

The energy transition as a driver of resilience: geospatial intelligence for the grid of tomorrow

GeoSquare Academy Conference

June 12th, 2026

fluvius.
Tot bij u



Nice to meet you, I am Bram Van Eeckhout!



Head of department
Grid Transition

Who's who in the Flemish energy market?



Electricity producers
 Both individuals and businesses can produce electricity. Businesses produce electricity at nuclear or conventional fossil fuel plants, among others. Green electricity uses renewable energy sources, such as wind and solar.



Natural gas importers

There are no sources of natural gas in Belgium. Natural gas is imported mainly from Norway, the Netherlands and Qatar (liquefied natural gas = LNG), and to a lesser extent from Great Britain. LNG is brought in by methane carrier ship, via Zeebrugge.



Flemish Utility Regulator

In Flanders, the Flemish Utility Regulator (Dutch: Vlaamse Nutsregulator) advises the regional government and monitors the application of decrees and decisions.



Elia

Elia transports electricity from generation plants, through the high-voltage grid, to the Fluvius grids and to large industrial consumers.



Fluxys



Fluxys

Fluxys transports natural gas from the gas terminals, through the high-pressure grid, to the Fluvius grids and to large industrial customers.



Fluvius

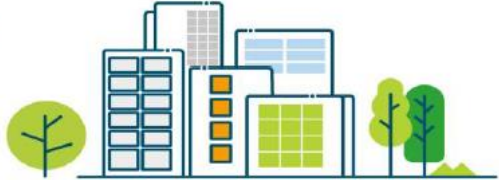
In Flanders, Fluvius, as the distribution system operator, brings natural gas and electricity to customers (to homes and smaller businesses).

Customers



Energy suppliers

Energy suppliers buy electricity and natural gas from electricity producers and natural gas importers. They resell the energy to customers.

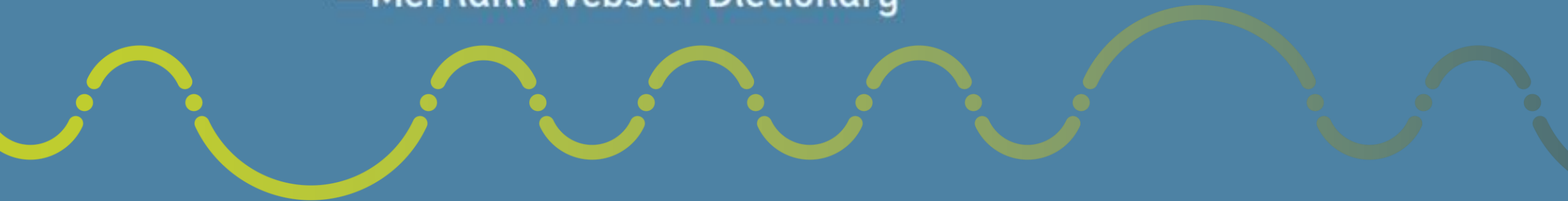




resilience:

“an ability to recover from or adjust easily to misfortune or change.”

—Merriam-Webster Dictionary



Climate events



Data explosion



652.568.026.607

Cyber security





Energy transition

Resilience in Energy Transition

Ramp-up in
CAPEX

Keep the grid
operational

Ramp-up in CAPEX

PER YEAR	2022		2025
Transformers	500	x 6	3000
Km MV grid	900	x 1,7	1500
Km LV grid	1200	x 3,5	4200



The largest grid adaptation ever.

Keep the grid operational



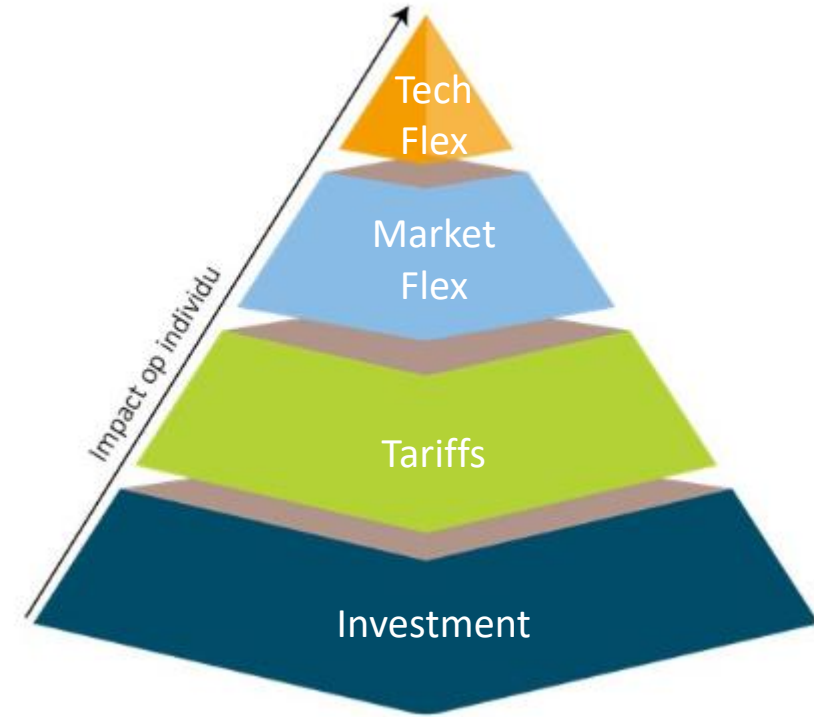
Security of supply



Balancing and incompressibility



Congestion

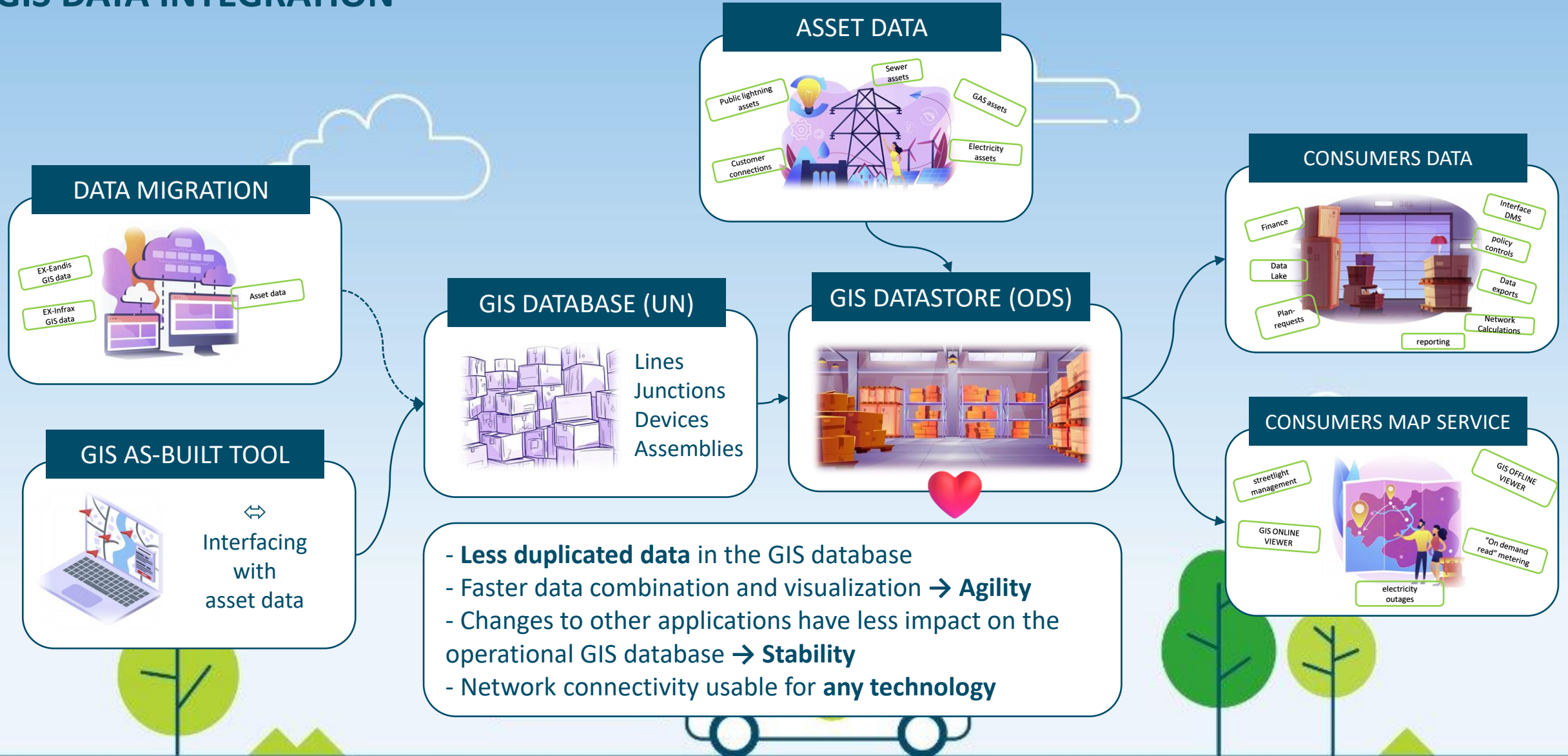


Use cases of GIS in the energy transition context

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GIS DATA INTEGRATION



NGIN – Next Generation Infrastructure, now ElectrifiedGrid



Attention Zones

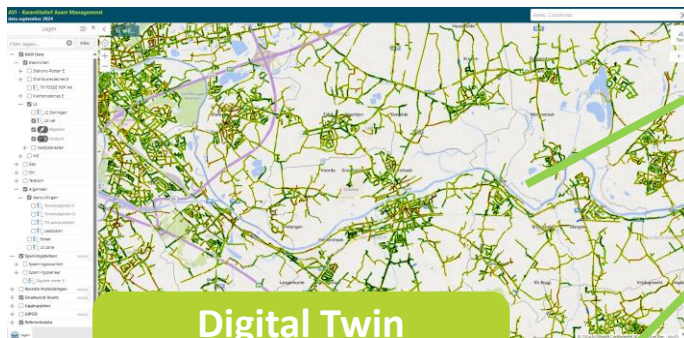


Synergy

Gipod

Input municipalities

Work zones per municipality per budget

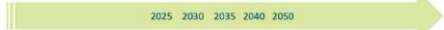


Digital Twin (ODS)

Asset & load data

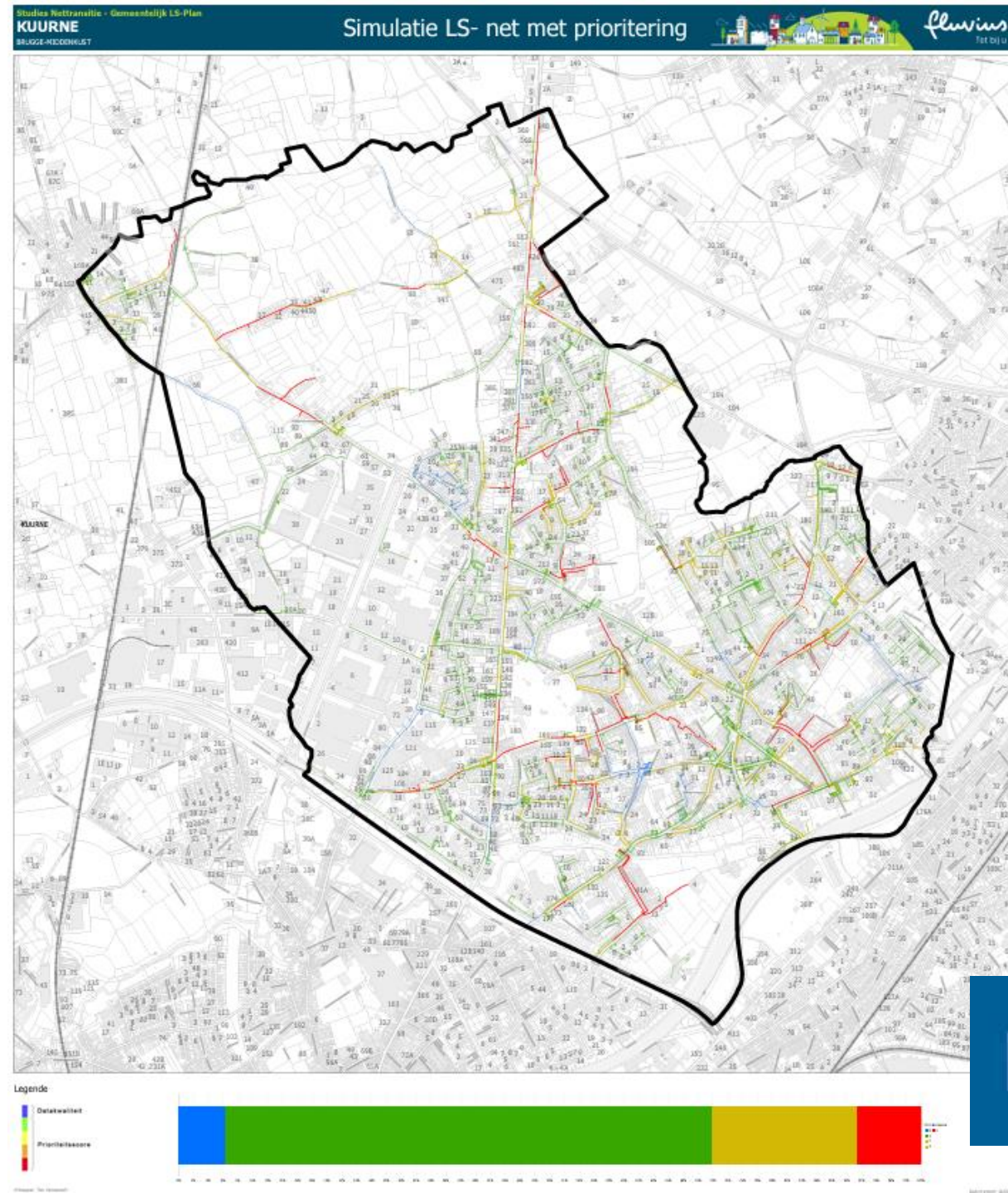


Hoog	Midden	Laag
1,9 miljoen in 2030 60% gelijktijdig thuisladen in avondpiek	1,5 miljoen in 2030 60% gelijktijdig thuisladen in avondpiek	1 miljoen in 2030 40% gelijktijdig thuisladen in avondpiek
Nieuwbouw 100% warmtepomp in 2025 Renovatie vanaf 2030 100% warmtepomp	Nieuwbouw 100% warmtepomp in 2025 Renovatie vanaf 2035 100% (hybride) warmtepomp	Nieuwbouw 100% warmtepomp in 2025 Renovatie vanaf 2040 100% (hybride) warmtepomp
Impact injectie PV ligt lager dan maximale afnamepiek 's avonds		



Proactive Grid Reinforcement

NGIN-results





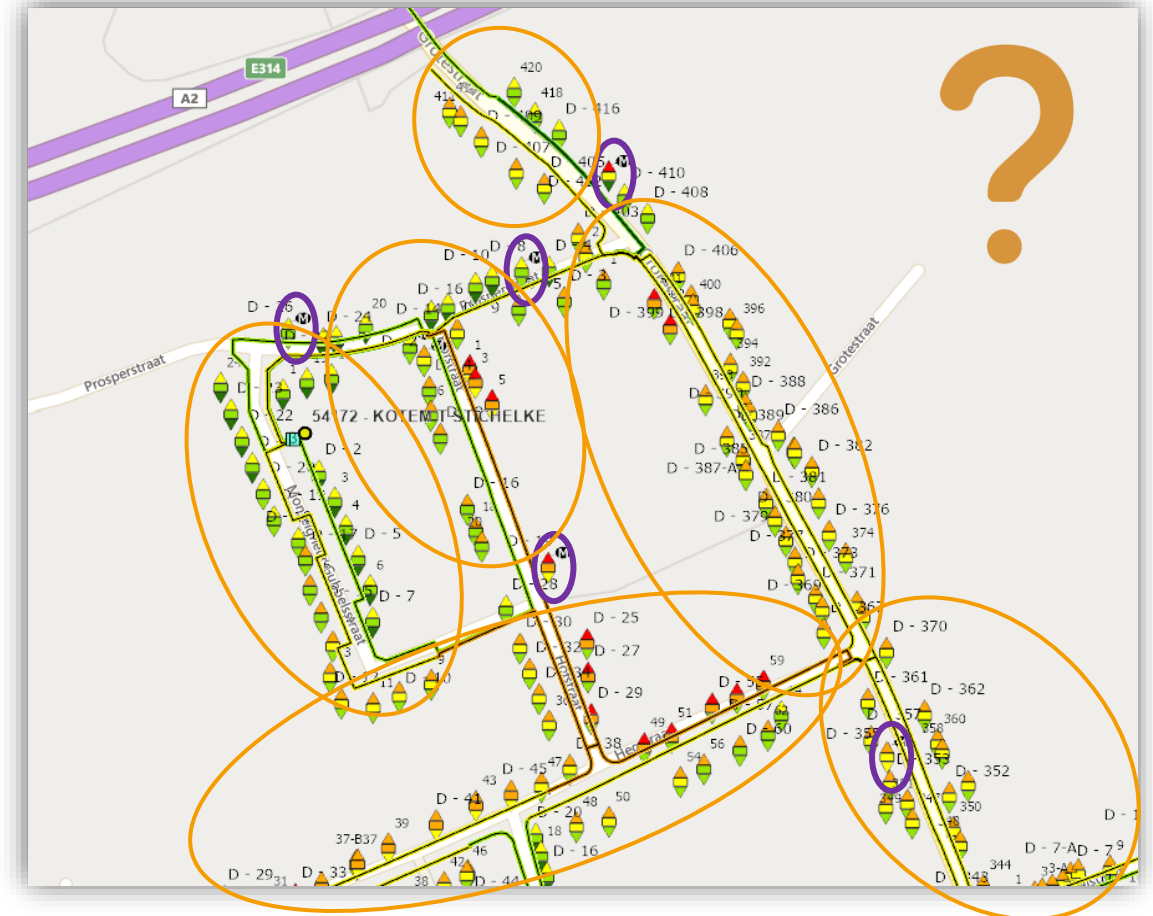
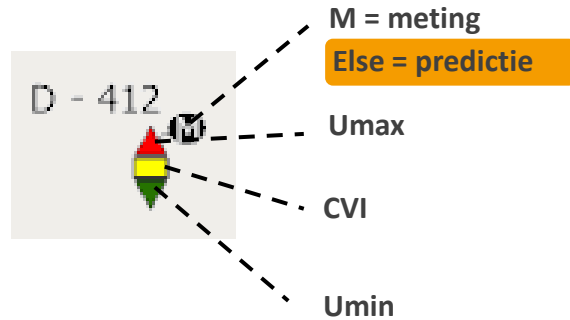
CVI – Customer voltage indicator

- Digital meter as LV grid sensor
- Voltage too high or low? → U_{max} & U_{min}

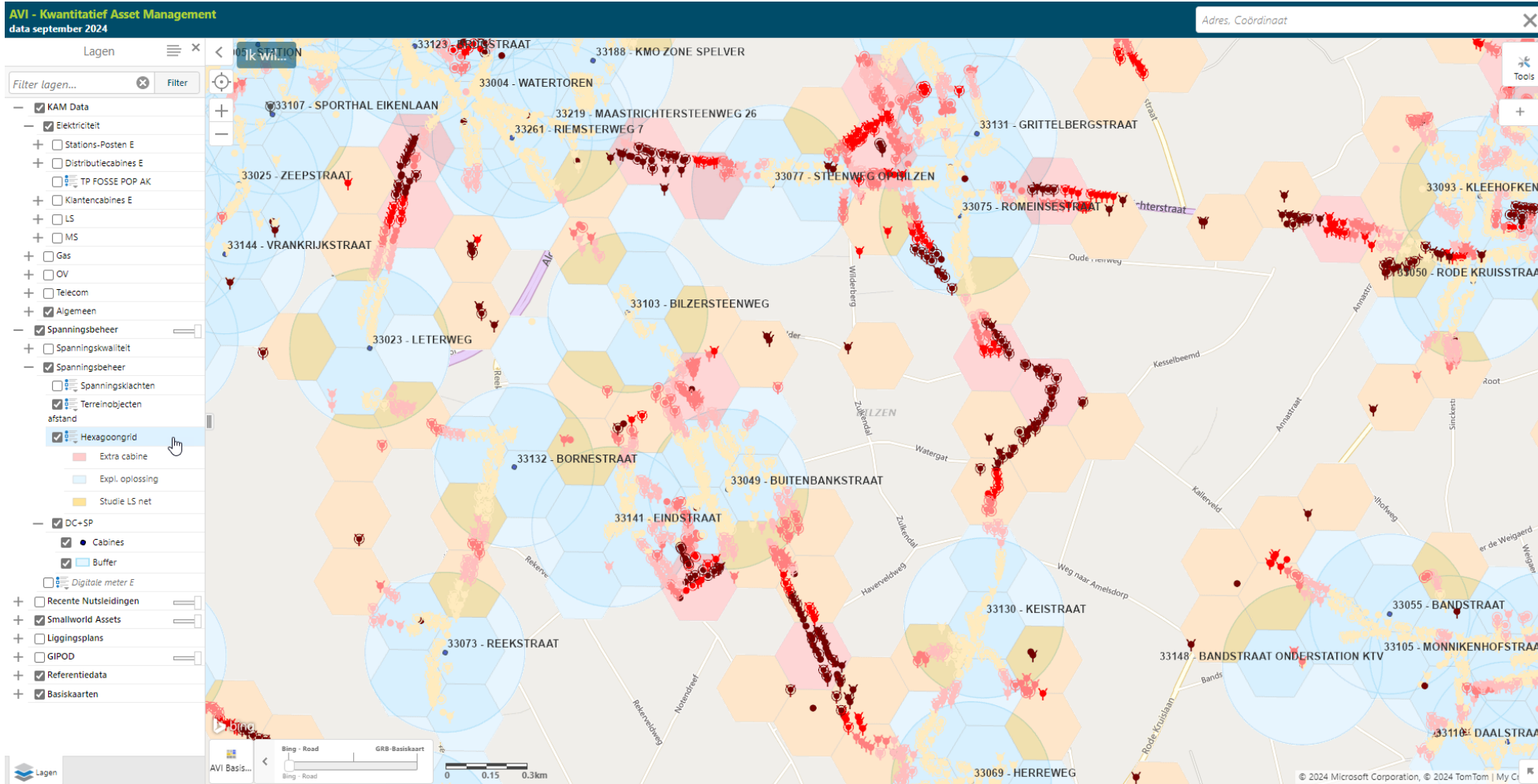
U _{min}		U _{max}		CVI			
≥ 225	Zeer goed	1	≤ 235 V	Zeer Goed	1	Zeer goed	1
≥ 220	Goed	2	≤ 240V	Goed	2	Goed	2
≥ 215	Matig	3	≤ 245V	Matig	3	Matig	3
≥ 210	Slecht	4	≤ 250V	Slecht	4	Slecht	4
≥ 207	Zeer slecht	5	≤ 253	Zeer slecht	5	Zeer slecht	5
< 207	Extreem slecht	6	> 253V	Extreem slecht	6	Extreem slecht	6

CVI

- Zeer goed
- Goed
- Matig
- Slecht
- Zeer slecht
- Extreem slecht



Cabinet Search Zones

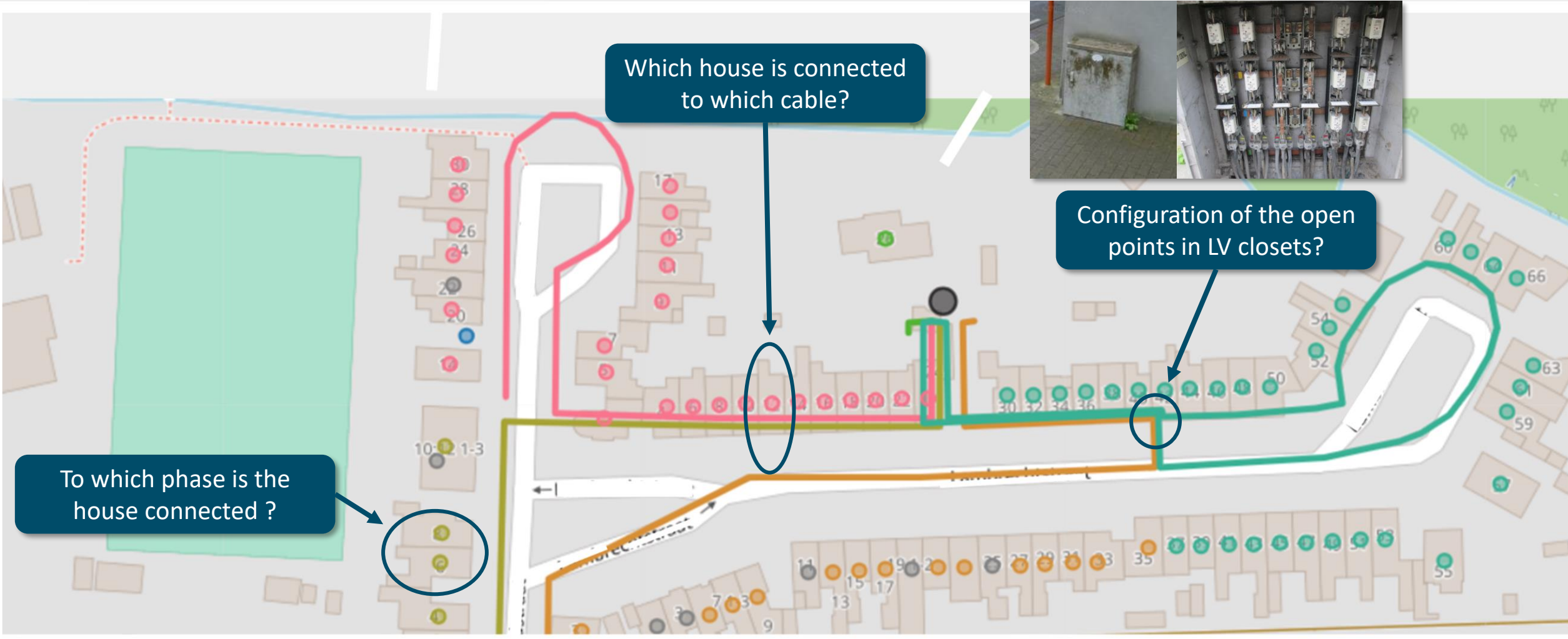


- Buffers (r=300m)
- Customer to cabinet distance
- Hexagones

The LV connectivity challenge



Fluvius Case – In search of a solution to detect and update.....



Piri algorithm

Piri: detection algorithm & tool developed in collaboration with Fluvius



Smart meter
V data



Ensemble algorithm combining multiple variations on:

- **Voltage correlation** clustering
- Grid expert **symbolic reasoning**

Cables & connections
GIS data



cable2cable, house2cable,
Phase connectivity

Conclusion

- For Fluvius as a distribution system operator, resilience is key in tackling the challenges of today
- The energy transition and electrification require firm action and new operating models
- GIS is at the core of the Fluvius data model and enables Fluvius in many ways to cope with the challenges

