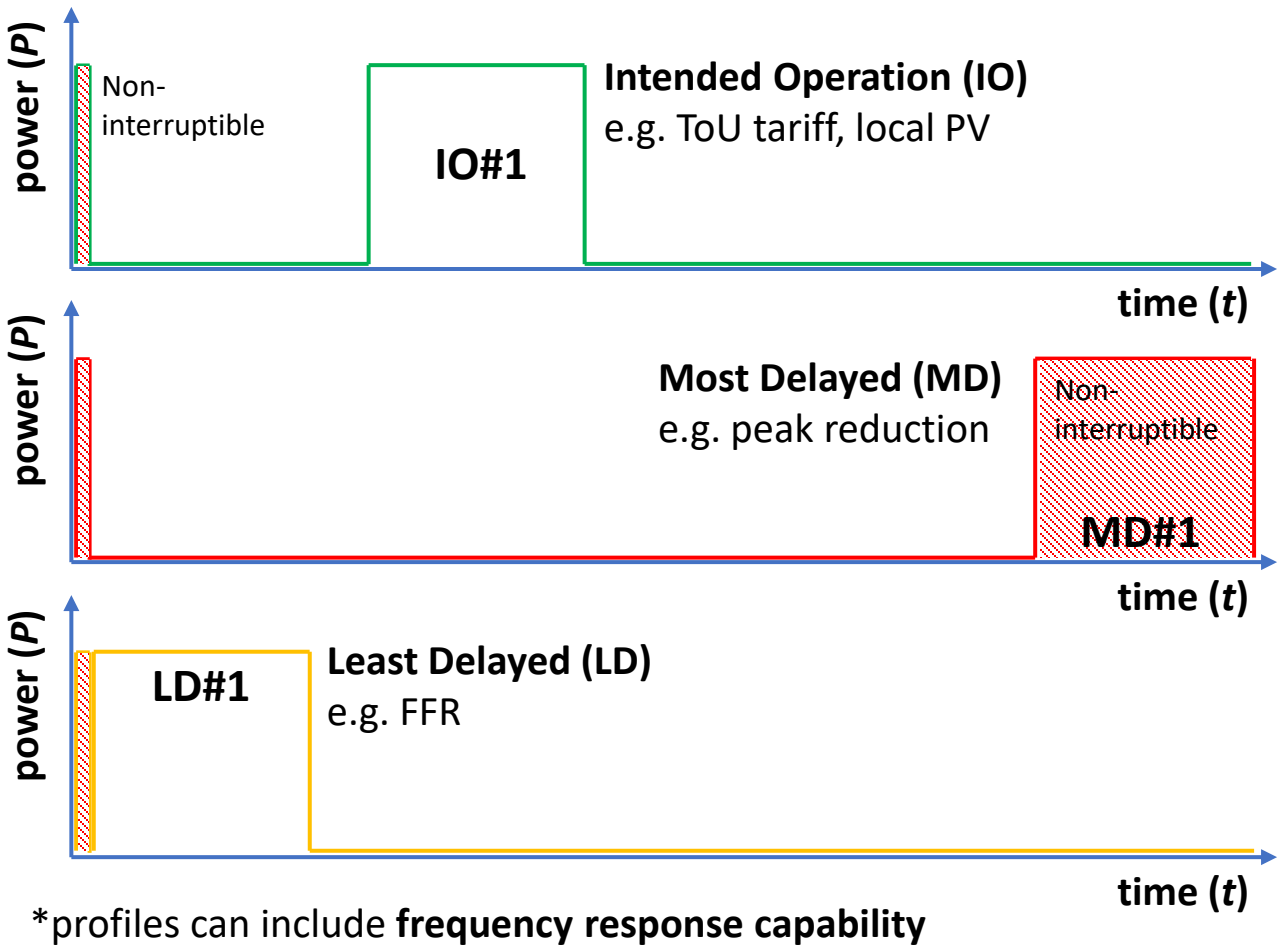
- During a Response call, the DSRSP will **request flexibility** from **~100,000 devices**.
  Requests will be **statistically calculated** with overheads as some **non-response is expected**.
  This makes the system more **resilient**.
- **Cyber security requirements** are also specified.
  Grid stability risks mean they **go beyond IoT** security, but employ **well established industry best practice**.
  e.g. authentication, encryption, updates, ETSI EN 303 645

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.



*profiles can include **frequency response capability**

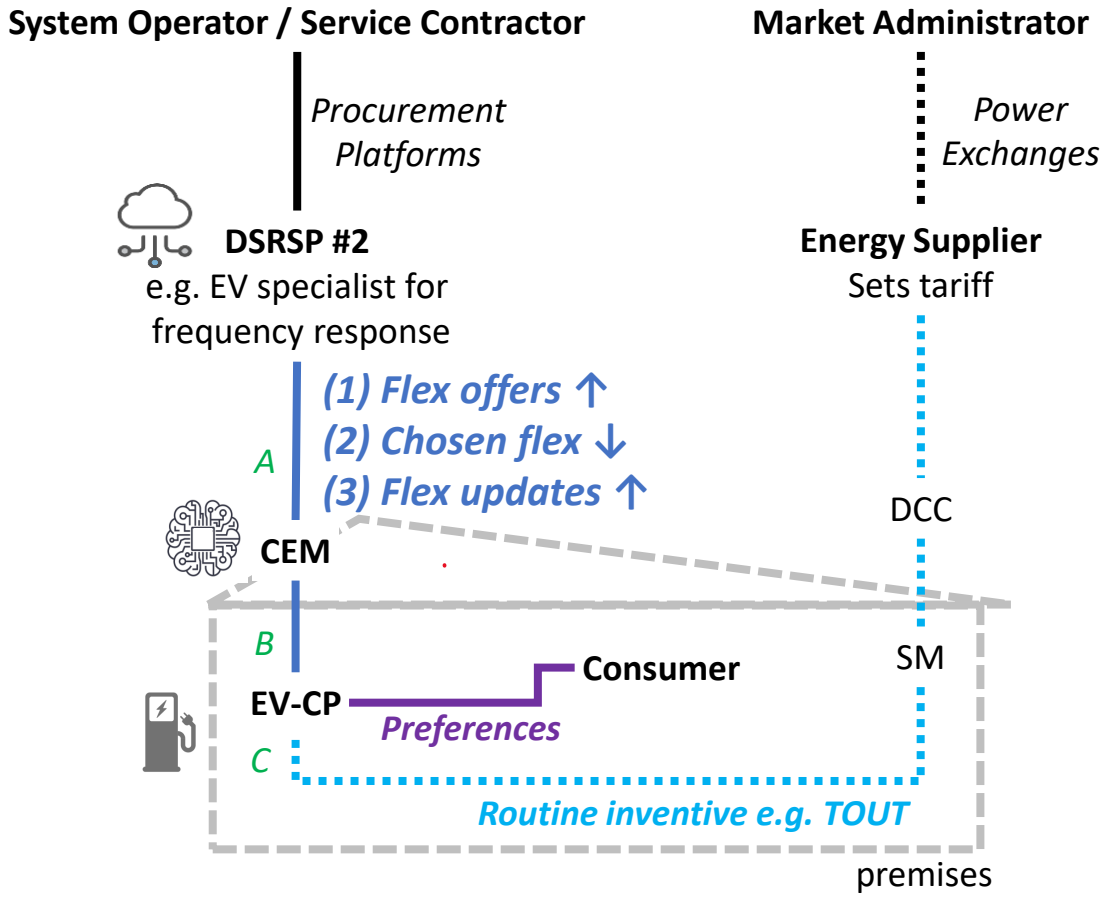
Worked Example #1 (illustrative)

- During **Routine Mode**, the **ESA** regularly creates and sends **power profiles** to the DSRSP, the route is:
  (1) ESA>CEM>DSRSP
- The ESA sends **updates** whenever the flexibility **status changes.**

- During a **DSR Response request**, the DSRSP selects an appropriate **power profile** and **duration time** and sends the **chosen flexibility** to the **CEM** for the **ESA to implement**, the route is:
  (2) DSRSP>CEM>ESA
- The DSRSP keeps a live merit order of **pre-registered power profiles**, so a **single request** delivers a DSR response, enabling fast response **high-value DSR services**.

- During **Response Mode**, the **ESA** regularly sends **active power and power profile updates** to the DSRSP, the route is:
  (3) ESA>CEM>DSRSP
- The ESA sends **updates** whenever the flexibility **status changes** and in accordance with the **technical requirements** of the **DSR service**.
- The DSRSP can then call **more/less DSR response** from its **live merit order** as necessary to meet system requirements.

- When the DSR **request period ends**, after duration time, **Routine Mode** operation can **resume**, e.g. optimised for **TOUT** from **Smart Meter**.



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3. Timelines

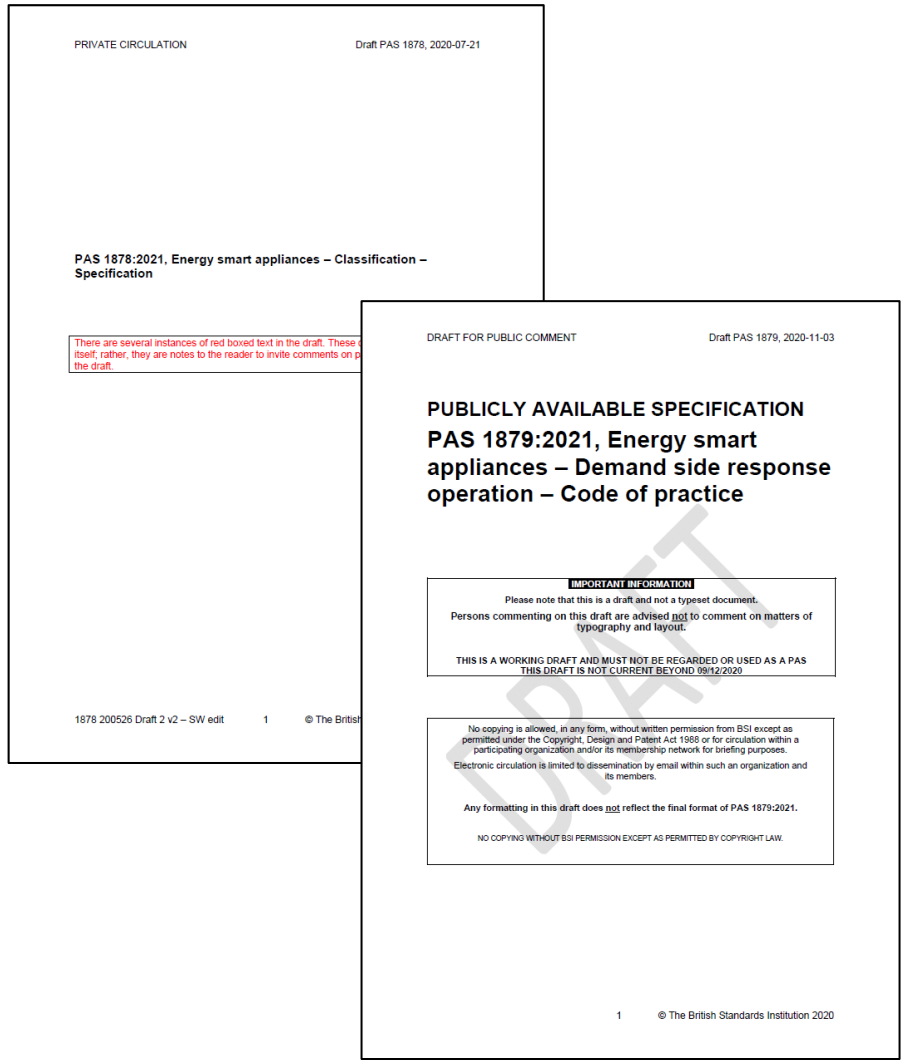
Programme Timelines

PAS 1878 – ESA Specification

- **Public consultation** received **>650 comments**
  https://standardsdevelopment.bsigroup.com/projects/2019-01576#/section
- Steering Group review and updates
- **Publication** planned for **Spring 2021**

PAS 1879 – DSR Code of Practice

- **Public consultation** received **>350 comments**
  https://standardsdevelopment.bsigroup.com/projects/2019-01575#/section
- Steering Group review and updates
- **Publication** planned for **Spring/Summer 2021**



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Thank you

If you have further questions, please contact me
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ESA Programme website:

www.bsigroup.com/smart-appliances-flexible-energy