SmartPlexity

European decentralised energy device identity registry

How DSOs & Prosumers can benefit from a blockchain-based energy device identity registry

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dena
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Challenges for DSOs:

Billions of internet-connected DERs, heat pumps, power storage units and electric vehicles expected to integrate with existing electric grids by 2030.

- DERs often “too small to matter” - not worth the expense to justify traditional processes for enrolling.
- Rising costs related to the registration of small-scale DERs.
- Grid Management: rising complexity and lack of transparency.
- ID management in particular is costly and demands a high grade of consistent data base integration.

Challenges for prosumers:

Need to transition prosumers from being a passive “end point” in a complex supply chain to active participants in a dynamic energy system (enabling dynamic retail tariffs, local electricity markets, exposing retail customers to wholesale markets, “peer-to-peer” or other types of customer-centric energy market designs).

- Even in instances where DER market participation is allowed (e.g., California’s DRAM program), established processes used by grid operators to integrate large-scale resources are not upscaling to customer-owned DERs.

- Maintaining an accurate state of both the physical and financial relationships between customers, DERs, and other market participants (e.g., aggregators, service providers, and installers) is costly.
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- Aggregation does not solve the fundamental problems of onboarding and integrating DERs at scale and at low cost alike.

- Aggregation only outsources costly administrative duties to aggregators themselves. These operating expenses are the reason why even aggregators typically exclude certain types or sizes of DERs due to the impact on company profit margins.

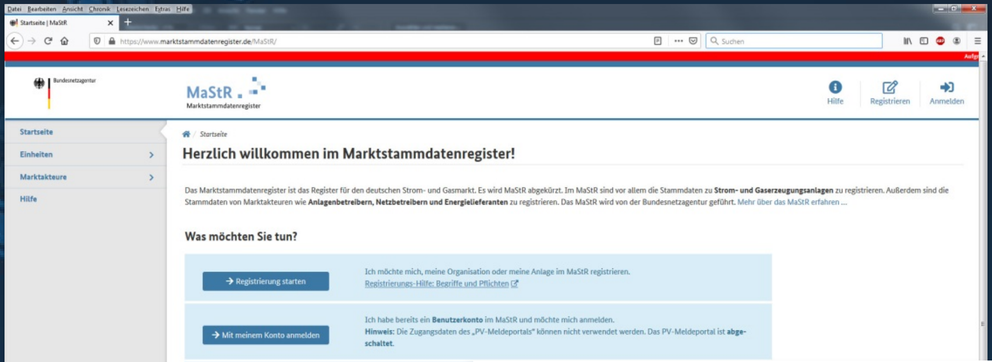
What are the barriers? What is needed?

- Fundamental barrier to small-scale DER integration is the issue of onboarding, vetting, and sharing key information about DER attributes, capabilities, relationships, and behaviors that allows system-wide optimization in the first place.
- Just as banks need to perform “know-your-customer” checks to verify the identity of potential customers, assess their suitability for various products, and manage risk, grid operators need to qualify and register every asset that provides services to the electricity grid.
- Dynamic onboarding and dynamic status information in real-time remain the key problems: Any device that wants to participate in a given electricity market has to establish first a self-sovereign digital identity to coordinate with other systems and participants.

As a result, a universal device ID solution that is compatible with different ICT and data base architecture is needed.

The German case (standardisation of ICT and data base architecture):

good preconditions for managing device IDs via a core market data register (MaStR) and the smart meter gateway (SMGW) infrastructure



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Was möchten Sie tun?

→ Registrierung starten — Ich möchte mich, meine Organisation oder meine Anlage im MaStR registrieren. Registrierungs-Hilfe: Begriffe und Pflichten

→ Mit meinem Konto anmelden — Ich habe bereits ein **Benutzerkonto** im MaStR und möchte mich anmelden. **Hinweis:** Die Zugangsdaten des „PV-Meldeportals" können nicht verwendet werden. Das PV-Meldeportal ist **abgeschaltet**.

→ Betreiberwechsel registrieren — Meine Anlage wird von einem an
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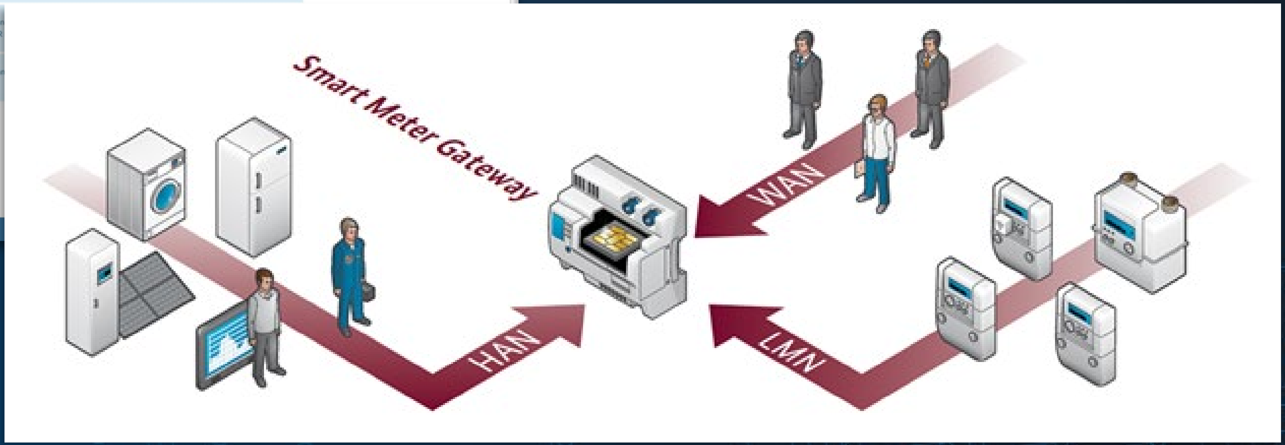
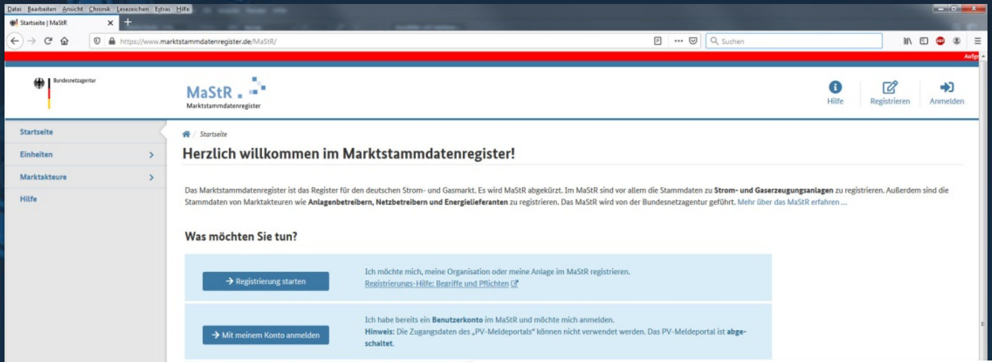


The German case: obstacles due to scattered competence and the lack of an integrated architecture approach (unclear segmentation of smart grid and smart market)



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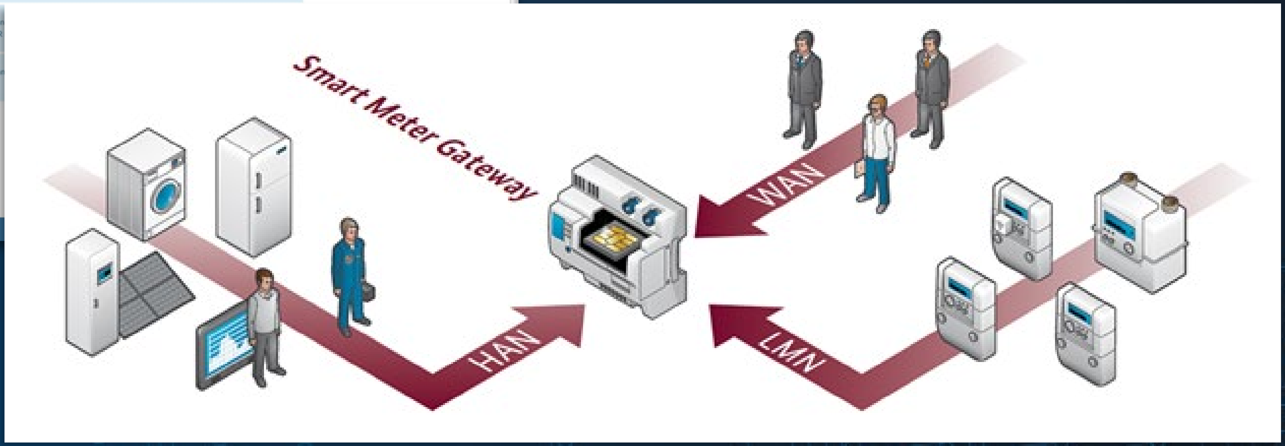
- Not automated.
- Not linked to the SMGW infrastructure.
- Impractical data base architecture.



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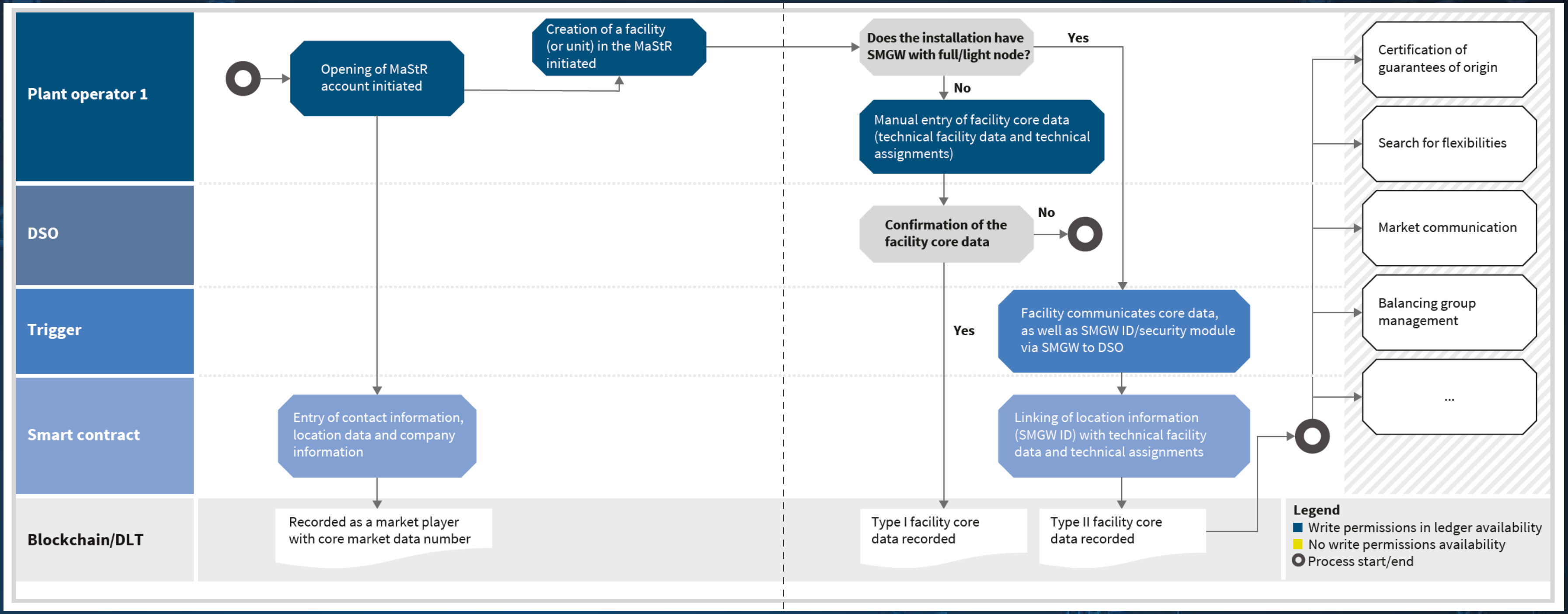
Improving the registration of installations in the German core market data register (MaStR) using the SMGW & blockhain/DLT according to the dena blockchain study



Plant operator 1

DSO

Trigger

Smart contract

Blockchain/DLT

Opening of MaStR account initiated

Creation of a facility (or unit) in the MaStR initiated

Entry of contact information, location data and company information

Recorded as a market player with core market data number

Does the installation have SMGW with full/light node?

Yes

No

Manual entry of facility core data (technical facility data and technical assignments)

Confirmation of the facility core data

No

Yes

Facility communicates core data, as well as SMGW ID/security module via SMGW to DSO

Linking of location information (SMGW ID) with technical facility data and technical assignments

Type I facility core data recorded

Type II facility core data recorded

Certification of guarantees of origin

Search for flexibilities

Market communication

Balancing group management

...

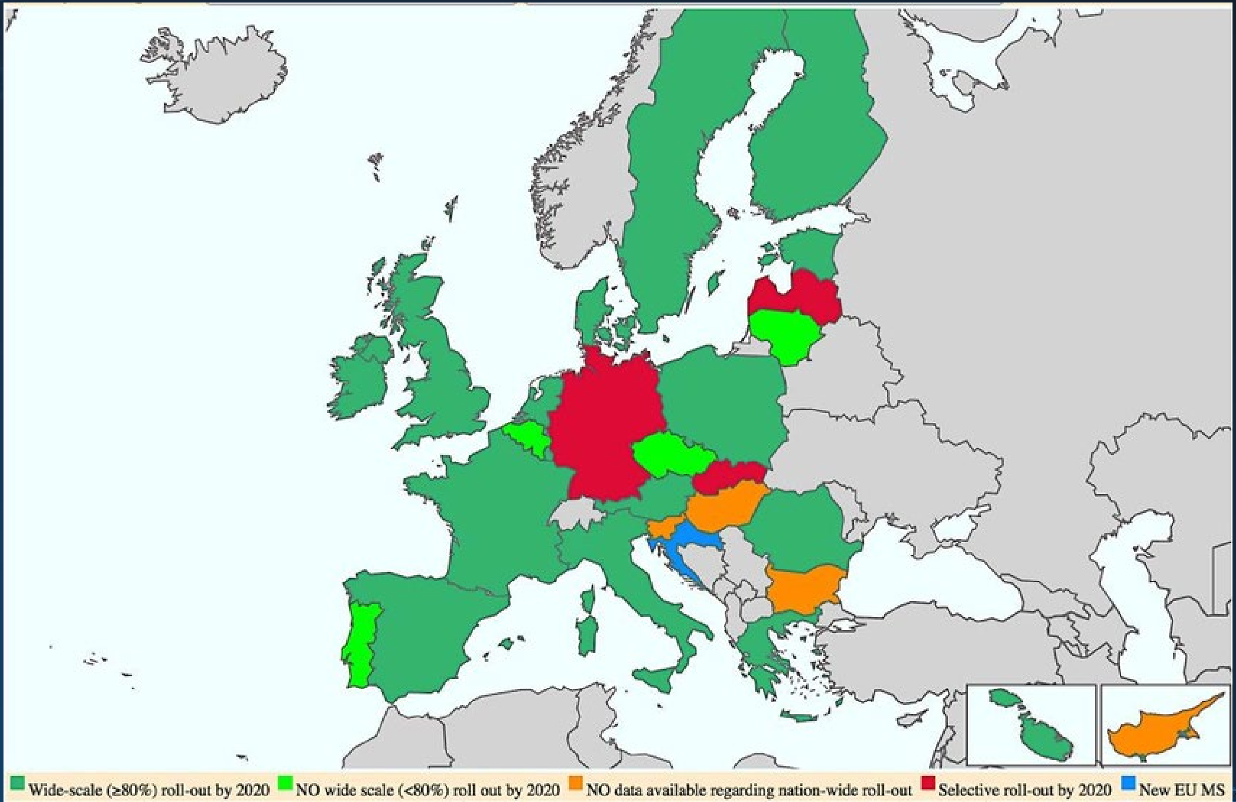
Legend

🟦 Write permissions in ledger availability

🟨 No write permissions availability

○ Process start/end

However: availability and architecture of smart metering infrastructure in the EU varies significantly


🟩 Wide-scale (≥80%) roll-out by 2020
🟩 NO wide scale (<80%) roll out by 2020
🟧 NO data available regarding nation-wide roll-out
🟥 Selective roll-out by 2020
🟦 New EU MS

European Smart Meter Deployment for 2020 (Source: European Commission, 2014)

Premise of SmartPlexity: A minimal and decentralized solution following the idea “more than a (proprietary) database, less than a digital infrastructure”

A European solution should therefore focus on the necessary minimum (e.g. number and timestamp) in order to fit in different national and regional approaches regarding smart metering and data handling and to be open for the emergence of new technologies and approaches to data handling.

SmartPlexity: goals & challenges

- Ways for a secure data exchange between a data provider and data consumer, and across industry borders (i.e. between strangers [customers, companies and machines] without up-front exchange of credentials etc.).
- Data proof of origin on the device level.
- While European GDPR placed concepts like “user control” and “privacy-by-design”, this does not limit the concept to data minimization; blockchain-based data sovereignty enables people/machines to stay in control of their data (usage control).

To achieve this, the project has to tackle the following tasks:

- Testing device identity approaches for inverters, IoT, smart meters and gateways interaction with existing and planned European asset registries (e.g., Germany and UK).
- Evaluating blockchain-based “privacy-by-design” solutions for data sharing (e.g., on-chain-/off-chain configuration and hashing, zero-knowledge proof, role-based access controls, homomorphic encryption).
- Testing blockchain-based solutions for balancing different optimization strategies (sector integration).
- Testing blockchain-based solutions to foster physical and cyber resilience.
- Testing blockchain-based solutions to enable “user control” and “privacy-by-design” approaches to be compliant with GDPR.

SmartPlexity: possible impact

- Improving grid management by providing transparency and automation.
- Cost reduction due to a higher grade of automation.
- Facilitating the coordination between TSOs, DSOs and prosumers by breaking data silos open and speeding up processes.
- Lowering market entry barriers for consumers, prosumers and energy communities.
- Enforcing future carbon tax policies related to the European Green Deal: The proposed solution could be expanded to enable a proof of origin for carbon certificate trading and taxation.
- Improving cyber-resilience by combining a blockchain/DLT with (a) Trusted Third Party (TTP) or (b) a hardware-based root of trust (RoT).

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Thank you for your attention!

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