

# Now/New/Next

Urban Energy Transition Insight Series

## Delivering an affordable and flexible energy system with **Virtual Power Plants**

As cities move closer to a carbon-neutral future, decentralised energy technologies such as solar PV, battery storage, heat pumps, and electric vehicles are being rapidly adopted to meet rising electrification demands. This shift, however, introduces a new challenge: uncontrolled peak power demand (kW) is putting additional strain on the local electricity grid. Peak loads are expected to triple in many urban areas, pushing municipalities and local Distribution System Operators (DSOs) to the limits of current infrastructure capacity.

Virtual Power Plants (VPPs) are emerging as innovative solutions. VPPs enable dynamic load balancing by digitally aggregating and coordinating decentralised energy assets, which matches local demand with available storage and generation in real time. In doing so, they relieve grid stress, unlock much-needed local flexibility, and offer cities a viable alternative to costly and time-consuming grid upgrades.

### About Now New Next

The **Now-New-Next** series highlights innovative concepts and trends within the Urban Energy Transition, covering the Political, Economic, Societal, and Technological advances that will be central to local energy transition.



## Challenge

- The widespread adoption of solar PV, heat pumps, and electric vehicles, as part of the shift from fossil fuels, will introduce significant new peaks in renewable energy demand on local grids, leading to **power capacity constraints**.
- Due to **renewable intermittency**, it is rather a kW- than a kWh-challenge
- While some European countries are working to proactively expand grid infrastructure, others, like the Netherlands, are already approaching **grid capacity limits** in many areas.
- To address these (and future) constraints and avoid costly grid upgrades for peak demand—typically around just 5-10% of the time—solutions such as VPPs and battery storage systems need to be developed.



## NOW : Grid challenges recognised

- Cities have recognised the **challenge of impending grid constraints** within urban local grids due to the widespread adoption of solar PV, heat pumps, and EV charging stations.
- Cities have received **high-level investment plans from their Distribution System Operators (DSOs)** outlining future grid reinforcements in specific areas, which is often cost inefficient to cover peak power demand and not targeted at the LV-level
- Numerous cities have set ambition to realise full electric neighbourhoods and/or Positive Energy Districts (PEDs) but **have not come up with a technical solution** to do so.
- The challenge is identified, and an initial concept or ambition has been outlined, but no partners have yet been engaged to assess viable VPPs.



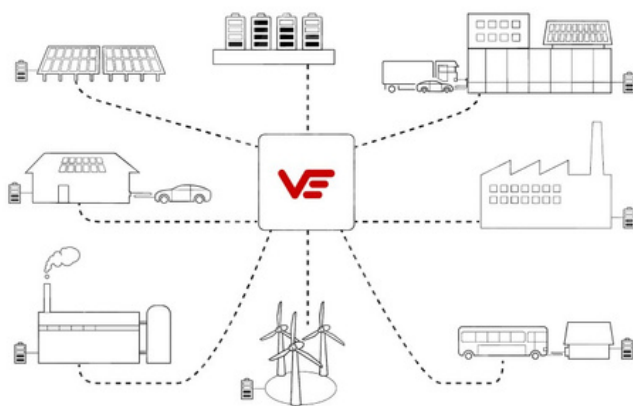
## NEW : City-led stakeholder alignment and virtual demonstration

- Cities are **beginning to align with key stakeholders**, including internal teams, the Distribution System Operator (DSO), and technical specialists (such as technical researchers and technology solution providers).
- **First-of-a-Kind (FOAK) VPPs** of bundled energy assets such as battery storage, EV-chargers, electric vehicles, heat pumps, are being developed by frontrunners in Europe.
- **Persistent inconsistencies and non-standardised policies** across individual EU nations remain a significant hurdle, impeding seamless, large-scale VPP deployment and limiting their full cross-border potential.



### CASE STUDY

#### Nätflex, a 33.8MW virtual power plant in Varberg, Sweden



The publicly owned utility and DSO of the city of Varberg, Varberg Energi, manages Europe's first city-wide Virtual Power Plant (VPP) for a population of 35,000.

Known as Nätflex, Varberg Energi's VPP has already achieved more than 33MW of flexible capacity, distributed across a range of energy assets, including EV chargers, home batteries, and stationary batteries.

For end-users, Nätflex acts as a local flexibility market, consolidating multiple electricity markets at both national and local levels to create a flexible local electricity grid. This approach leverages favourable pricing to optimize and stimulate flexible use at the end-user.



## ➡ NEXT : Established, viable VPPs

- VPPs will be **scaled and replicated** across Europe, from a validated first of a kind models to running multiple, large-scale VPP bundles of 50-100MW of 10-100+ energy assets.
- Driven by European legislation, **DSOs will increasingly procure flexibility services** which will increase the attractiveness of VPPs
- Supported by increasingly harmonised regulation on flexibility in Europe, **viable VPPs will roll out across European cities**, connecting local sustainable energy sources, alleviate grid congestion and work towards their climate goals.

### Now New Next – Virtual Power Plants

#### ➡ NEXT

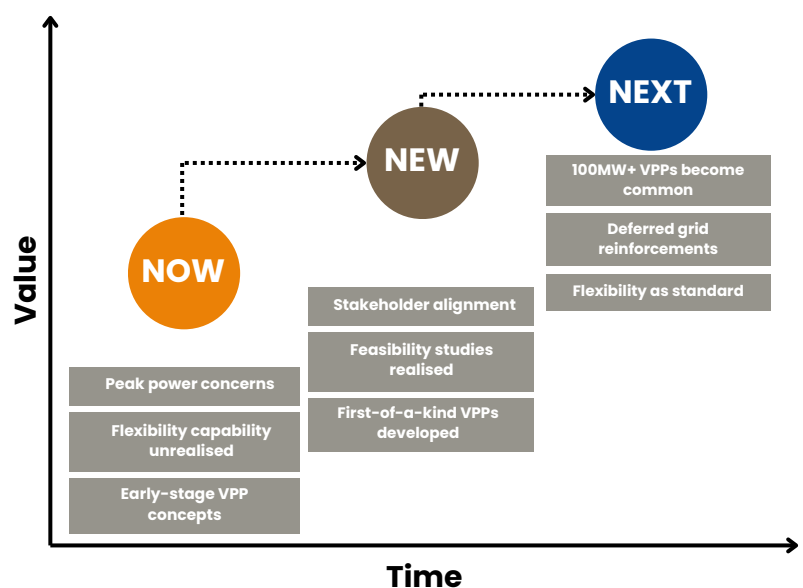
Large-scale VPPs provide city-level flexibility across Europe

#### ⚙️ NEW

First-of-a-kind VPPs are developed and tested

#### ⬇️ NOW

Limited coordination of energy assets



### About Now New Next

The *Now New Next* series is developed by the COPPER partnership, an initiative in which six cities and representatives from DSOs, academia and business are building Europe's first wave of Local Energy Action Plans.

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Learn more: [interregnorthsea.eu/copper](https://interregnorthsea.eu/copper)  
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