

Smart Buildings and Energy Flexibility

Annex 81 'Data-Driven Smart Buildings' Perspective

IEA EBC Technical Day, June 22, 2023

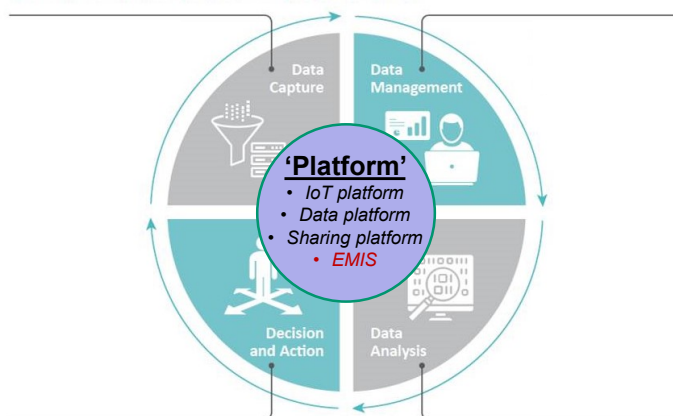
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Digitalisation: Data to Decisions



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It's a business model enabler

1. Administrative tool for markets and schemes

- Data entry
- Compliance processes/steps
- Governance

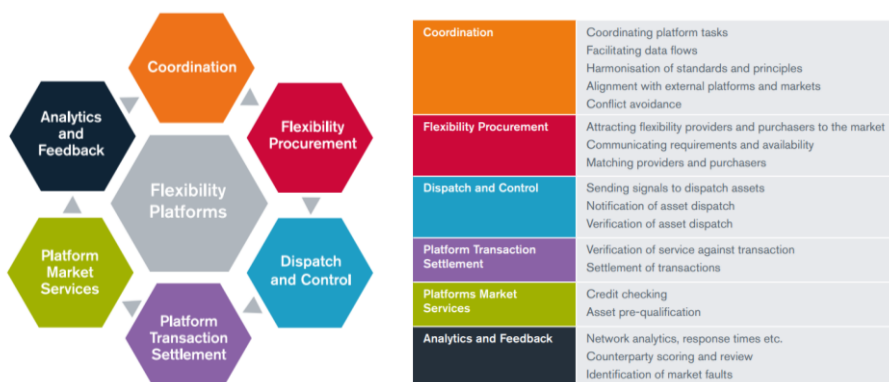
2. Engineering tool for automating

- Energy efficiency
 - Fault Detection and Diagnosis (9%)
 - Advanced controls (up to 40%)
- Synchronising consumption with renewables
 - Time of use (guarantee-of-origin) carbon emissions
 - Demand response

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Example of some platform functions

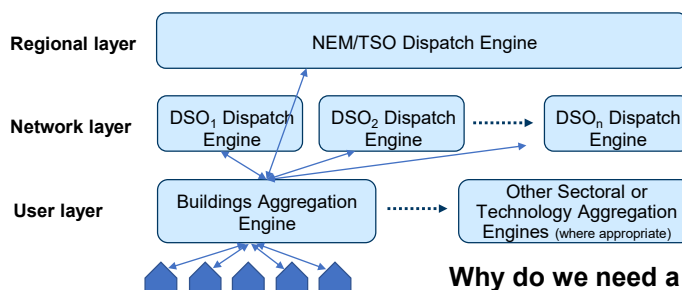
(Example of a DER flexibility management platform (DSO))



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Source: Ofgem, 2019

What could the 'Digital Grid' look like if we want buildings (smaller assets) to participate at scale?



Why do we need a user layer?

- ✓ Simplification
- ✓ Enable user-centric business models
 - ↳ Trust
- ✓ Competition and innovation
 - Ideally the user layer contains a mix of open, independent platforms along with the proprietary platforms of retailers and technology providers

Overcoming Apparent Complexity with Digitalisation (Scalability)

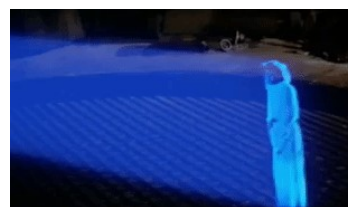


1. Infrastructure for self-service implementation

- Findable, Accessible, Interoperable, Reusable (FAIR) data

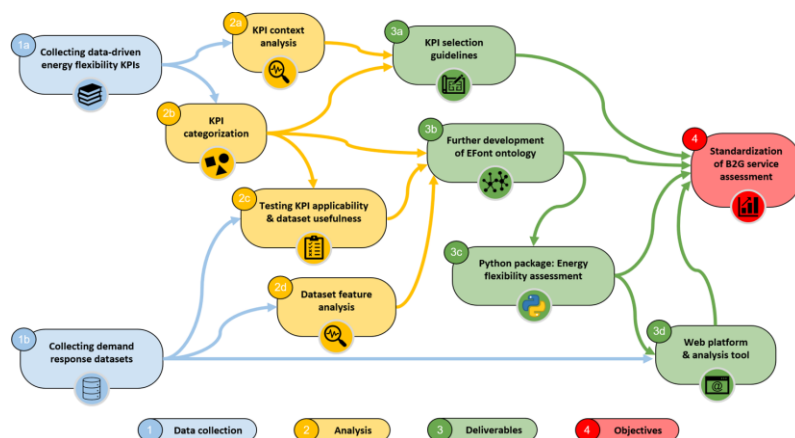
2. Analytics/controls that are agnostic of building

- Physical rules based **Vs** unconstrained machine-reasoning



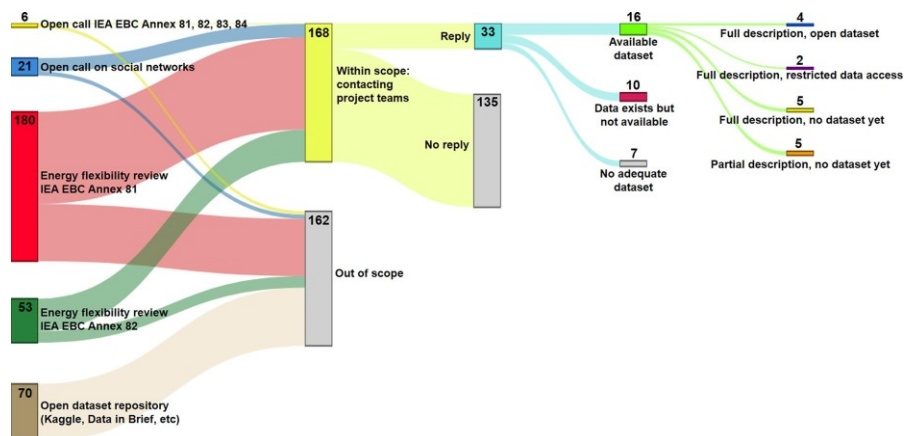
*Help us digitalisation.
You're our only hope!*

Annex81 Activity C3 (B2G)



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Dataset Collection



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Review of Energy Flexibility KPIs

48 data-driven KPIs in 12 main KPI categories:

- Peak power shedding
- Energy / average power load shedding
- Peak power / energy rebound
- Valley filling
- Load shifting
- Demand profile reshaping
- Energy storage capability
- Demand response energy efficiency
- Demand response costs / savings
- Demand response emission / environmental impact
- Grid interaction
- Impact on indoor environmental quality

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Data available vs Data required....

Primitive variables	% required by KPIs	% available in datasets
Event timing	37.66%	18.75%
Energy consumption	35.06%	81.25%
Power demand	32.47%	6.25%
Event request action	24.68%	37.50%
Price signal	16.88%	50.00%
Energy generation	12.99%	25.00%
Event request size	11.69%	0.00%
Indoor temperature	5.19%	93.75%
Thermostat setpoint	5.19%	62.50%
Emission signal	3.90%	12.50%
Storage volume	2.60%	0.00%
Monetary incentives	2.60%	0.00%
Occupancy	1.30%	56.25%
Indoor CO2	1.30%	12.50%

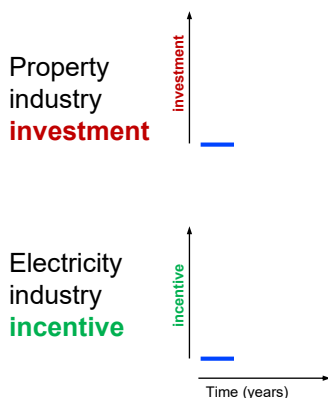
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Flexibility from hidden behind the meter sources can be cheap (~20% of electric batteries) but only with a user centred business model.

1. Utilise the existing property industry supply chain as a distribution channel
2. 'Crowd-sourced' rather than 'customer-campaign'

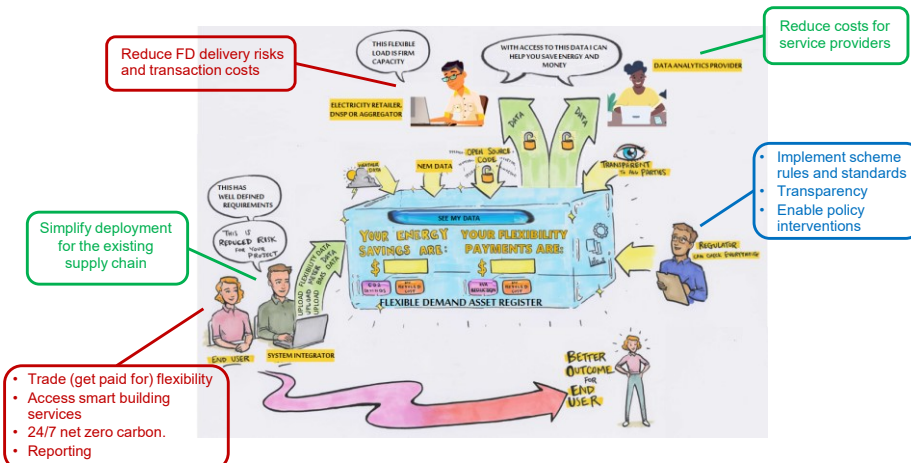
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1. Engaging the supply chain



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2. Crowd sourcing flexibility



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In summary

- Digitalisation (powered by data) is both an administrative and engineering tool
- Digitalisation is delivered over a 'platform'
- Scalability will require
 - Standardisation of data and administrative requirements (implemented on the platform(s)) to achieve 'self-service'
 - User-layer platform(s) to enshrine user-centric business model(s)
- Good evidence that this can be done at ~20% of the cost of batteries

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Thank You

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