



S2 Standard

#### S2 Standard EN 50491-12-2

# CoC Brussels, 18 september 2024







# **Energy Management Timeline**



Nr. of flexible devices on premise

CoC should be able to deal with all scenarios

- USP for a smart device will be how much added value it can bring to a consumer out of the box
- A HEMS coordinating multiple smart devices will not be on most consumers mind yet
- However, smart devices can have a lifespan of up to 15 years or more and should be able to deal with both autonomous operation and central control by a HEMS
- If the HEMS scenario is not taken into account smart devices may even hinder the full flex potential of a premise



2

# **Short history of S2**

- 2011 Mandate 490 by European Commission
- 2015 Start of standardisation of current S2 version in CENELEC TC205/WG18
- 2022 Official European S2 standard: EN 50491-12-2
- 2022 Start of global S2 standardisation in IEC SC23K WG3 / TC13
- 2023 Aligned with SAREF within the InterConnect project



### Key takeaways of S2

Only manages energy flexibility

Future-proof interoperability

S2 does not interfere with the OEM

S2 is an add-on to existing protocols

Open market for EMS



4

### S2 services <u>all</u> stakeholder-groups:

- DSO's and TSO's
  - Congestion management and balancing
- Energy Service Providers & Energy Communities
  - E.g. optimize for dynamic tariffs or optimization within community
- OEMs / manufacturers of Energy Smart Appliances
  - Full control over how much flexibility is being exposed
- EMS / HEMS / BEMS developers
  - Freedom to develop new optimization strategies/algorithms for orchestration of Energy Smart Appliances



#### Flex capability based approach of S2

8 generic energy flexibility capabilities ...

... are combined into 5 control types ...

# ... to manage flexibility of energy smart appliances



TTO innovation for life

### S2 architecture



- Responsibility of OEM, OEM keeps control
- Communicates flexibility options from smart device
- Safeguards safety and performance constraints
- End user provides comfort requirements
- Translates device protocol into S2 and vice versa

### Adding new use cases



- Use cases are only implemented on the HEMS → HEMS providers can freely implement new use cases
- Interoperability is guaranteed when the HEMS implements all 5 control types and the ESA at least 1
- No ESA updates required for a new use case



8

# Fill Rate Based Control (1/2)

- Applicable for HVAC, Smart EV Charging, Batteries, etc.
- Modelled around the SoC of a buffer/storage
  - The quantity that is being managed is not relevant
    - Could be temperature, kWh, etc.
- Actuators convert electricity into additional SoC
  - Or vice versa in the case of storage



net fill rate = fill rate actuator0 + fill rate actuator1 - leakage rate

# Fill Rate Based Control (2/2)

- The behaviour of an actuator is modelled as a state machine
- States are referred to as Operation Modes
- An Operation Mode features a fill rate function that shows the ratio between power consumption and the fill rate of the buffer/storage
- Transitions between Operation Modes can have constraints associated with them in the form of timers



innovation