

Perspectives for Blockchain and Digitalisation from an DSO's point-of-view



Ein Unternehmen der
ENERGIE STEIERMARK

15th IAEE European Conference 2017

5.9.2017

Dipl.-Ing. Dr. Franz Strempl

■ **Agenda**

- **Energienetze Steiermark GmbH**
ein Unternehmen der Energie Steiermark AG

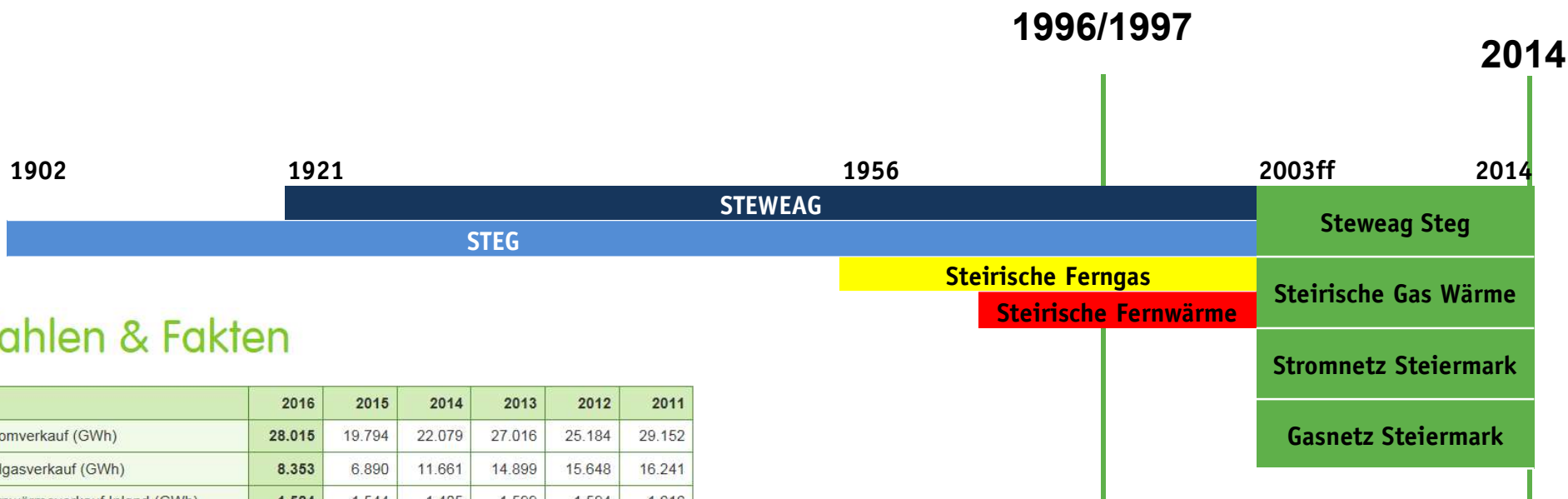
- **Energy transition**
Challenges an new roll of DSO's

- **Perspectives for Blockchain and Digitalization**
from a DSO's point of view



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ENERGIE STEIERMARK

■ Energie in der Steiermark through the ages



Zahlen & Fakten

	2016	2015	2014	2013	2012	2011
Stromverkauf (GWh)	28.015	19.794	22.079	27.016	25.184	29.152
Erdgasverkauf (GWh)	8.353	6.890	11.661	14.899	15.648	16.241
Fernwärmeverkauf Inland (GWh)	1.584	1.544	1.405	1.599	1.594	1.616
Fernwärmeverkauf Ausland (GWh)	608	583	551	642	653	673
Umsatzerlöse (Mio. Euro)	1.039,2	1.132,9	1.366,0	1.728,8	1.972,6	1.370,7
Mitarbeiter (Jahresdurchschnitt)	1.731	1.708	1.689	1.672	1.687	1.739

**ENERGIE
STEIERMARK**

**ENERGIE
STEIERMARK
NEU**

**ENERGIENETZE
STEIERMARK
NEU**

	Gasnetz	Stromnetz
Netzlänge	4.000 km	29.050 km
Versorgte Gemeinden	187	-
Versorgungsgebiet	-	10.500 km ²
Kunden (Zählpunkte)	42.000	466.000
Netzdurchsatz	14.426 GWh	8.050 GWh

■ Organisation



Energie Steiermark AG

Shared Services

Controlling, Finanzwesen, Rechnungswesen, Strategie & Organisation, Personal, Recht, Interne Revision, Kommunikation, Business Development, Innovation, Bereiche mit Richtlinienkompetenz: IT, BF, Materialmanagement

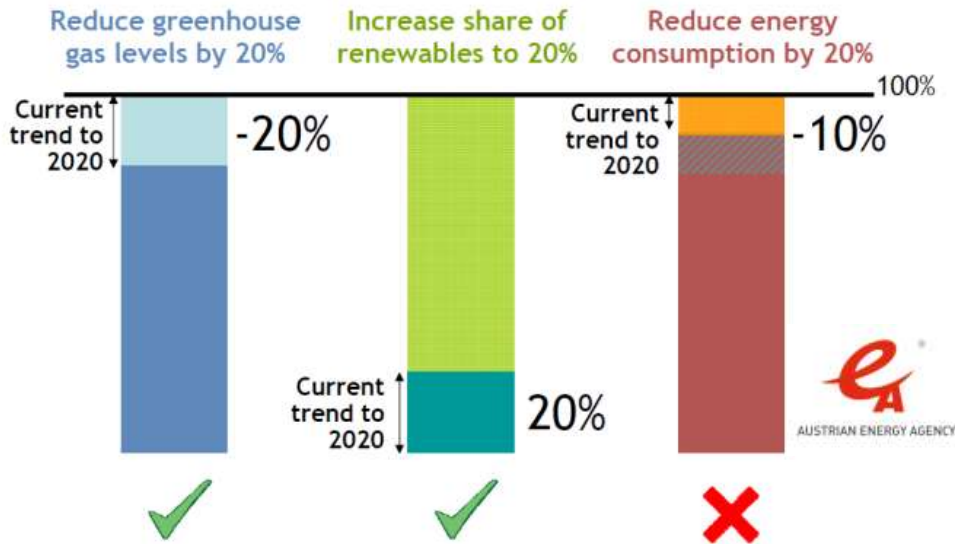
Energienetze Steiermark GmbH (128 MA)*	Energie Steiermark Technik GmbH	Energie Steiermark Kunden GmbH	Energie Steiermark Service GmbH	Energie Steiermark Green Power GmbH	Energie Steiermark Wärme GmbH	Ausland
<p>Netzstrategie, Netzplanung, Asset-management</p> <p>Regulator-/Energiedaten-/Durchleitungsmanagement</p> <p>Grundsatzplanung, Normung, Projektierung</p> <p>Betrieb Netzleitwarten</p> <p>NIS/GIS</p>	<p>Betrieb Instandhaltung Netze (Strom/Gas)</p> <p>Umsetzung Netzprojekte</p> <p>Durchführung Netzanschlüsse</p> <p>Zählerwesen (vor Ort)</p> <p>Kundenbetreuung vor Ort</p> <p>IT, Behördenverfahren & Facility-Management (BF), Materialmanagement</p>	<p>Vertriebssteuerung, Marketing, Produktentwicklung (Strom/Gas/ zum Teil Fernwärme)</p> <p>Kundenakquisition und Betreuung</p> <p>Energiedienstleistungen</p> <p>Handel, Portfolio-/ Risk-/ Bilanzgruppenmanagement</p>	<p>Kundenbetreuung</p> <p>Vertragsmanagement</p> <p>Billing Fakturierung Mahnwesen</p> <p>Zählerwesen Smart-Meter Einführung</p>	<p>Erneuerbare Stromerzeugung</p> <p>Betrieb Wartung Planung und Errichtung</p> <p>Genehmigungs- und Förderverfahren</p>	<p>Wärmenetze Heiz(kraft)-werke</p> <p>Anlagenmanagement Fernwärme</p> <p>Betrieb Wartung Instandhaltung Planung Errichtung</p>	<p>Stefe s.k.</p> <p>Adriaplin</p> <p>Jihlavske Kotelny</p>

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- **Energy Transition**
Challenges and new roll of DSO's
- **Perspectives for Blockchain and Digitalization**
from a DSO's point of view

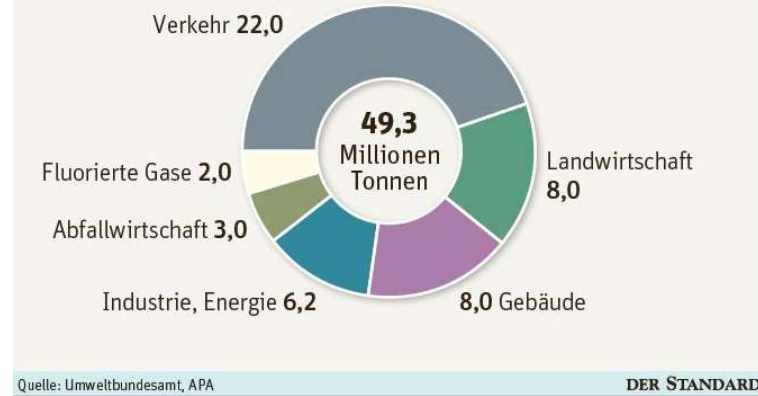
40-27-27

Energy and climate target 20-20-20



Treibhausgasemissionen 2015

in Mio. Tonnen Kohlendioxid-Äquivalenten, Emissionshandel eingerechnet

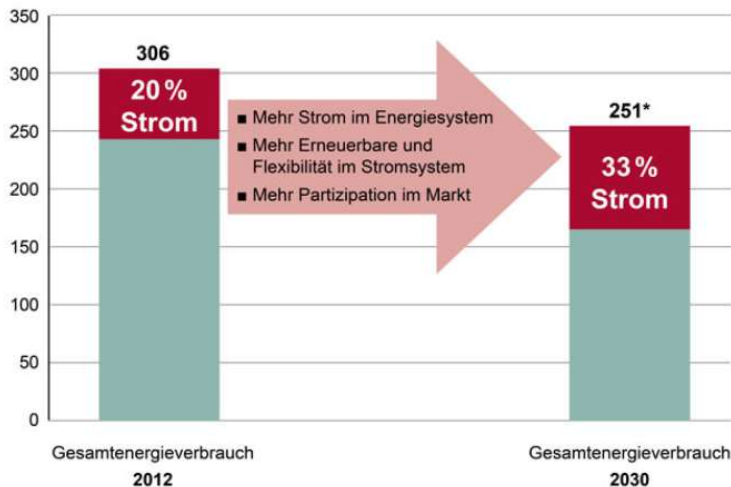


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STEIERMARK**

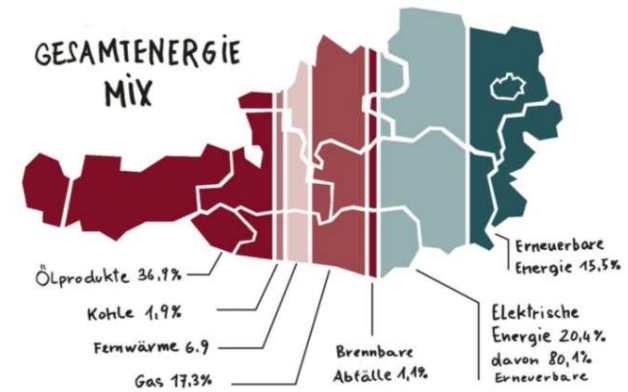
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Energy Transition in Austria

e oesterreichs energie.



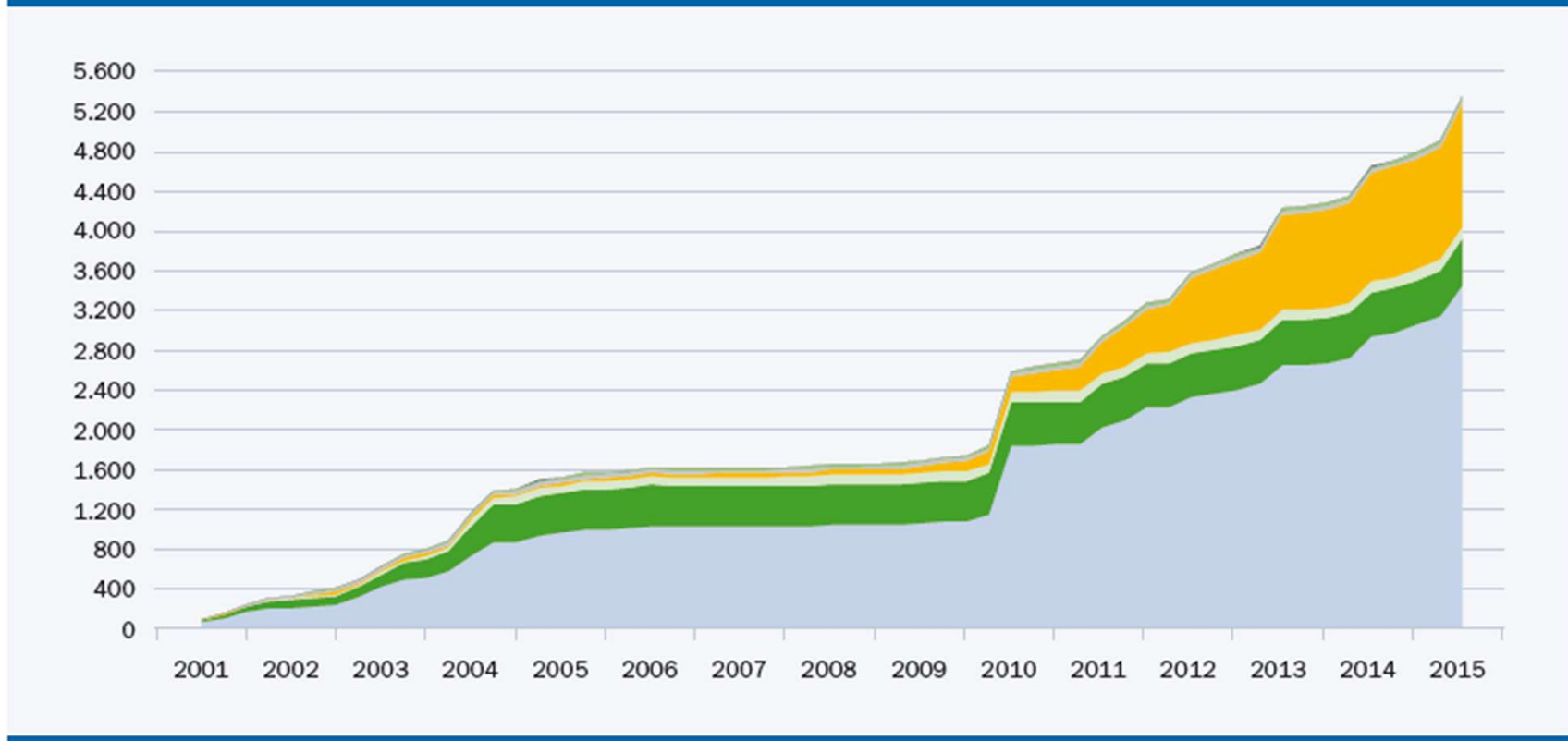
- ✓ Strom deckt 33 % vom Endenergieverbrauch ab
- ✓ Ausbau der Erneuerbaren Wind, Wasser, PV: jeweils + 6-8 TWh
- ✓ Anteil Erneuerbarer an der Stromerzeugung 85%
- ✓ Zusätzliche CO₂-Einsparungen von bis zu 20% ggü 2012
- ✓ Ausbau Pumpspeicherleistung um 3.500 MW



■ Installed Power of RES in Austria

ENTWICKLUNG DER ANERKANNTEN „SONSTIGER ÖKOSTROMANLAGEN“ in MW

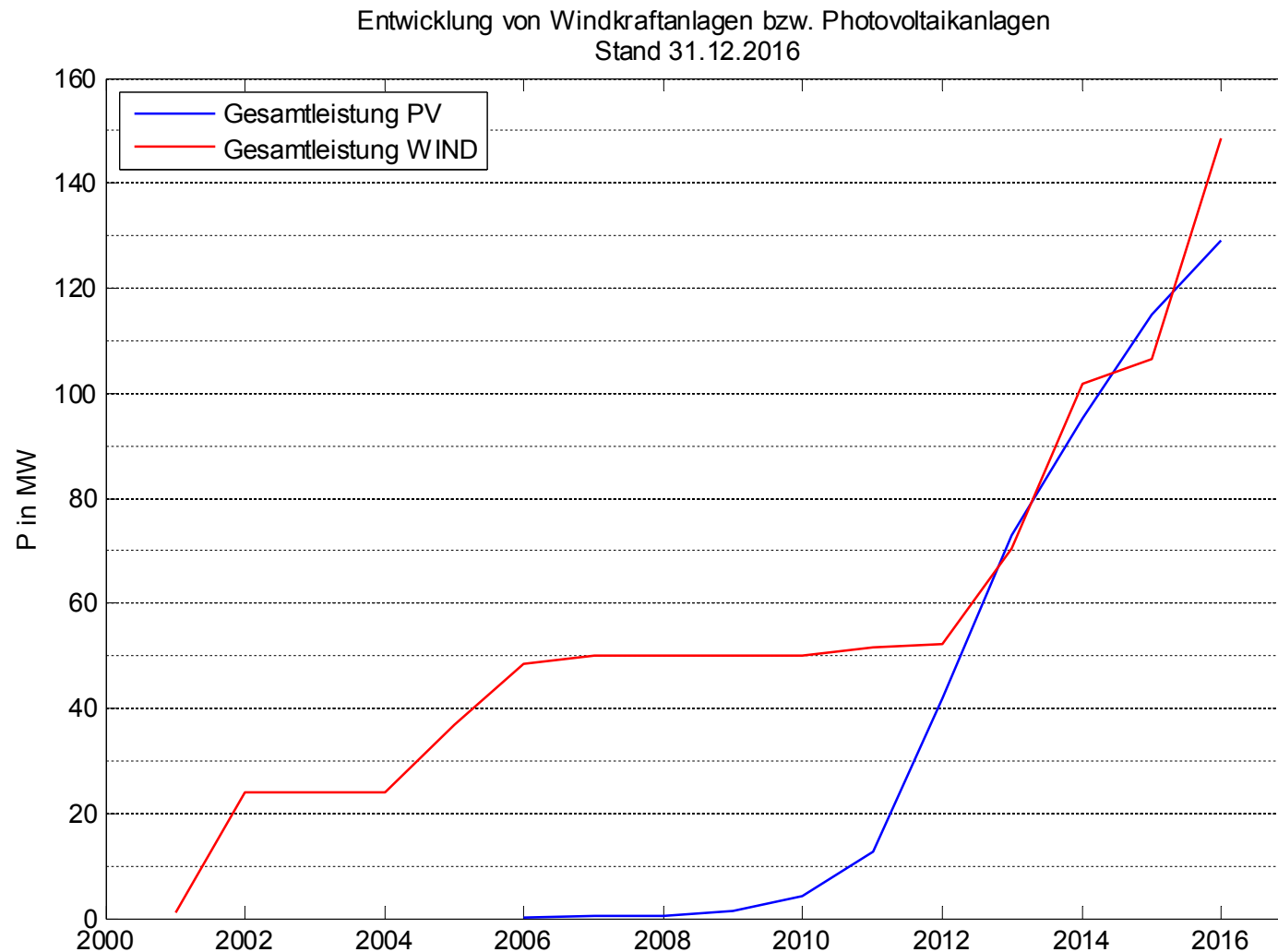
- Geothermie
- Biomasse flüssig
- Deponie- und Klärgas
- Photovoltaik
- Biogas
- Biomasse fest
- Wind



Entwicklung anerkannter
Ökostromanlagen lt.
Bescheiddatenbank
2002 bis 2015
(Stand jeweils 31.12.)

Quelle: E-Control

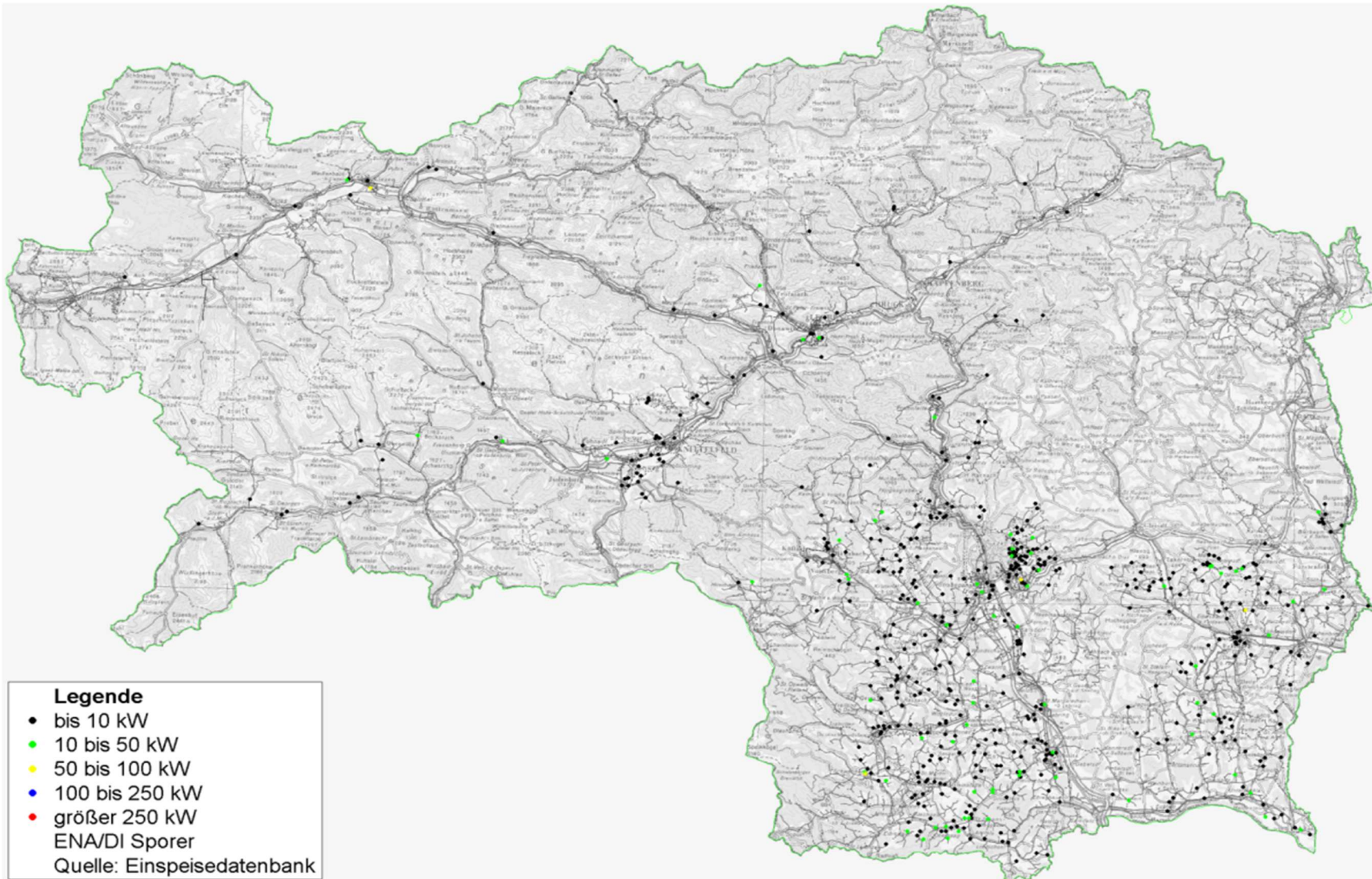
■ Installed Power of RES Wind and PV connected to EN's distribution grid



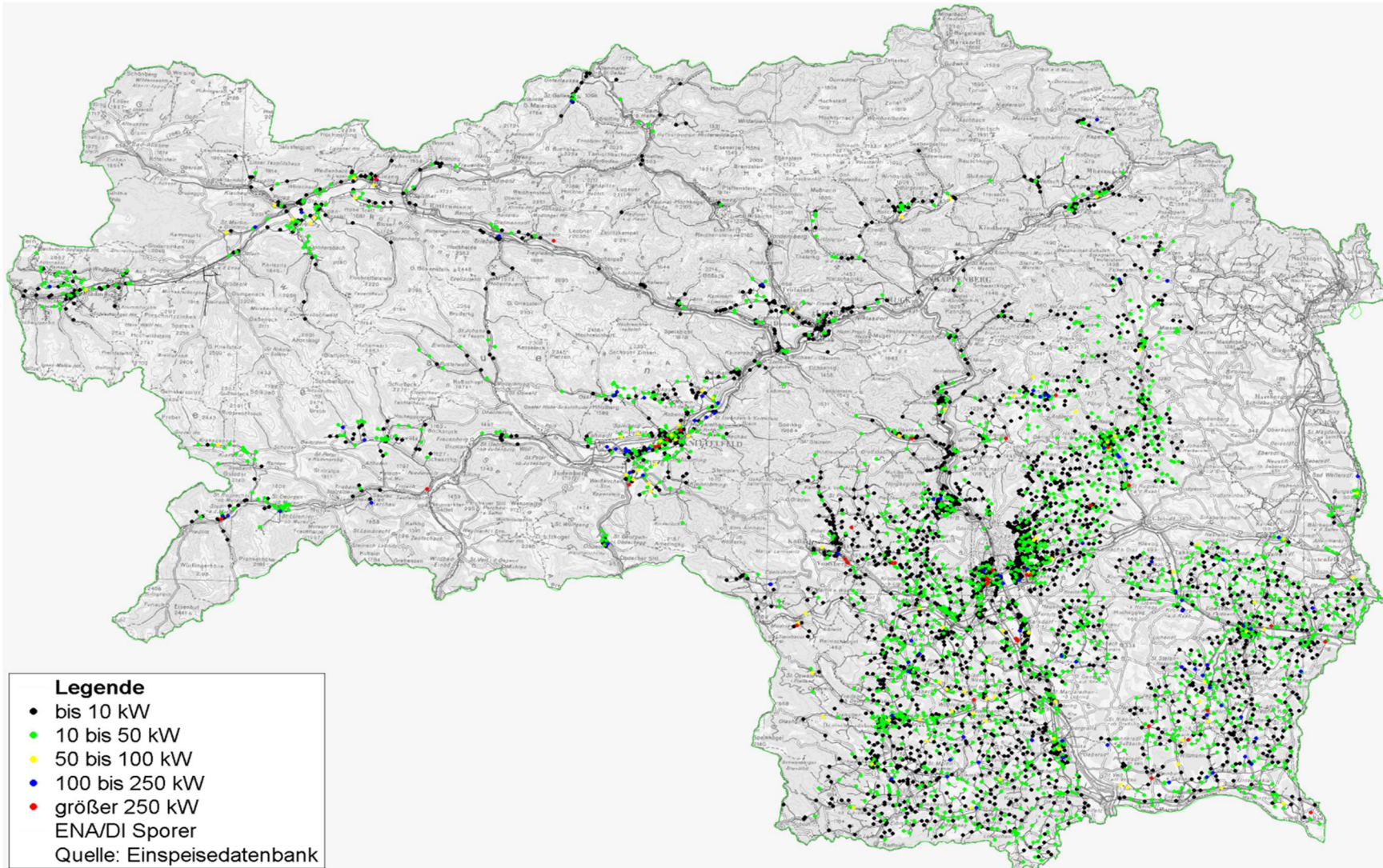
■ PV and Wind parks connected to EN's distribution grid



■ **PV**
31.12.2010 ... approx. 4 MWp



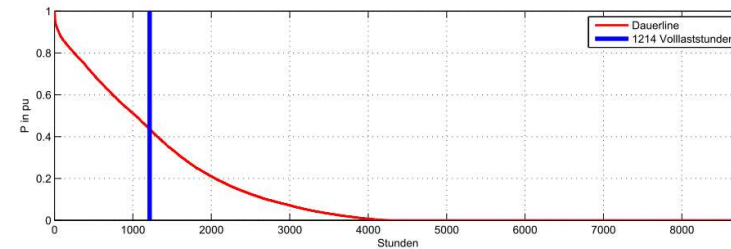
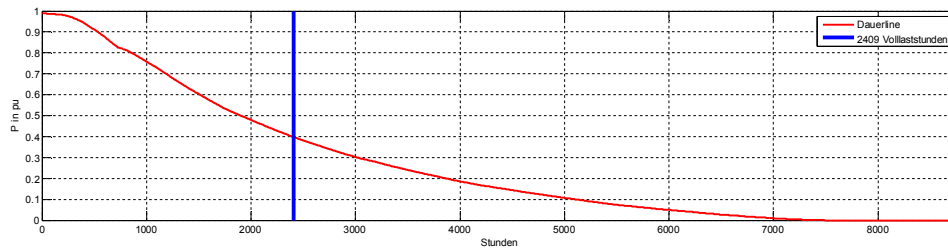
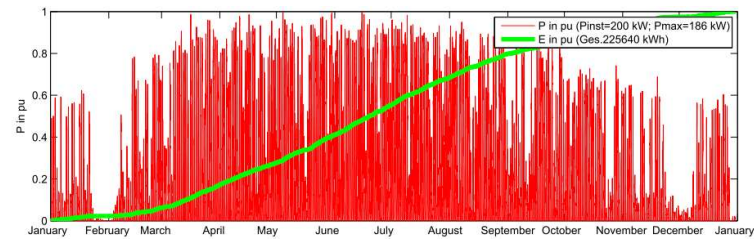
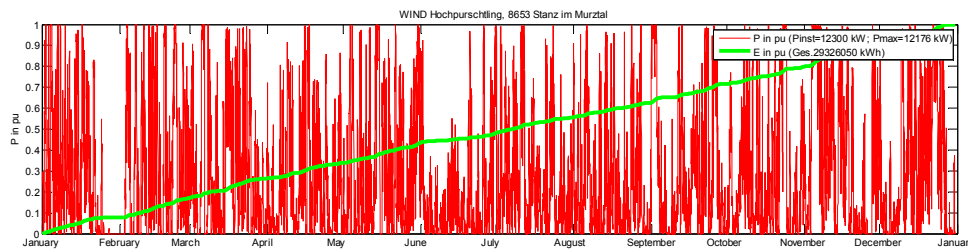
■ **PV**
31.12.2016 ... approx. 130 MWp



■ Load profile of RES

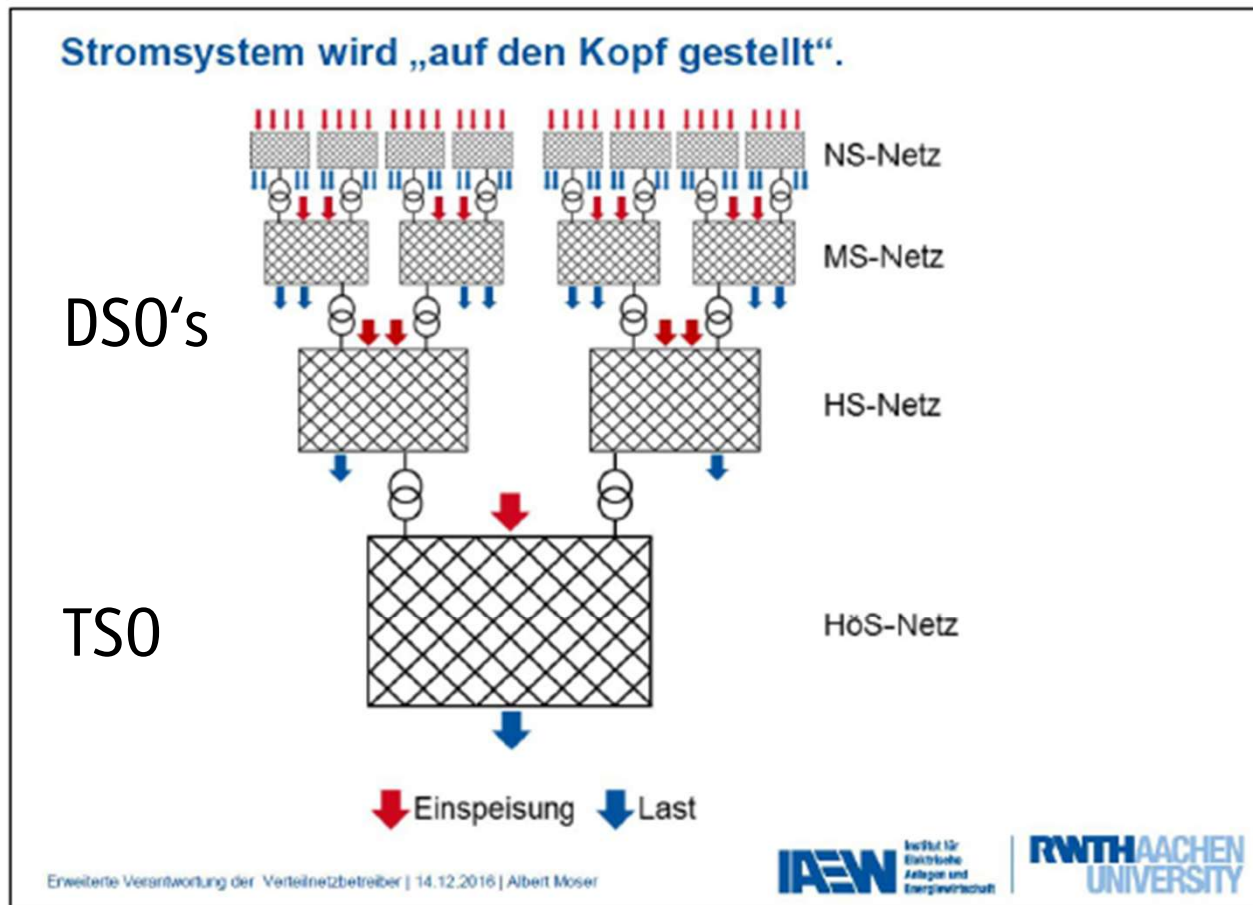
■ High alpine Wind park 2409 full-load hours

■ PV 1214 full-load hours



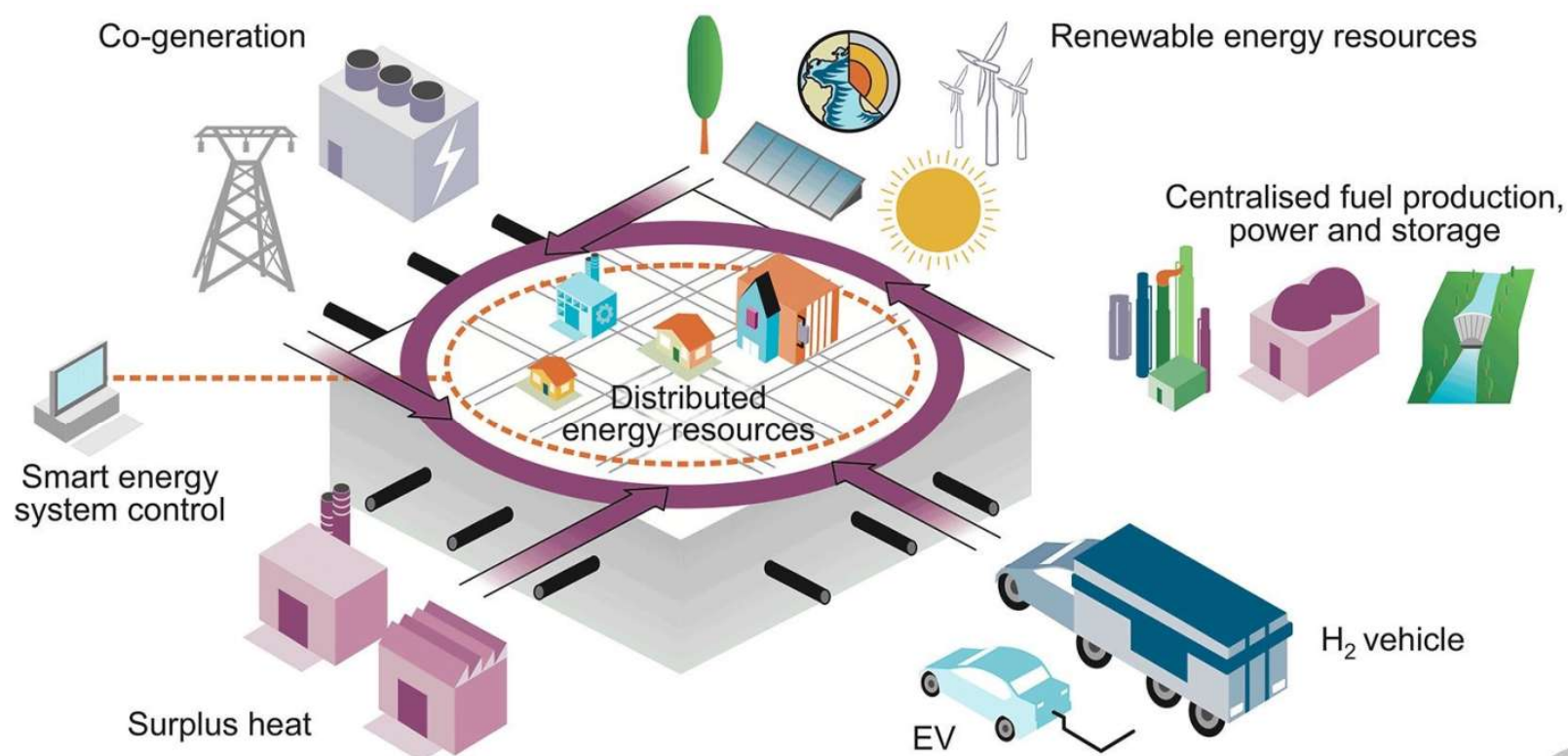
■ The electricity system is changing dramatically!

More **RES** in the distribution grid turns the system **upside down**



Increased cooperation between DSO and TSO is important

Vom **DNO** (Distribution Network Operator) zum **DSO** (Distribution **System** Operator)



■ Challenges for DSO's

■ Smart Metering, Digitalization and Data hub

- Digitalization requires Smart Meter installation (almost 100 %!)
- Grid automation at all voltage levels
- Big data analytics
- Commercial data management and data availability to the market

■ RES and Flexibility

- RES are almost connected to the distribution grid (DSO)
- Active grid management and interaction with generators and active customers
- Activation of local/regional flexibility (generation, heat pumps, batteries, e-vehicles, air conditions, etc.)

■ System stability

- Ancillary services need to be provided on distribution grid level
- Local problems must be solved locally – congestion management
- Cooperation of TSO and DSO for the overall system stability

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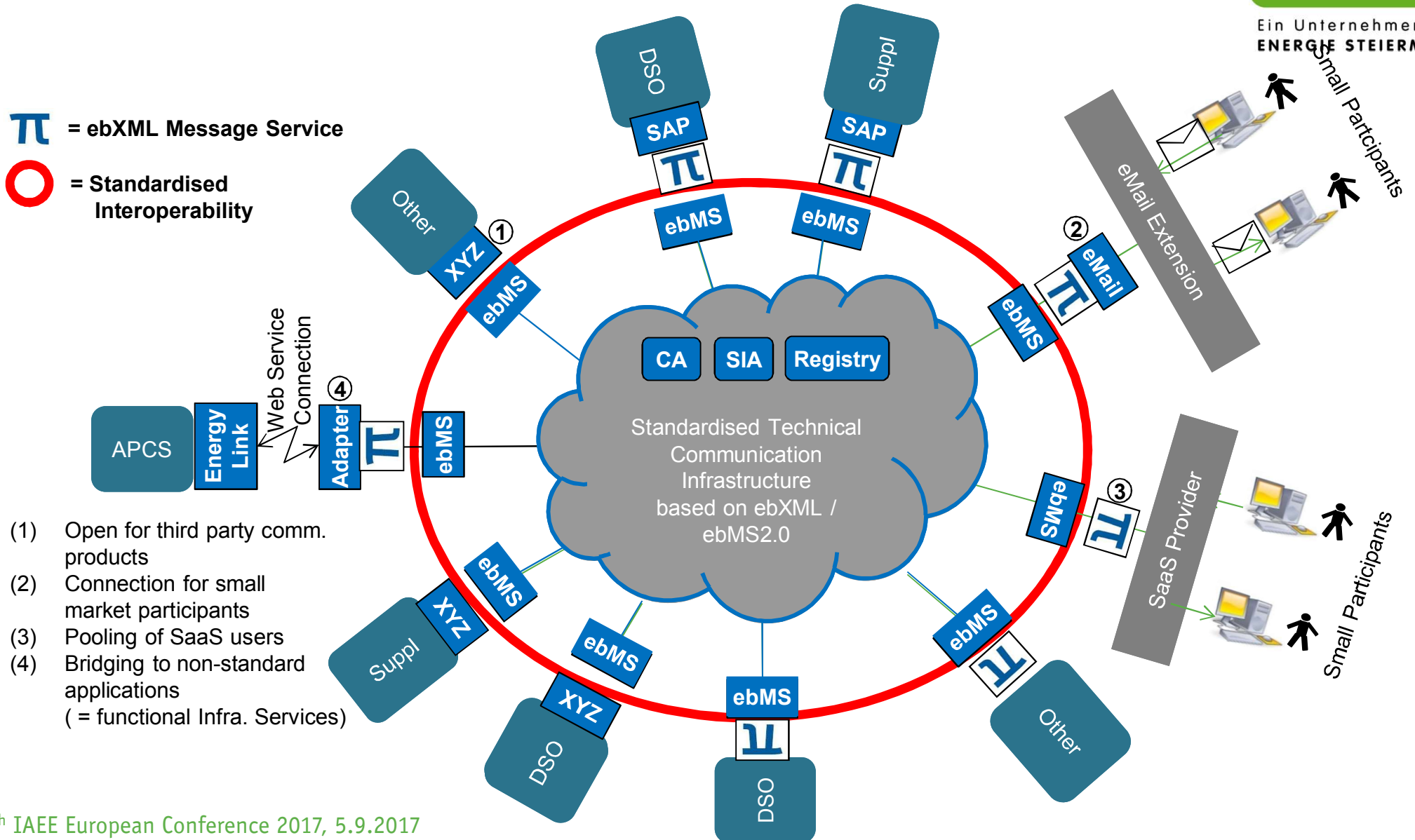
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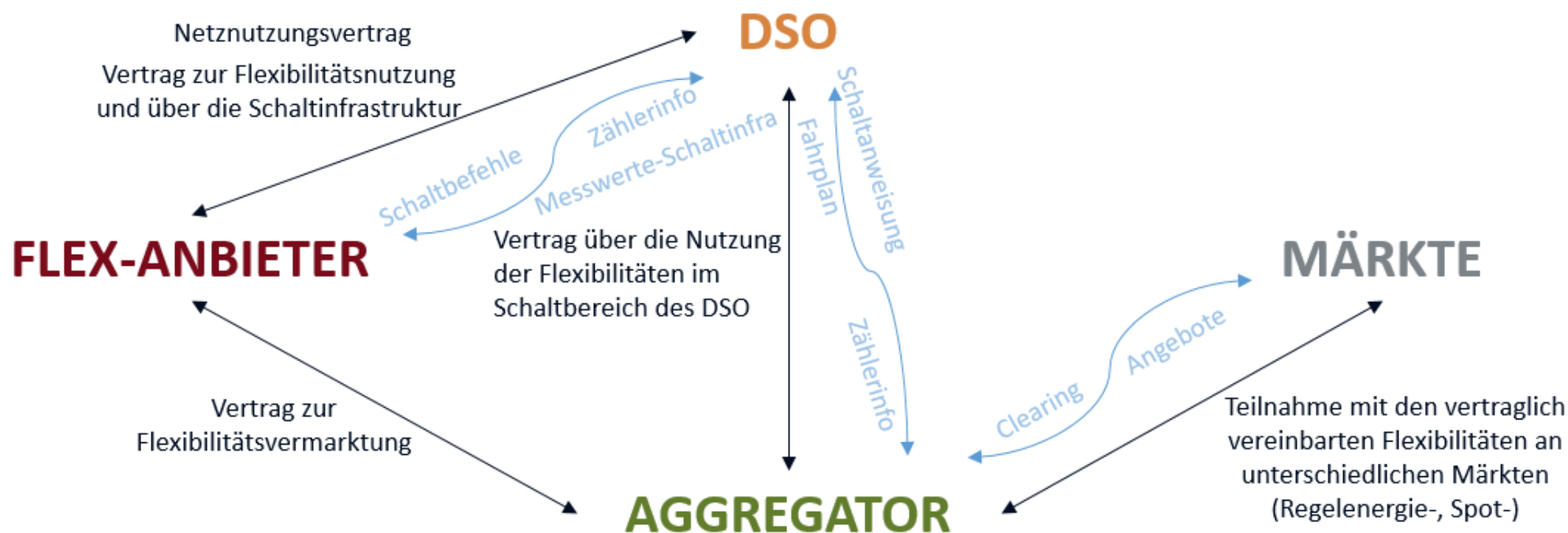
- **From asset owner to market facilitator...**
- **DSO as a Platform Provider for Smart Grids**
 - DSO's ensure **safe and efficient** grid operation
 - Because of **Unbundling** DSO's are **neutral market facilitator** and ensure interaction with all customers in a **non discriminatory way**
 - DSO operates a **digital platform** (data hub) for the **exchange** of commercial data and grid data - **EDA**
 - DSO shall **interact with the network customers** and host a market platform for regional flexibility
- DSO's facilitate the requirements for digitalization along the whole value-chain and provides security of supply in the usual service quality

EDA viewed from 10.000 km above...

π = ebXML Message Service
 ○ = Standardised Interoperability



Flexibility Platform Provider



■ *Some DSO Blockchain Use Cases ...*

■ Commercial Use Cases with strong DSO participation

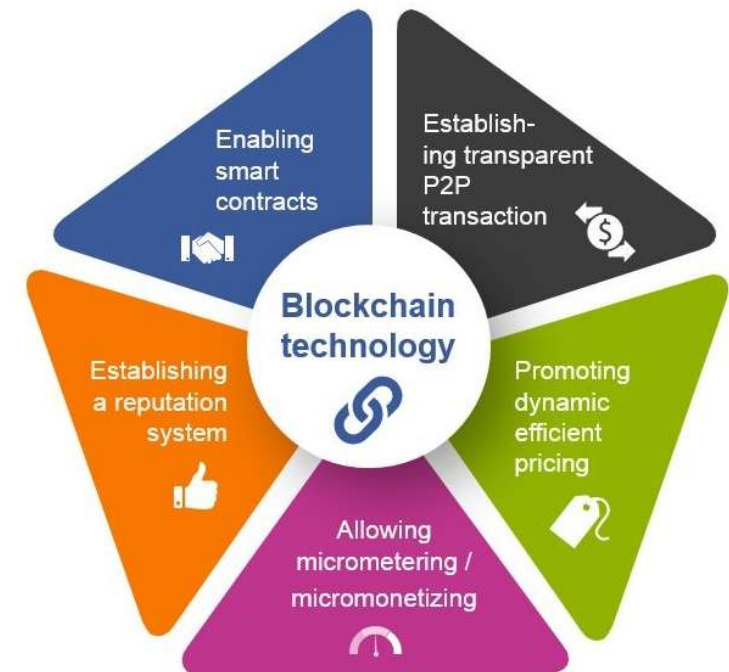
- Peer-to-peer (local) energy trading
- „Mieterstrommodell“
- Auxiliary Services (EDA 2.0: Gridchain)

■ Decentral Management of a central grid power storage unit

- Prosumers are able to store their surplus
- Decentral central storage units

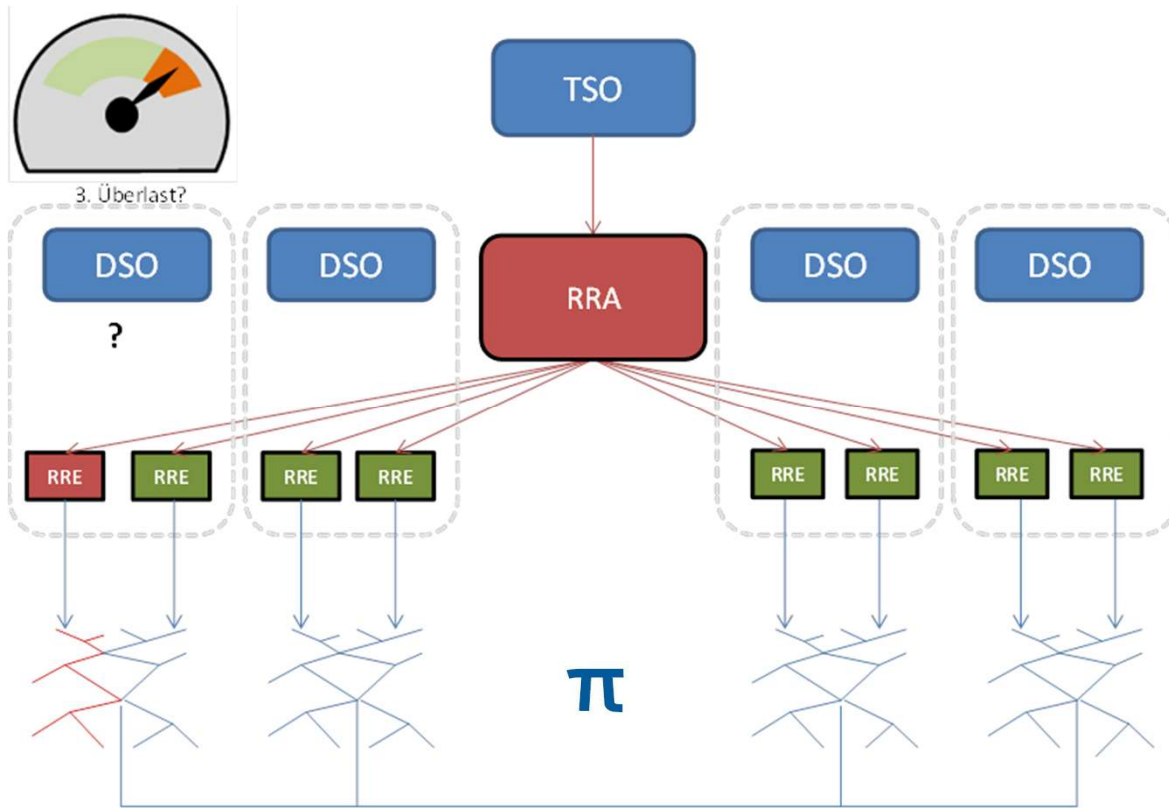
■ Peer-to-peer flexibility exchange

- Provision of free grid capacity by local prosumers
- More efficient and targeted use of existing grid resources



■ GridChain

- Developed an innovative pilot software (Phonton) based on blockchain technology that simulates future processes for real-time grid management.



- Process that coordinates requesting of balancing power between TSOs, DSOs, aggregators, and generation units within seconds
- enable DSOs to interact with the balancing request process in congestion situations
- provide a means to inform aggregators about adjusting their merit order list depending on short-term load signals
- bring down settlement time from > 1 month to just 15 minutes.

■ Project LEAFS 2.0: Project Details

- **Title:** LEAFS 2.0
- **Duration:** 10/2017-10/2018
- **Coordinator:** Austrian Institute of Technology (AIT)
- **Partner:** Energienetze Steiermark, Siemens, AIT, Grid Singularity



■ **Concept LEAFS 1.0**

■ **Why LEAFS? Basic Idea?**

- Improved economics through higher utilization
- Hybrid Use Cases (Grid, Consumer, Market,...)

■ **Why „central“ Storage?**

- Lower specific costs
- Easier Communication,
Control and Maintenance
- New Business Models

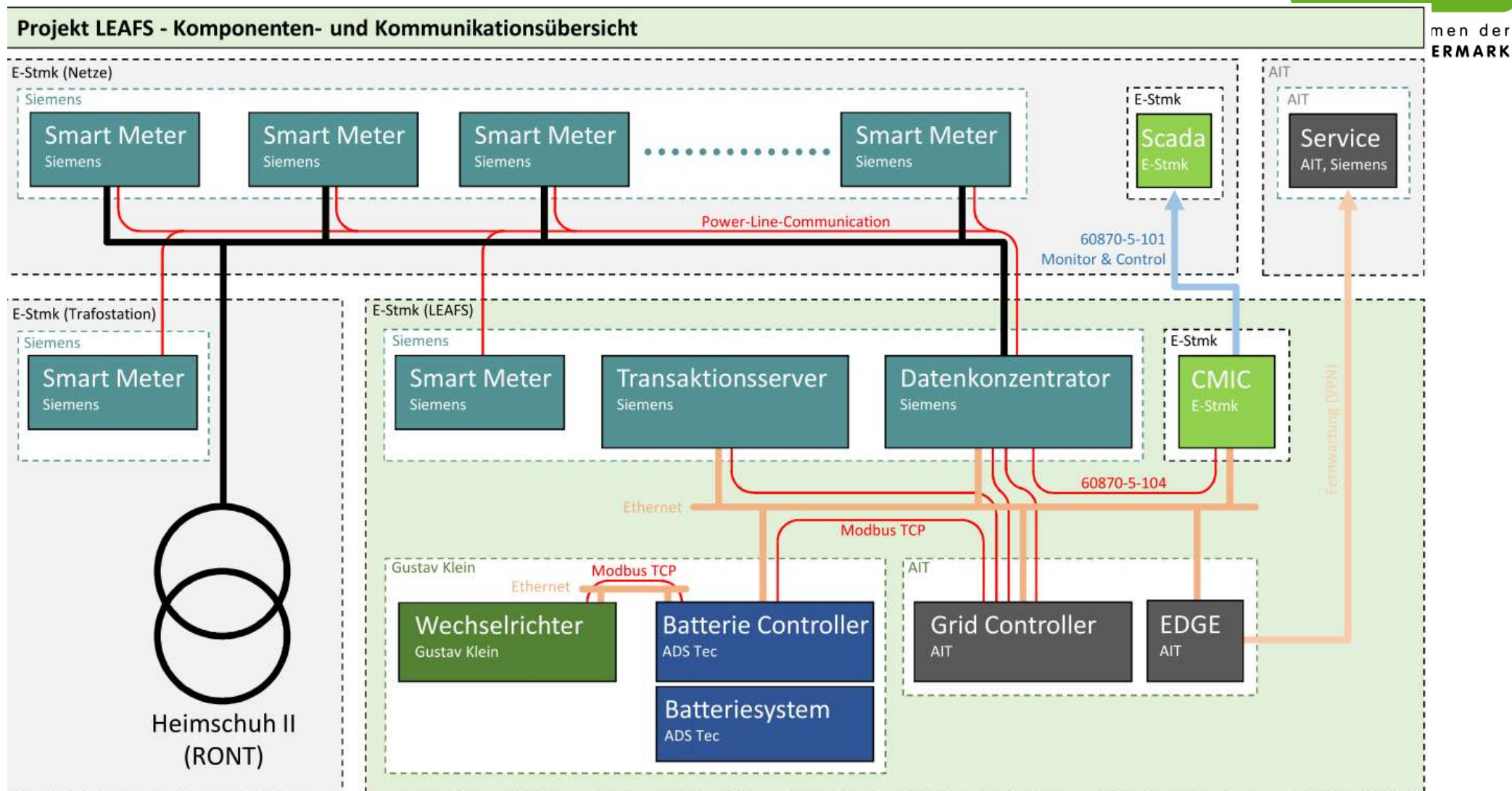
■ **Why installed decentral?**

- Advantages for the DSO



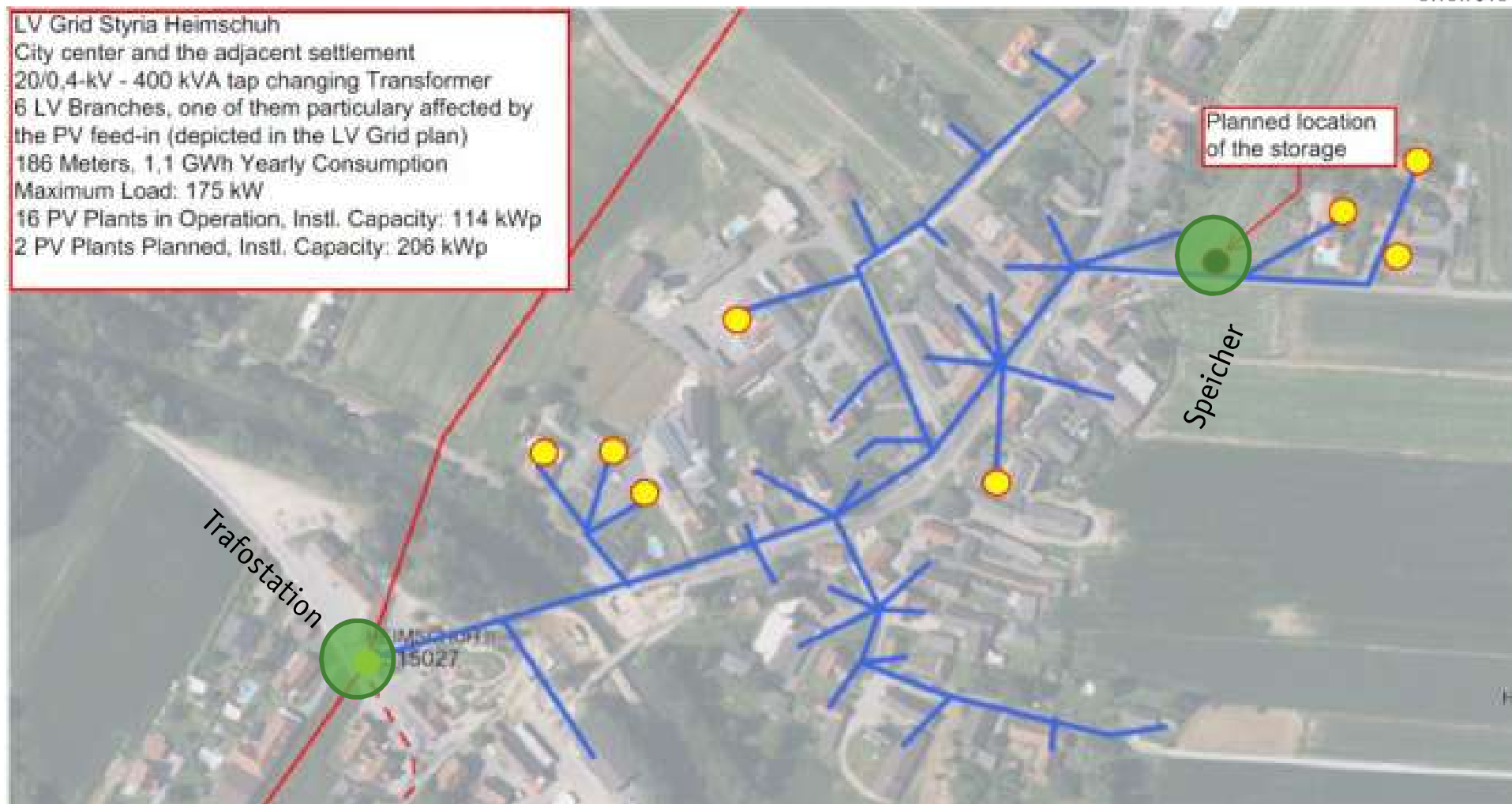
Source: EN

LEAFS 1.0: Communication Concept



Source: EN

LEAFS 1.0: Map of Heimschuh



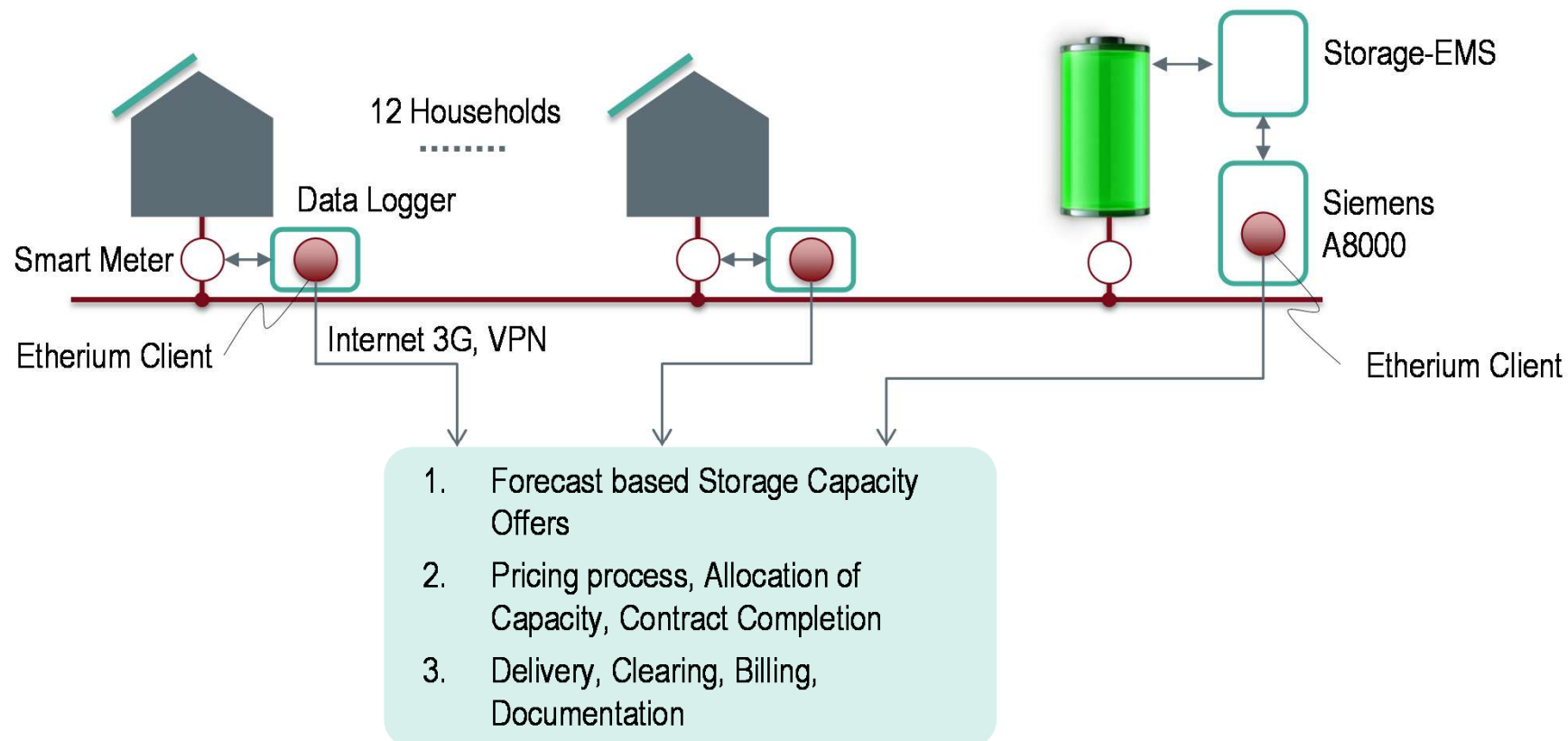
Source: EN

■ Concept LEAFS 2.0 1/2

- Customer sets the price range and storage capacity requirements
- Day-Ahead Planning: reservation of the storage capacity based on the consumption and generation forecasts
- Physical delivery: the results of the pricing process are stored in the Smart Contracts
- Hardware:
 - Installation of an Ethereum Client and Siemens SM in all households
 - Installation of a Siemens A8000 Computer in the Urban Box
- Blockchain functions:
 - Pricing process
 - Data storage
 - Billing

■ Concept LEAFS 2.0 2/2

BLOCKCHAIN PILOT



■ Adjustment of the Market Design

■ Grid Tariffs

- No disadvantages for storage and interruptible loads

Winter Package: „Clean Energy for all Europeans“

„... Grid Tariffs ... should not lead to disadvantages for the Storage Systems and should not lead to negative Incentives for the participation in the load management...“

- Use of the Pumped-Storage Tariffs for Battery Storage?

■ Storage Ownership

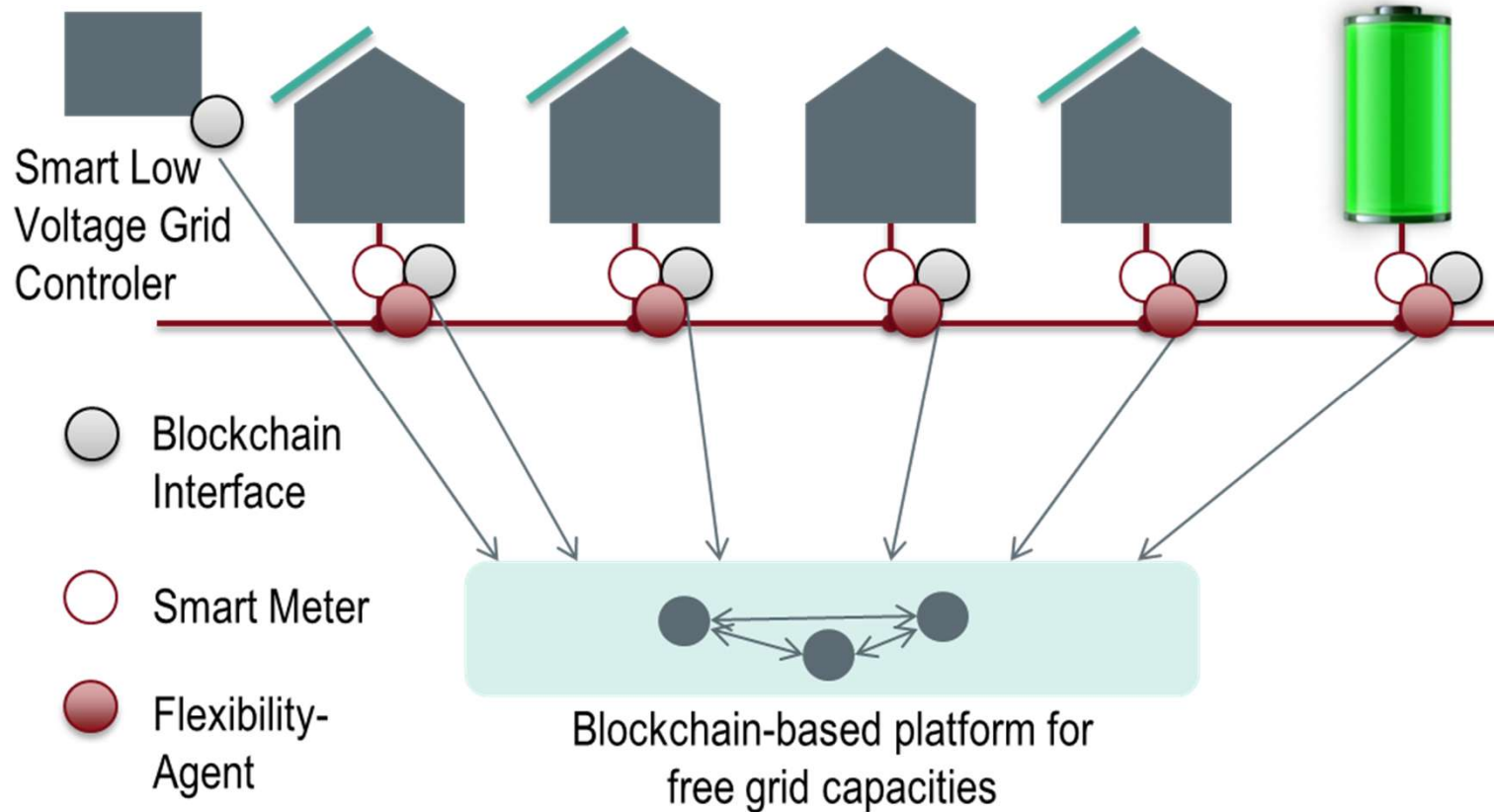
- **DSO should be allowed to own and operate storage units**

Only used for grid stability as alternative to Grid Expansion (Assignment to the Balance Group of grid losses)

- Decision is made by the Asset Management of the DSO!!
- Alternatively the DSO can cooperate with a Service Provider
It's the DSO's decision!

■ Concept LEAFS 3.0

■ Peer-to-peer flexibility exchange



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Viel Energie!