

# Flexibility Digital Infrastructure System Use Case exercise

GreenSync

January 2024, Version 1.1

*Disclaimer: The material in this proposal comprises of GreenSync's current thinking around a Flexibility Digital Infrastructure (FDI). This is purely an information gathering exercise to enable a more informed discussion on Ofgem's FDI technical workstream. The System Use Case (SUC) proposals in this document are an example and not necessarily a fully functional implementation specification.*

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## Version history

Version	Date	Author(s)	Notes
	4 <sup>th</sup> December 2023	Ofgem	Emailed to participants.
1.0	11 <sup>th</sup> January 2024	GreenSync	Reviewed and collected inputs from Greg Johnston, Senior Digital Energy Consultant at ESC
1.0	15 <sup>th</sup> January 2024	GreenSync	Reviewed with Ofgem in a FDI check-in
1.0	17 <sup>th</sup> January 2024	GreenSync	Reviewed and collected inputs from the DCC
1.1.	19 <sup>th</sup> January 2024	GreenSync	Emailed to Ofgem as final contribution

## Glossary

Glossary	
User	Data producers and consumers verified within the FDI ecosystem, e.g. MO, SO, FSP and Special Users
Special Users	Other entities verified within the FDI ecosystem such as the regulator, investors, or third-party service provider with an interest in flexibility services.
Flexibility Service Provider (FSP)	Umbrella term to cover the contracting entity selling and delivering flexibility services, e.g. asset owners, asset operators, aggregators, suppliers and DSRSPs.
Market Operator (MO)	Entities that provide platform services to facilitate the end-to-end flexibility service delivery i.e. an operator of an independent market platform or in-house market platform
System Operator (SO)	Entities that buy flexibility to operate the power system e.g. ESO, DNO.
Decentralised Energy Exchange (deX)	GreenSync's deX platform
AAR/CAR	Automated Asset Registration and Central Asset Register system
AAR/CAR Operator	Operator of the AAR/CAR system
Data Communications Company (DCC)	Consortium partner in the AAR Programme and proposed provider of Retail Energy Location (REL) Address and MPAN data as part of the AAR solution.

## 1. Introduction

This document has been prepared by GreenSync, with contributions from GreenSync's consortium partner in the AAR Programme, the DCC and Greg Johnston, Senior Digital Energy Consultant at ESC.

Following represents GreenSync's current understanding and thinking around a Flexibility Digital Infrastructure (FDI) to provide possible solution(s) for BUC.2 and BUC.4.

To narrow down the scope and make this proposal as pragmatic as possible, we have made the following assumptions:

1. BUC.2 and BUC.4 are inherently linked and shall be looked in conjunction, specific to registration of LCT assets. Registering participants of digital processes and systems such as asset registration, within the domain of such systems, allows for easy automation and scalability.
2. Same approach can be taken for BUC.4 and other BUC's dependent on a 'participant' registration.
3. For any participant registration system, the key challenge is not in generating and managing assignment of a unique ID, but in establishing eligibility for a User to register as participant of such a system, and authentication of the User to access the system for registration. For this exercise, we assume, that solving for this is out of scope of the SUC's described hereinafter.
4. Although we believe the proposed features enough flexibility to be utilised in different deployment scenarios, we assumed for this exercise a centralised approach. For example, a single system covering bulk registration of domestic and non-domestic <11kV connected assets across DNO license areas. Should there be a need for an additional system, e.g. for registration of larger assets, same or similar system can be setup in parallel (if not existing already like ECR), following the same approach. Resolving for scalability, centralised approach represents the simplest and most probably fastest go-live option, as it does not require any specific coordination systems and processes, as it does not need to depend on shared infrastructure, except for general items such as digital certification of Users, etc.
5. To make the SUC's as crisp and tangible as possible, we have allowed ourselves to describe the interactions and design based on GreenSync deX technology; not implying such technology must be used for the SUC's to be implemented.

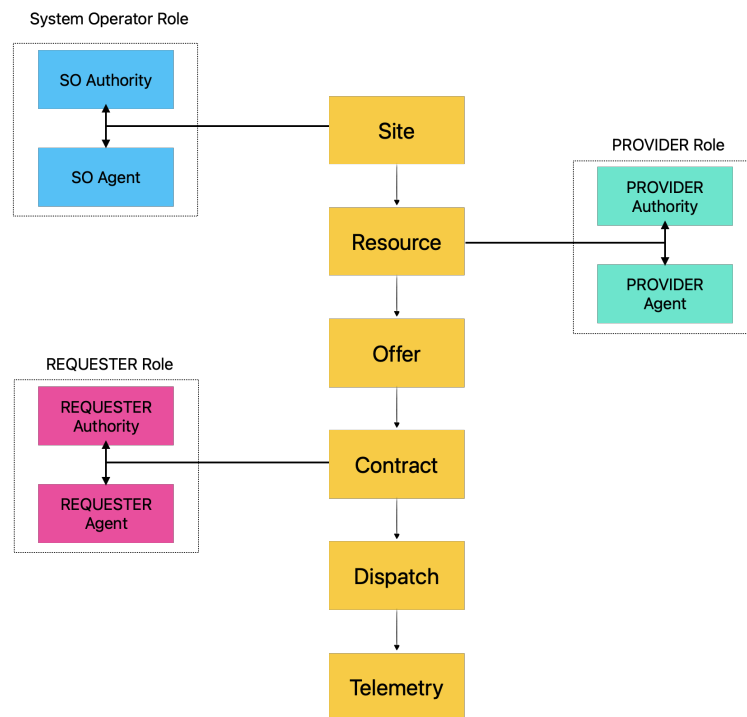
GreenSync is convinced FDI can benefit from following the approach and concepts described below, not only for BUC.2 but potentially also other BUC's with direct dependency on BUC's 2 and 4, utilizing it either in centralized, hybrid or fully decentralized deployment schemes.

## 2. Decentralised energy exchange concepts

GreenSync decentralised energy eXchange (deX) establishes an open access digital protocol (and associated physical standards) allowing all LCT technologies to participate, create standard contractible services and ensure cybersecurity.

deX vendor-integrations enable LCT devices (assets), with customer consents in place, to be registered in deX as 'Resources', and in doing so unlock access to value for the device owners as well as support to the retailers, aggregators, market operators or networks who contract their services. Specifically, a contracted deX 'Registrar' can register and make

visible devices via deX so that they may be used in other applications. They can then be contracted, via an aggregator or retailer for grid services, unlocking new value streams for device owners such as energy generation during peak demand, managing frequency or grid voltage, or reducing network constraints.



*Figure 1 Basic flow and roles in deX platform*

As shown on Figure 1 deX is based around 3 major roles – System Operator, Provider and Requester role. Each of these roles are represented with an Authority i.e. unique identification and authentication of a business on the platform, as well as identification of an Agent i.e. the system (DERMS, DMS, VPP, other registers and market platforms, etc.) used by the respective business.

A System Operator could be any of the DNO's, Provider would typically be an asset owner or asset operator and the Requester would typically be aggregators, suppliers and/or DSRSPs.

The process can be divided in 4 distinct phases – Registration, Contracting, Dispatch and Telemetry.

The Registration provides verification of the asset and key asset details, Contracting provides the agreement for the provision of the services and Dispatch the actual operation on the Resource – requesting a change in the behaviour of the Resource for a finite duration.

Unique IDs for resources and new sites are allocated during the registration process, while participant IDs can be created beforehand.

Much like the energy supplier churn process, deX trusts clients to act as agents on behalf of the customer. E.g. a supplier can “churn” a customer from another supplier, on behalf of the customer, if they have the customer’s consent. The same principle is followed in deX to digitalise the registration of LCTs.

### 3. SUC for BUC.4

Please use this template (based on [IEC standards](#)) to set out your SUC proposals which deliver the BUC narrative and KPIs, and address the scenario provided above. You may find the [PlantUML website](#) tool useful for making sequence diagrams (tutorial seen [here](#)), but diagrams created in Word/PowerPoint (or equivalent) are entirely acceptable.

Narrative of the System Use Case
Short description
<p><i>Written description of your SUC implementation of the BUC. Describe the SUC operation and what new/existing systems are involved and what system functions are used to deliver the BUC. Describe any aspects of the BUC narrative or KPIs or scenario that your SUC implementation does not meet. Optionally, please also include any overall architectural diagrams.</i></p> <p>The proposed SUC describes how an approved platform (building on SUC/BUC.2) can act as FDI to deliver the BUC.4 outcomes. In the proposed, BUC.2 and BUC.4 are inherently linked and specific to registration of LCT assets, allowing for a ‘participant’ to be fully automated, seamless, and scalable.</p> <p>For any participant registration system, the key challenge is not in generating and managing assignment of a unique ID, but in establishing eligibility for a User to register as Participant of such a system, and authentication of the User to access the system for registration. For this exercise, we assume, that solving for this is out of scope of the SUC, and that such a validation or certification system (and/or organization), implemented based on clear market rules, who is eligible and authorised to participate in SUC/BUC.2, exists.</p> <p>Worth highlighting that there is robust process for User registration validation in place today across smart metering and there may be opportunities to re-use.</p> <p>With this allowing for Participant registration, allocating unique, machine-generated ID’s and exposing such IDs to other authorized market participants is easily achievable. A good example of such practice is GreenSync deX, automatically registering and assigning unique Participant IDs to eligible and authorised Users that wish to participate in asset registration.</p> <p>Once assigned, any Participant ID can be either easily queried through an API e.g. GET /participant/{id} or through deX update feeds, creating full transparency for all Participants.</p> <p>deX acts as both a system of record, and a communication mechanism, by broadcasting “snapshots” of state to all affected clients, whenever an entity changes. Transparency is one of the key benefits, noting:</p> <ul style="list-style-type: none"><li>• Encouraging transparency discourages storage of client-specific data in deX.</li><li>• By being transparent to all involved parties, it is clear as to what has happened, and mitigates repudiation security risk.</li></ul>

- It enables (authorised) parties to “mirror” all relevant data, removing the risk of total data loss.



With proposed system based on deX, the system clients (participant systems) simply identify themselves to the system’s API through an authentication mechanism. Please note cyber security of such a system is paramount and demands dedicated deep dive. For the purpose of this document, we assume that modern cybersecurity methods are applicable to the proposed system, making it compliant to the NCSC CAF and/or other frameworks (IEC27001, SOC2, etc).



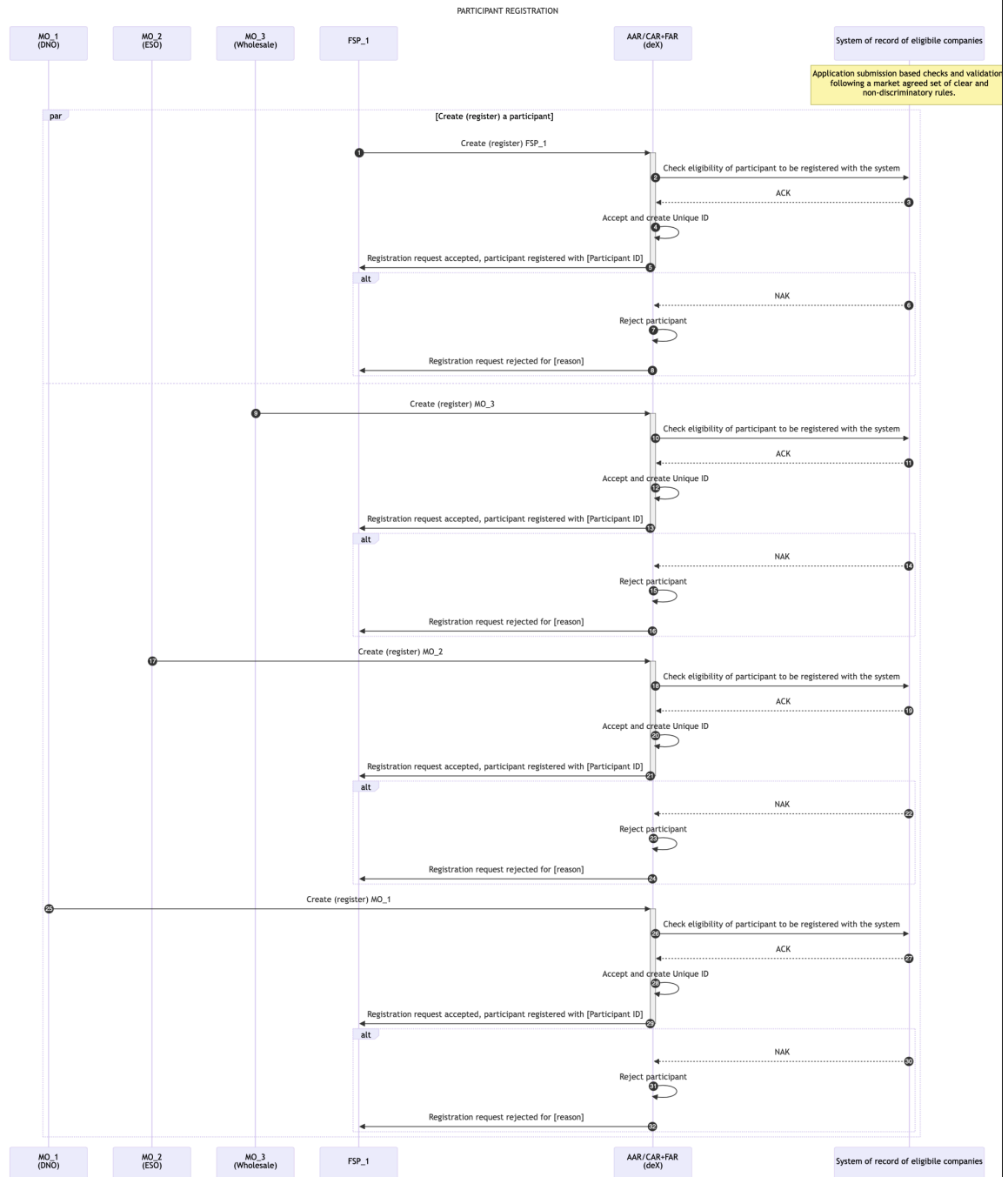
Use Case conditions	
Assumptions/Prerequisites	
1	Seamless integration utilising the Data Sharing Infrastructure (Trust + Prepare + Share) outcomes defined in BUC.1 and BUC1.1.
2	Relevant data- and entity- assurance agreements are defined as part of BUC.1 and/or BUC.8 and are readily implementable by the system.
3	Information flows utilise a necessary common data standard and wider IT architecture to support the functions, defined in BUC1.1.
4	Seamless integration to enable common asset registration outcomes in BUC.2.
5	Seamless integration to enable common registration of products outcomes in BUC.5.
6	Seamless integration to enable common pre-qualification outcomes in BUC.7.
7	Seamless integration to enable common TSO-DSO coordination outcomes in BUC.6.
8	Seamless integration with relevant common compliance tools in BUC.8
8	Asset details submitted to the system are accompanied with a mechanism for validating owner consents.
9	Asset details are validated according to a transparent and well-defined logic.
10	System integrations in place between deX, Provider and Requester systems.
11	Clear and market accepted rules for who is eligible to register as participant.

Actor name	Actor type ("system" or "business")	Actor description
FSP_1(Requester)	Business/System	FPS is an asset operator, aggregator, supplier or a DSRSP who is bulk registering domestic and non-domestic <11kV connected assets across DNO license areas. Assumed having the Asset Owner's consent to act as Requester Authority in deX terms for this SUC. As Requester Authority, we assume the FPS has a system in place able to interact with deX as Requester Agent.
MO_1(DNO)	Business/System	Local DNO market (run by MO-1)
MO_2(ESO)	Business/System	ESO national market (run by MO-2)
MO_3(Wholesale)	Business/System	Wholesale market (run by MO-3)
deX	System	Market platform for automated asset registration and central asset register (AAR/CAR)
AAR/CAR+FAR	Business	Entity operating UK-wide AAR/CAR (automated asset registration and central asset register) + FAR (flexibility access register), powered by deX

System of record of eligible companies	System	<p>System of record for pre-screening and validation of companies and businesses that wish to participate in FDI BUC.2 and/or other BUC's. The system could be something as simple as an application submission-based checker or something more sophisticated like a digital certification system.</p> <p>In any case, there is a need for a governance regime, procedures, and an administrator (ideally separate to the operator of the BUC.2/BUC.4 system) to assess the suitability of participants wishing to register and monitor compliance on an ongoing basis, in sync with legislation.</p>
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## Diagram(s) of the Use Case

Please include sequence diagram(s) working through the scenario steps to show how they are implemented in the SUC proposed.



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## 4. SUC for BUC.2

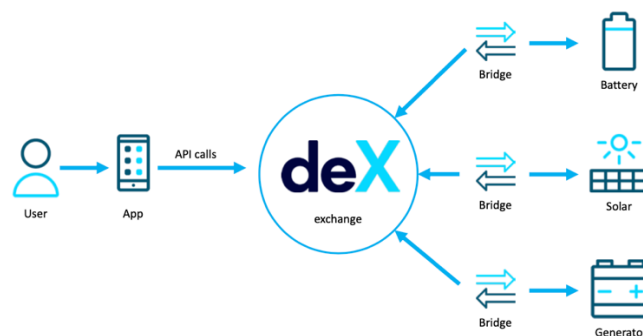
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### Narrative of the System Use Case

#### Short description

*Written description of your SUC implementation of the BUC. Describe the SUC operation and what new/existing systems are involved and what system functions are used to deliver the BUC. Describe any aspects of the BUC narrative or KPIs or scenario that your SUC implementation does not meet. Optionally, please also include any overall architectural diagrams.*

The proposed SUC describes how an approved platform can act as FDI to deliver the BUC.2 outcomes. For this purpose, a platform such as GreenSync deX may be used. GreenSync deX as a single market platform interacts with Users over an open API and with pre-integrated LCT Technology Vendor systems, enabling fully automated asset registrations that can easily scale with forecasted UK LCT growth.



The following systems and actors are involved:

- The system 'deX' is a new system which provides a common point of access and facilitates common data exchange between the Requester and Provider platforms and systems other actors.
- As per DESNZ AAR/CAR Innovation project proposal, 'deX' could be operated by an independent 'AAR/CAR Operator' (confirmation pending final project report). AAR/CAR represents the market platform for automated asset registration and central asset register that can be extended to facilitate also for the Flexibility Access Registration (FAR) to cover partly or in full BUC.4 (see SUC\_BUC.4 for more details).
- The 'Installer' is the nominated installer of LCTs who physically installs the asset and triggers its registration by notifying relevant parties.

- The 'FPS\_1' is an asset operator, aggregator, supplier or a DSRSP who is, with the consent of the Asset Owners, bulk registering domestic and non-domestic <11kV connected assets across DNO license areas. A Requester Authority and Requester Actor in deX terms.
- It's either the 'Installer' or the 'FPS\_1' that is the deX Registrar, registering the asset. In this example, we have selected the 'FPS\_1' to be the Registrar.
- The 'SO\_1' is the DNO in who's license area is the asset is connected, hence linking the MPAN scheme to the asset Site ID.
- The 'Tech Vendor' is the asset OEM registered and integrated with deX. A Provider Agent in deX terms. May act as a Provider Authority if empowered by the Asset Owner.
- The 'Asset Owner' is the physical or legal entity that owns the asset in question.

Essentially there are only a few preconditions for the SUC to work – the Tech Vendor's system is integrated with, registered, and approved by deX. This enables MO\_AAR/CAR to manage and maintain the vast variety of LCT technologies and vendors as 'Providers' to deX.

Likewise, it is recommended that the FPS registers with deX as 'Requester' prior to the registration of the asset. Namely, unique IDs for resources and new sites are allocated during the registration process, while participant IDs are ideally created beforehand.

deX manages and auto generates and assigns unique IDs to participants e.g.

```
Participant {
  id                                string
                                   example: P-01C81Q43FDBJFEBPXAYD60MT5W
                                   the deX ID of the participant. This id is returned when a participant is registered with deX
  description                       string
                                   example: Battery device operator
                                   The high level details of this participant
}
```

Participants can act and identify themselves as Requesters and Providers.

Once participants are registered, and corresponding consents, satisfying the requirements and compliance to the Data Protection Act, are in place, the registration can be triggered with deX by a simple API call from the 'Requester Agent' i.e. the system used by the 'Requester', in this SUC the FPS. The request contains the participant IDs, the location (MPAN) and the external asset reference such as serial number. Response includes unique Resource ID linked with the Site ID and nameplate parameters of the asset as provided by the Provider. From that moment onwards the Resource can be probed by any authorized deX participant to view its details. Below and example of a Get Resource information request response.

```
{
  "type": "Battery",
  "siteId": "S-01CPP3MGVWBVRBJFDKFZQQZN0P",
  "annotations": {
```

```

    "make": "ACME Battery Company Inc",
    "model": "Largest Battery Ever 2700X",
    "serialNumber": "R59234ZZXGSS",
    "additionalProp1": "string",
    "additionalProp2": "string",
    "additionalProp3": "string"
  },
  "capabilities": {
    "maximumContinuousRealLoadW": 5000,
    "minimumContinuousRealLoadW": -5000,
    "maximumContinuousStorageLoadW": 5000,
    "minimumContinuousStorageLoadW": -5000,
    "maximumContinuousApparentLoadVa": 5800,
    "minimumContinuousApparentLoadVa": -5800,
    "maximumContinuousReactiveLoadVar": 600,
    "minimumContinuousReactiveLoadVar": -600,
    "maximumRuntimeS": 3600,
    "minimumRuntimeS": 300,
    "maximumPeakRealLoadW": 7000,
    "minimumPeakRealLoadW": -7000,
    "maximumPeakApparentLoadVa": 7200,
    "minimumPeakApparentLoadVa": -7200,
    "maximumPeakDurationS": 10,
    "minimumRestDurationS": 300,
    "maximumStoredEnergyWh": 15000,
    "minimumPowerFactorInductive": 0.8,
    "minimumPowerFactorCapacitive": 0.8
  },
  "id": "R-01C81Q43FDBJFEBPXAYD60MT5W",
  "parties": [
    {
      "role": "Requester",
      "authorityId": "P-01C81Q43FDBJFEBPXAYD60MT5W",
      "agentId": "P-01CWSK0XHH8T8S77FG7B425NAP"
    },
    {
      "role": "Provider",
      "authorityId": "P-01CC2JK97ZG90T8ZMMGMWMQ9Q0",
      "agentId": "P-01CWSK18NAEAW2GQBVV5Q3R93"
    },
    {
      "role": "SystemOperator",
      "authorityId": "P-01CWCXQGH862YYMT68QV5NP73N",
      "agentId": "P-01CWCXPQR8407BJ3FKW3AWS7MJ"
    }
  ],
  "deregisteredAt": "",
  "registeredAt": "2023-03-16T00:00:00Z"
}

```

Note that at this point, although Resource is registered and may be made available to any Participant, no Contract has been created yet, hence no actions (dispatch or configuration instructions) can be applied to the Resource. See **Error! Reference source not found.** for Contract creation details. Below is an example of a digital Contract with eligible services for the given Resource as agreed between a Requester (FSP) and the Provider (Asset Owner supported by the Tech Vendor's system).

```

{
  "resourceId": "R-01C81Q43FDBJFEBPXAYD60MT5W",
  "startAt": "2023-07-23T00:00:00Z",
  "endAt": "2023-12-23T00:00:00Z",
  "parties": [

```

```

{
  "role": "Requester",
  "authorityId": "P-01DGH3JEVZYMAWB1KBJQ56ZEYC",
  "agentId": "P-01CWSK0XHH8T8S77FG7B425NAP"
},
{
  "role": "Provider",
  "authorityId": "P-01DGH3JEVZCEPXHAVYSNMHVFK2",
  "agentId": "P-01CWSK18NAEAW2GQBVV5Q3R93"
}
],
"annotations": {
  "notes": "Call Joe if a dispatch fails",
  "additionalProp1": "string",
  "additionalProp2": "string",
  "additionalProp3": "string"
},
"rights": [
  {
    "type": "Dispatch",
    "availableDispatches": [
      {
        "dispatchType": "SetLowerLimit",
        "measuredProperty": "RealLoadW",
        "range": {
          "from": -2000,
          "to": 0,
          "step": 10
        }
      }
    ]
  }
],
},
],
"id": "C-01DGH3JEVZWB5WDETW40WWDWS",
"createdAt": "2023-07-19T00:00:00Z",
"acceptedAt": "2023-07-19T00:00:00Z",
"terminatedAt": "",
"terminatedReason": "",
"acceptances": [
  {
    "partyId": "P-01DGH3JEVZCEPXHAVYSNMHVFK2",
    "role": "Provider",
    "status": "Granted",
    "requestedAt": "2023-07-17T00:00:00Z",
    "respondedAt": "2023-07-17T00:00:00Z",
    "reason": "Looks good"
  },
  {
    "partyId": "P-01DGH3JEVZYMAWB1KBJQ56ZEYC",
    "role": "Requester",
    "status": "Requested",
    "requestedAt": "2023-07-17T00:00:00Z",
    "respondedAt": null,
    "reason": null
  }
]
}

```

Any operations of a Participant that do not have a valid contract will be automatically rejected.

Note that a Resource may have multiple Contracts (e.g. a dynamic connection agreement with curtailment and a commercial capacity contract) hence it is possible dispatch signal is



called against multiple Contracts, in which case, to avoid conflict, market rules must be clear on priority order or shared allocation of the Resource. Market rules prioritization may be easily implemented as Contract extension.

Contracts represent an essential extension to asset registration as they provide information on eligibility and capability of an asset for flexibility service. For example, in this way an MO could be informed not only that an asset is a Solar PV with a X kW inverter but also, as per example above, that it has the 'SetLowerLimit' capability exposed and hence can participate in a flexibility scheme that requires reduction of generated power (up to Y kW) at connected Site Z in the given DNO's license area N. That is, if an MO is interested in this level of details at an asset level. If not, the FPS can provide, based on the same approach, an aggregated view e.g. in the given DNO's license area N, there are M Solar PVs with aggregated capacity of XX kW and capability to dispatch YY kW reduction. Such aggregation again could easily be an extension of the proposed 'deX' system as part of future FDI.

Use Case conditions	
Assumptions/Prerequisites	
1	Seamless integration utilising the Data Sharing Infrastructure (Trust + Prepare + Share) outcomes defined in BUC.1 and BUC1.1.
2	Relevant data- and entity- assurance agreements are defined as part of BUC.1 and/or BUC.8 and are readily implementable by the system.
3	Information flows utilise a necessary common data standard and wider IT architecture to support the functions, defined in BUC1.1.
4	Seamless integration to utilise common user registration outcomes in BUC.4.
5	Seamless integration to enable common pre-qualification outcomes in BUC.7.
6	Seamless integration to enable common TSO-DSO coordination outcomes in BUC.6.
7	Seamless integration with relevant common compliance tools in BUC.8
8	Asset details submitted to the system are accompanied with a mechanism for validating owner consents.
9	Asset details are validated according to a transparent and well-defined logic.
10	System integrations in place between deX, Provider and Requester systems.
11	Assets are 'internet enabled' i.e. can be reached remotely through Tech Vendor's system.
12	Clear and market accepted rules for who is eligible to register as participant.

Actor name	Actor type	Actor description
Asset Owner	Business	Private or legal entity owning the asset. A Provider Authority in deX terms.
Installer	Business/System	Installer of LCTs who physically installs the asset and triggers its registration by notifying relevant parties
FSP_1(Requester)	Business/System	FPS is an asset operator, aggregator, supplier or a DSRSP who is bulk registering domestic and non-domestic <11kV connected assets

Actor name	Actor type	Actor description
		across DNO license areas. Assumed having the Asset Owner's consent to act as Requester Authority in deX terms for this SUC. As Requester Authority, we assume the FPS has a system in place able to interact with deX as Requester Agent.
SO_1(DNO)	Business/System	DNO in who's license area the asset is connected
deX	System	Market platform for automated asset registration and central asset register (AAR/CAR)
AAR/CAR+FAR	Business	Entity operating UK-wide AAR/CAR (automated asset registration and central asset register) + FAR (flexibility access register), powered by deX
Tech Vendor/Bridge (Provider)	System	OEM registered and integrated with deX. A Provider Agent in deX terms. May act as a Provider Authority if empowered by the Asset Owner.

## Diagram(s) of the Use Case

Please include sequence diagram(s) working through the scenario steps to show how they are implemented in the SUC proposed.

