



IEC 61850

DER Grid integration Multivendor Systems

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DER Grid Integration with IEC 61850

Integrating DER

- IEC 61850-90-15: IEC 61850 based DER Grid Integration
 - Basic concepts
 - Functional requirements
 - IEC 61850 data models

This part of the presentation discusses concepts from documents in preparation that can still change in the future



Technical Report IEC 61850-90-15

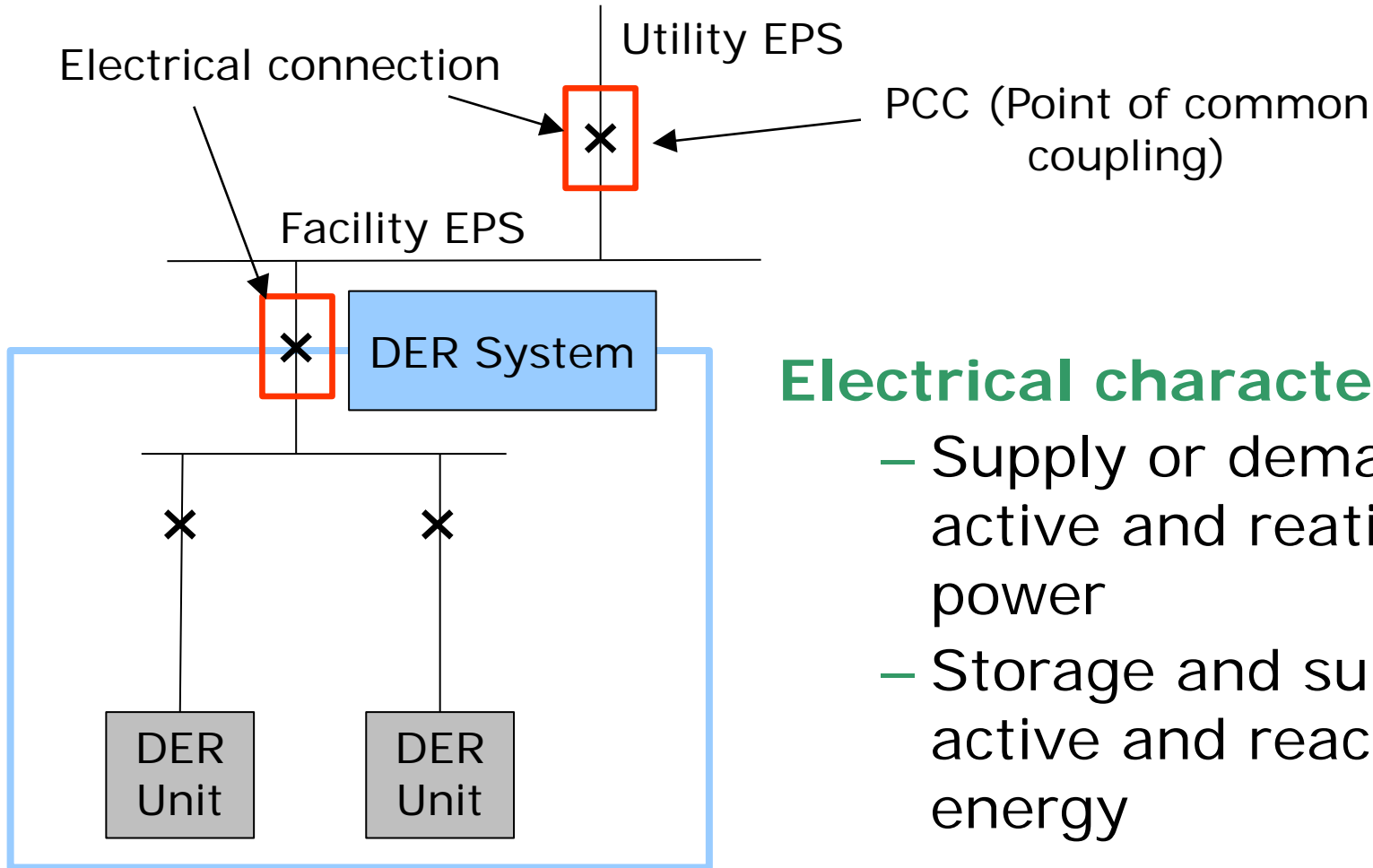
Scope

- Describe the concepts to integrate DER systems into the grid using IEC 61850
 - Concept of a hierarchical DER system which comprises a **DER management system**, **DER systems** and various types of **DER units**
 - Functional requirements of DER grid integration
 - Setting up an information model of the DER system based on IEC 61850

DER Grid Integration - Definition

DER Grid Integration means that for reasons of **security of supply** and **security of the power system**, DER system should provide on request **ancillary services** that are in conventional power systems provided by bulk power generation systems.

Integration of DER



Electrical characteristics

- Supply or demand of active and reactive power
- Storage and supply of active and reactive energy

Modeling requirements for integration

■ Various usage of DER

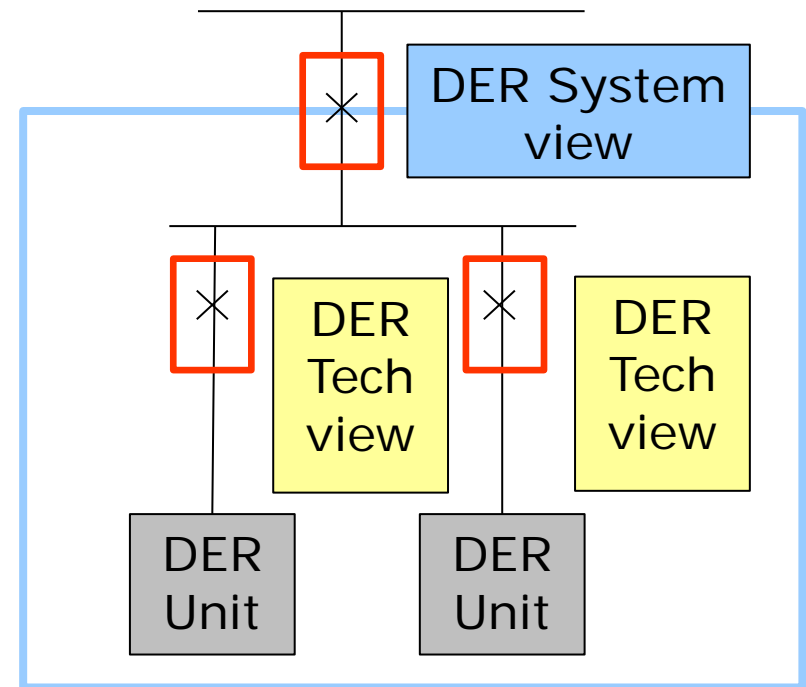
- Provide active power for local use and feed remaining power into the network (not controllable from the DSO)
- Provide active and reactive power to the network (scheduled and dispatched by DSO)
- Commercial usage – Participation in the market
- Offering of ancillary services (e.g. Frequency control, Reactive power and voltage control)

■ DER systems may be hierarchical

■ Legal constraints (Grid Codes) that may vary between regions need to be supported

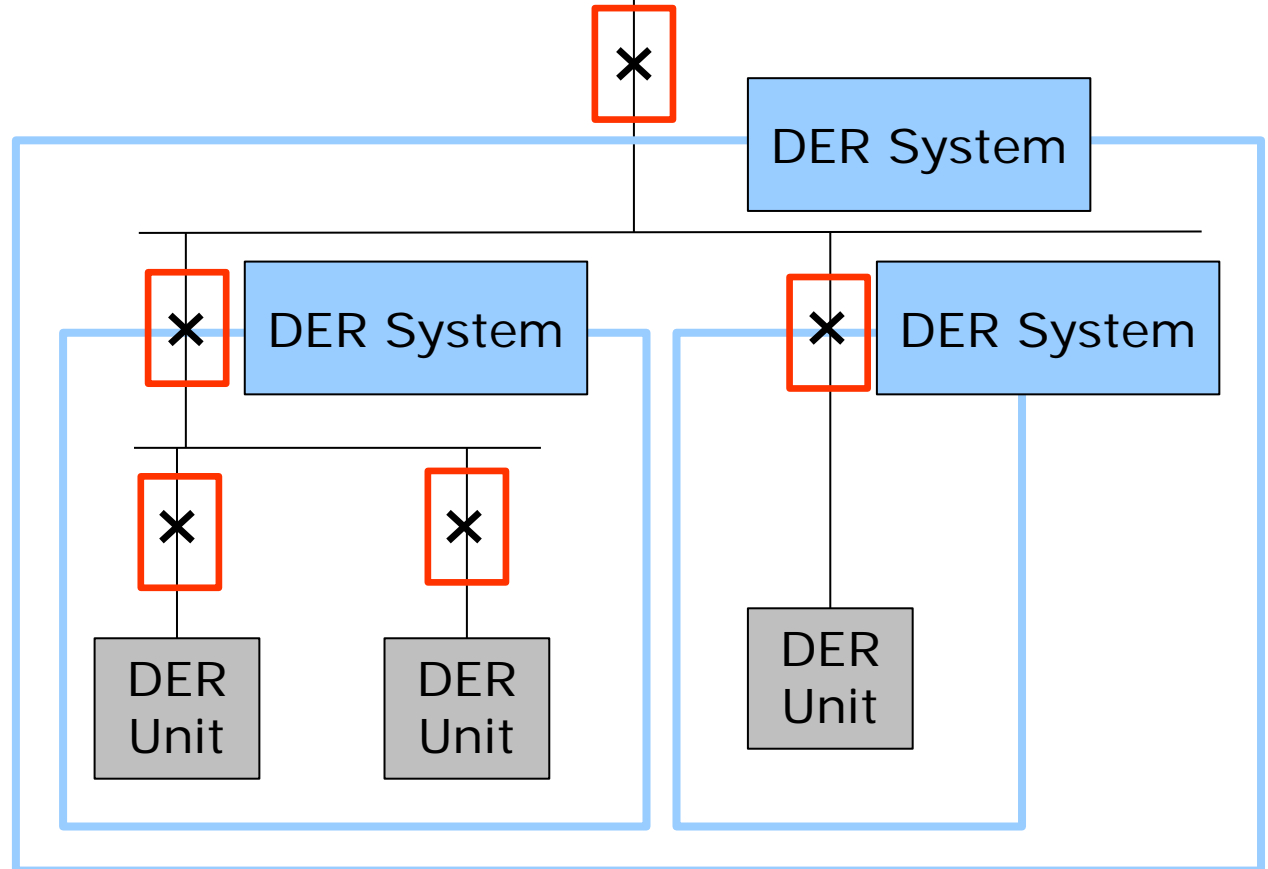
DER System

- A DER System may group multiple DER units of different types
- A DER unit is of one single type, e.g.
 - PV unit
 - Battery
- A DER unit has equipment specific characteristics



DER System

- DER systems may be hierarchically
- Services at a higher ECP are an aggregation of the lower ECP including the consideration of local load



Generic Electrical Characteristics

- Measurements (active power, reactive power, ...)
- Control
 - Commands (Start-up, ...)
 - Setpoints (active power, reactive power, power factor, ...)
 - Selection of modes
 - Schedules
- Capabilities of the plant for generation and load (active power, reactive power, ...)
 - Rated values
 - Current operation dependent values
- Storage capabilities (stored energy, available storage capacity, loss)
 - Rated values
 - Current operation dependent values
- Further characteristics
 - Start-up time, ...

Management of the DER system

Influence the actual value of the electrical characteristics

- Tightly coupled interactions
 - Controls
 - Direct setpoints with optional ramps for changes
- Loosely coupled interactions
 - Modes responding to local sensed conditions (electrical or temperature) or prices
 - Schedules
- Broadcasting interactions
 - Emergency signals (acting on setpoints or controls; factors for reduction of supplied power)
 - Prices

*Challenges in applying IEC 61850 for
Multivendor Systems*

Multivendor Systems

What are the issues?

- The main drivers for IEC 61850:
 - ... to reduce costs of implementation
 - ... to achieve interoperability using standards-based products and technologies
 - ... to enable seamless integration

... What does "interoperability" mean?

... What is the impact of a multivendor system on cost reduction for implementation and seamless integration?

Interoperability

From IEC 61850-2

"ability of two or more **IEDs** from the same vendor, or different vendors, to **exchange information** and **use that information** for correct execution of specified functions"

Interoperability and IEC 61850

- IEC 61850 has three core components
 - Information exchange – ACSI and mappings on communication protocols
 - Application modeling – Logical nodes
 - Engineering – Configuration Language
- Interoperability has the same levels
 - Ability to exchange information is provided by ACSI – **this is achieved today**
 - Ability to use the information is supported by the application models – **improvements are possible**
 - Engineering interoperability today is **limited** – multivendor systems can be realized, but **efficiency** can be improved

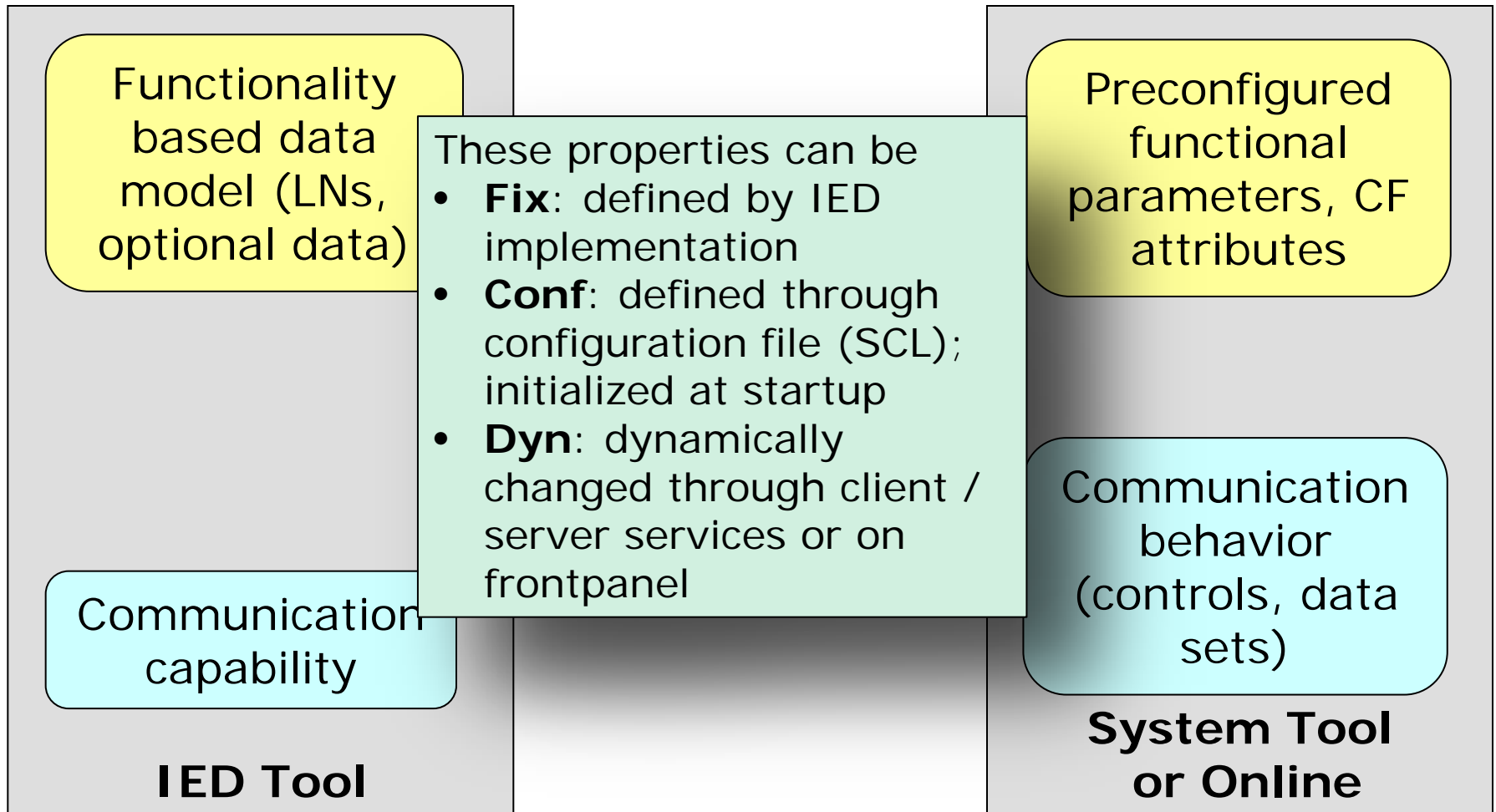
Options in the standard

... you need to know what you require

- **PICS** provide information about optional communication services and engineering capabilities
- **PIXIT** provide extra information for testing

→ Formal description of PICS and partly PIXITS is available in the ICD file

IED properties and flexibility



What needs to be done?

■ As a community

- Extend conformance testing to tools
- Define profiles to limit options

■ As vendors

- Improve the products
- Provide the flexibility required to efficiently build multivendor systems

■ As users

- Understand the issues – know what you have to look for
- Participate in the standardisation process – provide your feedback

Interaction between stakeholders

