

Latest blockchain technologies for trading Unlocking flexibility in a smart portfolio

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Gas & Power Sector Coupling

Sharing of innovation and best practices



“Electricity and gases will complement each other in the new, sustainable energy system to keep it reliable and affordable”

Infrastructure Outlook 2050 - joint study by Gasunie and TenneT
on integrated energy infrastructure in the Netherlands and Germany

Blockchain

Opportunities and challenges



Evolution of the Built Environment



De Ceuvel

Globally visible circular economy showcase

- Existing project with ~2.200 m² of retrofitted office space
- Private microgrid behind one shared connection
- 30 kWp of PV production + 15 x Heat Pumps
- Local biogas production
- Local energy management and real-time data monitoring



Jouliette

A blockchain-based renewable energy token



“Companies such as Spectral Energy in the Netherlands and LO3 Energy and Grid+ in the US are leading the way.”

- Don Tapscott (Founder Blockchain Research Institute)



Blockchain-enabled hardware evolution

Pilot solution
(September 2017)



Spectral embedded systems (2018-2019)

P1 port reader / smart-metering devices,
M2M communications modules, EMS
control systems, IoT enabled sensors

Key benefits: Low cost, high performance,
high reliability, tamper-proof, blockchain
enabled

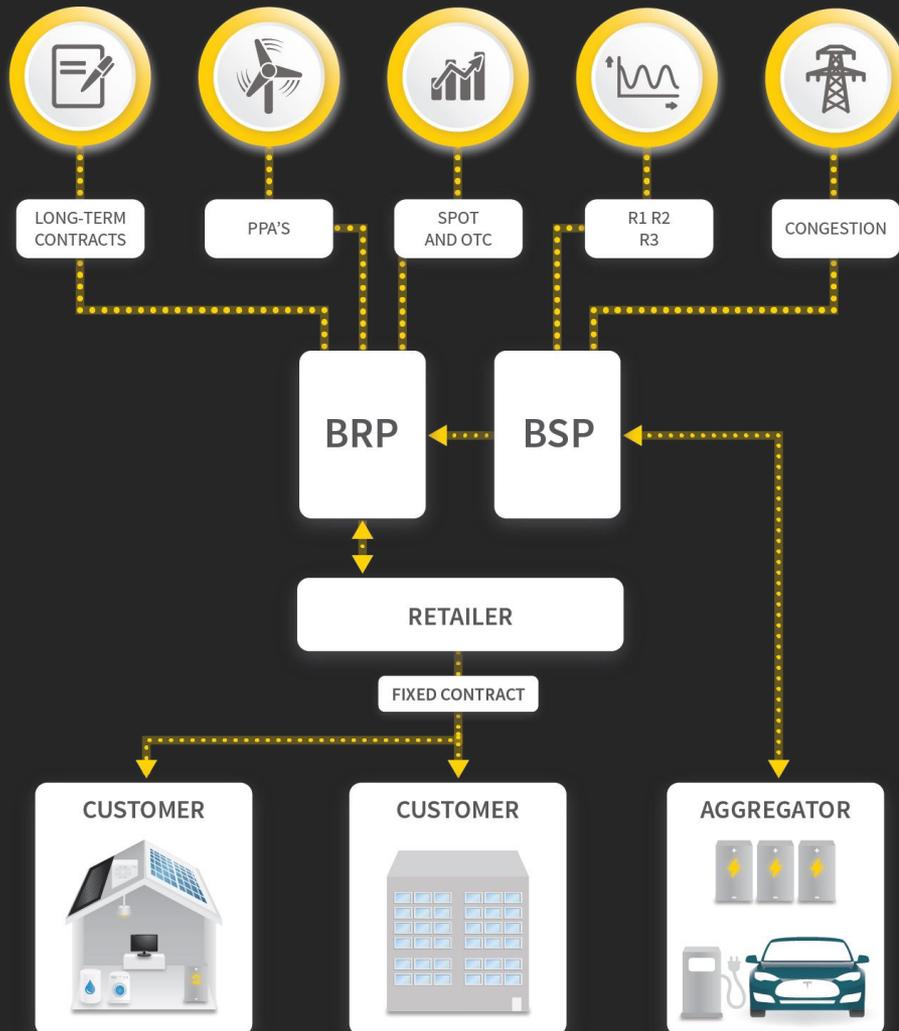


City of Groningen blockchain implementation

“Sharing energy with your neighbours”



Current Market Models



» **Fixed energy supply** contracts with customers

» **Single-sided** communication between Retailer and customers with lack of incentives for flexibility activation

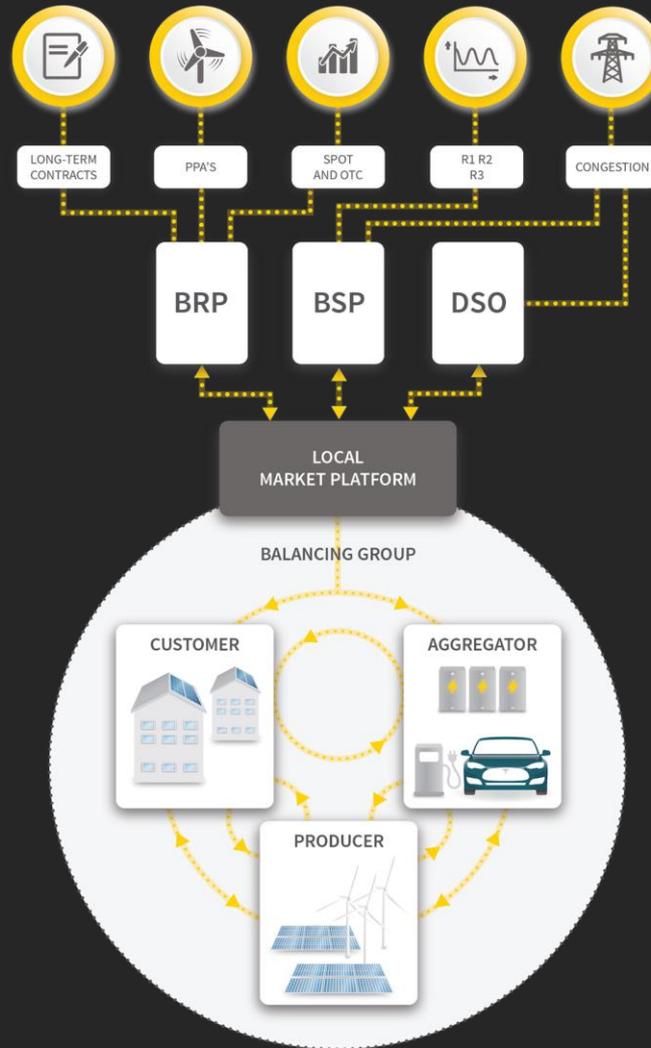
» More **complex integration** of flex services and aggregators

» Customers **lack market access and transparency** into source of energy supply

Emerging Market Models

» Local Market Platform as a **gateway to wholesale** and balancing **markets**

» **Two-way** communication and **dynamic pricing** based on wholesale market participation



» **Automated trading** of PPA's, smart flex contracts, and P2P energy exchange

» Deployment of **local energy services** (eg. congestion relief for the DSO)

» **Seamless integration** of new customers, producers, and aggregators

EU Clean Energy Package

Article 16

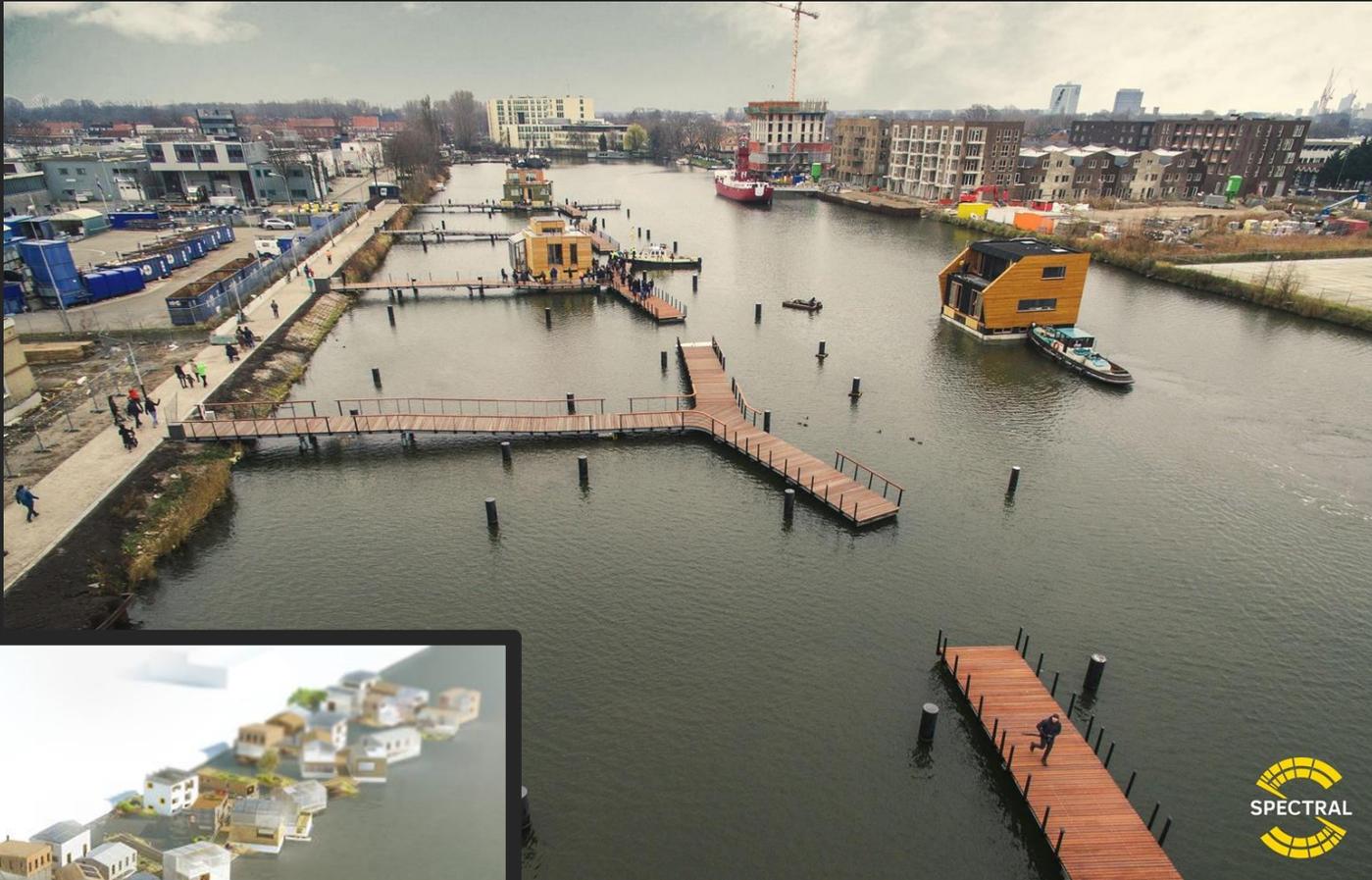
“1. Member States shall ensure that local energy communities:

(a) are entitled to own, establish, or lease community networks and to autonomously manage them;

(b) can access all organised markets either directly or through aggregators or suppliers in a non-discriminatory manner;”



Schoonschip Smart Grid



space&matter

Schoonschip Smart Grid – Battery Systems



Republica Smart Grid



Engineering the integrated electrical and thermal microgrid, including:

- Aquifer Thermal Energy Storage (ATES)
- Local renewable energy production sources (~500 kWp of PV)
- 25 EV charging points & large centralized batteries (872kW / 1396 kWh)
- Smart energy management systems
- Private distribution network (for both heat and power)



BANLIEU

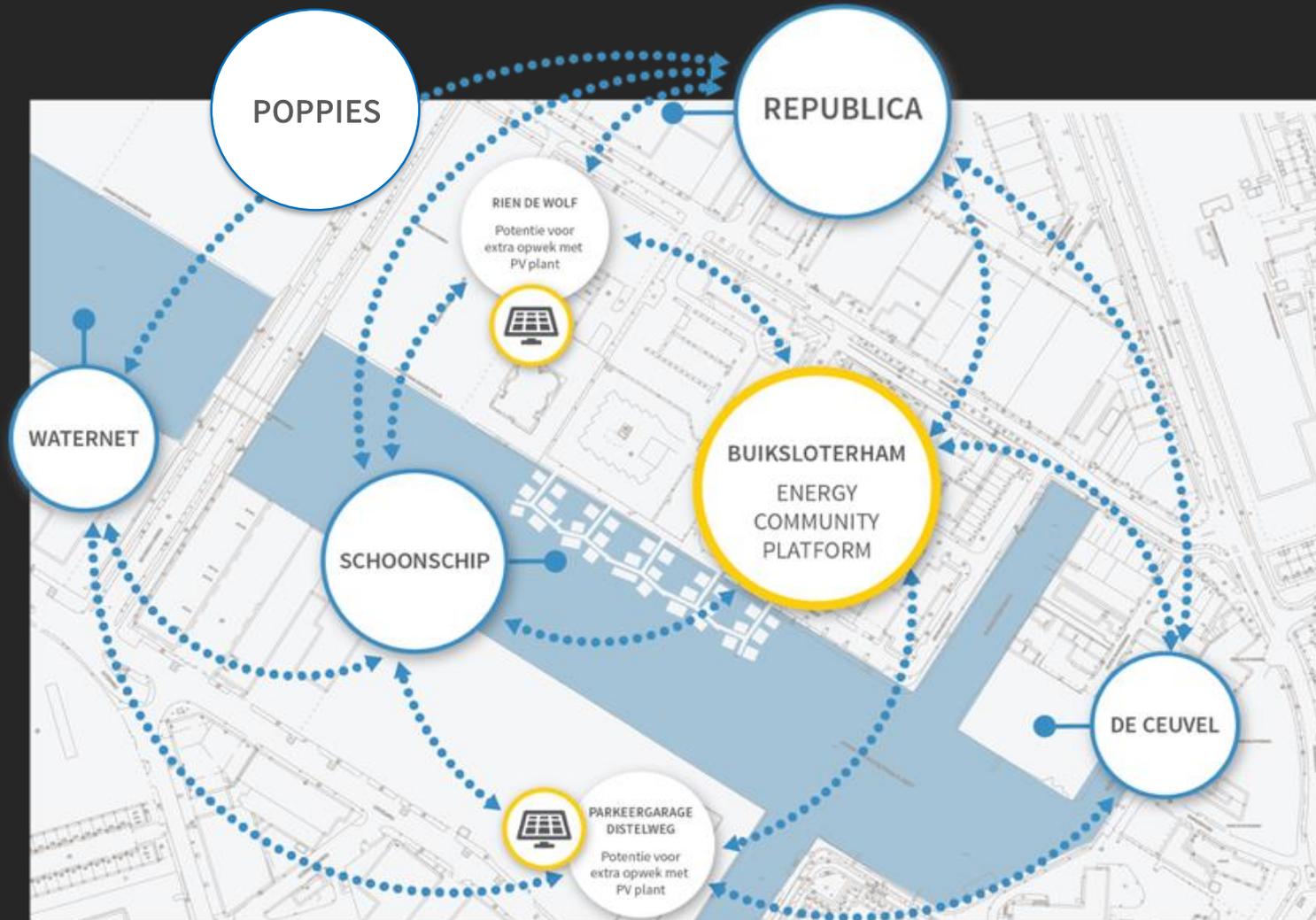


Kavel 3D (“Poppies”)



- New build project of 6.000 m² (mixed commercial / residential)
- **Very high ambition** for sustainability and circularity
- Target of EPC -0,34
- 1.000 m² of PV panels
- ATES + hot and cold network
- Plans for a **smart grid** with advanced energy management

EU Smart Cities & Communities Project: Positive Energy Districts



Spectral Energy Management System (SEMS)

Smart Assets



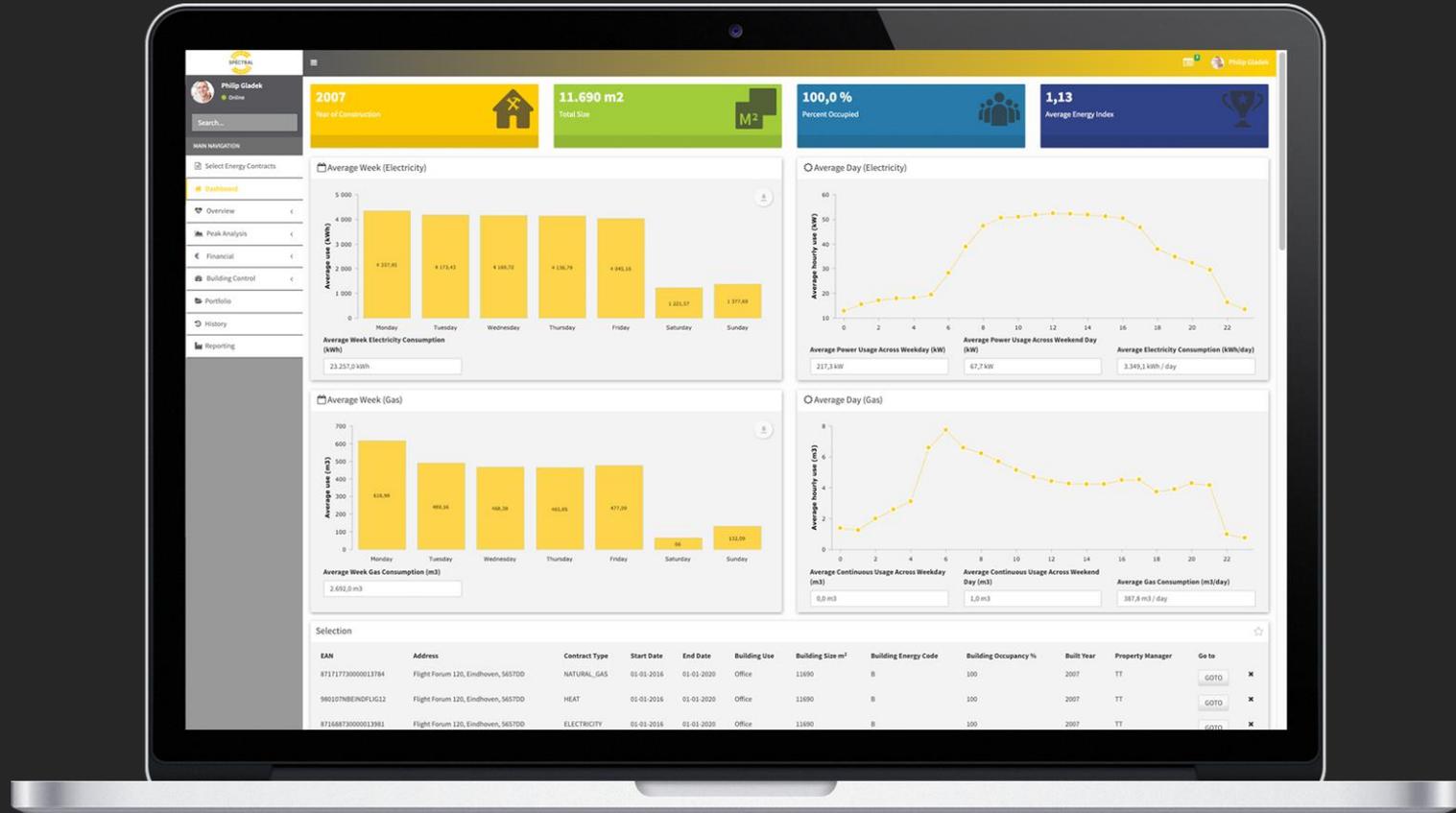
Smart
(Community)
Microgrids



Smart Buildings



SEMS - Smart Buildings



SEMS – Smart Assets

