EGVIA

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*Smart system of renewable energy storage based on **IN**tegrated E**V**s and b**A**tteries to empower mobile, **D**istributed and centralised **E**nergy storage in the distribution grid*

Flexibility for the DSO and BRP

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INVADE
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The ambition

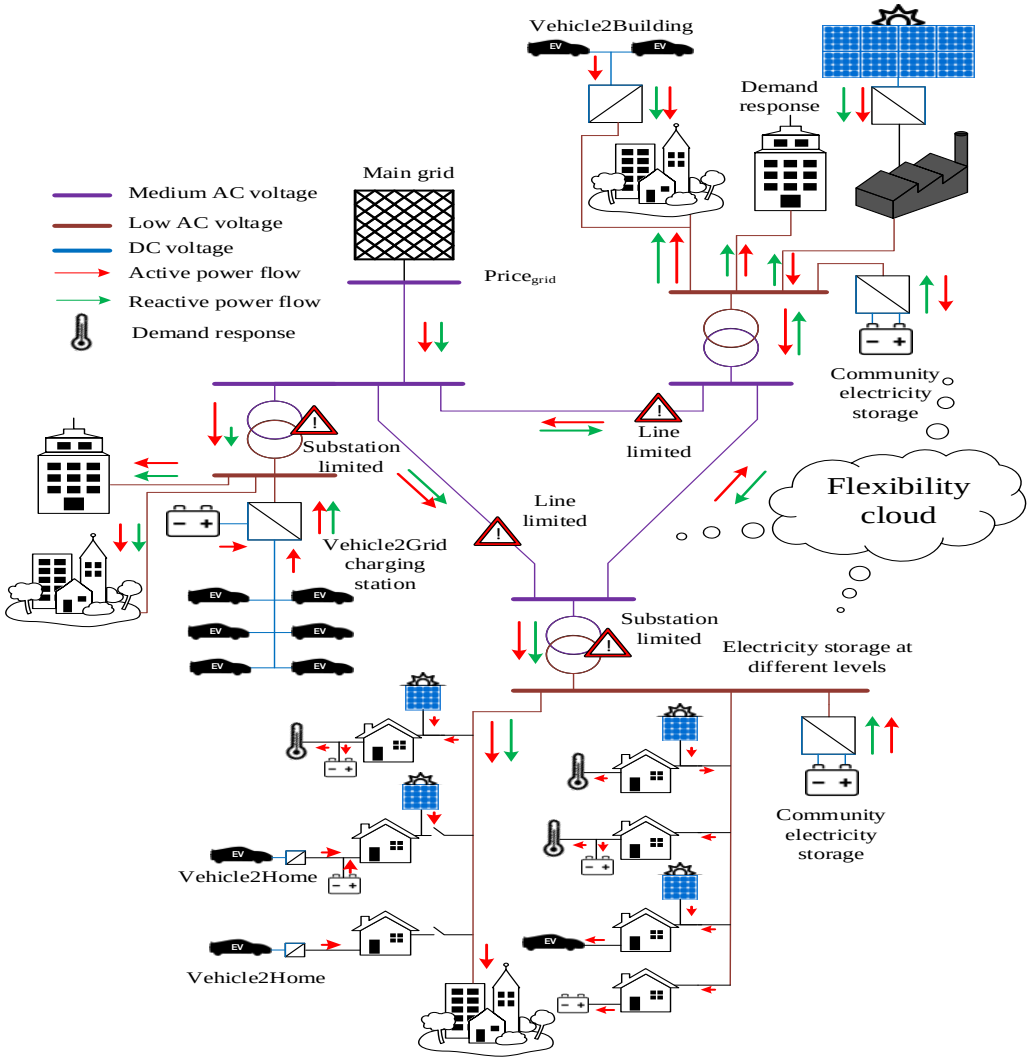
The **INVADE project aims** to deliver a Cloud-Based Flexibility Management System….

…integrated with EVs and batteries empowering energy storage at mobile, distributed and centralised levels to increase the share of renewables in the smart grid.

This entails

1. Design a **flexibility management system** using batteries that supports the **distribution grid** and **electricity market**
2. Develop a **model for batteries including EVs** focusing on prediction of batteries lifetime and impact factors
3. Deliver the **Integrated INVADE Platform** based on Flexibility Cloud enabling
    1. flexible management algorithms
    2. functions and monitoring and control dashboards using Internet of Energy Things
    3. Big data analytics
    4. visualisation techniques
    5. cyber security principles by design
4. **Integrate the INVADE platform** with **existing infrastructure** and systems in selected pilot sites in Bulgaria, Germany, Spain, Norway and the Netherlands and validate the platform
5. **Design** innovative and competitive **business models** and verify them
6. **Engage with full chain stakeholders** to support **large scale deployment** of INVADE within EEA and beyond and
7. **Build awareness of the project** and its contribution to both climate change and energy efficiency targets

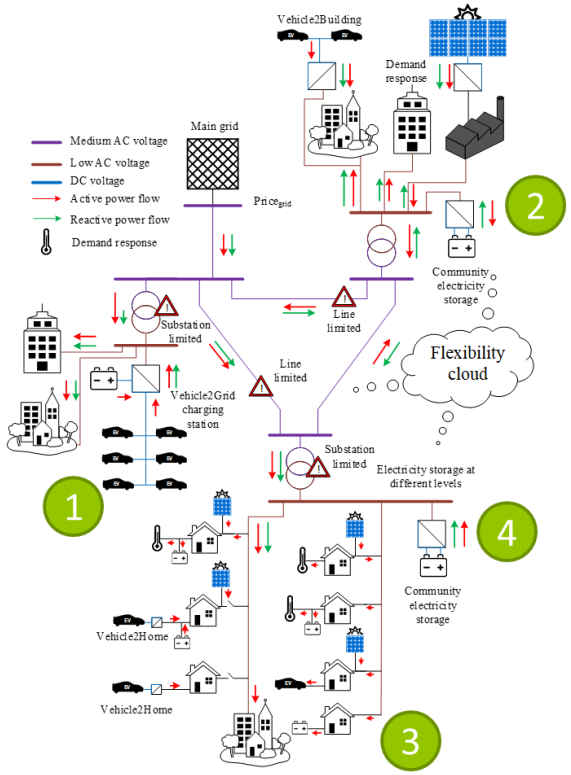
INVADE pilot overview



Use cases

4 different use cases (UC):

1. Mobile energy storage using EVs for V2G, V2B and V2H operations
2. Centralized energy storage using an array of batteries at the sub-station or street level
3. Distributed energy storage using individual batteries at the household level
4. Hybrid level energy storage solutions addressing a combination of use cases 2 and 3

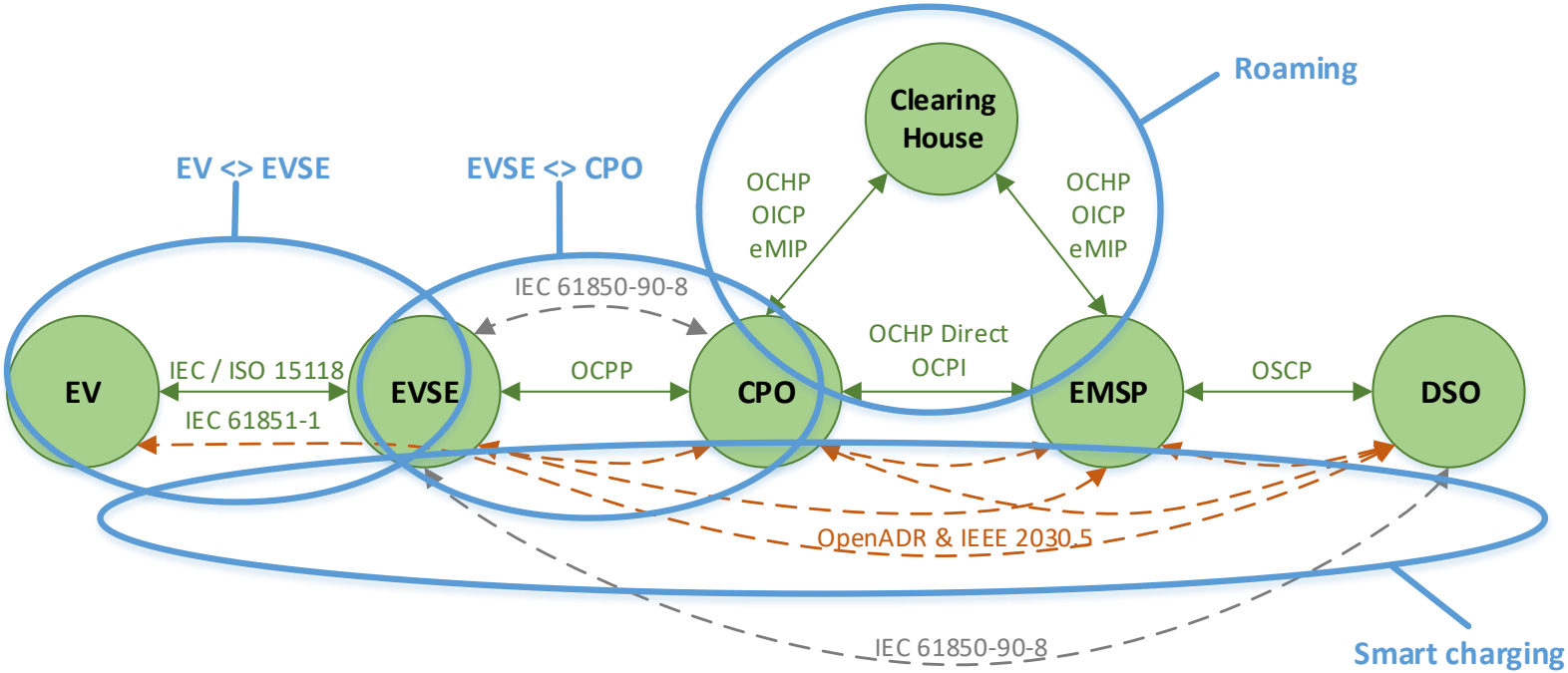


5 Pilots:

- Norway: UC 1 & 3
- The Netherlands: UC 1
- Bulgaria: UC 2
- Spain: UC 2
- Germany: UC 4

Smart charging and V2G/B

- Standards and communication protocols
  - Characteristics of EV-related standards and protocols
  - New OCPP v2.0 protocol for integrated smart charging and V2G
  - New OCMP 1.0 draft for information between EMSP and the FO
  - Input to define the communication layer in T4.5 and in WP7
- All this has been reflected in deliverable D4.1

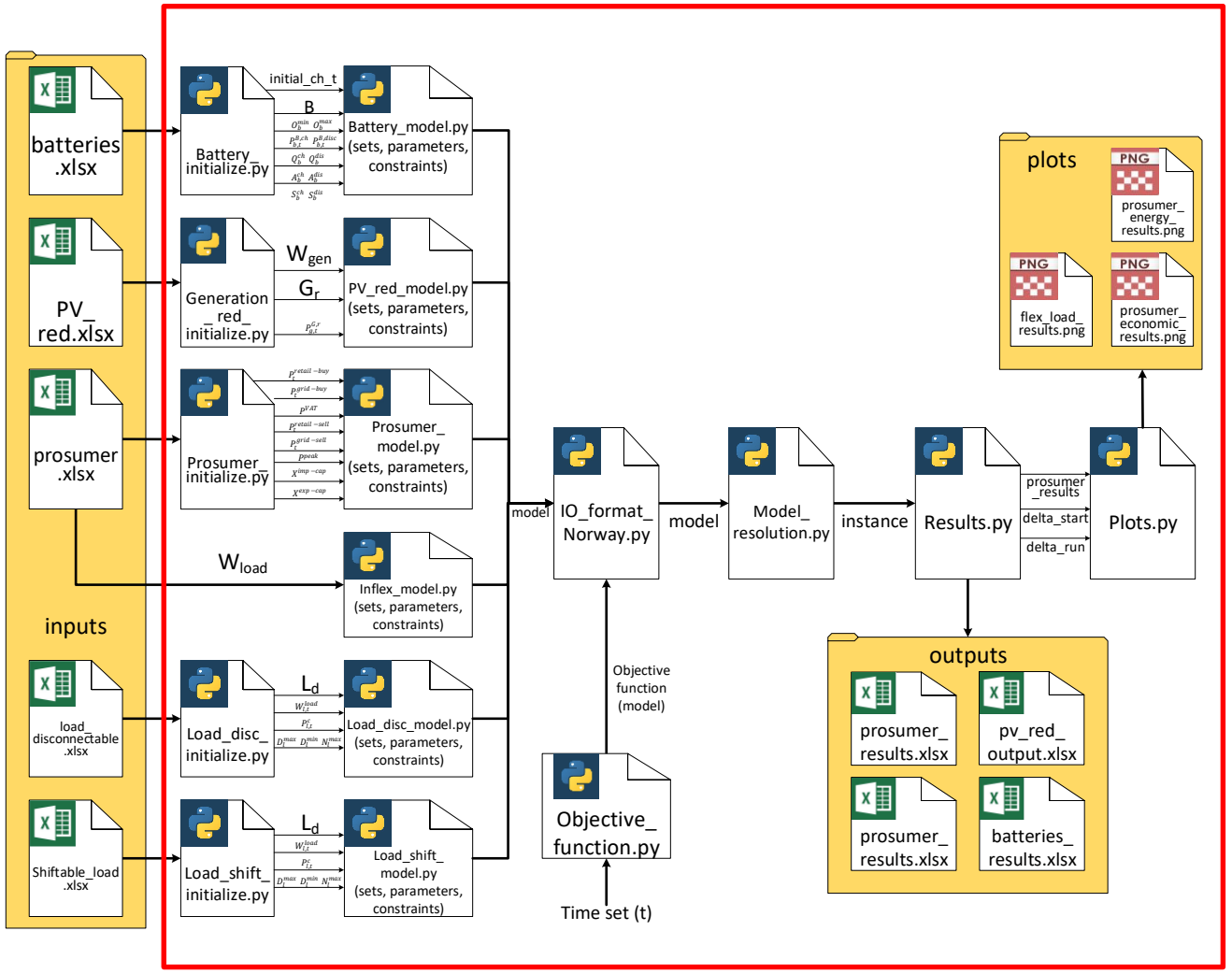


Optimizing for self-consumption and profit

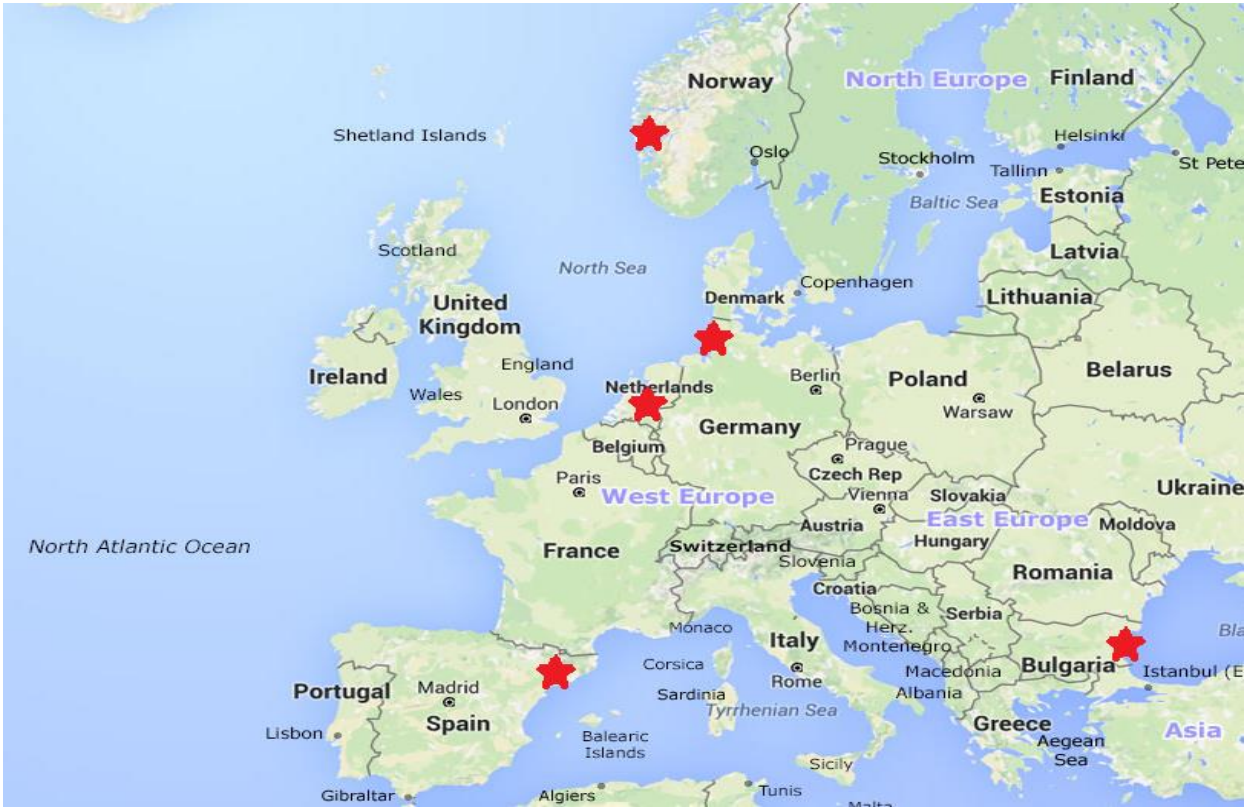
Models:

- Battery
- Reducible PV
- Inflexible load
- Disconnectable load
- Shiftable load (EV)

- Without rolling horizon
- Dynamic & fixed parameters in the same input file



Pilot locations



Flexibility services to be used in each pilot

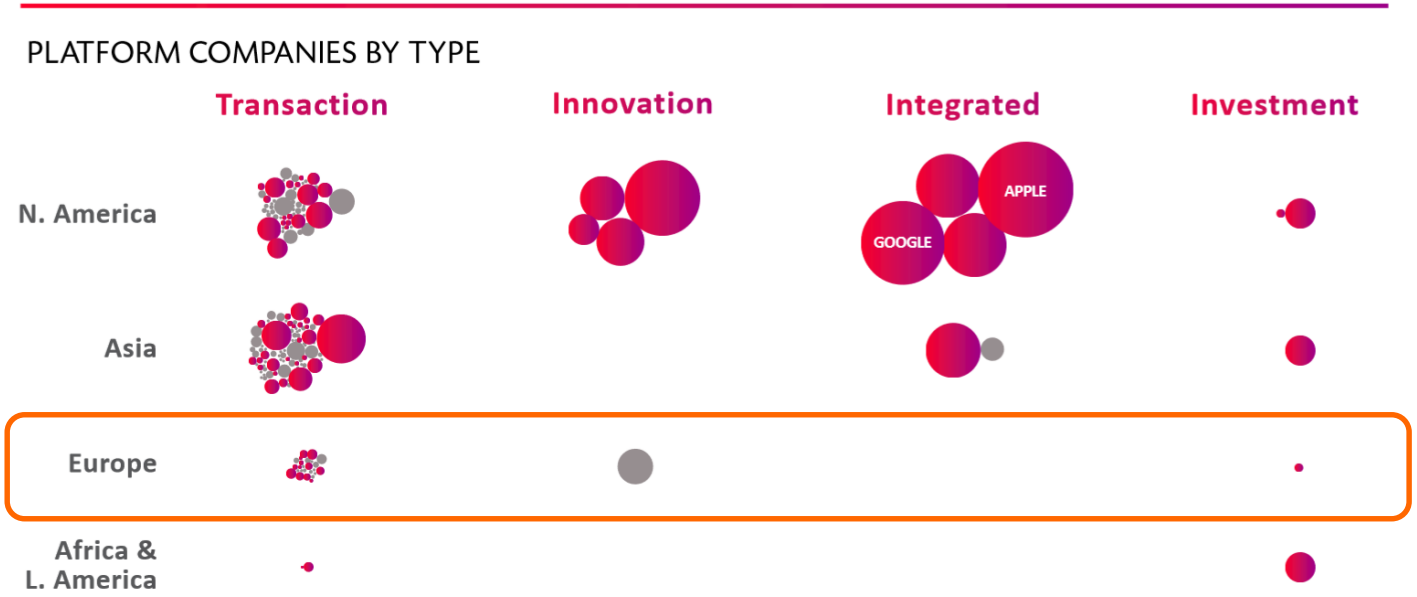
Flexibility customer	Flexibility services INVADE	Norwegian pilot	Dutch pilots	Bulgarian pilot	German pilot	Spanish pilot
DSO	Congestion management	N	Y	N		Y
	Voltage / Reactive power control	N	Y	N		Y
	Controlled islanding	N	N	N		Y
BRP	Day–ahead portfolio optimization	N	Y	TBD		TBD
	Intraday portfolio optimization	N	Y	TBD		Y
	Self-balancing portfolio optimization	N	Y	TBD		Y
Prosumer	ToU optimization	Y	Y	Y		TBD (phase 2)
	kWmax control	Y	Y	Y		TBD (phase 2)
	Self-balancing	Y	Y	Y		TBD (phase 2)
	Controlled islanding	TBD	N	TBD		N

Prosumer services:

- **ToU optimisation:** *is based on load shifting from high-price intervals to low-price intervals*
- **kWmax control:** *is based on reducing the maximum load (peak shaving) that the Prosumer consumes within a predefined duration*
- **Self-balancing:** *is typical for prosumers who also generate electricity. value is created through the difference in the prices of buying, generating, and selling electricity*

Platform based business models

Europe versus US and Asia

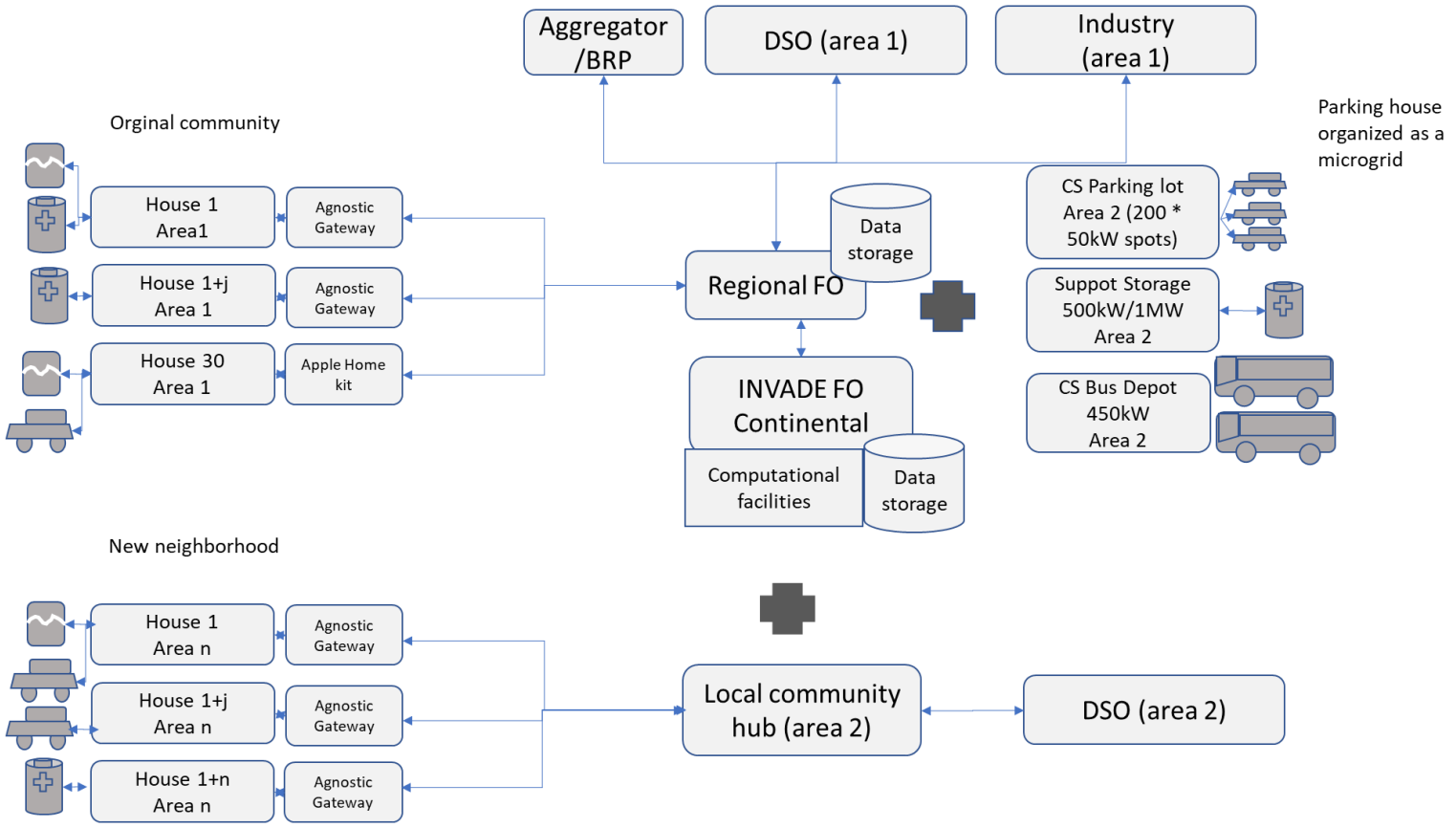


SOURCE: Global Platform Survey, The Center for Global Enterprise, 2015

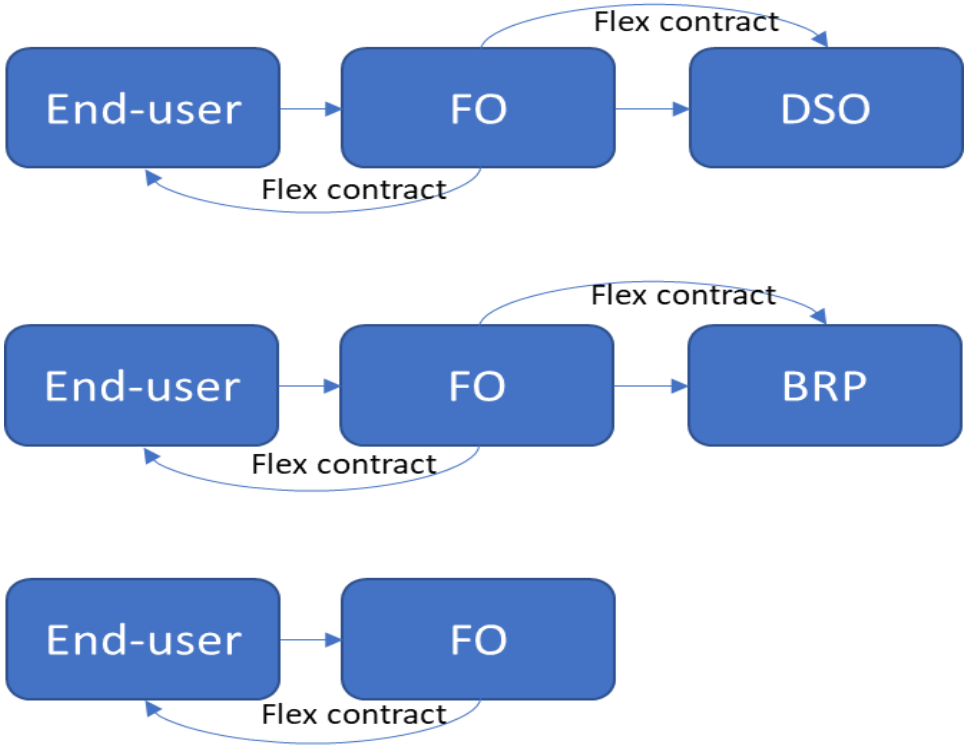
FIGURE 7

Note: Each bubble represents a company sized by market cap as of December 1, 2015

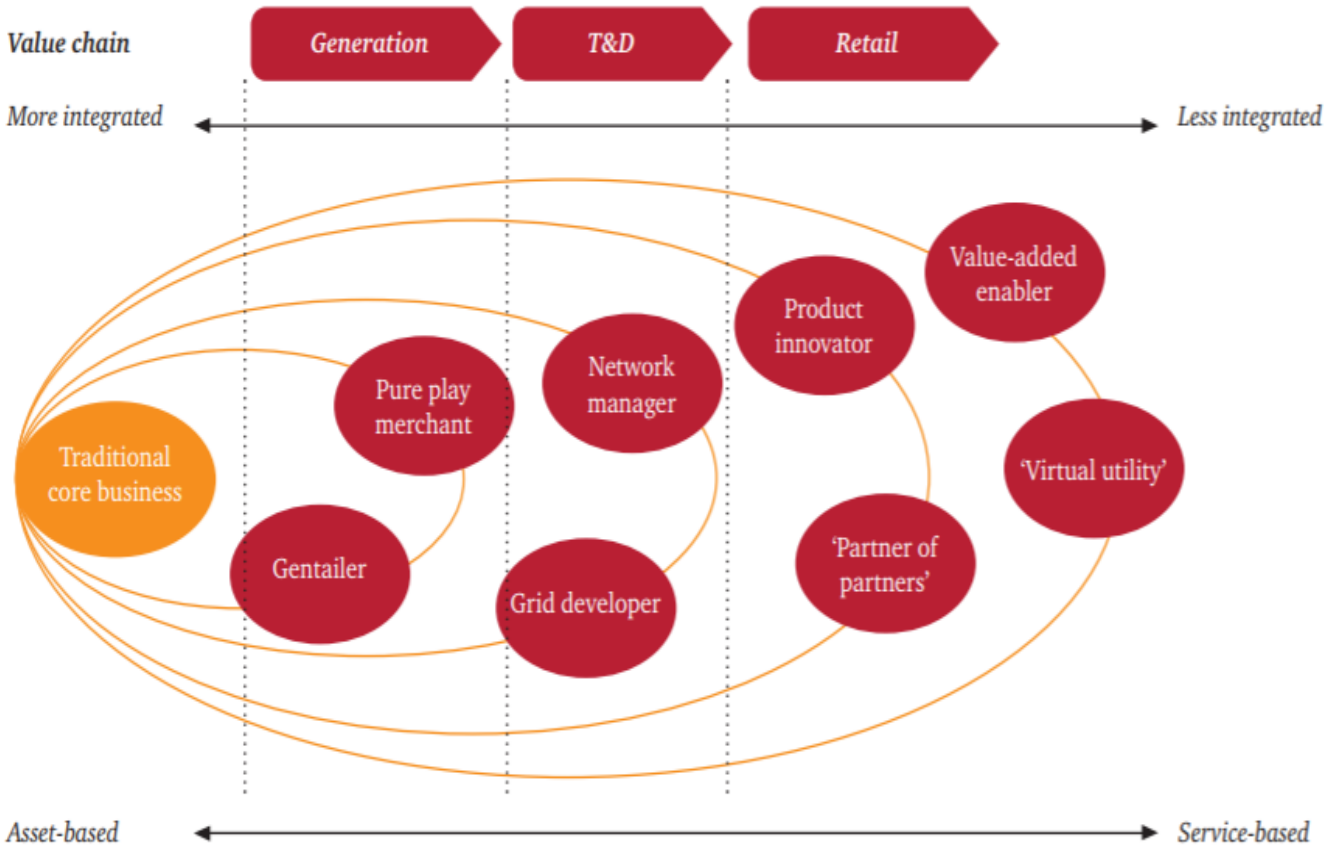
Creating platform based ecosystems



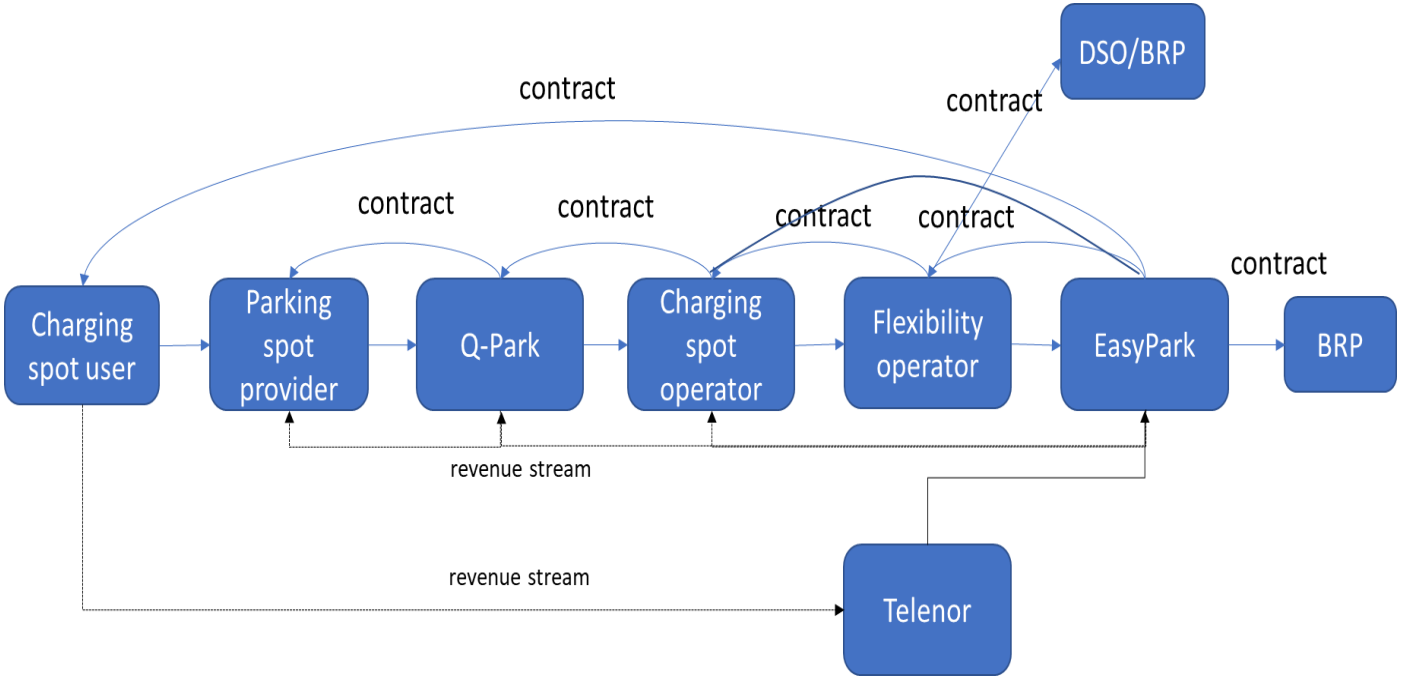
Contracts – the traditional view



Strategic choices



Contracts – how we should see it

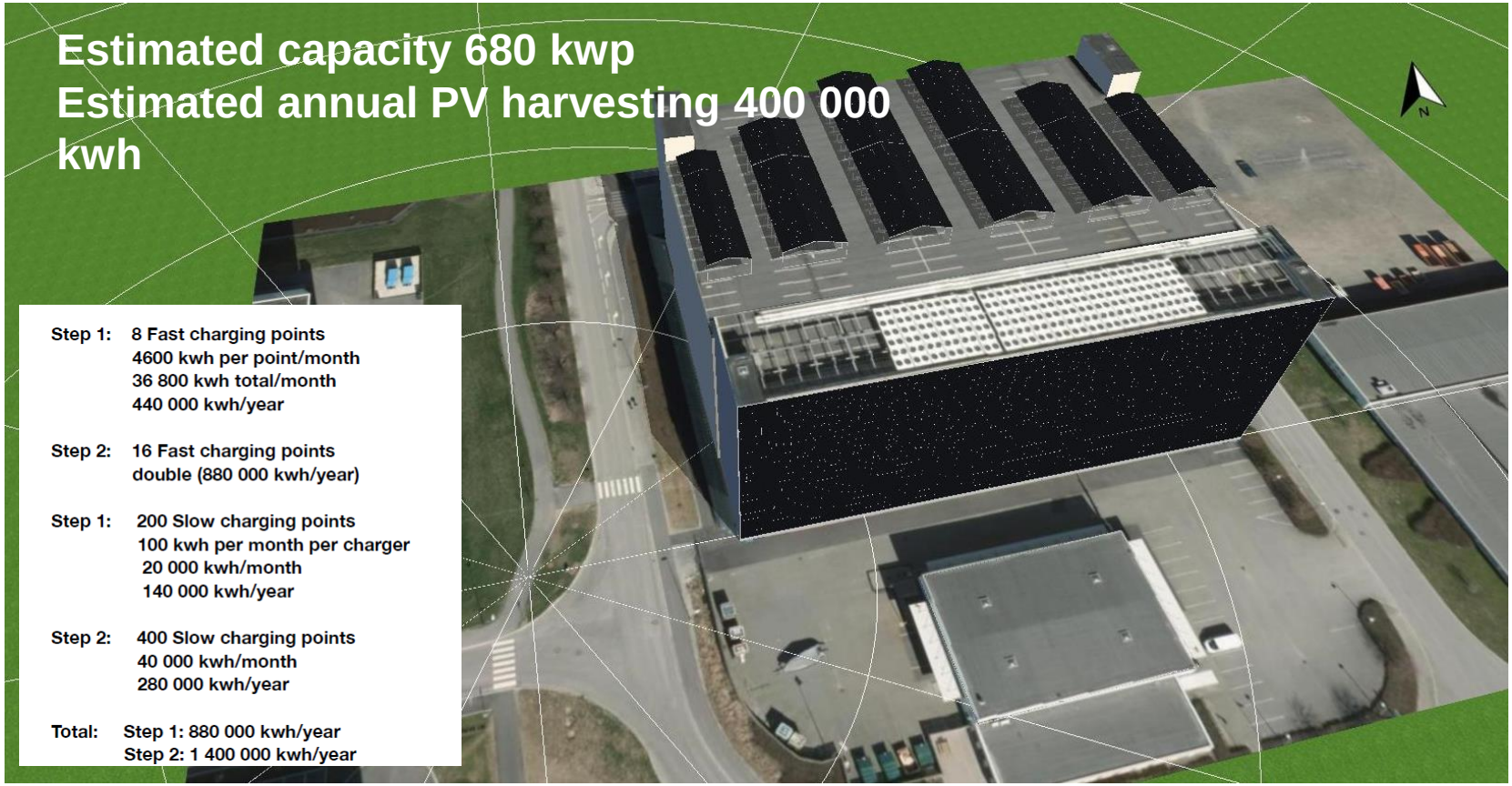


Piggy back existing systems/ecosystems

EasyPark

Simple user interface – added value proposition on proven concepts

Stakeholder uptake: The acid test



Summing up achievements this far

- Designed a flexibility platform
  - For end-users (peer-to-peer), BRPs and DSOs
  - for managing different sources of flexibility and contracts
- Established a control and communication regime for smart charging
- Currently setting up 5 pilots for large scale testing
  - 3 will address EV based flexibility
- Created a platform based business concept: “Local service – global business”
  - Explored suitable contracts under this regime
- “Winner takes all” – must apply a symbiotic approach to ensure sustainable business development
  - strategy for this defined
- Explored and mapped stakeholders for future interaction
  - Some external stakeholders already adopting INVADE concepts

Any question or comment?

Thank you!

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