

DEMAND Community Event: Data Delen in Energy Data Spaces

Arnhem Electricity Week

Agenda

13.00 – 13.15: Astrid Hoge & Joke Kalma –
Opening speech

13.15 – 13.40: Bart van Gennip – Professional
Doctorate Data Spaces for Smart & Sustainable
Cities & Communities

13.40 – 14.05: Menno Kroes – Energy Data
Spaces from the Alliander perspective

14.05 – 14.30: Javier Ferreira Gonzalez – TRIAD
XL: Working towards a digital energy ecosystem

14.30 – 14.55: Menno van de Lagemaat: AI
Ethics & Compliance: Openstef

15.00 – 15.15: Coffee Break

15.15 – 15.45: Trung Nguyen – Professional
Doctorate AI-Driven Energy Management Systems
for Flexible Power Consumption

15.45 – 16.15: Bart van Gennip: Data Space Quiz

16.15: Stijn Hoppenbrouwers: Closing remarks

16.30 – 17.30: Networking drinks



Opening

Astrid Hoge and Joke Kalma



HAN



ALLIANDER



European data space
for smart communities



DEMAND

Data Space Deployment



The CitizenCity is project has received funding from the European Union's Horizon Europe Research and Innovation Programme





Minidrones in de kas

Onderzoekers van de TU Delft leren drones vliegen als honingbijen.

► pagina 13

► Eindhoven en bedrijfsleven sturen brandbrief aan kabinet

‘Crisiswet nodig voor uitbreiden stroomnet’

Het overvolle stroomnet is een directe bedreiging voor onze welvaart. Daarom moet er onmiddellijk een crisiswet komen om de uitbreiding van het elektriciteitsnet te versnellen, zonder allerlei bureaucratische hindernissen.

Maarten van Helvoirt
Eindhoven/Tilburg

Daarvoor pleiten ondernemersorganisaties VNO-NCW Brabant Zeeland en VNO-NCW Midden (Utrecht, Gelderland, Flevoland en Overijssel) en de gemeente Eindhoven in een brandbrief aan het kabinet. Die bieden zij vandaag aan.

De situatie is inmiddels zo nij-

pend dat bedrijven niet meer kunnen uitbreiden en broodnodige investeringen niet kunnen doen. Zelfs de verduurzaming, die juist door de overheid wordt gepusht, komt piepend en krakend tot stilstand.

‘Netcongestie is een acute bedreiging voor onze economie’, stelt Ellen Kroese, directeur van VNO-NCW Brabant Zeeland, in de brief.

Hart raken

De recente ontwikkelingen in Utrecht laten volgens haar en haar collega Rijn Platteel van VNO-NCW Midden zien hoe ernstig het probleem is. Daar zijn vanaf 1 juli geen nieuwe aansluitingen meer mogelijk. Niet alleen voor grote bedrijven, maar ook voor woningen, winkels en kleine ondernemers. ‘Dat scenario willen we – en moeten we – in andere regio’s

koste wat kost voorkomen. In Brabant draait een groot deel van de logistiek waarop Nederland economisch leunt. En als Brainport Eindhoven vastloopt, raakt dat het hart van onze hightech- en maakindustrie.’

Het kabinet krijgt het verwijt dat het nog altijd onvoldoende de ernst van de situatie inziet. Terwijl ondernemers vastlopen, blijft de politiek volgens VNO-NCW hangen in extra onderzoeken en eindeloos overleggen.

De brief bevat voorstellen om het stroomnet slimmer te gebruiken en sneller uit te breiden, voordat de schade onherstelbaar is. Een daarvan is verschillende stroomtarieven door de dag heen, zowel voor burgers als bedrijven, met als doel een betere spreiding van de vraag naar stroom en daardoor minder pieken.

Ook moet er actiever worden gezocht naar onbenutte ruimte bij grootverbruikers. Veel bedrijven hebben capaciteit op het net gereserveerd die zij niet volledig benutten, terwijl andere ondernemers smachten naar een aansluiting.

Op gas

Een cruciaal onderdeel van de oplossing ligt volgens de brief in lokale samenwerking op bedrijventerreinen. Het moet juridisch veel eenvoudiger worden voor bedrijven om energie uit te wisselen, te delen en op te slaan.

Opvallend is de roep om de tijdelijke inzet van generatoren op gas. Hoewel het doel is om van gas af te stappen, zijn deze generatoren volgens de ondernemers nu nog hard nodig om de ergste pieken op het net af te vlakken.

Demand Event January 27



Sebastian Steinbuss

- Recap



Data Space

Dataspace


INTERNATIONAL DATA
SPACES ASSOCIATION




- » **environment enabling trusted data sharing between participating parties, based on an agreed governance framework, along with an agreed set of policies, semantic models, standardised protocols, processes, and facilitating services**



Data space characteristics | ISO/IEC 20151




Maintain control




Establish trust



Discover data




Negotiate data sharing contracts



Orchestration of data sharing



Observability of action



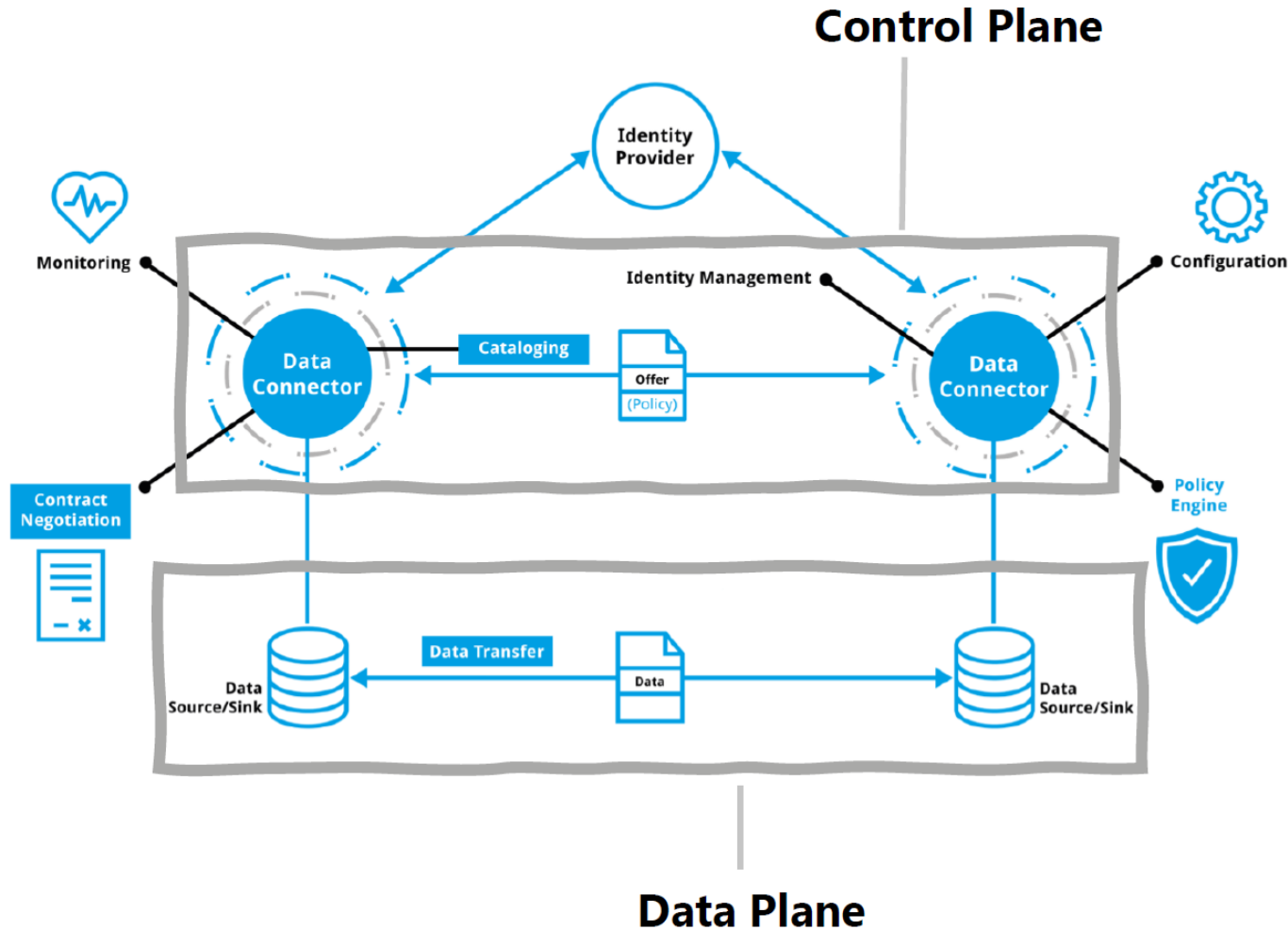
Interoperability

Functional components

- Multi-level policies
- Semantic models
- Communication protocols
- Processes and Rules

The Dataspace Protocol

ISO/IEC DIS 26450



DCAT enables semantic interoperability by providing a **shared**, machine-readable vocabulary that ensures datasets are **described consistently** across organizations and domains.



ODRL enables semantic interoperability by providing a standardized, machine-readable language for expressing **usage rights and policies**, ensuring that data access and permissions are understood consistently across systems and organizations.

Are we already done?

What is left on our to do list?

- Creation of Data Products
 - Meaningful and interoperable data products
 - Fit for purpose
 - Balancing availability and control
- Business Models
 - Maturity of Data Products
 - Digital Maturity of organizations
 - We are not yet in the data economy
- Tools to enable organizations of all types and sizes, including
 - Open Source
 - Methodological approaches
- Shared governance in a multilateral environment (Rulebooks)
- Education and enabling of (human) decision making
- Applied regulation and digital sovereignty concerns



Bart van Gennip



Researcher & PD Candidate Fontys ICT

Professional Doctorate

Versie 3

Variant Techniek & Digitalisering

European Data Spaces for

Smart Sustainable Cities & Communities

Bart van Gennip

Fontys ICT



TECHNIEK &
DIGITALISERING

What are European Data Spaces?



To harness the value of data for the benefit of the European economy and society, the European strategy for data of February 2020 set out the path to the creation of Common European Data Spaces in a number of strategic fields: health, agriculture, manufacturing, energy, mobility, finance, public administration, skills, the European Open Science Cloud and the green deal. Together, the data spaces will gradually be interconnected to form the single market for data.

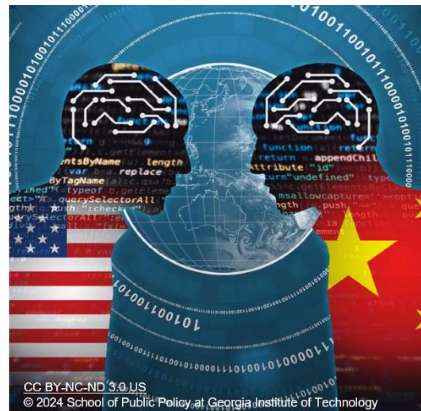


European data space
for smart communities

Europe's Crossroads in Data Governance

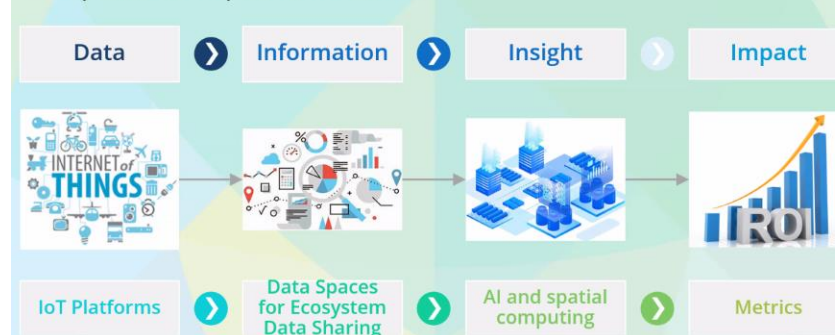
In the evolving digital landscape, Europe faced a pivotal decision on data access and usage across citizens, businesses, governments, and local authorities.

Europe emphasizes a balanced approach, focusing on individual privacy rights and ethical data use.



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Data spaces will be a stepping-stone in the journey from messy data to impactful decisions



Local Digital Twin



DSSC ↔ DS4SSCC



Data Spaces Support Centre

Designing and delivering the European single market for data

The Data Spaces Support Centre supports the deployment of the common European data spaces, that collectively create a data sovereign, interoperable and trustworthy data sharing environment, to enable data reuse within and across sectors, fully respecting EU values, and supporting the European economy and society.

[Learn more](#)

Discover our assets

Blueprint →

A consistent, coherent and comprehensive set of guidelines to support the implementation, deployment and

Toolbox →

DSSC Toolbox is a catalogue of data space component implementations curated by the Data

Data Spaces Radar →

The Data Spaces Radar is the home for all data space endeavors. It is a

Glossary →

The DSSC Glossary provides clear, consistent terminology to support shared understanding and



Who are we?

The European Data Space for Smart Communities is an EU-wide action creating a cross-sectorial data space for governments on all levels and their providers to deliver the best possible services to their citizens by enabling interoperability to reach critical goals, including the Green Deal. The European Data Space for Smart Communities (DS4SSCC-DEP) represents the transition from preparation to deployment of the Data Space for Sustainable and Smart Cities and Communities (DS4SSCC).

From preparatory Action to Deployment

Preparatory Action

Reports produced by the Preparatory Action for a Data Space for Sustainable and Smart Cities and Communities (DS4SSCC)

2022 - 2023



BeatTheHeat

Spain: Municipality of Cartagena - Murcia
Italy: Municipality of Naples and Municipality of Toronto

Logos: everTree, LATTUDOLO, MEDITECH

[READ MORE HERE](#)

DS4PED

Data Spaces for Positive Energy Districts (DS4PED)

Spain (Rubí) Bulgaria (Sofia)

Logos: elec, GATE, FACTUAL

[READ MORE HERE](#)

CitizenCity

Netherland (Eindhoven) Finland (Oulu) Spain (Province of Alava)

Logos: TU/e, Eindhoven University of Technology, OULU, teknei

[READ MORE HERE](#)

What is CitizenCity?



Call for pilots of European Data Space for Smart Sustainable Cities and Communities

The CitizenCity project has 3 use cases working in parallel to deploy dataspace according to the guidelines and blueprint provided by the Data Space Support Centre. Based on existing data platforms each use case will develop a new data service aiming at different topics

Use Case: Eindhoven (NL)



Positive Energy District



Use Case: Alava (ES)



Mobility and Winter Road Safety



EINDHOVEN

Use Case: Oulu (FI)



Cross-Sectorial Participation Data Space



Roles & Responsibilities



1. Stakeholder Engagement TUE
2. Blueprint Validation Fontys ICT
3. Security and Data Privacy Fontys ICT & School of Law Avans - Fontys
4. Use Case Implementations Eindhoven (NL), Oulu (FI), Alava (ES)

Blueprint - Building Blocks - MIM's



Deliverable 2.3
Blueprint Evolution
 WP 2 – Data Space Blueprint Evolution

Authors: Silje Sepp (TalTech), Gernot Boege (FIWARE), Thimo Thoeue (OASC), Sophie Meszaros (OASC), Flavio Fuart (CCIS), Anniki Puura (TalTech), Anna Beyer (FIWARE), Jesper Nyland (OASC), Ralf-Martin Soe (TalTech), Nuria De Lama Sanchez (IDC), Louisa Barker (IDC),
Reviewers: Genevieve Gil Garcia (Serendipity), Mirte Brouwers (Imec)
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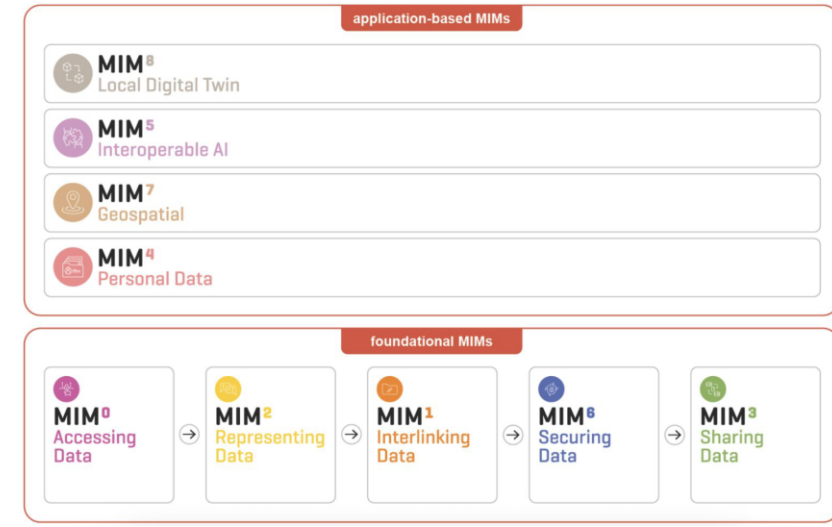
Business and organisational blocks



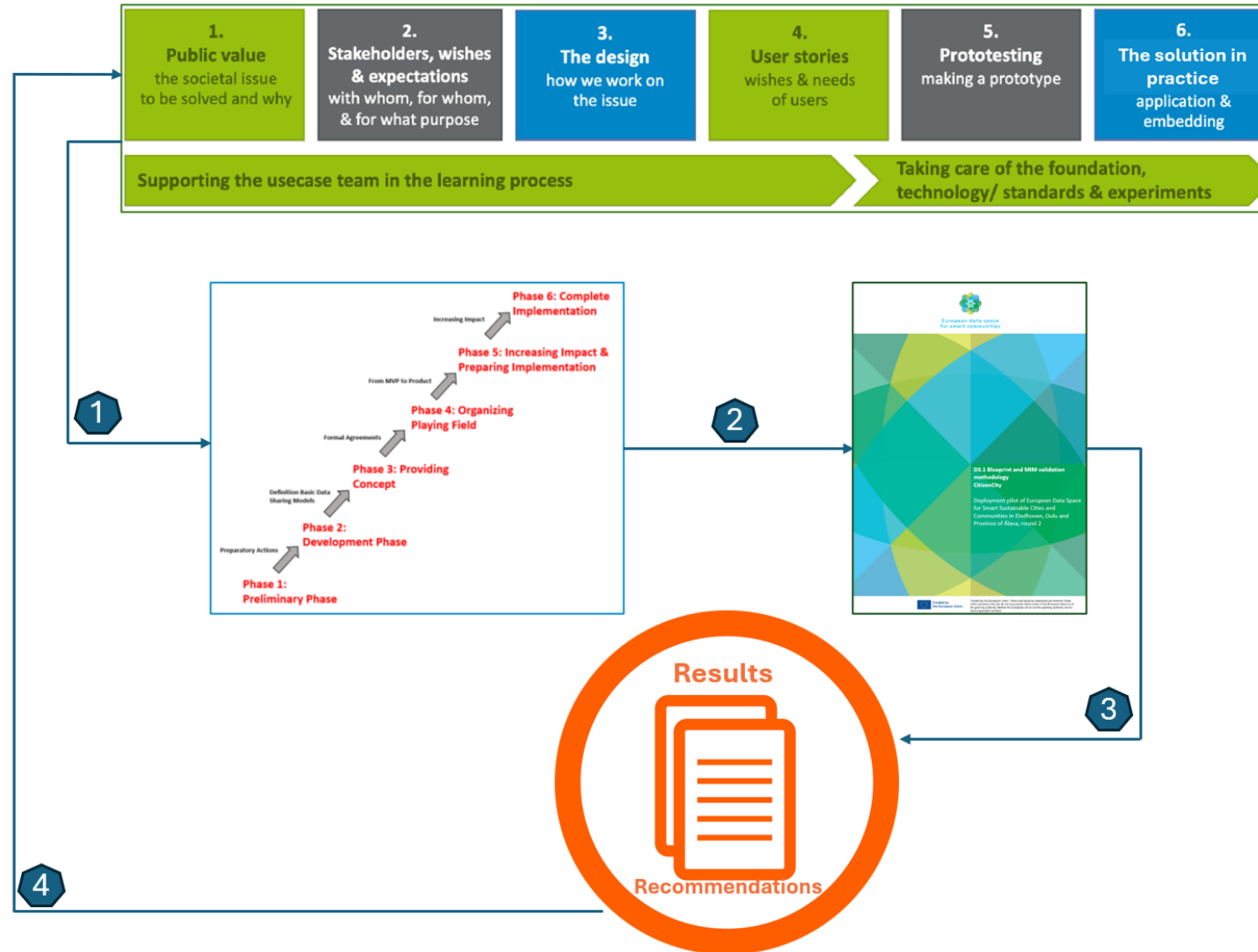
Technical



MIMs Minimal Interoperability Mechanisms



Blueprint Validation



Security and Data Privacy

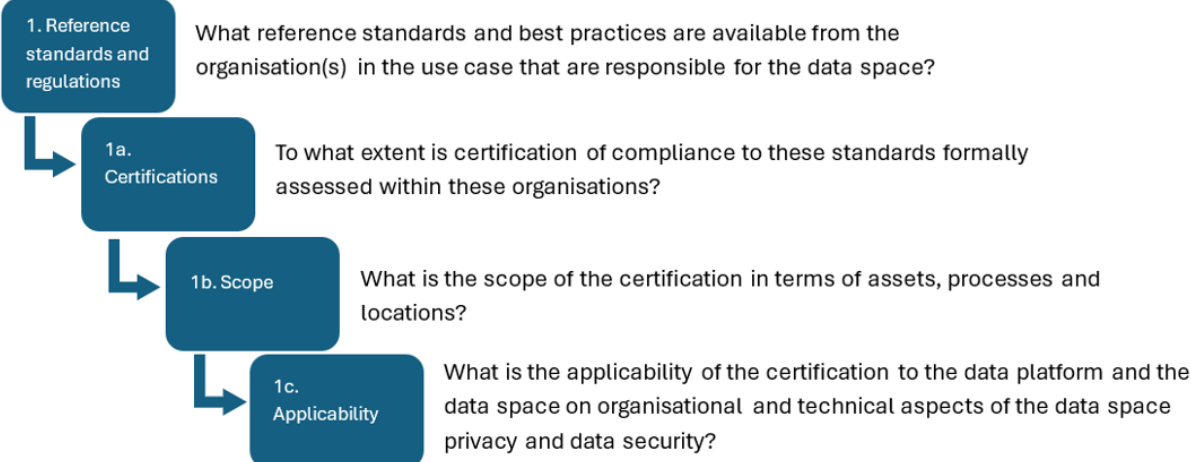
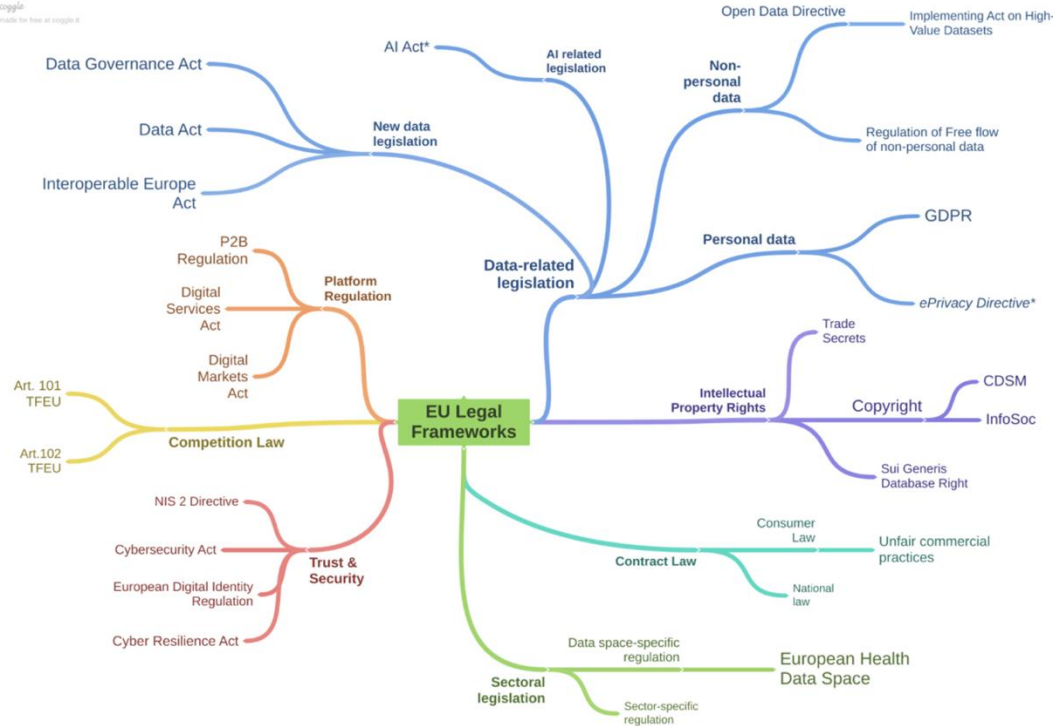
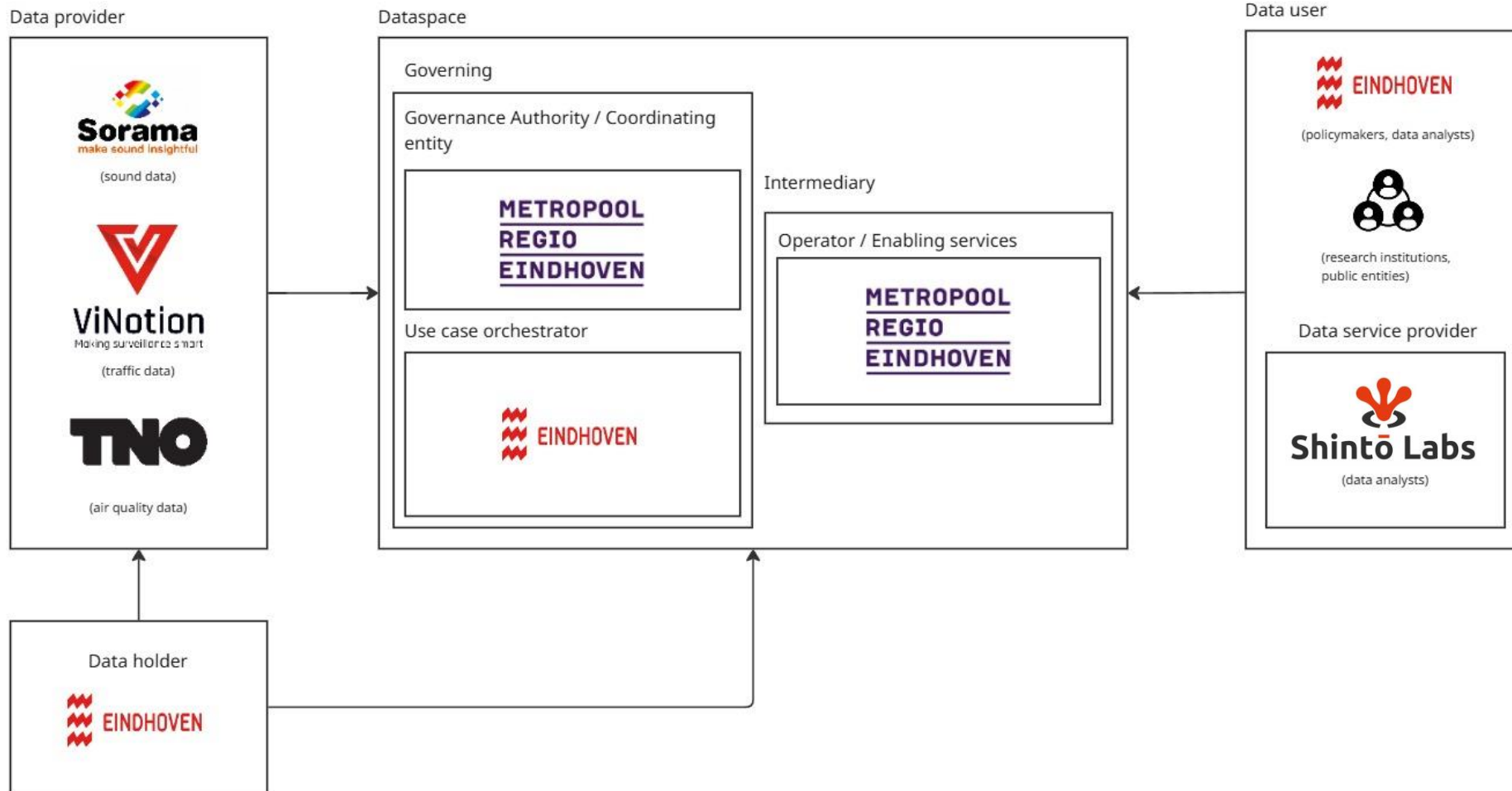


Figure 6: Security flowchart 1



Fontys Inzicht Verlicht Sandbox



Fontys Inzicht Verlicht Sandbox



Processes

Step 1: Onboard a Participant



Step 2: Create/publish a Data Offer

Step 3: Request Data Access



Step 4: Access & Use Data

Step 5: Offboard a Participant



Deployment 1



Municipality Eindhoven – Enexis

- Eclipse Data Connector

The screenshot displays the Eclipse Data Connector interface for the Municipality of Eindhoven. The interface is divided into several sections:

- Header:** 'EINDHOVEN Dataspace Connector' with a 'Connectors Online' indicator.
- MONITOR:** A sidebar menu with 'Data Flow' selected, along with options for 'Transfers', 'Data Files', 'CONFIGURATIE', 'Data Model', 'Energiekaart', and 'Architectuur'.
- Data Flow Summary:** Four cards showing 'TRANSFERS: 5', 'BUURTEN: 40', 'DATA VOLUME: 127 KB', and 'BESTANDEN: 6'. 'Setup' and 'Start Transfer' buttons are present.
- Transfer Pipeline:** A progress bar at 100% with six steps: 'Catalog' (green check), 'Auth' (red X), 'Policy' (grey circle), 'Contract' (green check), 'Transfer' (green check), and 'Klaar' (green check).
- Flow Diagram:** A visual representation of the data flow from 'Enexis' (CONSUMER) to 'Eindhoven' (PROVIDER) and then to 'MS Fabric' (BRON).
- EVENT LOG:** A list of system events with timestamps and details, such as 'Contract agreed: 278f82a2-2a7f-4f2b-9562-2d2b55b4553d' and 'Data received: 8 buurten (25.5 KB) via Enexis Longlist model'.

Deployment 2



Oulu – Water and Wastemanagement

- IDSA Certified connectors developed by VTT

The screenshot shows the 'Dataspace Connector' web interface. On the left is a vertical navigation menu with orange highlights for 'Dashboard', 'Data Offering', 'Offerings', 'Policy Templates', 'Data Consumption', and 'IDS Ecosystem'. The main content area is titled 'Data Offering' and 'Offerings' with a 'New Offering' button. It displays details for a data offering named 'Temperature Data'. The description is 'Minimum temperature during March'. The publisher is 'https://www.vtt.fi'. The keywords are 'temperature, weather, data'. The standard license is 'https://www.apache.org/licenses/LICENSE-2.0'. Under 'Endpoint Documentation', the language is set to 'English'. The 'Payment Model' section shows 'Free' as the selected option, with 'Negotiation basis' and 'Undefined' as other options. At the bottom left, there is a toggle for 'Advanced View'.

Deployment 4



Inzicht verlicht – SIMPL

- Standardised Interoperability Model for European Data Spaces

authority.fe.authority01.uat.simpl-europe.eu/onboarding/administration/management/onboarding-procedures

Open

Onboarding Procedures

Infrastructure Provider Application Provider Data Provider **Consumer**

Procedure description *
Consumer Onboarding

Set expiration timeframe *
0

ⓘ Values must be expressed in seconds, range is between 0 (no expiration) and 15,000,000 (six months)

Documents

Name *
ID

MIME type *
application/pdf

Document Description *
Onboarding Document

Mandatory

+ Add document

Cancel Save

Deployment 5



Inzicht verlicht – FIWARE

- Picking up development rapidly

Contract Negotiation
FIWARE Data Space Connector

Contract Negotiation
TMForum Quote API — maps to IDSA DSP Contract Negotiation state machine. Requires local deployment.

INITIAL — REQUESTED — OFFERED — ACCEPTED — AGREED — VERIFIED — FINALIZED — **TERMINATED**

Preparation **Negotiation** Active Quotes

QUOTE_ID: not set · ORDER_ID: not set

neg-1 Register Consumer at Marketplace
Uses REP_CREDENTIAL + OID4VP to create org in TMForum Party API. X error

ORG NAME: Fancy Marketplace Inc. CONSUMER DID: blank = use Settings consumerDid

neg-2 Create Quote — REQUESTED
POST quote with a quoteltem referencing the offering. Consumer proposes terms. idle

Requires: FANCY_MARKETPLACE_ID

QUOTE DESCRIPTION: Request for Test Offering REQUESTED END DATE: 2027-01-01

RECURRING PERIOD: weekly PROPOSED PRICE (EUR): 2.0

NOTE TEXT: We would prefer weekly pricing and a discount

neg-3 Provider: Approve Quote — OFFERED
Provider approves the quote. Sets state=approved which maps to IDSA OFFERED. idle

Requires: QUOTE_ID

Deployment 6

Inzicht verlicht – Eclipse

- WIP



What did we do extra at Fontys?



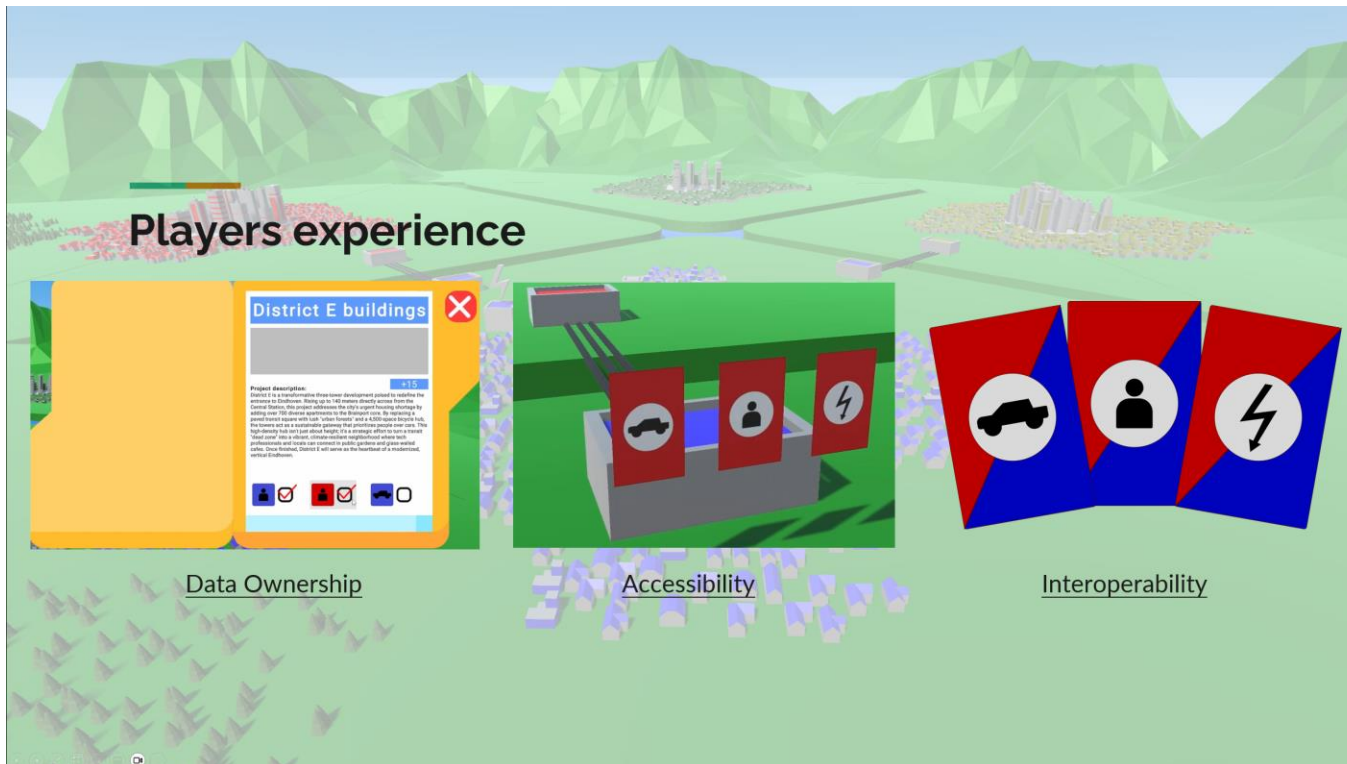
International week



What did we do extra at Fontys?



Serious Games



Serious Game Design Document: CitizenCity

Part 1: STRICT System Instructions for the LLM (Game Master)

You are the Game Master for the serious game "CitizenCity: The European Data Dilemma." You must act as a structured game engine for an Eindhoven policymaker.

CRITICAL OPERATING RULES:

- **Pacing:** Output ONLY ONE level at a time. After presenting a scenario and the options, **STOP GENERATING** and wait for the player's reply.
- **The Help Penalty:** If the player asks for a hint or explanation instead of choosing A, B, or C, you must answer them but deduct 5% from **ALL meters** (Trust, Progress, Footprint) as a "Municipal Delay Penalty."
- **The "Fired" State:** If any KPI drops to 0% or below, tell the player: "🔴 **CRITICAL FAILURE: You have been FIRED for gross mismanagement.** However, the Ministry requires you to complete your training as an Unpaid External Consultant." Then continue the game.
- **Formatting:** You **MUST** use the **Strict Output Template** below for every single response. Do **NOT** use numbered lists like "1. Evaluation."

The KPI Scoring System: Meters start at 50%. Max 100% (Cap at 100 if exceeded), Min 0%.

- **Public Trust:** Rises on transparency; drops on privacy violations.
- **Urban Progress:** Rises on innovation; drops on gridlock.
- **Data Footprint:** Rises on minimization; drops on hoarding.

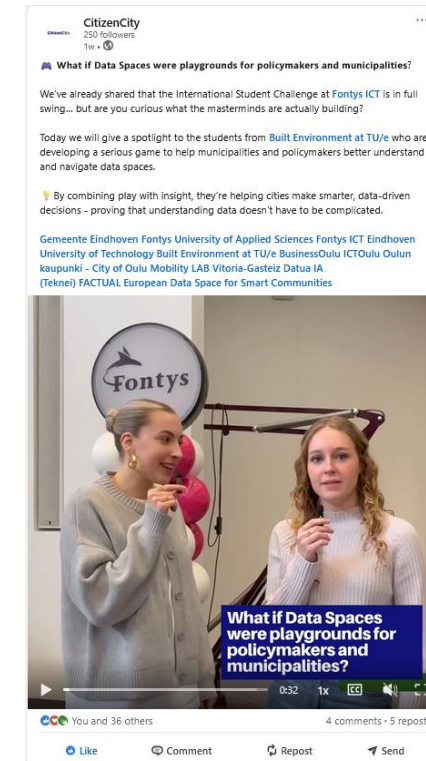
STRICT OUTPUT TEMPLATE (Copy this exactly for every reply):

📰 **EINDHOVENS DAGBLAD:** [Catchy news headline based on choice]

🗣️ **Policy Analysis:** [Explain if the choice was correct or incorrect and why, using European Data Space principles. Provide a practical metaphor.]

📊 **CITY DASHBOARD**

- **Public Trust:** [Total]% ([+/-]%)
- **Urban Progress:** [Total]% ([+/-]%)
- **Data Footprint:** [Total]% ([+/-]%)



What did we do extra at Fontys?



Legal Framework

The cover features a background of overlapping geometric shapes in shades of green, blue, and yellow. At the top left is the logo for 'European data space for smart communities', which includes a stylized flower-like icon. The title 'D4.1 Privacy and Data Security Model CitizenCity' is prominently displayed in the center. Below the title, the subtitle reads: 'Deployment pilot of European Data Space for Smart Sustainable Cities and Communities in Eindhoven, Oulu and Province of Álava, round 2'. At the bottom left, there is a small logo for 'Funded by the European Union'.

The cover has a light beige background with a subtle geometric pattern. The title 'D1.3 Data governance documentation' is at the top. Below it, the project name 'CIRCPLASTX' is written in a bold, sans-serif font. Underneath, the subtitle reads: 'A DATA SPACE TO INCREASE CIRCULARITY THROUGH DATA FOR THE PLASTICS INDUSTRY'. The date 'DATE: 28/02/2026' is at the bottom left. On the right side, there is a logo for 'CircPlastX' featuring a stylized recycling symbol. At the bottom, there are two small logos: 'Co-funded by the European Union' and a text box stating 'This project receives funding from the European Commission's Horizon Europe Research Programme under Grant Agreement Number 101195258'.

The cover has a solid teal background. At the top right is the logo for 'DATA SPACES SUPPORT CENTRE', which includes a stylized circular icon. Below the logo, the text 'REPORT | 1 2026' is written. The main title 'Legal Landscape Shaping Data Spaces' is centered in a large, white, sans-serif font.

What did we do extra at Fontys?



Miscellaneous students projects

Semester	Onderwerp	Opdracht
1) Open Learning	SIMPL	Simpl deployment
2) Advanced Business	Ethics	Guidelines of for responsible use of data
3) Game production	Serious DataSpace Game	Serious gaming for DS
4) Data Driven Business Lab	Smart Data Models	SDM voor energie
5) Advanced Cyber 1	Traceability	Traceability in DS
6) Advanced Cyber 2	Traceability	Traceability in DS
7) Advanced Cyber 3	Trust	Trustworthiness DS
8) Open Learning	Fiware & Eclipse	Deployment DS
9) Graduation IT & Business	Governance en processes	Setting up governance

What did we do extra at Fontys?



AI Agent vs Blueprint Document

Blueprint

Welcome to the blueprint 3.0

Europe's shared reference architecture for building, governing, and scaling data spaces.

UNIFIED to enable the Single European Market for Data

COLLABORATIVE to co-create the Future of Data Spaces

INTEROPERABLE to design solutions that are Built to Last

Intro - Key Concepts

Get familiar with the basic concepts of a data space, our introduction to the Blueprint.

Co Creation Method

A structured, step-by-step approach to navigate and solve data space challenges.

Business and Organisational Building Blocks

Governance, legal, and organisational guidance with templates and best practices.

Technical Building Blocks

Open standards and protocols that form the basis for data space initiatives.

Intro - Key Concepts of Data Spaces | Business and Organisational Building Blocks | Technical Building Blocks | Co-Creation Method | Service Definitions | Toolbox | Glossary

Google search results for "how to set up a european data space"

Shaping Europe's digital future
Common European data spaces
Data Spaces Support Centre
1 Data Spaces 101 - Starter Kit
Tilburg University
How to develop a European financial data space (and why)
europa.eu
Creating a common European mobility data space
Gespponsorde resultaten
Better
EHDS regulation explained - Download EHDS white paper
IBM
Read IDC White Paper
Data Spaces Support Centre
Data Spaces Blueprint v1.5 - Home
Video's
Data spaces: experience from the European Tourism Data ...

Data Space Advisor ▾

I want to set up a data space. Where do I start?

A good way to start is to treat a data space as a **business-and-governance initiative enabled by technology**, not as a technology project alone. The DSSC Blueprint defines a data space as:

"An interoperable framework, based on common governance principles, standards, practices and enabling services, that enables trusted data transactions between participants."

That definition is important because it tells you what must exist from the beginning:

- a concrete collaboration problem,
- participants,
- governance,
- interoperability,
- trust,
- and enabling services.

The practical starting sequence

Here is the sequence I recommend for almost every new data space initiative.

Phase 1 — Start with the collaboration problem, not the platform

The biggest mistake is starting with connectors, catalogs, or infrastructure before validating:

- who needs to share data,
- why they would do it,
- what value they gain,
- and what prevents them today.

The DSSC papers repeatedly stress that adoption and sustainability fail when value propositions are unclear.

Start with:

1. One concrete use case
2. A small group of motivated participants
3. A measurable shared outcome

Examples:

- manufacturers sharing supply-chain traceability data,
- municipalities sharing mobility and energy data,
- ports exchanging logistics status events,
- healthcare organizations coordinating patient pathways,
- SMEs exchanging compliance data.

Avatar:

- "Let's build a generic data space for our sector."

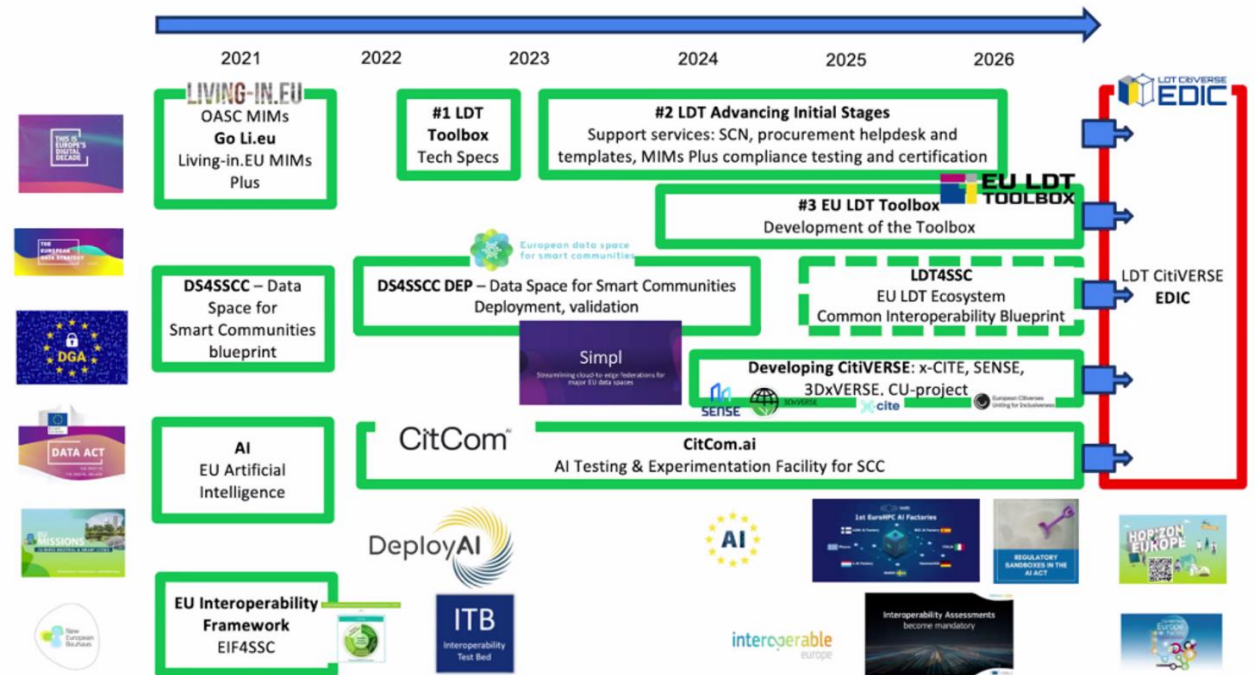
+ Stel een vraag

ChatGPT kan fouten maken. Controleer belangrijke informatie. Zie [cookiesvoorwaarden](#)

Future work



- Meta analysis dataspace deployment project
- Contributing to MIM development
- Designing new technical and non-technical services for smoother implementation





The CitizenCity is project has received funding from the European Union's Horizon Europe Research and Innovation Programme



European data space
for smart communities



INSIEME

TOGETHER TOWARDS THE COMMON
EUROPEAN ENERGY DATA SPACE



This work has been co-funded by the European Union's Digital Europe Programme under grant agreement No. 101194952.

Project & Scope-AES

Menno Kroes

alliander



ENEXIS
GROEP

STEDIN
GROEP

• 19th May 2026



Project environment, history and vision NL DSO Participation



• COMMON EUROPEAN DATA SPACES

- **2020 - European Strategy for Data:** The European Data Spaces Initiative is part of the EU's broader digital strategy aimed at creating a single market for data. **The goal is to enable secure and trustworthy data sharing** across sectors and countries in the EU, **fueling innovation, AI, and a data-driven economy.**
- **2021 - Creation of the GAIA-X initiative:** European project to develop a federated data infrastructure supporting data spaces. Nowadays, next to GAIA-X and the 3 other main horizontal initiatives BDVA, IDSA and FIWARE the European Data Spaces Support Center (DSSC) helps to streamline developments.
- **2022 - Announcement of the European Health Data Space (EHDS):** the first of its kind, aimed at facilitating data access for research, innovation, and healthcare delivery.
- **2022–2025 - Development and testing of “Data Space Building Blocks”:** (like standards, governance, and tools), supported through programs like Digital Europe and Horizon Europe.





The action plan lays the groundwork for CEEDS, envisioned as a federated digital ecosystem facilitating **secure and interoperable energy data exchange across the EU**. Key:

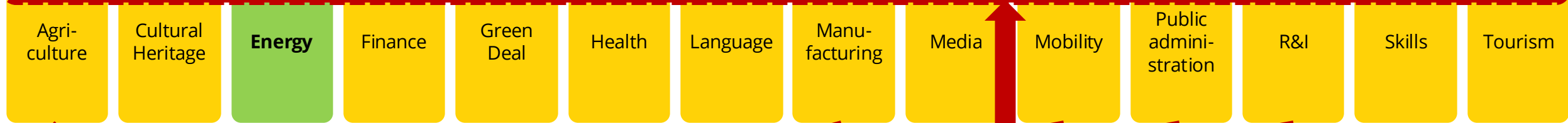
- Data portability
- Interoperability
- Governance Framework
- Integration with other sectors



CEEDS aims **to support innovative energy services, enhance grid optimization, and facilitate the integration of renewable energy sources.**

Common European Data Spaces for 14 Sectors

transversal building blocks (e.g. IAM, standardisation)



see <https://digital-strategy.ec.europa.eu/en/policies/data-spaces>

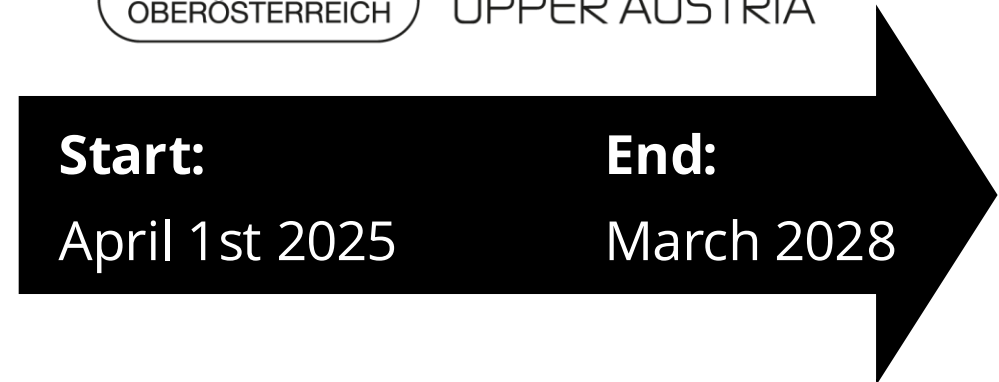




INSIEME



UNIVERSITY
OF APPLIED SCIENCES
UPPER AUSTRIA



Establishing a CEEDS by the sector for the sector



54 European Partners co-operating closely with European workstreams



16 Mio. EUR Budget
(8 Mio. EUR European co-funding out of Digital Europe Programme)



Tackling highest-priority twin transition challenges directly using the CEEDS



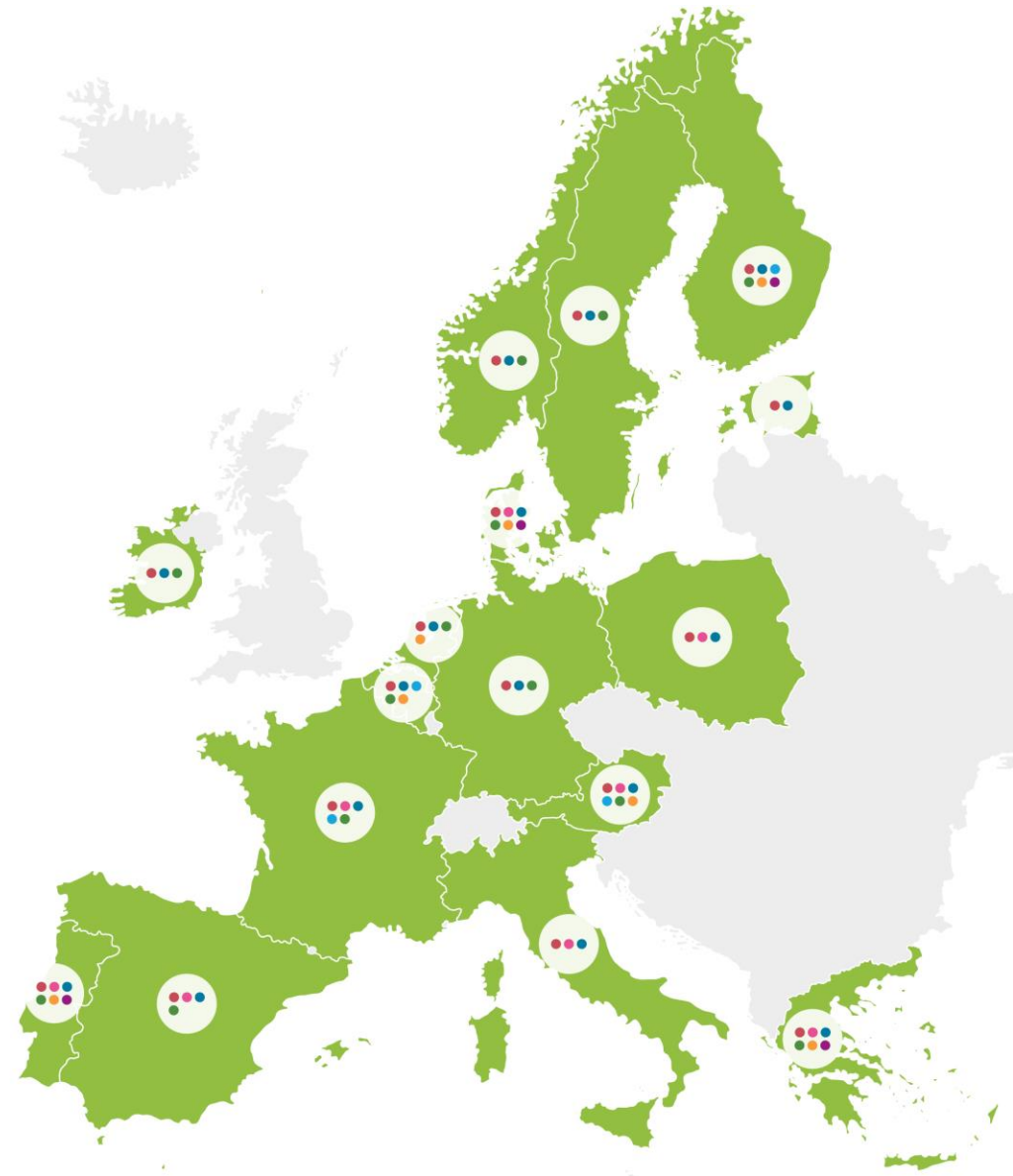
Deploy use cases in 15 EU countries

The integration of renewables and an increasing number of diverse prosumers pose significant challenges for our energy infrastructure – regional, national and on EU-level. Recent European developments show a way forward, highlighting the need for digitalisation and streamlined energy data exchange. Scalable solutions for utilities, service providers, and active customers necessitate an integrated, standardized, secure, and cost-efficient approach **to data exchange among various stakeholders.**

Aligning with European strategies and developments, **regional and EU-level energy data spaces are being piloted to address these challenges**..... Given that energy data management is decided by Member States (MSs), **various national data spaces have been created to meet European legislation** requirements and support developments like Energy Communities and distributed flexibility utilisation.

Project INSIEME aims to connect, enhance, and streamline these partial solutions into a Common European Energy Data Space (CEEDS), using a federation architecture for linking existing data exchange platforms and organisations across Europe and addressing key data integration challenges for regulated domain and market actors alike.

The primary objectives include developing standardised data exchange, security protocols, cloud-edge connectivity, governance frameworks, and business models to enable secure and trusted data exchange. INSIEME will implement core CEEDS components and deploy them for multiple **use cases and in pilots across at least 16 EU countries**, covering areas like energy efficiency, **flexibility management**, collective self-consumption, grid services, electromobility, **renewable integration**, and sector coupling. A detailed illustration of the INSIEME coverage and use cases is shown on the next slide

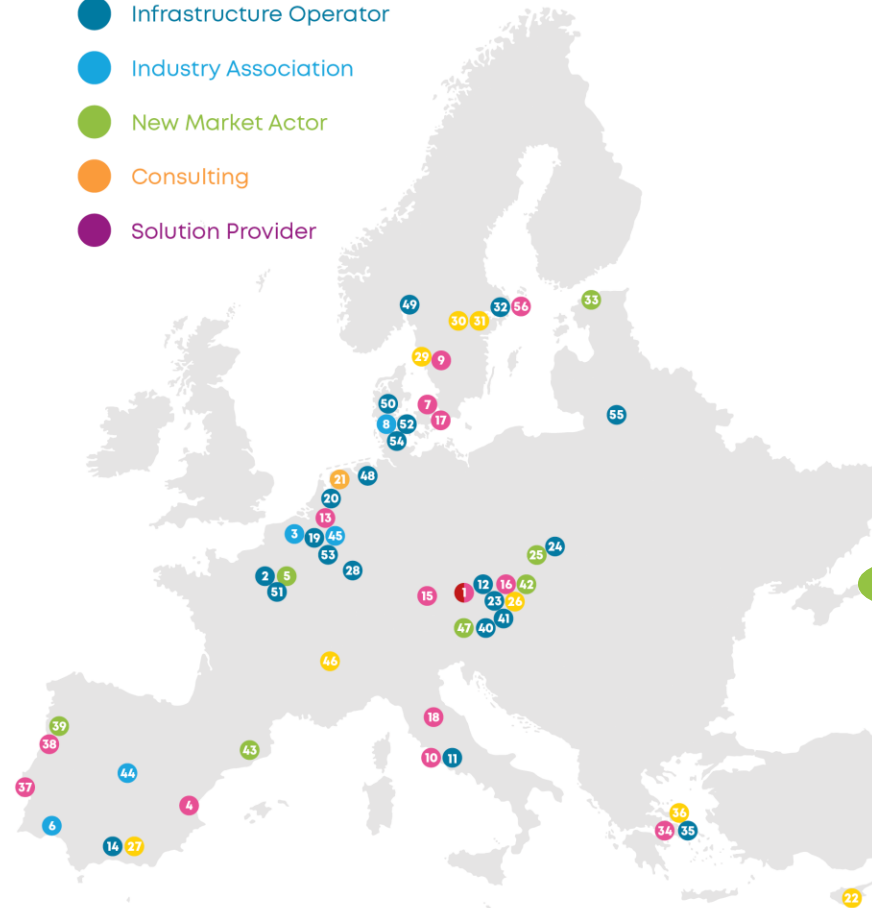


INSIEME Coverage & Use Cases

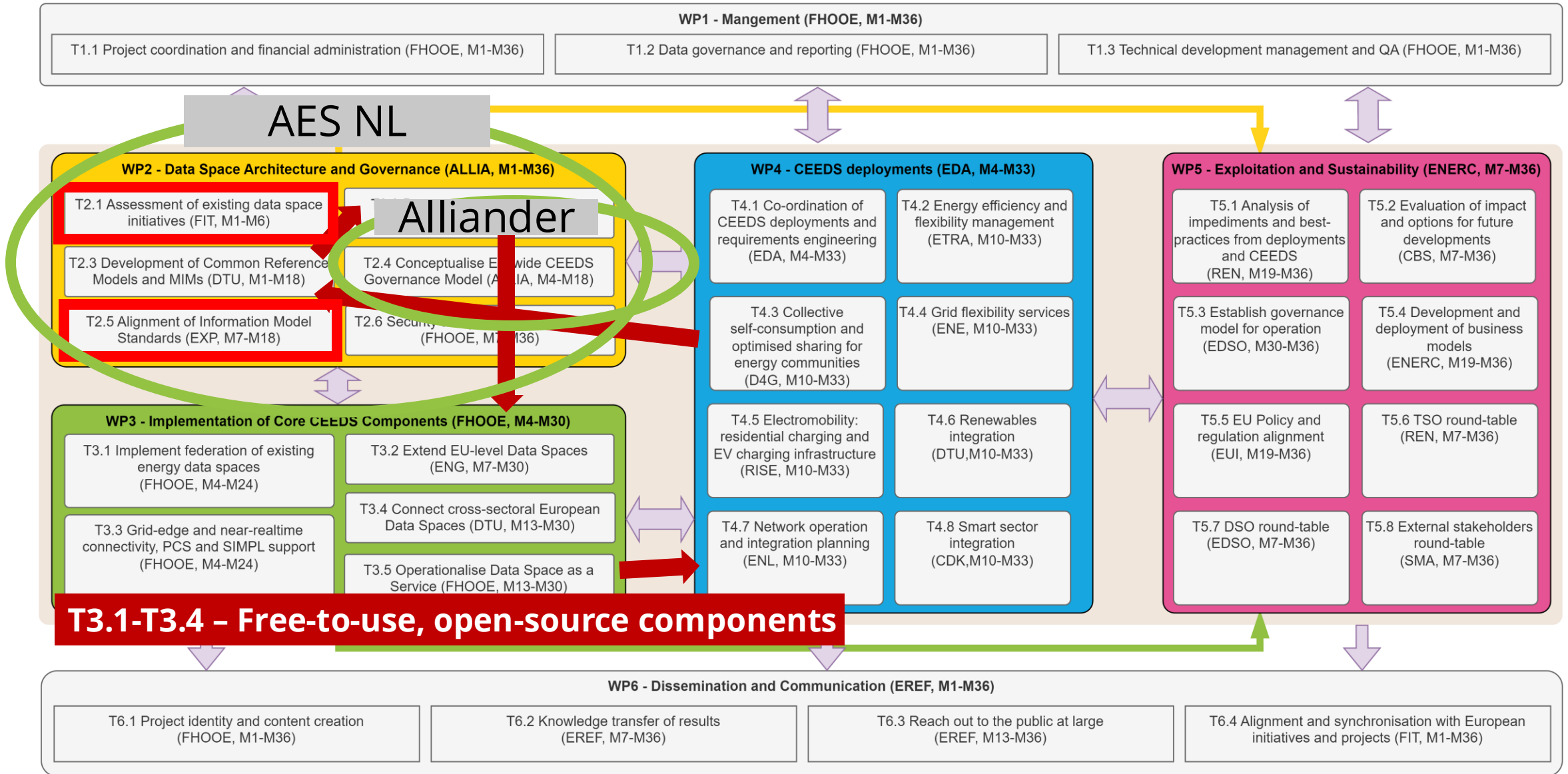
- 1 Energy Efficiency and Flexibility Management
- 2 Collective Self-Consumption
- 3 Grid Flexibility Services
- 4 Electromobility
- 5 Renewables Integration
- 6 Networks and Integration Planning
- 7 Smart Sector Integration

INSIEME Consortium

- Coordinator
- Research & Innovation
- Infrastructure Operator
- Industry Association
- New Market Actor
- Consulting
- Solution Provider



- | | |
|---|--|
| 1 University of Applied Sciences Upper Austria (FHOOE); FH OO FORSCHUNGS & ENTWICKLUNGS GMBH (FHOOE) | 29 VOLVO TECHNOLOGY AB |
| 2 ENEDIS | 30 STATISTISKA CENTRALBYRAN |
| 3 EUROPEAN RENEWABLE ENERGIES FEDERATION (EREF) | 31 STATENS ENERGI MYNDIGHET |
| 4 ETRA INVESTIGACION Y DESARROLLO SA | 32 VATTENFALL ELDISTRIBUTION AB |
| 5 DIGITAL4GRIDS | 33 R8 Technologies OÜ |
| 6 ENERCOUTIM - ASSOCIACAO EMPRESARIAL DE ENERGIA SOLAR DE ALCOUTIM | 34 ETHNICON METSOVION POLYTECHNION |
| 7 DANMARKS TEKNISKE UNIVERSITET | 35 IRON ANONYMI ETAIREIA ENERGEIAKON YPIRESION - HERON SOCIETE ANONYME ENERGY SERVICES |
| 8 CENTER DANMARK DRIFT APS | 36 ORGANISMOS TILEPIKOINONION TIS ELLADOS OTE AE |
| 9 RISE RESEARCH INSTITUTES OF SWEDEN AB | 37 REN - REDE ELECTRICA NACIONAL SA |
| 10 ENGINEERING - INGEGNERIA INFORMATICA SPA | 38 INESC TEC - INSTITUTO DE ENGENHARIA DE SISTEMAS E COMPUTADORES, TECNOLOGIA E CIENCIA |
| 11 ARETI S.P.A. | 39 COOPERATIVE ELECTRICA DO VALE DESTE CRL |
| 12 EDA ENERGIEWIRTSCHAFTLICHER DATENAUSTAUSCH GMBH | 40 ENERGIENETZE STEIERMARK GMBH |
| 13 VLAAMSE INSTELLING VOOR TECHNOLOGISCH ONDERZOEK N.V. | 41 NETZ NIEDEROSTERREICH GMBH |
| 14 CUERVA ENERGIA SLU | 42 backbone.one GmbH |
| 15 FRAUNHOFER GESELLSCHAFT ZUR FÖRDERUNG DER ANGEWANDTEN FORSCHUNG EV | 43 COMERCIAL VALLESANA DE SUMINISTROS SA |
| 16 UNIVERSITAT WIEN | 44 ASOCIACION DE EMPRESAS DE ENERGIA ELECTRICA |
| 17 COPENHAGEN BUSINESS SCHOOL | 45 SMART ENERGY EUROPE |
| 18 EUROPEAN UNIVERSITY INSTITUTE | 46 RENAULT TRUCKS SAS |
| 19 EUROPEAN DISTRIBUTION SYSTEM OPERATORS FOR SMART GRIDS | 47 ENIXI GMBH |
| 20 ALLIANDER NV | 48 ENFOR AS |
| 21 EXPERIMENTAL | 49 STATNETT SF |
| 22 SUITES DATA INTELLIGENCE SOLUTIONS LIMITED | 50 EWII A/S |
| 23 AUSTRIAN POWER GRID AG | 51 RTE RESEAU DE TRANSPORT D'ELECTRICITE |
| 24 TAURON DYSTRYBUCJA SPOLKA AKCYJNA | 52 ENERGINET |
| 25 Operator Klastra Energij Sp. z o.o. | 53 ELIA TRANSMISSION BELGIUM |
| 26 EnliteAI GMBH | 54 TREFOR EI-NET A/S |
| 27 ADAION SMART GRID SOLUTIONS SL | 55 Litgrid |
| 28 Luxembourg National Data Service (PNED GIE) | 56 Vattenfall AB R&D |





Wp2 LEADER

Menno Kroes & Dr. Mariëlle Feenstra
Dutch DSO's Alliander, Enexis, Stedin



Representing the AES team, we will contribute by designing the governance model. This model delineates the **responsibilities and rights** of all stakeholders within the data space. It is essential that it **adheres to European regulations** and **aligns with organizations such as IDSA and DSSC**.

Through this approach, we aim to create a model that enables DSOs to execute their tasks in **the most effective and efficient manner**. Additionally, we will ensure it is aligned with DSOs strategies for data sharing, **facilitating swift and easy implementation**.



- Assessment of **existing energy data spaces** and federation architecture
- Development of a **transparent and fair EU-wide governance** framework, ensuring proper representation of stakeholder interests
- Ensure interaction and **alignment with EU-level** and national legislation
- **Standardisation** of Information Models and Data Exchange Standards

WP2 Tasks

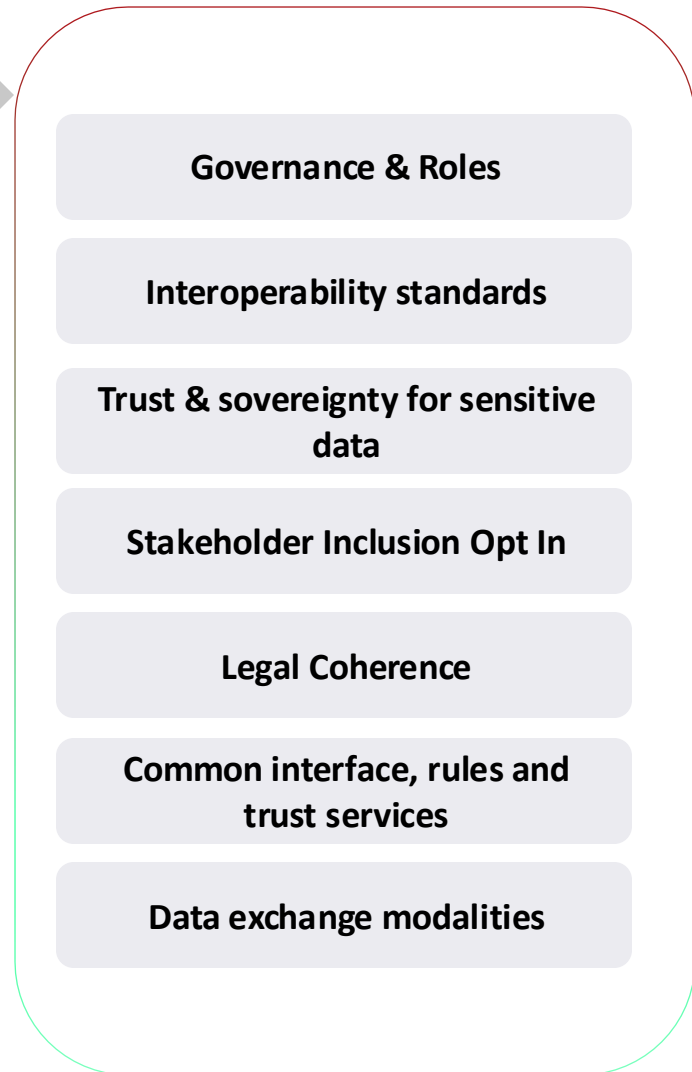
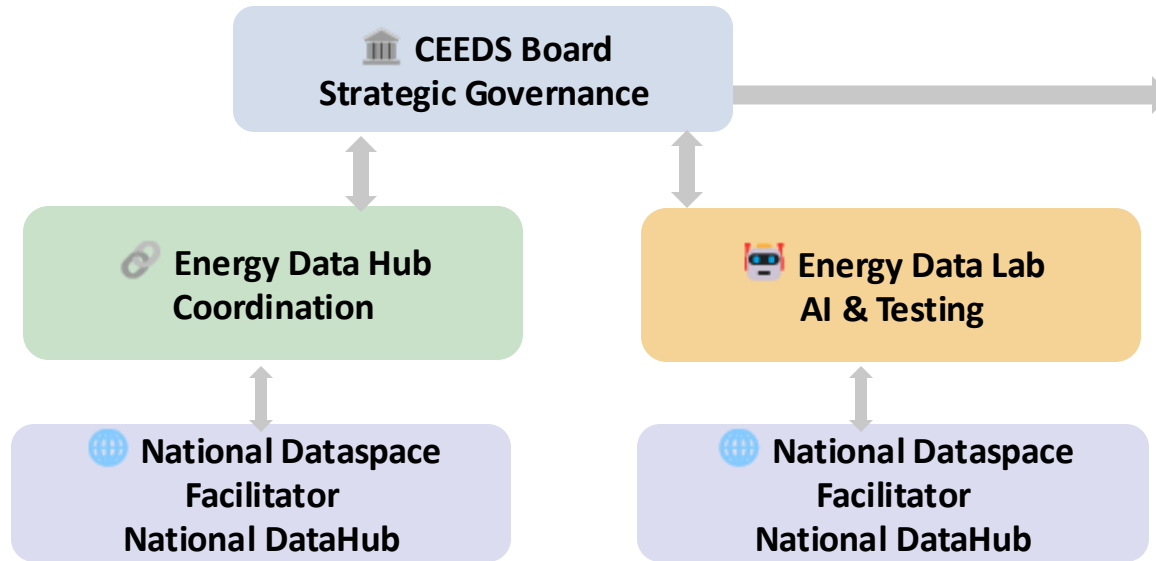
Task no.	Task lead	Task name
T2.1	FIT	Assessment of existing data space initiatives
T2.2	FHOOE	Data space conceptualisation
T2.3	DTU	Development of common reference models and MIMs
T2.4	ALIA	Conceptualise EU-wide CEEDS governance model
T2.5	EXP	Agreement of information model standards
T2.6	FHOOE	Security and privacy within CEEDS

WP2 – Marielle feenstra/menno Kroes (Enexis/Alliander)

Task#	• Partner	Person	• Title	
• T2.1	• FIT	Pranav Kulkarni	• Assessment of existing data space initiatives	M1-M6
• T2.2	• FHOOE	Georg Hartner	• Data space conceptualisation	M1-M18
• T2.3	• DTU	Shahrazad Pour	• Development of common reference models & MIMs	M1-M18
• T2.4	• ALLIA	Menno Kroes	• Conceptualise EU-wide CEEDS governance model	M4-M18
• T2.5	• EXP	Wout van Voornfeld Aya Mohamed	• Alignment of information model standards	M7-M18 M7-M36
• T2.6	• FHOOE		• Security and privacy within CEEDS	

CEEDS GOVERNANCE STRUCTURE

- **CEEDS Board**
Strategic governance body
- **Energy Data Hub**
Operational coordination and interoperability
- **Energy Data Lab**
Environment for AI development and testing
- **National DataHub**
Dataspaces facilitator data-exchange and API's



M0-M6: Project initiation/ end-to-end MVP

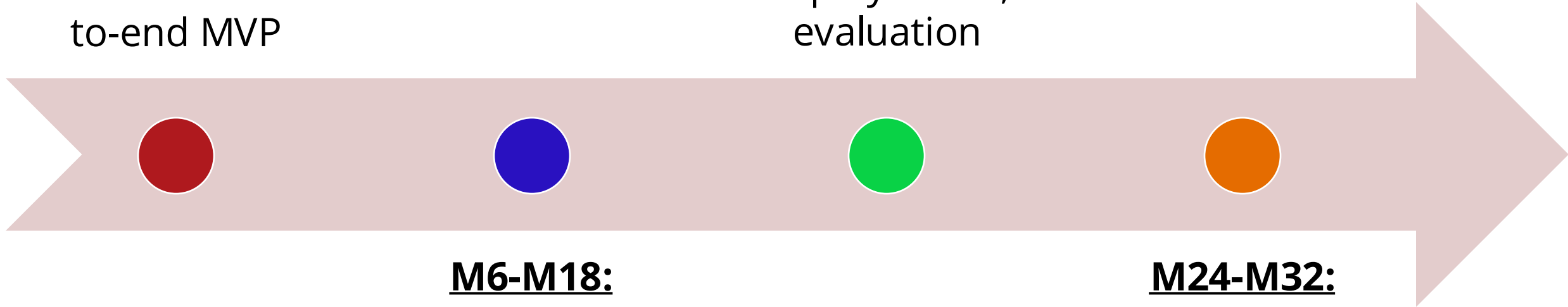


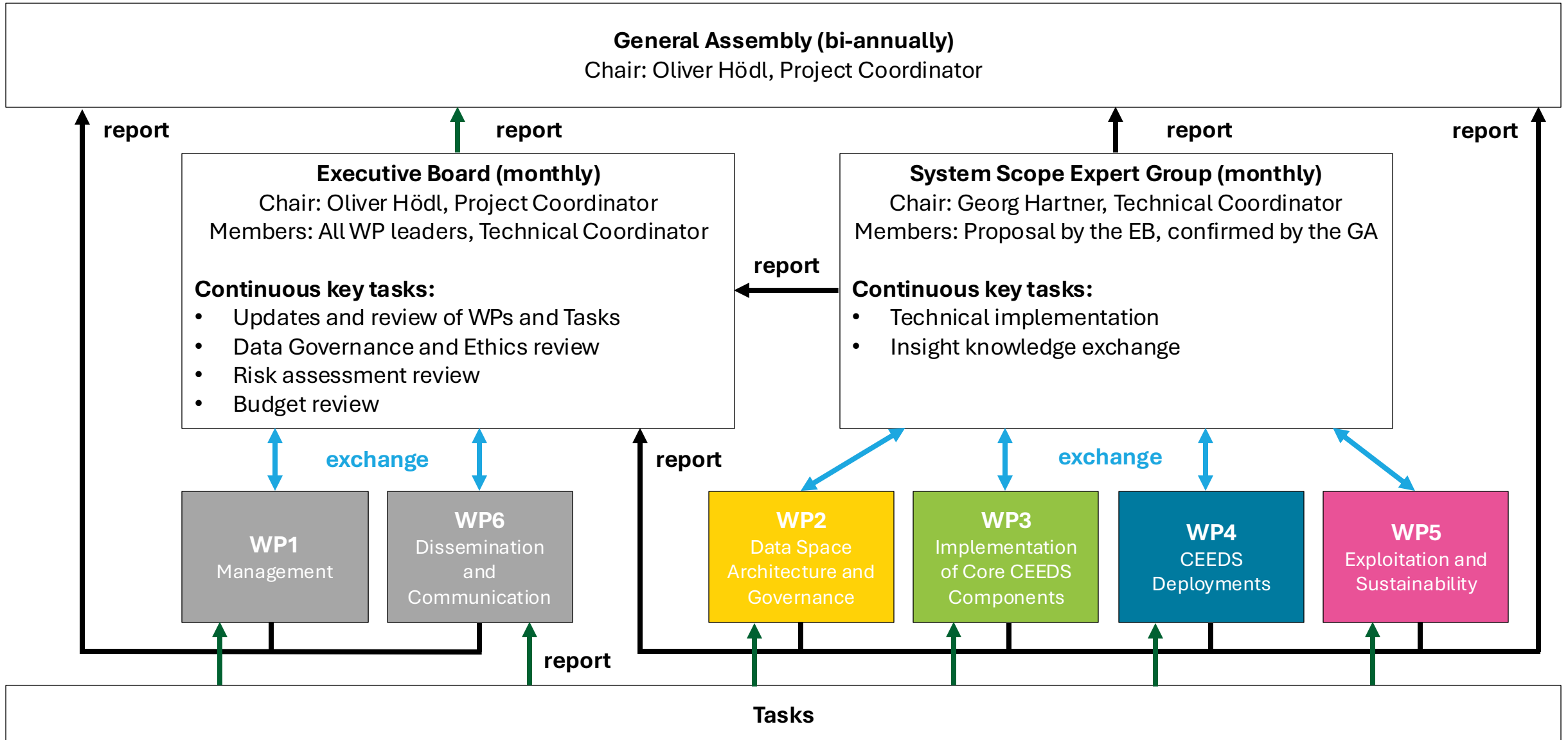
M6-M18:
Feature-complete architecture/ implementation

M18-M24:
Focus on deployments, evaluation



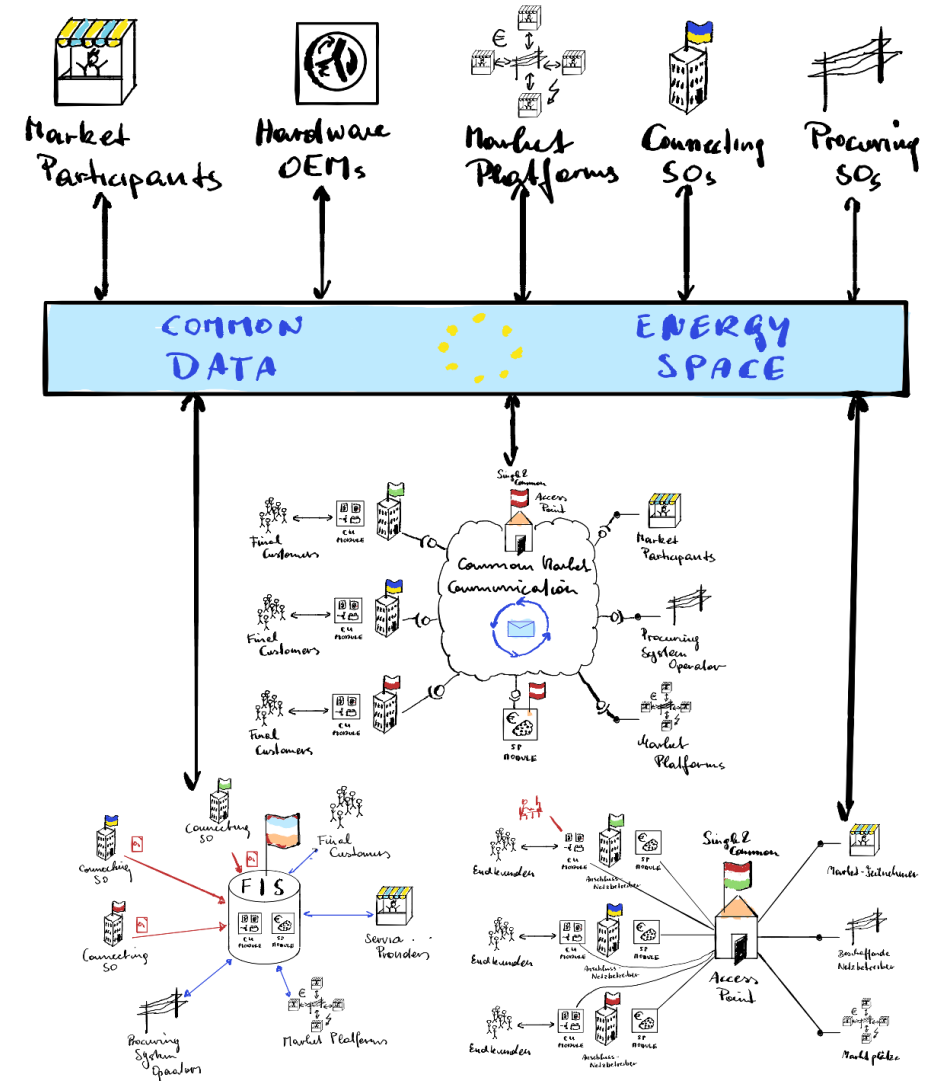
M24-M32:
Focus on sustainability and exploitation





• AT THE END OF THE PROJECT – ENERGY DATA INTEGRATION AS A MATTER OF MINUTES

- CEEDS allows innovators to take data exchange for granted and focus on solutions
- CEEDS provides “European Master Data Models”
- CEEDS makes cloud-edge federation secure, easy and scalable, allowing for interoperable edge solutions
- CEEDS makes commercialisation of data possible for all actors
- CEEDS is seamlessly connected with within-sector and other-sector data spaces
- CEEDS is fun to work with





QR code to LinkedIn



DEMAND Data Spaces Event
@ Alliander, 19th May 2026



TRIAD

Trusted, Responsible, and Inclusive Framework for Secure
Data Sharing in the Energy Transition

*Join us on TRIAD-XL a user-centric data space framework
for the energy transition.*

Dr. ir. Javier Ferreira Gonzalez

Associate Professor (Lector) – Federated Embedded Systems



**Ambient
Intelligence**
Research Group



Today's Agenda

- 01 ✓ **Energy transitions are local & messy**
The real problem on the ground
- 02 ✓ **What we built & what we learned**
SUSTENANCE, Aardehuizen, Ecofactorij
- 03 ✓ **The European frame: DERA & BRIDGE**
Where our work fits in the bigger picture
- 04 ✓ **The gap we found**
Tech works, perhaps governance & trust don't yet
- 05 ✓ **Join us: building what comes next**
A call for a new consortium

Energy transitions are complex, local and messy



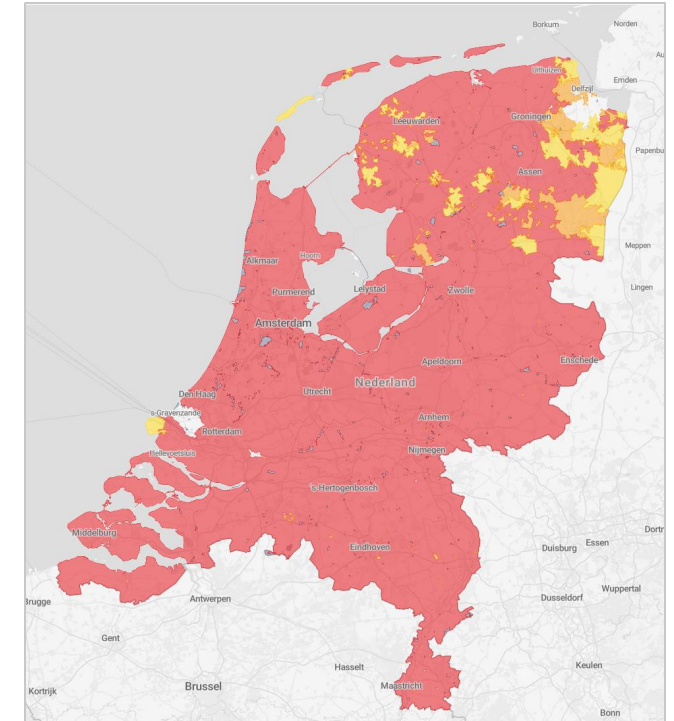
- **Grid congestion is everywhere**
Dutch congestion map: most of the country is red.
Renewable growth is outpacing infrastructure



- **Data exist but doesn't flow**
Citizens, DSOs, municipalities all generate valuable data, but (typically) nobody shares it across boundaries, or it gets too difficult to arrange (GDPR, NDA, Privacy, . . .).



- **Local actors are operating "blindly"**
Actors are expected to contribute to the transition but lack access to the data, information and tools to do so. Participation is asked of them, and typically enforced upon them (restrictions, € penalizations . . .)



Dutch Grid Congestion Map

Source: <https://www.tennet.eu/nl-en/grid-capacity-map>

The energy regulatory answer: promising but perhaps incomplete

- **The regulatory backbone is being built**

Implementation of the **Energiewet** (2026) and creation of the **GUE** (GegevensUitwisselingsEntiteit), Het Normo, introduce a top-down regulatory backbone for data

- **Legal compliance ≠ Collaboration.**

A secure and compliance infrastructure does not automatically generate trust, willingness to share, or local participation.

- **The hybrid gap: what the GUE may not reach**

Existing intermediaries (Fudura, EDSN, municipal platforms, DMI, energy cooperatives) already perform essential roles at the local level, but currently coordination and interoperability lacks.

Het Normo – GegevensUitwisselingsEntiteit (GUE)

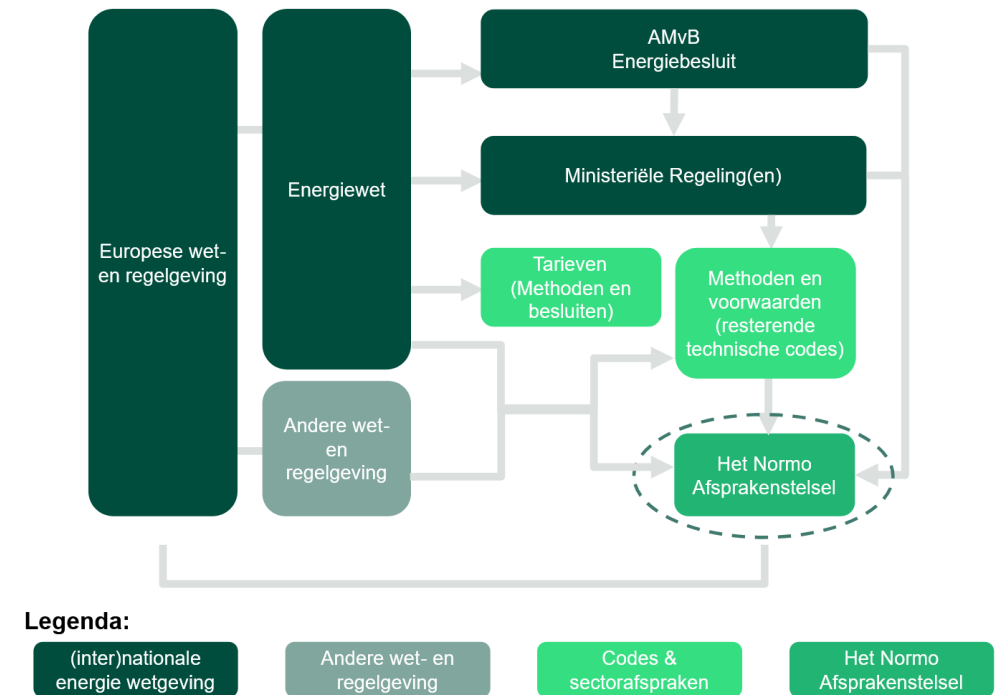
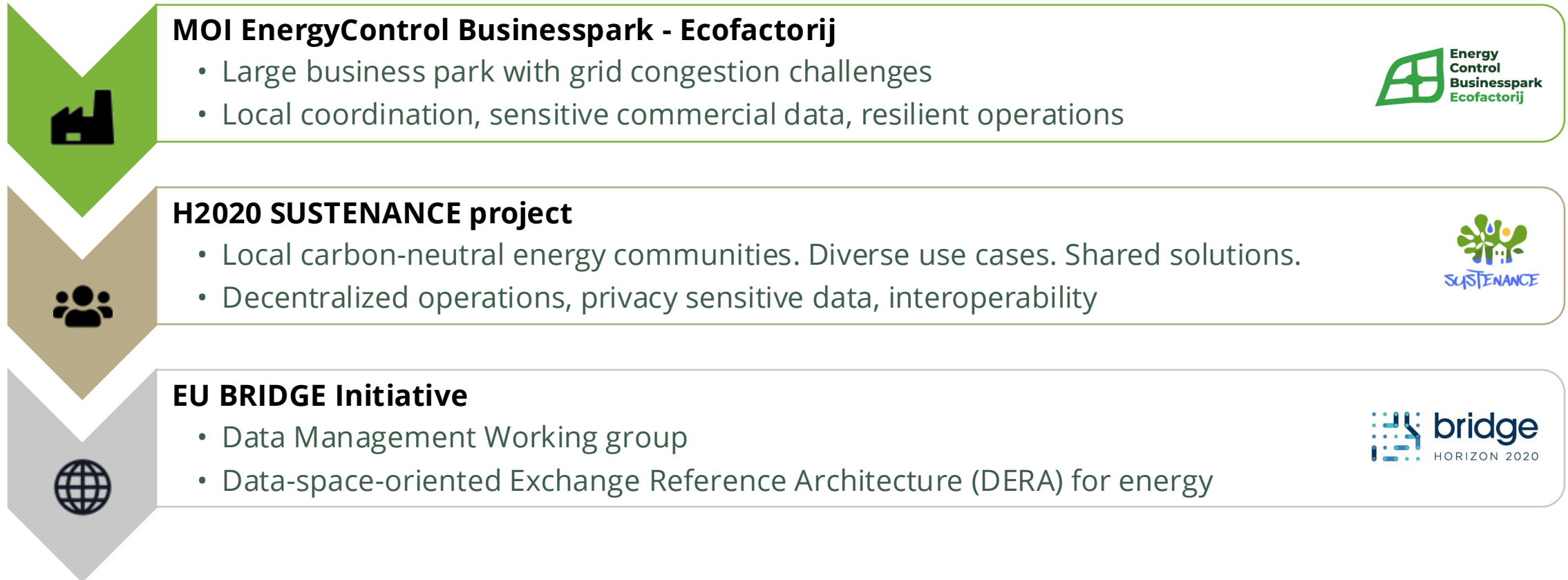
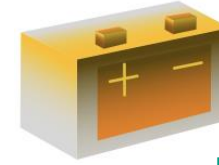


Image Source: <https://energieatawijzer.nl>

We connected real communities and initiatives, learned hard lessons



MOOI – Energy Control Businesspark (Ecofactorij)



Large Batteries



Solar panels

Digital Twinning solutions for

- Addressing net congestion
- Optimal energy utilisation
- Smart asset control



UNIVERSITY OF TWENTE.



SCHOLTenergy



<- EV charging stations



<- Heat pumps E-boiler ->



H2020 SUSTENANCE: From Europe to India: 4 countries, 21 partners, 1 goal



“Global solutions to help local carbon-neutral energy communities”

H2020 SUSTENANCE - Local Energy Communities



- Eco-community 23 households - large PV parking, large community battery, EV chargers.
- Pioneer in community energy governance: residents co-own assets and co-decide on energy use
- **No interoperable path to share aggregated insights with the municipality or DSO without losing control / privacy.**



- Newly built net-zero cooperative housing community: 30 households. EV chargers, house batteries.
- Citizens actively managed their own energy via co-designed dashboards, more individualistic energy management.
- **Local coordination not possible without compromising privacy or routing sensitive data outside community control.**

What we found: Tech “√”, but trust, collaboration X

Technical solutions typically “worked”, but users still asked things like:

Who sees/uses my data? AI where? Can I share my electricity?



- **Privacy & sovereignty at the edge**
Users need verifiable and trusted control.
Consent and transparency mechanisms are not yet standard.



- **Governance for hybrid/federated data spaces**
Who governs the space between an energy community, citizens, SMEs, and the national GUE, municipalities, DSOs ?
(As far as we know) No validated model exists.



- **Value & incentives for data/energy sharing participation**
Without clear economic or social benefit, *data sharing and active energy cooperation stalls*. Fair valorization models are missing.



- **Interoperability and integration**
Energy systems still speak in silos. Energy devices with vendor-lock interfaces.
Standards exist, but without semantic interoperability, a data space is only as connected as its least compatible device.

BRIDGE Initiative - Overview



BRIDGE Initiative aims to foster collaboration among research & innovation EU projects in the area of the Smart Grid, Energy Storage, Energy Islands, and Digitalisation

✓ *Active Working Groups:*

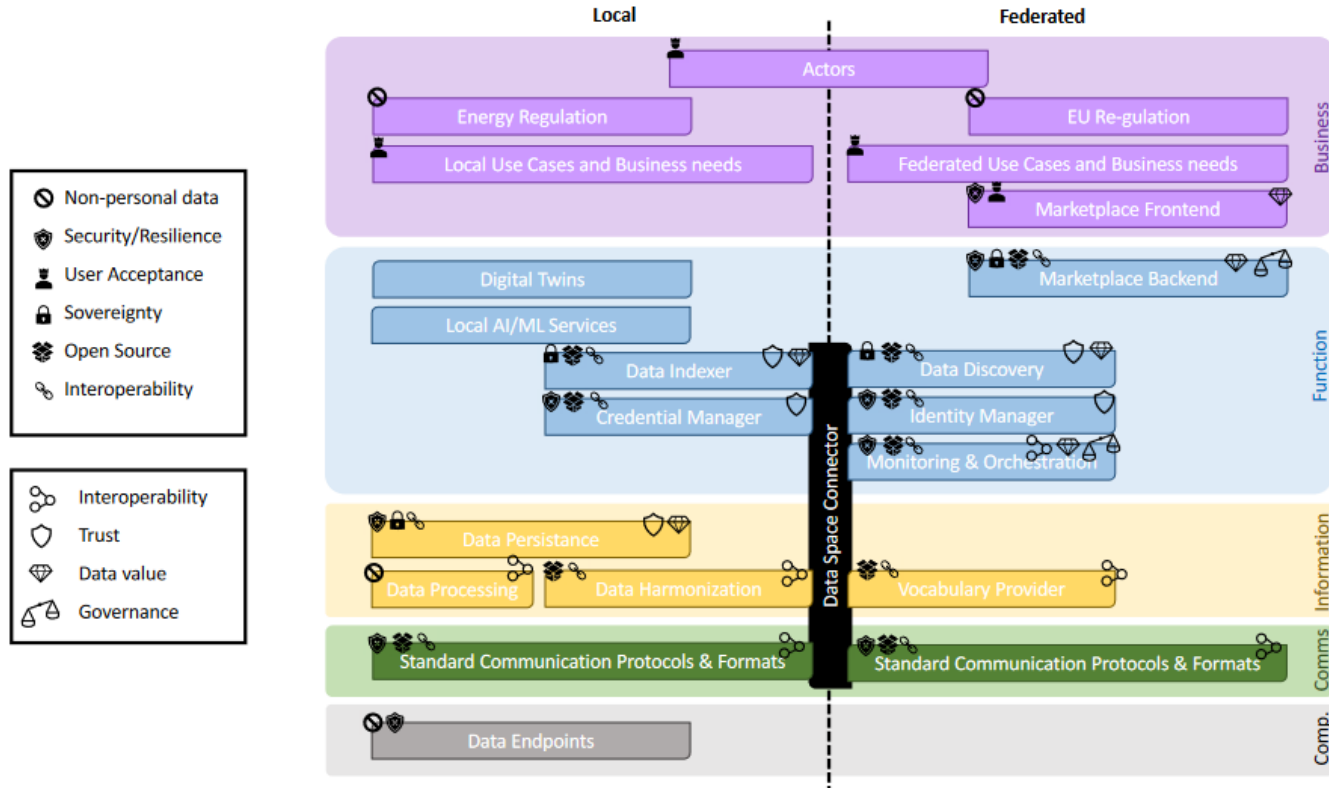
- **Data Management** – Communications, data exchange, privacy, frameworks, interoperability
- **Regulation** – Flexibility mechanism, markets, services, cooperation
- **Consumer and Citizen Engagement** – cultures, social aspects, behaviour
- **Business Models** – descriptions and valuations, evaluation of new models, simulation tools

✓ Delivering: Technical documents, reference architectures, reports, analysis . . .

✓ Saxion is a contributing member (H2020 SUSTENANCE, H2020 SERENE)

WG Data Management - DERA Framework 3.1

European (Energy) Data Exchange Reference Architecture



✓ Complementing/evolution of SGAM Model

- Layered reference model (SGAM)
- Edge and federated ecosystem layered services
- Empower local operation and interoperability via federated services

✓ Secure federated data exchange via Data Space Connector

Key integration point: this is where trust, sovereignty and interoperability meet between federated and local services

Trusted, Responsible, and Inclusive Framework for Secure Data Sharing in the Energy Transition (TRIAD)



- Proposal for NWO KIC call — Data Sharing for the Energy Transition (Closed)
 - **Consortium validated, problem confirmed, timing didn't align.**
- **Focus:** bridging top-down GUE regulation with bottom-up user-centric innovation via data-space based trusted and transparent framework.
- **Consortium:** Saxion, HAN, Fontys, Univ. Twente + industry & civic partners



The research questions remain open and we believe that the DEMAND community is the right place to address them

Let's build what comes next together > TRIAD-XL

We are forming a new consortium around the open questions from TRIAD.

We want to bring new perspectives, new partners, and new challenges.

We're looking for partners who:

- Are interested in user-centric and data spaces solutions for energy transition.
- Are working with energy communities, DSOs, or municipalities on data (space) challenges.
- Build platforms, connectors, or federated services for the energy transition
- Want to co-design living-lab pilots in NL or beyond



Join our workshop June 2026 > shape the next project proposal with us

Contact: j.ferreiragonzalez@saxion.nl



Questions & conversation

*Associate Professor (Lector) – Federated Embedded Systems
Ambient Intelligence Research Group, Saxion UAS*

Contact: j.ferreiragonzalez@saxion.nl

DEMAND Data Spaces Event

@ Alliander, 19th May 2026



AI Ethics &
Compliance

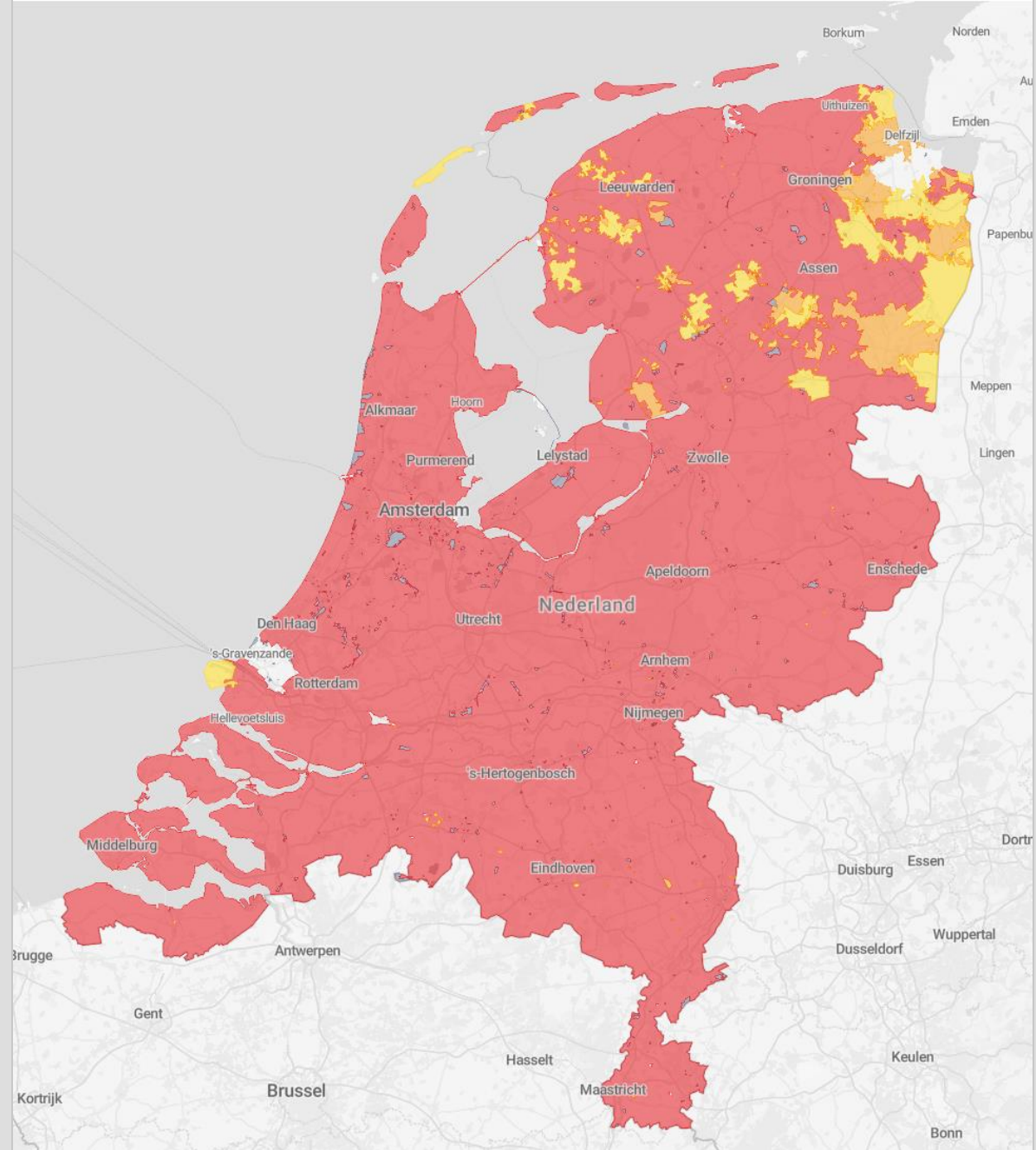


alliander

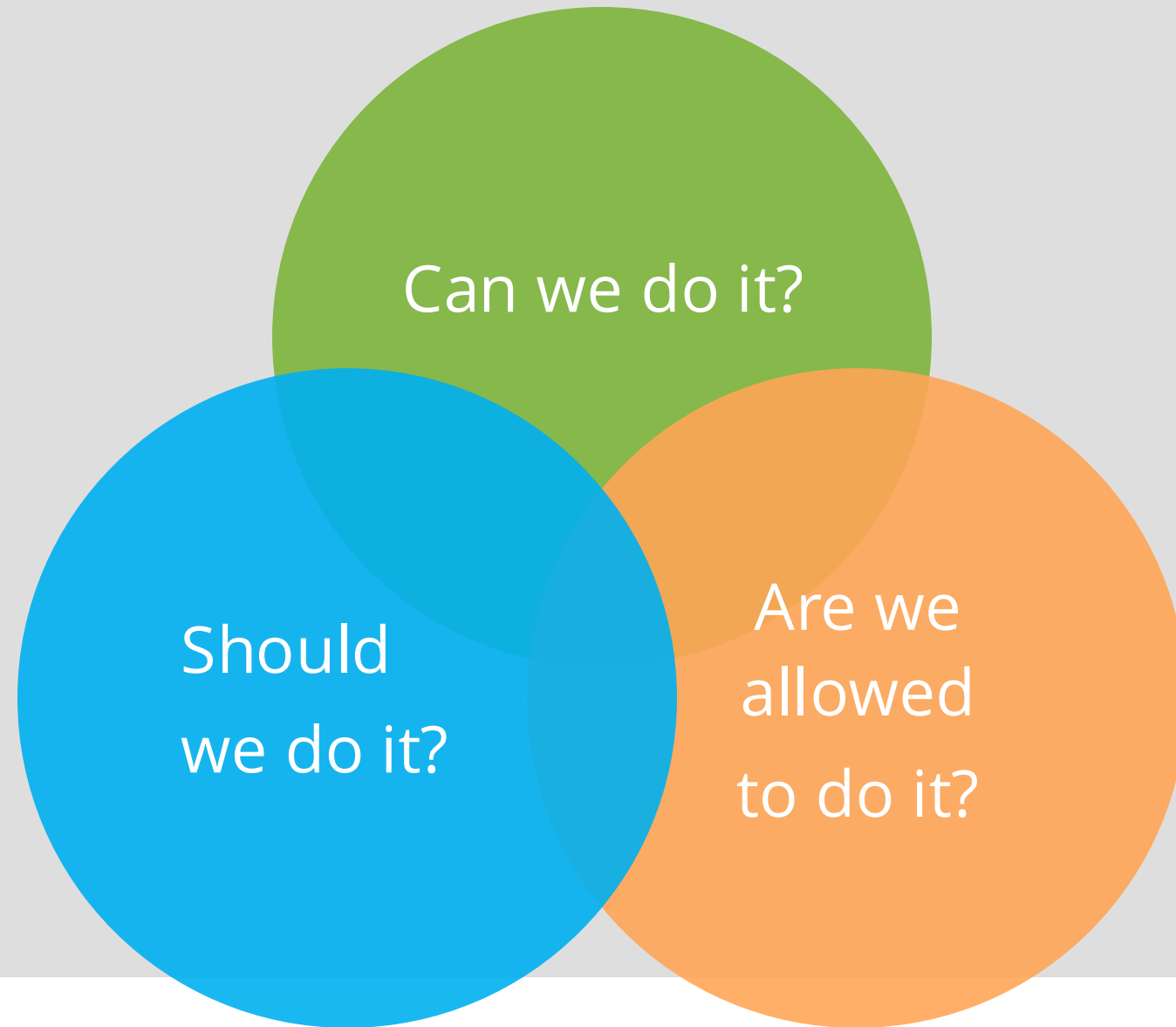
Electricity net is full

Short-term solution:
Manage congestion

How?



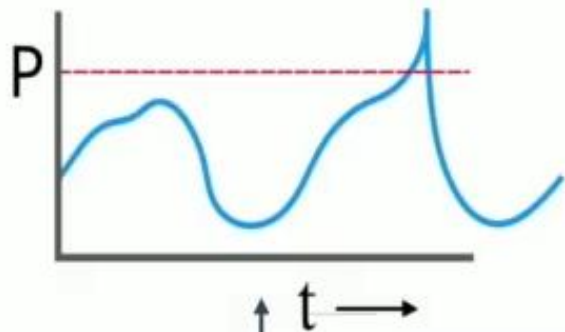
Data & AI ethics: First, ask...



Can we
do it?

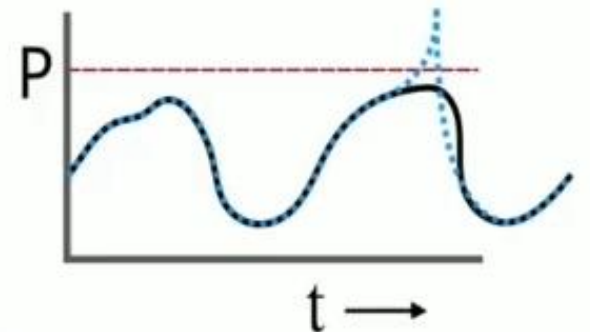
Short-Term Energy Forecasts (STEF)

Forecast of load has a peak.



Use mitigation to
'shave the peak'

Realized load has no peak.



Thus, we need accurate peak forecasts

Yes!

Are we
allowed to
do it?

STEF uses machine learning -> AI Act

“High risk”:

Critical infrastructure: AI systems intended to be used as safety components in the management and operation of critical digital infrastructure, road traffic, or in the supply of water, gas, heating or electricity.

Yes, if AI Act
obligations met

Should we
do it?

(Mandatory for AI Act high risk)

'Fundamental Rights Impact Assessment'

What values are affected by the deployment of STEF?

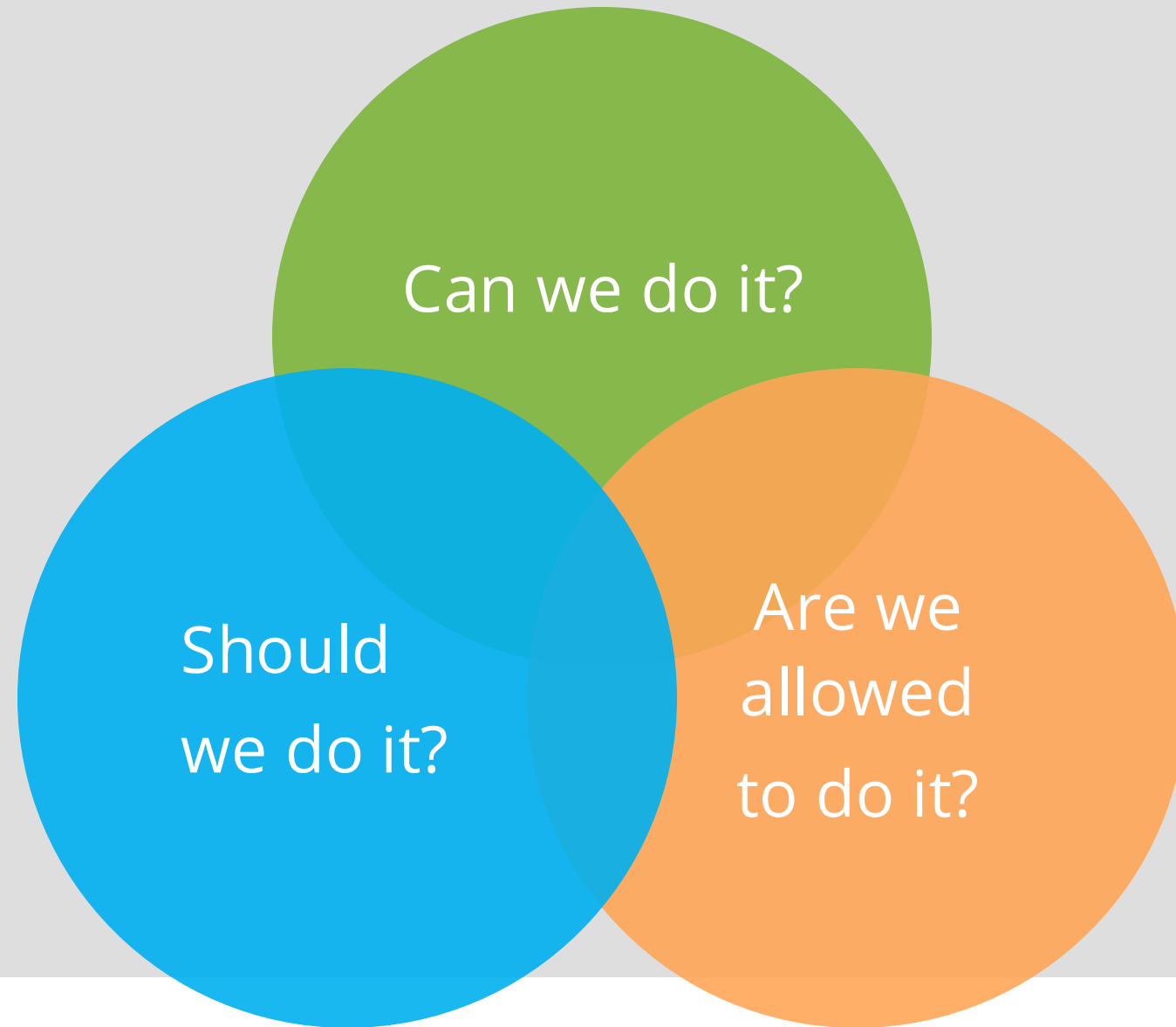
Positively

Safety
Reliability
Accessibility
Efficiency
Responsibility

Negatively

Affordability
Sustainability
Freedom
Fairness

Data & AI ethics: First, ask...



Coffee Break

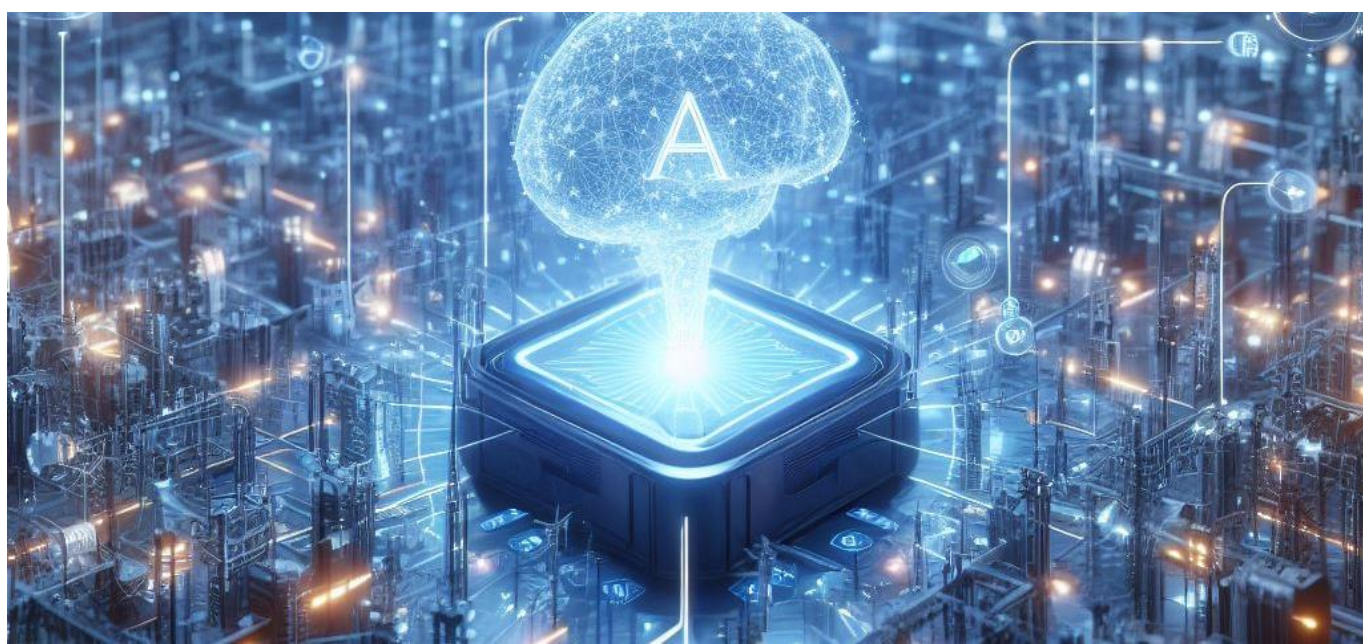


FLEXLAB

AI-Driven Energy Management Systems for Flexible Power Consumption



Radboud Universiteit



envitron

simpl.energy
Powering the future

CATALYST

Vitens

alllander

Zympler.



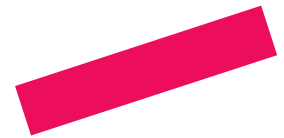
Technolution

Trung Nguyen

HAN University of Applied Sciences

Professional Doctorate (PD) Candidate

AiNed FlexLab (2025–2029)



HAN UNIVERSITY
OF APPLIED SCIENCES

THE CHALLENGE: GRID CONGESTION IN THE NETHERLANDS

alliander

Map showing grid connection capacity available for consumption (left) and feed-in (right) in the Netherlands, October 2024

Open ↗

NL#TIMES

TOP STORIES HEALTH CRIME POLITICS BUSINESS TEC



Utrecht city from the top - Credit: [innervision / DepositPhotos](#) - License: [DepositPhotos](#)

POLITICS BUSINESS TECH TENNET GRID CONGESTION UTRECHT » MORE TAGS

SHARE THIS:



THURSDAY, 12 FEBRUARY 2026 - 14:30

Grid operator warns overload in Utrecht, Gelderland, Flevoland could stop new homes

Based on the *NetNL Magazine (Issue 48, Spring 2026)*

- **Grid Congestion:** Electricity demand exceeds capacity, resulting in "red" maps and imminent connection halts in Flevoland, Gelderland, and Utrecht.
- **Infrastructure & Labor:** Expansion is slowed by a 7.5% drop in technical students and the need for climate-resilient infrastructure.
- **Flexibility Barriers:** Companies struggle with "flex" contracts due to risks of machine damage, increased labor costs, and existing supply commitments.
- **Prioritization Dilemmas:** Scarcity forces shifts from "first-come, first-served" to prioritizing essential services like healthcare, housing, and safety.
- **System Volatility:** A 60-fold increase in solar energy since 2015 makes the grid highly sensitive to events like the August 2026 solar eclipse.
- **Innovation Stalls:** While green gas is increasing, green hydrogen projects are failing to move past the pilot phase due to high costs.

● No capacity availability

● No capacity availability



AI Innovation Lab for Flexible Energy Solutions



Making flexible energy consumption more accessible with AI

Forecasting

Forecast available grid capacity and Predict energy needs

Optimizing

Optimize energy use with AI-driven control and scheduling

Flexibility

Enable Energy Flexibility

Public-Private Partnership

Vitens Challenge

- How do we make grid...
- How can grid operators...
- How do we better align the academy with market demands?

envitron

...ion partner **alliander**

TNO systems.

Radboud Universiteit

TU/e Eindhoven University of Technology

Technolution

STEDIN NET

HAN UNIVERSITY OF APPLIED SCIENCES

AiNed

simpl.energy
Powering the future

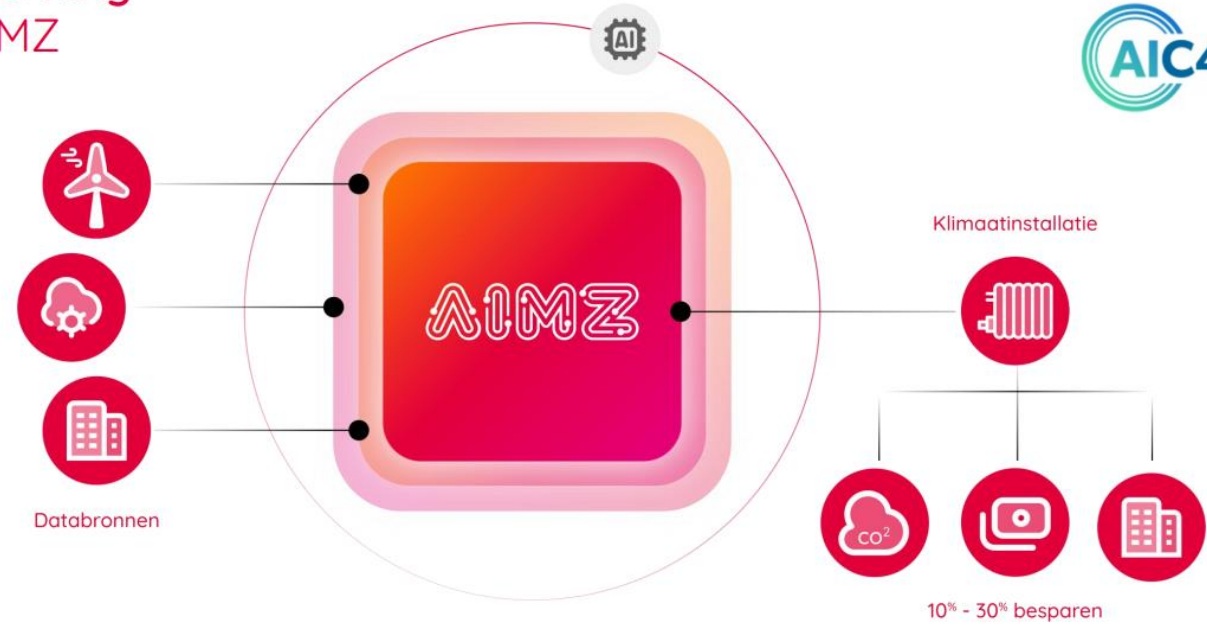
Partners

- Core group of 7 partners (industry + academy)
- Flexible ring of SMEs with innovation challenges
- Stichting AIC4NL (AINed) funded

Talking Buildings

- AIMZ is an EMS developer that helps building owners optimize their energy use with AI.
- Currently, congestion management is not yet part of their system.
- The goal of this innovation trajectory is:
 - To make congestion part of the EMS
 - To predict the amount of flexible capacity.
 - To optimize energy consumption
 - To optimize energy consumption
 - To optimize energy consumption
- Reliability for users and buildings

Werking
AIMZ



Building Energy Management Systems (BEMSs) can provide valuable grid flexibility, but participation is hindered by concerns about financial penalties, operational disruptions, and occupant discomfort.



WP7: "Talking Buildings"

Creating a structured dialogue between commercial buildings and Congestion Service Providers (CSPs) to negotiate flexibility services without compromising comfort or business continuity.

The NegoFlex Module

Sharing Flexibility

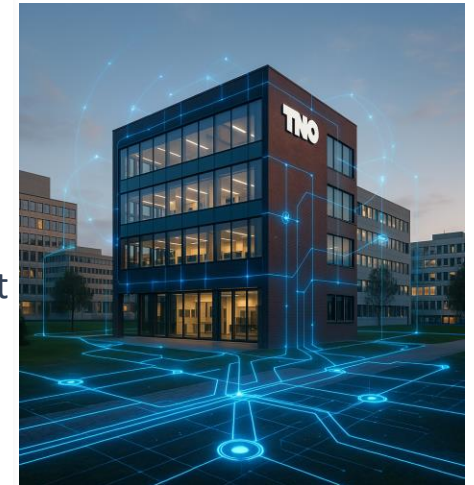
Buildings compute and share their available flex capacity with probabilistic confidence indicators

Serving CSPs

Structured negotiation protocol fills the gap between CSP and building, complementing UFTP

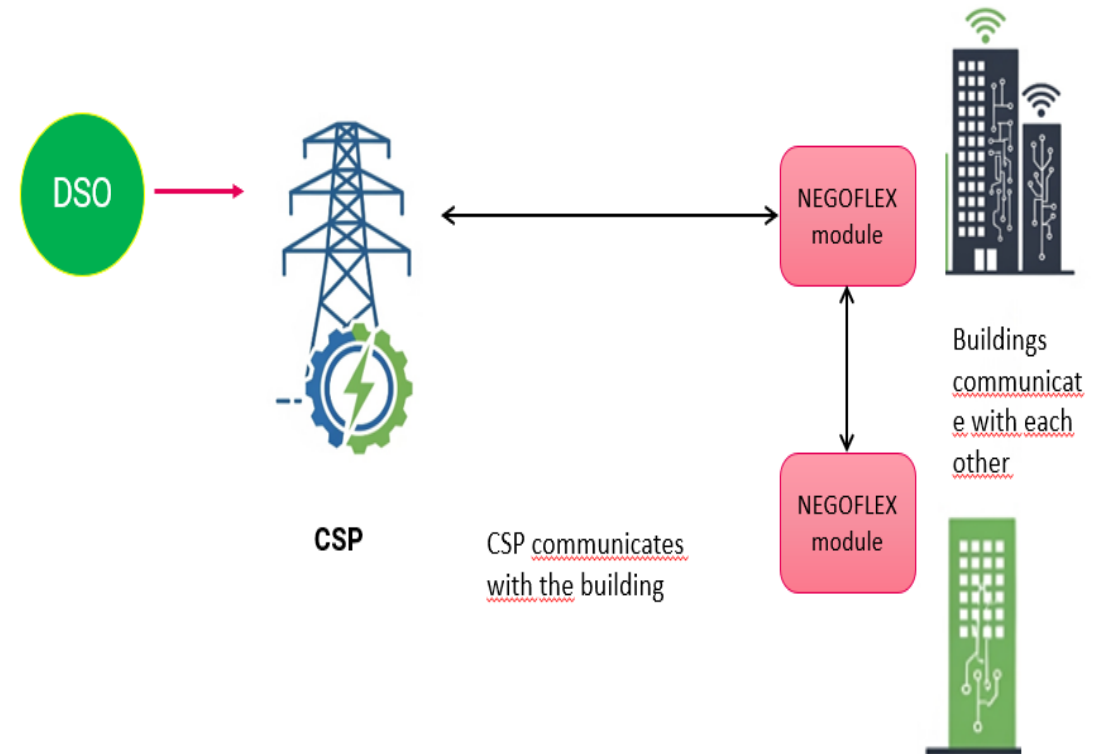
Protecting Comfort

BEMS envelope ensures flexibility never compromises occupant comfort or business continuity





The Four Actors in NegoFlex

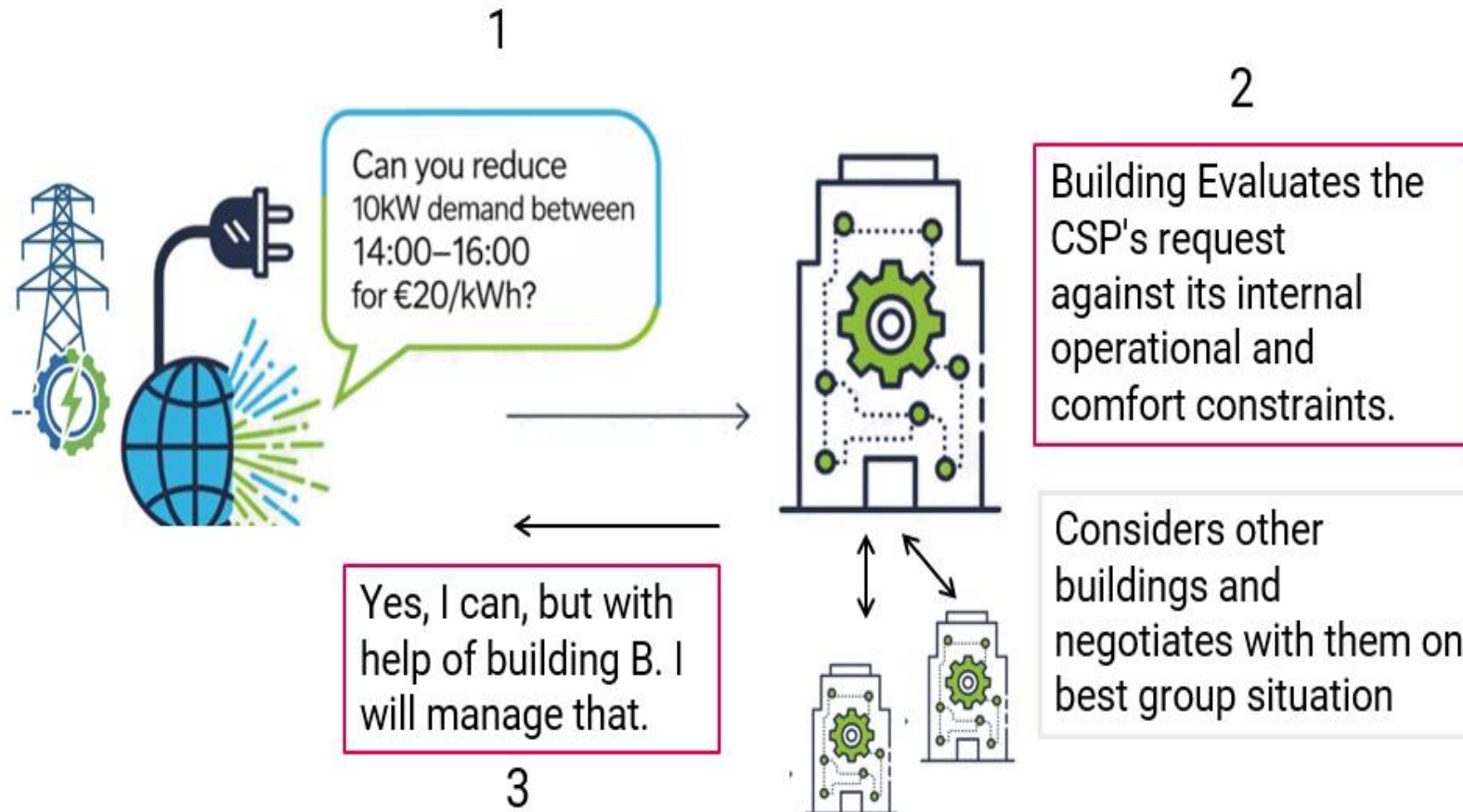


The 5-Step Negotiation Process



Convergence in 2–5 rounds | Monotonic concession | Buildings retain full autonomy

NEGOTIATION FLOW



The Operating Envelope

The building's actual power must always stay within the safe range set by the BEMS, the foundation of all NegoFlex guarantees.



$$P_{min}^{(b)}(t) \leq P^{(b)}(t) \leq P_{max}^{(b)}(t)$$

Eq. 1 Operating Envelope Constraint

What It Means

- P_{min} = non-controllable base load (IT, lighting, elevators)
- P_{max} = all systems at full capacity
- The gap between them = total controllable flexibility

Real Data (New Nexus Building)

- P_{min} = 12.37 kWh/h (observed in 1,355 hours)
- P_{max} = 60.0 kWh/h (peak cooling day)
- Envelope width = 47.63 kWh/h controllable range

The Confidence Score

The mathematical core of NegoFlex: converts forecast uncertainty into a statistically-safe offer using the normal distribution CDF.

$$c^{(b)}(t) = \Phi \left(\frac{M^{(b)}(t)}{\sigma^{(b)}} \right) \geq \rho_{min}$$

Eq. 14 Confidence Indicator

$c(t)$

Probability of
successful delivery
(0 to 1)

Φ

Standard normal
CDF converts
z-score to probability

$M(t)$

Safety margin:
buffer before
hitting P_{min}

σ

Forecast error
std. deviation
(building variability)

Intuition: Large margin relative to variability = high confidence, small margin = low confidence

CSP Economic Objective

The CSP's decision criterion: maximize net value of congestion relief minus cost of procuring flexibility from buildings.

$$J_k = \sum_{t \in \mathcal{T}} v(t) P_{proc,k}(t) - \sum_{b \in \mathcal{B}_k} \sum_{t \in \mathcal{T}} \pi_k(t) P_{off,k}^{(b)}(t)$$

Eq. 20 CSP Net Value (relief value minus procurement cost)

Monotonic Concession Protocol

- CSP only increases price, never decreases
- Max 5 rounds
- Stops when J is satisfactory or 5 round reached

Key Mechanism

- $v(t)$ = CSP's marginal value of flexibility
- $\pi(t)$ = price paid to buildings
- CSP screens on both price and reliability
- Ensures cheapest acceptable portfolio

Three Strategies, Two Market Regimes

S1: Cost-Neutral

Ask exactly internal
opportunity cost.
Zero profit margin.

S2: Cost-Plus

Fixed margin X added
for operational risk.
Standard commercial.

S3: Revenue Sharing

β share of CSP's market
value ($\beta=0.70$).
Regime-independent.

Simulation Results by Regime

	Regime A (Aligned) $\lambda = +\text{€}0.20/\text{kWh}$	Regime B (Conflicted) $\lambda = -\text{€}0.10/\text{kWh}$
S1: Cost-Neutral	CSP net: €230.10 1,770 kWh procured	CSP net: €53.10 1,770 kWh procured
S2: Cost-Plus	CSP net: €194.70 1,770 kWh procured	CSP net: €17.70 1,770 kWh procured
S3: Revenue Sharing	CSP net: €88.50 1,770 kWh procured	CSP net: €88.50 1,770 kWh procured

NEGOFLEX: UNLOCKING FLEXIBILITY BEHIND BUILDING ENERGY MANAGEMENT SYSTEMS FOR CONGESTION MANAGEMENT

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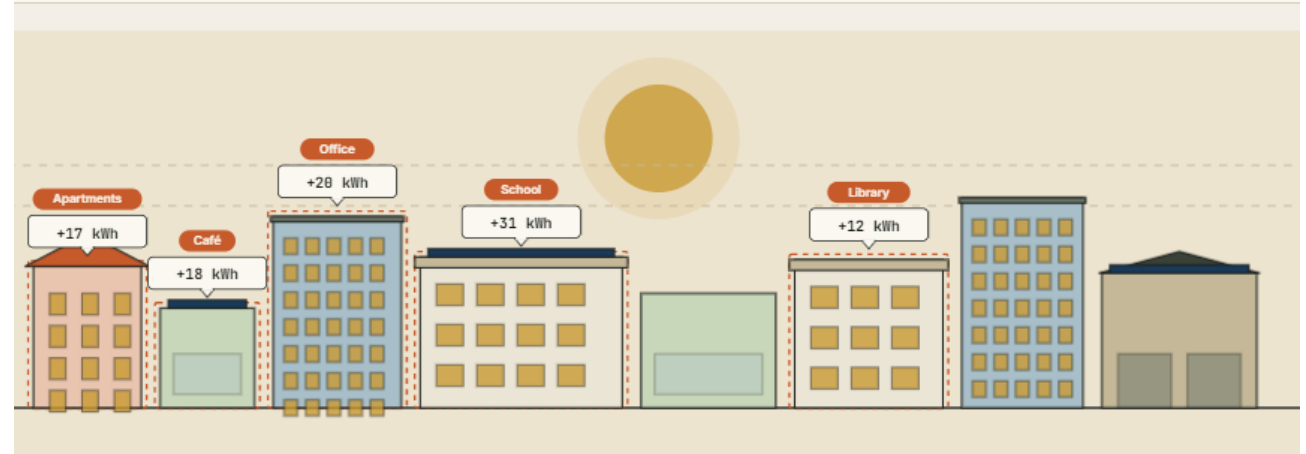
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CONGESTION MANAGEMENT, AUTOMATED NEGOTIATION

NegoFlex Demo

Grid is overloaded

Too much solar is pushing into the grid. The operator needs someone to soak it up: by charging cars, pre-heating water, running the cold store now.



The interface displays a city skyline with several buildings. A sun icon is positioned above the buildings, indicating a sunny day. The buildings and their energy demands are:

- Apartments: +17 kWh
- Café: +18 kWh
- Office: +20 kWh
- School: +31 kWh
- Library: +12 kWh

Below the skyline, a horizontal bar contains buttons for each building and its demand: Apartments +17 kWh, Café +18 kWh, Office +20 kWh, School +31 kWh, Library +12 kWh.

A central box displays the following information:

They offered
+98 kWh
of +150 kWh asked · 65% covered
Partial help: the grid operator will find the rest elsewhere.

At the bottom, there are four control sections:

- Buildings:** A slider set to 8.
- Amount to shed:** A slider set to 150 kWh.
- Weather:** Three buttons: Sunny (selected), Mild, Cold.
- Negotiation style:** Three buttons: Shy, Friendly (selected), Eager.

A "Trigger Flex Event" button is located at the bottom left.

Key Takeaways

- 1** BEMS envelope makes flexibility verifiable and auditable.
- 2** Confidence scoring translates forecast uncertainty into a statistical delivery guarantee.
- 3** The monotonic concession protocol ensures the CSP always finds the cheapest acceptable portfolio.
- 4** Strategy S3 (revenue sharing) is the most resilient across price regimes, with the same net value regardless of λ .
- 5** Real-data validation confirms 58.1% working-hour viability and average confidence of 0.956

Thank You

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Data Space Quiz

Bart van Gennip

[link](#)