HEDGE-IoT

Holistic approach towards Empowerment of the Digitalization of the Energy Ecosystem through adoption of IoT solutions

D7.3
Dissemination, Exploitation and market exploration, standardisation, and community building

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DOCUMENT CONTROL SHEET

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Main Author	Ana Barbosa de Melo (F6S); Vukašin Orsić (F6S)							
Other Authors	Nikolaos Bilidis (ED); Lenos Peratitis (ED); Léo Cornec (TRIALOG); Antonio Kung (Trialog); Olivier Genest (Trialog); Ioannis Michos (CLUBE)							
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PARTNERS

Participant number	Participant organisation name	Short name	Country
1	EUROPEAN DYNAMICS LUXEMBOURG SA	ED	LU
2	RHEINISCH-WESTFAELISCHE TECHNISCHE HOCHSCHULE AACHEN	RWTH	EL
3	ENGINEERING - INGEGNERIA INFORMATICA SPA	ENG	IT
4	EREVNITIKO PANEPISTIMIAKO INSTITOUTO SYSTIMATON EPIKOINONION KAI YPOLOGISTON	ICCS	EL
5	INESC TEC - INSTITUTO DE ENGENHARIADE SISTEMAS E COMPUTADORES, TECNOLOGIA E CIENCIA	INESC	PT
6	NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK TNO	TNO	NL
7	TAMPEREEN KORKEAKOULUSAATIO SR	TAU	FI
8	TEKNOLOGIAN TUTKIMUSKESKUS VTT OY	VTT	FI
9	TRIALOG	TRIALOG	FR
10	CYBERETHICS LAB SRLS	CEL	IT
11	CENTRO DE INVESTIGACAO EM ENERGIA REN - STATE GRID SA	NESTER	PT
12	INTERNATIONAL DATA SPACES EV	IDSA	DE
13	ELIA TRANSMISSION BELGIUM	ETB	BE
14	HRVATSKI OPERATOR PRIJENOSNOG SUSTAVA D.D.	HOPS	HR
15	UNIVERSITATEA TEHNICA CLUJ-NAPOCA	TUC	RO
16	CLUSTER VIOOIKONOMIAS KAI PERIVALLONTOS DYTIKIS MAKEDONIAS	CLUBE	EL
17	F6S NETWORK IRELAND LIMITED	F6S	IE
18	SOCIAL OPEN AND INCLUSIVE INNOVATION ASTIKI MI KERDOSKOPIKI ETAIREIA	INCL	EL
19	ABB OY	ABB	FI
20	ENERVA OY	ENERV	FI
21	JARVI-SUOMEN ENERGIA OY	JSE	FI
22	DIMOSIA EPICHEIRISI ILEKTRISMOU ANONYMI ETAIREIA	PPC	EL
23	DIACHEIRISTIS ELLINIKOU DIKTYOU DIANOMIS ELEKTRIKIS ENERGEIAS AE	HEDNO	EL

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24	INDEPENDENT POWER TRANSMISSION OPERATOR SA	IPTO	EL
25	ELLINIKO HRIMATISTIRIO ENERGEIAS	HENEX	EL
26	HARDWARE AND SOFTWARE ENGINEERING EPE	HSE	EL
27	QUE TECHNOLOGIES KEFALAIOUCHIKI ETAIREIA	QUE	EL
28	ARETI S.P.A.	ARETI	IT
29	APIO S.R.L.	APIO	IT
30	ACEA ENERGIA SPA	AE	IT
31	VOLKERWESSELS ICITY B.V.	VWICI	NL
32	ARNHEMS BUITEN BV	AB	NL
33	STICHTING VU	VU	NL
34	COOPERATIVE ELECTRICA DO VALE DESTE CRL	CEVE	PT
35	REN - REDE ELECTRICA NACIONAL SA	REN	PT
36	MC SHARED SERVICES SA	SONAE	PT
37	ELES DOO SISTEMSKI OPERATER PRENOSNEGA ELEKTROENERGETSKEGA OMREZJA	ELES	SI
38	ELEKTRO GORENJSKA PODJETJE ZA DISTRIBUCIJO ELEKTRICNE ENERGIJE DD	EG	SI
39	OPERATO DOO	OPR	SI
40	SVEUCILISTE U ZAGREBU FAKULTET ELEKTROTEHNIKE I RACUNARSTVA	UNIZG	HR
41	INSTITUT JOZEF STEFAN	JSI	SI
42	KONCAR - DIGITAL DOO ZA DIGITALNE USLUGE	KONC	HR

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EXECUTIVE SUMMARY

Deliverable 7.3 provides a comprehensive report on the communication, dissemination, exploitation, standardisation, and community-building activities undertaken during the first 12 months of the HEDGE-IoT project. This document, the first of three iterations, sets the foundation for ongoing and future efforts to promote the project, its results, and its alignment with EU priorities, while engaging key stakeholders and exploring market opportunities. It is structured into five main chapters, each contributed by a specific partner.

The deliverable concludes with recommendations to ensure the alignment of activities with project objectives and Key Performance Indicators (KPIs).

The communication and dissemination efforts aim to promote the HEDGE-IoT project to a wide range of audiences, from the general public to specific stakeholder groups such as the scientific community, industry, and policymakers. Dissemination activities focus on publicly disclosing project results to maximise their utility and impact, while communication efforts ensure the project's benefits and are accessible and understood by diverse audiences.

The deliverable emphasises the importance of fostering clear communication channels within the consortium and beyond, ensuring that the project's results address societal challenges and contribute to a sustainable energy transition. Key stakeholders are actively engaged in the project's implementation phases, ensuring their input and involvement in shaping the outcomes.

The first set of exploitation activities focused on establishing an initial alignment between the technical developments and market demands, regulatory requirements, and societal needs, to ensure short and long-term utilisation of project results.

HEDGE-IoT's first-year achievements set a strong foundation for an intensive, clear, and effective strategy for dissemination, communication, and exploitation in the years ahead. These efforts, guided by well-defined plans and KPIs, are critical for driving awareness, adoption, and the long-term success of the project.

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ABBREVIATIONS

aerOS	Autonomous, Scalable, Trustworthy, Intelligent European Meta Operating System
AI	Artificial Intelligence
AIOT	Artificial Intelligence of Things
AIOTI	The Alliance for IoT and Edge Computing Innovation
CEEDS	Common European Data Spaces
CEEDS	Common European Energy Data Space
CEF	Connecting Europe Facility
CEI	Cloud-Edge-IoT
CSAs	Coordination and Support Actions
CSI	Continuous Semantic Integration
DC	Dissemination and Communication
DSOs	Distribution System Operators
DT	Digital Twin
EU	European Union
FluiDOS	Flexible, Scalable, Secure, and Decentralized Operating System
HPC	High Performance Computing
IoT	Internet of Things
KOM	Kick-Off Meeting
LEC	Local Energy Community
ML	Machine Learning
NEMO	Next Generation Meta Operating System
ODPs	Operational Digital Platforms
SNN	Spiking Neural Network
TaRDIS	Trustworthy and Resilient Decentralized Intelligence for Edge Systems
TEF	Testing and Experimentation Facility (AI)
WG	Working Group
WP	Work Package

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1 INTRODUCTION

Deliverable 7.3 "Dissemination, Exploitation and market exploration, standardisation, and community building" is a first iteration of a public document that aims to report on the communication, dissemination and exploitation activities, standardisation suggestions and liaisons with other projects and initiatives conducted until the M12 of the project's lifetime. This document will be updated two times until the end of the project – in M27 and M42.

Considering different stage of implementation of the reported activities, the information provided by the contributing partners is organized in different chapters, each produced by a different partner:

- F6S covered chapter 2. Dissemination and Communication, this section highlights the communication and dissemination efforts of the first year, including social media campaigns, KPI achievements, and plans for expanding activities in the project's second year.
- CLUBE covered chapter 3. Exploitation and Market Exploration, where they presented the strategy and activities implemented in the first year, KER identification and analysis, market exploration and analysis, as well as planning for the second year of the project.
- TRIALOG covered chapter 4. Standardisation, presenting the strategy for the standardisation activities, targeted subject and groups and providing an overview of some relevant standards considering HEDGE-IoT scope.
- ED covered chapter 5. Community Building and Stakeholder Engagement, discussing activities aimed at building a strong community and fostering connections with stakeholders, related projects, and initiatives, along with plans for continued engagement in the second year.
- Finally, last chapter includes conclusions and recommendations taken from this deliverable

As Exploitation and standardisation activities progress, along with the project implementation, it is expected that the reporting activities, main strategies and conclusions become more integrated and aligned.

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2 DISSEMINATION AND COMMUNICATION

2.1 STRATEGY FOR YEAR 1

Dissemination and communication (DC) represent horizontal activities in HEDGE-IoT. Communication activities aim to promote the action and its results to multiple audiences, including the media and the broad public. Whilst dissemination activities aim to publicly disclose results to enable others to understand and use them.

As the technical results of the project are still not available to the public, DC activities in Year 1 aimed to boosting HEDGE-IoT's brand awareness and credibility with compelling visual identity and strategic engagement communication, targeting both the general public and main the industry players.

- Producing the visual identity of the project and specific materials: logo, templates, brochure, Posters, Roll-ups
- Creating and activating specific Communications channels (website and social media accounts)
- Raising awareness about the Project's objectives and expected outcomes (specific social media campaigns and targeted communication)
- Raising awareness about the Consortium and its partners (specific social media Campaigns)
- Initial engaging activities with both general and targeted audiences.

As explained in the Communication and Dissemination Plan, the focus was on DC activities for awareness, targeting mainly the general public and those stakeholders that should be aware of the work of HEDGE-IoT but do not require detailed knowledge of the project.

With this focus, four Social Media Campaigns were organized, and results are detailed in the following section. By using multi-channel communication, the project started to foster closer links with its targeted audiences, across various topics important to identified ecosystem stakeholders.

Finally, a monitoring system was designed to ensure proper collection of relevant DC inputs from project's partners, monitoring results and reporting on DC activities.

2.2 ACTIVITIES IMPLEMENTED IN YEAR 1

2.2.1 COMMUNICATION ACTIVITIES

In Year 1, HEDGE-IoT had a proactive and well-planned communication efforts, with tailored messaging, both in terms of content and target group definition. This contributed to secure both wide and targeted communication among HEDGE-IoT target audience and to enable active engagement of partners and stakeholders.

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A coherent approach towards visual identity was adopted to synchronise communication activities performed by HEDGE-IoT consortium. Easy-to-understand visual content will continue to ensure wide recognizability of the project's ideas and benefits and will continue to have a positive impact on the engagement of all stakeholders.

HEDGE-IoT has directed its communication efforts on a wide array of communication channels. This is proving to be an effective method for raising awareness of the project and fruitfully connecting target audiences, researchers, industry leaders, and other stakeholders.

The project is using the potential of its 8 different dissemination and communication channels to boost its presence: LinkedIn, Facebook, Instagram, Twitter/X, YouTube, project website, Mailchimp and F6S platform.

2.2.1.1 HEDGE-IoT Visual Tools

The main visual tools were developed in the first 3 months of the project and are already included in the DC Plan and follow the EU specifications.

We hereby summarize the main achievements:

- **Visual identity** of the project was developed, as a foundation for all communication products and tools and establishment of a strong brand, including the project logo and style. A specific color pallet was used, to ensure consistency.
- **Word and Power Point templates** we developed to ensure coherent representation of the project.
- **Institutional presentation** was created, containing the most relevant information about the project
- **Promotion Materials** were created and used in several DC activities implemented during Year 1 (leaflet, roll-up, flyer, poster), all including the EU.

2.2.1.2 HEDGE-IoT Website

HEDGE-IOT website is the main interface for communication with the public and it is suitable for addressing the various target audiences in HEDGE-IOT. The website domain (https://hedgeiot.eu/) was launched in March 2024 and will be available for a period of the project duration and additional 5 years after the lifetime of the project.

As a key management tool, the website is considered a living platform which will continue to change and grow throughout the project. F6S updates the project website based on contributions from all partners and the activities that take place.

The website displays information on the aims, objectives, members and consortium, Open Calls, etc. This online platform will also include important information about the project (testimonials, working materials and activities, downloadable promotional material, deliverables, PowerPoint presentations and videos), events, reports announcements, photos, news and links to downloads.

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The website contains the following sections and features:

- Home page - Description of the project scope and objectives, link to the latest news published on the website, links to the social media channel and funding information, project logo.
- About page - Description of the project objectives in more details, as well as pilot areas, work plan and consortium members
- Resources section - Links to public deliverables, scientific publications, press kit and press releases.
- News page - Blog posts informing the stakeholders about the project's progress, planned and realised activities and upcoming events.
- Contact page - Contact form is available on the page with the "Send message" button forwarding the mail to info@hedgeiot.eu. This enables easy communication with our stakeholders.

HEDGE-IoT website Privacy Policy, Cookies Policy and Terms and Conditions have also been included, setting the general rules and policies, in accordance with the relevant regulations such as General Data Protection Regulation (GDPR). Privacy Policy, Cookies Policy and Terms and Conditions can be accessed on the bottom of each page of the HEDGE-IoT website.

Additionally, the HEDGE-IoT website features an accessibility tool, enhancing the viewing and reading experience for individuals with visual impairments or sensitivities to the website's standard layout and colour scheme.

2.2.1.3 HEDGE-IoT Social Media Channels

The most active DC engagement channel was through the **Social Media Channels** created for the project. HEDGE-IoT has a social media presence on five social media networks: LinkedIn[1]; X/Twitter[2]; Facebook[3]; Instagram[4] and YouTube[5].

As of the latest update (30th November 2024), HEDGE-IoT has a total of 656 followers across its five social media networks. Notably, our social media presence continues to exhibit a consistent upward trajectory, predominantly on LinkedIn where HEDGE-IoT page is followed by 599 persons.

HEDGE-IoT's profiles and pages on LinkedIn, X/Twitter, Facebook and Instagram are actively used for two-way communication. The HEDGE-IoT's YouTube channel will be used to promote project activities in the form of videos, webinars, etc.

Project-related news and updates are regularly posted on the HEDGE-IoT social media pages.

[1] https://www.linkedin.com/company/101509134/
[2] https://x.com/HEDGE_IoT
[3] https://www.facebook.com/profile.php?id=61564002249880
[4] https://www.instagram.com/hedge_iot_eu/
[5] https://www.youtube.com/@HEDGE-IoT

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In addition, to enhance the reach and influence of the project's events and achievements, partners are encouraged to amplify HEDGE-IoT's social media content by resharing and reposting it, especially when their institution or organisation is featured. This collaborative effort benefits both HEDGE-IoT and the partner's online platforms, generating increased engagement.

Moreover, partners are expected to generate content pertinent to the project's initiatives and distribute it through their communication channels, with a special focus on events and press-related activities. This approach contributes significantly to broader project visibility and dissemination.

- **LinkedIn**

The LinkedIn page is leveraged for targeting content at very specific industries, policymakers and organisations, all of which are connected through this channel for networking will target audiences. From HEDGE-IoT's perspective, it is a place open to all who are interested in learning about project's opportunities, infrastructure, and future services, sharing opinions, asking questions, and getting more involved with the project.

For now, posts are released once to twice per week throughout the project. Depending on the phase of the project, increasing in frequency might be needed, during phases such as events and results sharing. LinkedIn is sustained by content created by F6S and content provided by the partners.

Figure 1: HEDGE-IoT LinkedIn page

Also important to note that HEDGE-IoT LinkedIn strategy aims for favorable metrics that boost the project's awareness and aims to build relationships with stakeholders. This is being done by implementing social media campaigns that put consortium partners in the spotlight, introducing them and their work to the public.

- **X/Twitter**

HEDGE-IoT's X/Twitter account serves as another form of communication with the general public and it's being used to further promote the project-related news and activities. Although LinkedIn is

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the main social media network encompassing the majority of the HEDGE-IoT followers and audiences, project's X/Twitter account serves as additional tool as it allows us to easily connect with other EU-funded projects and initiatives.

Figure 2: HEDGE-IoT LinkedIn page

- **Facebook**

Considering the diversity in age, expertise, geo location of HEDGE-IoT partners, stakeholders as well as the target audience, Facebook was chosen as a "supporting" channel. It provides a more personal approach to the target groups and covering the gap that might occur in case of LinkedIn – where not all the stakeholders have profiles on that network. In addition to Facebook, HEDGE-IoT also uses Instagram as an additional supporting social media channel to share news with the general public.

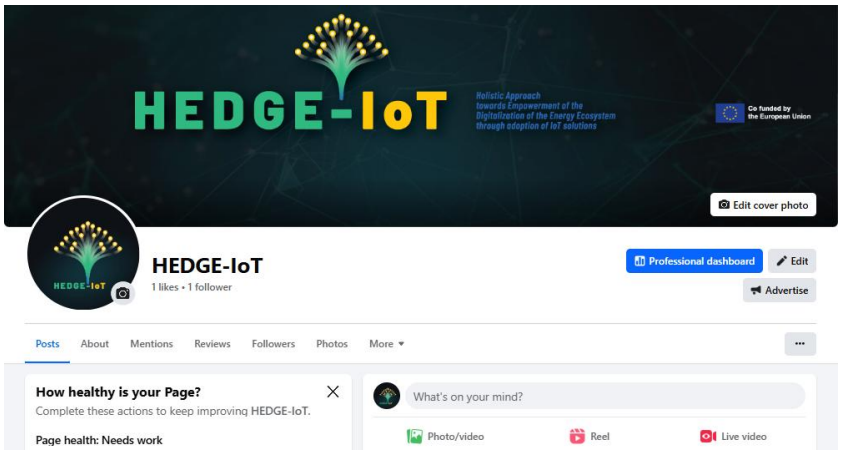

Figure 3: HEDGE-IoT Facebook page

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- **YouTube**

The HEDGE-IoT YouTube Channel, will play a pivotal role in facilitating communication and disseminating video materials generated by the project. It will be utilised in the upcoming period to promote the videos generated by the HEDGE-IoT demos, project partners, etc.

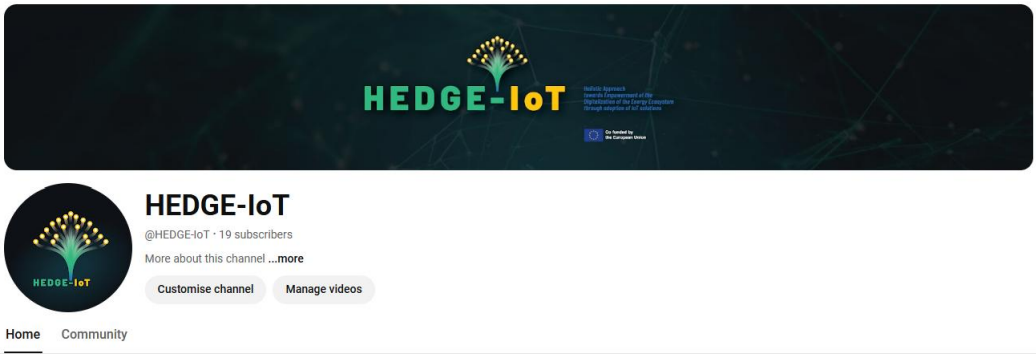

Figure 4: HEDGE-IoT YouTube channel

2.2.1.3.1 Social Media Campaigns

During Year 1, the HEDGE-IoT's social media campaigns strategy focused on building a wide audience and introducing the project, its objectives and consortium partners to the general public.

1. HEDGE-IoT Objectives Campaign

This was one of the first social media campaigns implemented in the HEDGE-IoT social media channels, which used infographics and illustrations to showcase the project's key pillars and objectives. One example of this campaign can be seen in figure 5 below.

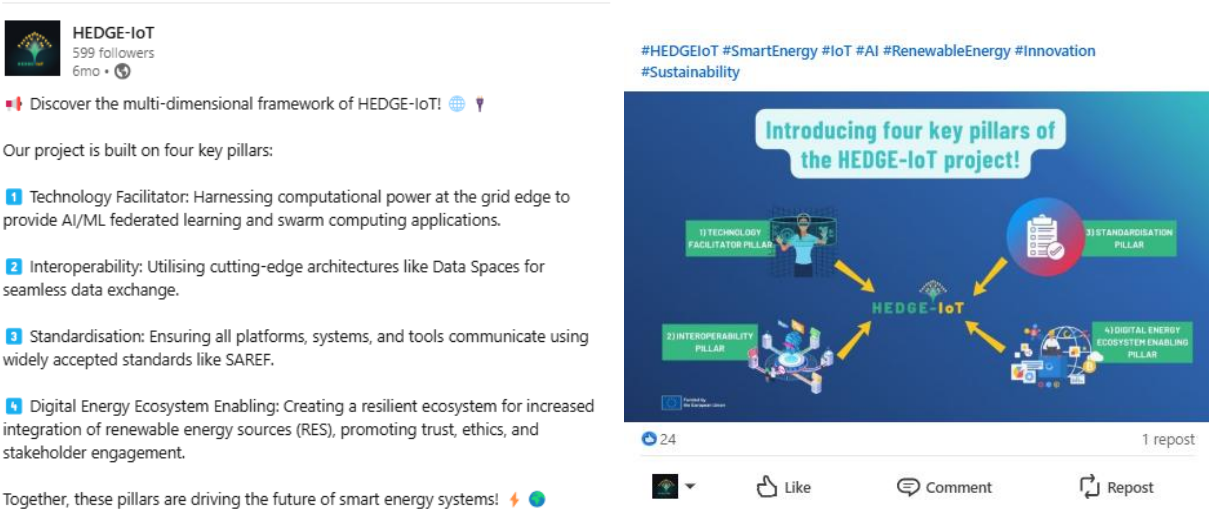

Figure 5: Example of a social media post published in the scope of the "HEDGE-IoT Objectives" campaign

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2. "Meet our Partners" Campaign

This initiative aims to spotlight each member of the HEDGE-IoT consortium, offering a deeper insight into their unique contributions and expertise, introducing project to the general public. The campaign follows a structured schedule, featuring one partner on a weekly or bi-weekly basis, aligning with the partner sequence outlined in the Grant Agreement.

To create a post for this campaign, each partner organisation provides key details about their involvement in the project, including:

- Their role in the project: Explaining their specific expertise and the value they bring to HEDGE-IoT.
- Team members: Introducing the individuals working on the project, complete with photos, titles, and their specific roles within both their organization and HEDGE-IoT.
- A highlight of their organisation: A concise statement showcasing what makes their organization unique.
- A quote or statement about the project: Reflecting their perspective on why the project is impactful, what excites them about it, or their expectations for its outcomes.

This campaign not only showcases the diverse expertise within the consortium but also brings a human element to the project, making it more relatable and accessible to the public. An example of the "Meet our Partners" campaign is illustrated in Figure 6 below.

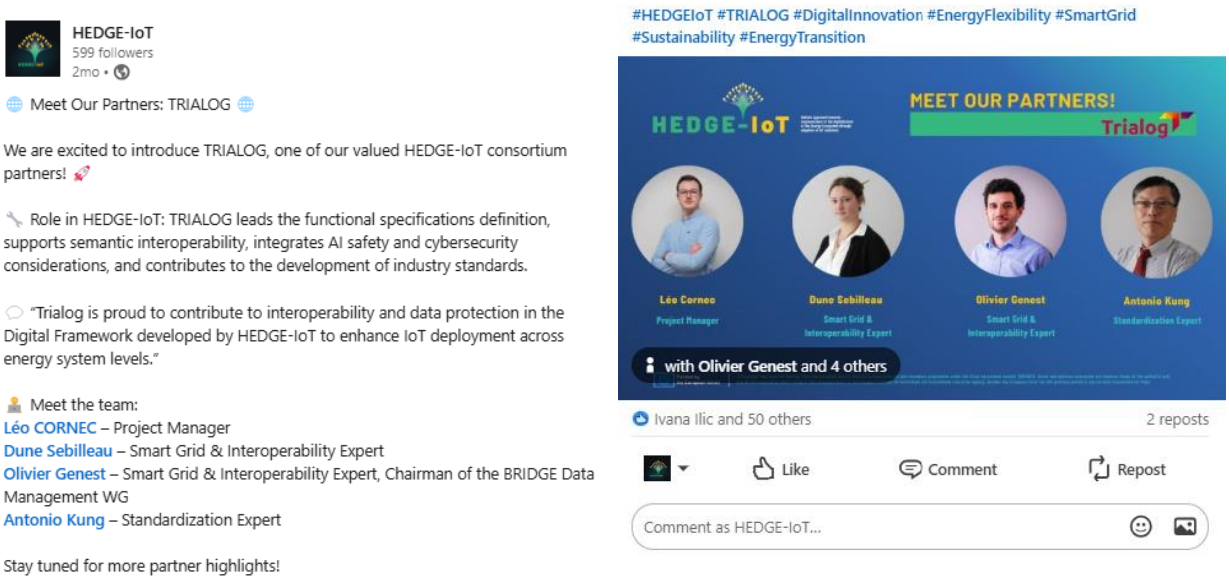

Figure 6: Example of a social media post developed in the scope of "Meet our Partners" campaign

To date, the "Meet our Partners" campaign has successfully highlighted a total of **11 consortium partners**, showcasing their unique roles, expertise, and contributions to the HEDGE-IoT project. This campaign is an ongoing initiative, and its impact will continue to grow as it progresses. Each

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partner will have their moment in the spotlight, ensuring that the entire consortium is thoroughly introduced to the public.

The campaign will carry on until every single partner has been featured, celebrating the collective expertise and collaborative spirit driving the success of HEDGE-IoT.

3. "Partners Articles" Campaign

The "Partners Articles" campaign is a cornerstone of HEDGE-IoT's communication and dissemination strategy, designed to foster engagement, share knowledge, and amplify the project's visibility.

This initiative involves publishing monthly articles on the HEDGE-IoT website, with each article written by one of the consortium partners. Covering a diverse range of project-related topics, the articles highlight innovative approaches, share best practices, and explore relevant industry trends. To ensure every partner has the opportunity to contribute, the campaign follows a pre-determined schedule outlined in the Grant Agreement, assigning each partner a specific month to submit their article.

This campaign not only provides valuable content for the HEDGE-IoT website but also fuels our social media presence, helping to maintain a consistent connection with our audience. With 42 partners involved, the campaign spans the project's 42-month duration, offering every partner a chance to showcase their expertise while driving broader awareness of HEDGE-IoT's goals and achievements.

Once written, the article is then published on the project's website (Figure 7) and shared on the HEDGE-IoT social media channels (Figure 8).

Figure 7: Example of a website article written by Končar, one of the HEDGE-iot partners in the scope of "Partners Articles" campaign

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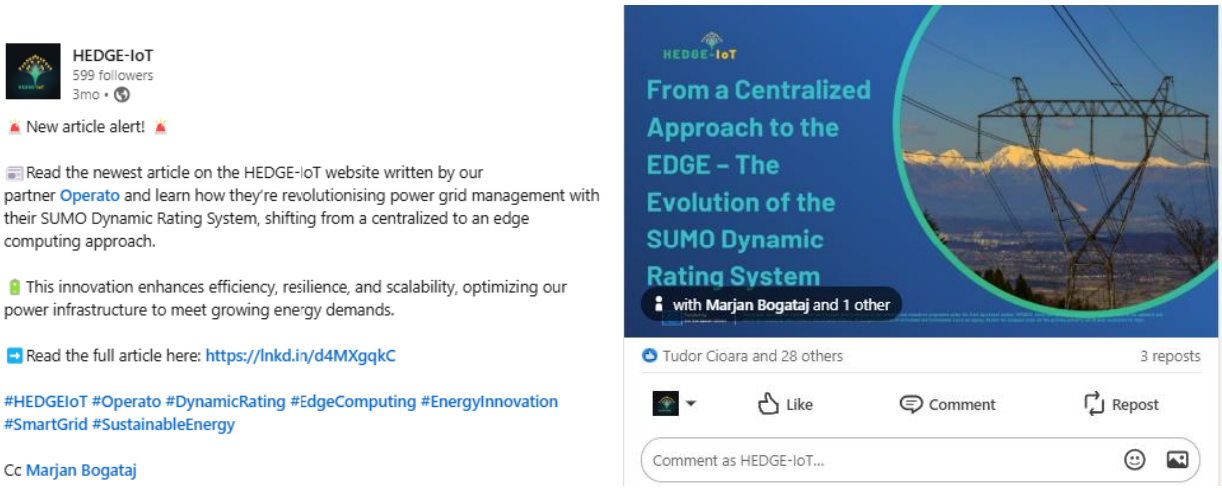

Figure 8: Example of a social media post promoting the article written by Operato, one of the HEDGE-IoT partners, in the scope of "Partners Articles" campaign

The following table showcases all the partners articles that were developed and published so far.

#	Partner Name	Article Title
1	KONCAR - DIGITAL DOO ZA DIGITALNE USLUGE	Končar Unveils PowerCIM: Enhancing Grid Data Exchange at International CIM Conference
2	INSTITUT JOZEF STEFAN	Maximizing utilization of the transformers using Dynamic Thermal Rating
3	SVEUCILISTE U ZAGREBU FAKULTET ELEKTROTEHNIKE I RACUNARSTVA	UNIZG FER Presents The Importance Of HEDGE-IoT Solutions At The MIPRO 2024 Conference
4	OPERATO DOO	From a Centralised Approach to the EDGE – The Evolution of the SUMO Dynamic Rating System
5	ELEKTRO GORENJSKA PODJETJE ZA DISTRIBUCIJO ELEKTRICNE ENERGIJE DD	Smart Asset Management: A Key to Efficient Operations in the Energy Sector
6	ELES DOO SISTEMSKI OPERATER PRENOSNEGA ELEKTROENERGETSKEGA OMREZJA	ELES projects and concepts to accelerate the green energy transition

Table 1: List of all the articles published so far in the scope of "Partners Articles" campaign

4. International Women's Day Campaign

Also, when tailoring and scheduling social media post, important dates were taken into consideration – this allowed us to develop social media campaigns in order to commemorate important dates – such as International Women's Day.

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To commemorate International Women's Day on March 8th, the HEDGE-IoT project launched a special social media campaign celebrating the remarkable contributions of the women driving innovation and progress within our consortium. The campaign highlighted the stories, achievements, and insights of these talented individuals, offering a platform to inspire and empower others. Female team members across the consortium were invited to share personal quotes reflecting their motivations, aspirations, or advice for others aspiring to make an impact in the energy and technology sectors. Accompanied by their photos, these quotes answered thought-provoking questions such as their motivations for joining the project and how their work aligns with HEDGE-IoT's broader goals.

The campaign not only celebrated their invaluable contributions but also showcased the diversity and expertise within the HEDGE-IoT team, reinforcing the importance of inclusion and representation in driving meaningful change. These posts were shared on International Women's Day and continued throughout the week, amplifying the voices of the incredible women shaping the future of energy systems. An example of the "International Women's Day" campaign is illustrated in Figure 9 below.

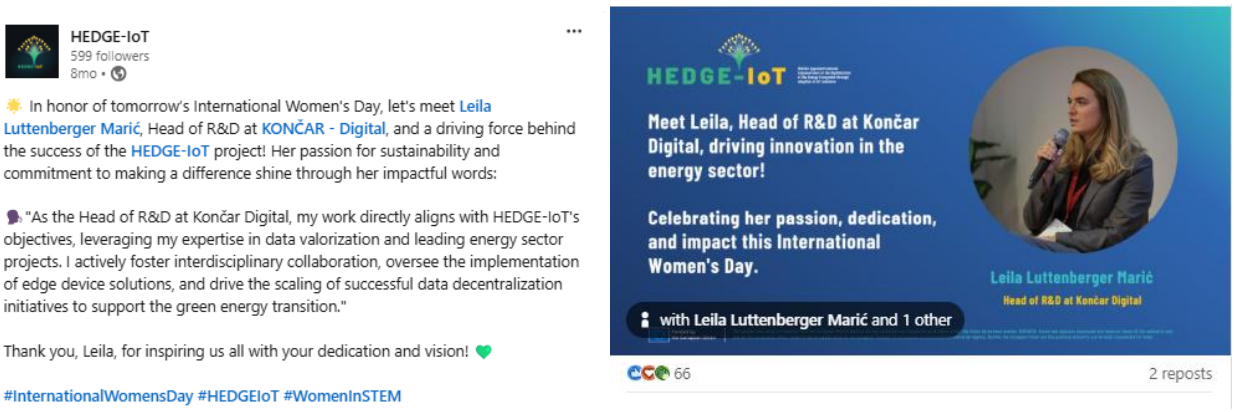

Figure 9: Example of a social media post developed for the "International Women's Day" campaign

2.2.1.4 Other Communication Methods

- **Press releases**

So far, **1 (one) press release** was developed by the Communication Team and the project coordinator, to inform about the kick-off meeting held in Athens. Other press releases will be generated, about major achievements of the project or any newsworthy items and distributed to both to specialised and general media channels.

All HEDGE-IoT partners will actively collaborate with the press releases dissemination to relevant media in their own countries and regions.

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2.2.2 DISSEMINATION ACTIVITIES

Active engagement with HEDGE-IoT's target audiences is pivotal for realising sustained impact and successful dissemination of project outcomes.

HEDGE-IoT will capitalise on its partners' networks and knowledge, leveraging their involvement in various initiatives, ecosystems, platforms, and conferences to reach and sway diverse target groups. Each partner will focus on garnering the interest of target demographics.

Partners will strategise their dissemination activities and, during monthly consortium meetings, will share their achievements relative to their planned endeavours.

2.2.2.1 Scientific Conferences and Events

During the first year of the HEDGE-IoT project, partners actively participated in various international and local conferences, meetings, and events—both virtual and in-person—to disseminate the project's vision and initial achievements while fostering awareness of our activities. These engagements served as a platform to connect with diverse stakeholders, ranging from industry experts to academic researchers, ensuring the project gained visibility and momentum within relevant communities.

The activities undertaken included exhibition stands at industry innovation fairs, participations and contributions to international peer-reviewed conferences. These events facilitated direct interaction with industry professionals, policymakers, and innovators, offering valuable insights and feedback, provided an opportunity to present HEDGE-IoT to key players in the energy and IoT sectors and enabled the exchange of knowledge and the alignment of HEDGE-IoT's innovations with global scientific advancements.

Each partner identified events of strategic importance to the HEDGE-IoT project, focusing on those held in European cities with strong startup ecosystems. This approach ensured that the project's results reached a wide and diverse audience, including innovators, entrepreneurs, and technology adopters.

Some of the events attended by the HEDGE-IoT partners where the project was presented are listed below:

- **MIPRO Conference** – This event is intended primarily for participants from companies and institutions affected by the processes of deregulation of the power sector, i.e. the green transition of the energy sector. System operators, the academic community and industrial partners are preparing for the challenges of the future through various research and development projects. At this seminar, projects from Horizon 2020, Horizon Europe, Digital and CEF were presented. HEDGE-IoT was one of the projects that was presented by our consortium partners UNIZG and HOPS.

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Figure 10: Photo of the HEDGE-IoT presentation from the MIPRO conference

- **Arnhem Electricity Week** - This event brought together experts to discuss the valuable findings from the InterConnect project and explore how these insights can be applied to the HEDGE-IoT project, which was presented by our consortium partner AB.
- **Lisbon Energy Summit** - recognised as Europe's leading energy transition event, offered a strategic conference that delved into transitioning the EU's energy system to one rooted in renewables. Attendees explored various themes across the exhibition's hydrogen & decarbonisation, climatech, and innovation zones. Here, HEDGE-IoT and its partner projects showcased their solutions and goals aimed at delivering a cleaner, greener energy system. Our consortium partner had a booth at the summit for several projects in the energy domain and HEDGE-IoT was one of them.

Figure 11: Photo from the Lisbon Energy Summit showcasing the booth with the HEDGE-IoT branding

- **IISA 2024** (The Fifteenth International Conference on Information, Intelligence, Systems and Applications) – The IISA conference series has become an international forum for researchers and professionals in all areas of Information, Intelligence, Systems and Applications. HEDGE-IoT partner TUC presented a paper regarding task offloading in smart grids.
- **ICCP 2024** (2024 IEEE 20th International Conference on Intelligent Computer Communication and Processing) – The goal of the 2024 IEEE 20th International Conference on Intelligent Computer Communication and Processing was to bring together researchers,

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engineers and practitioners working towards improving the power of both communication and processing software using the most advanced intelligent methods available today. HEDGE-IoT partner TUC has created awareness about the project through the participating sessions.

- **Smart Energy Day 3.0** – This event focused on scalable propositions together with innovative entrepreneurs, start-ups and scale-ups. HEDGE-IoT consortium partner AB presented the learning from Interconnect and plans for HEDGE-IoT project.
- **ENLIT Europe 2024** - Enlit is a high-level energy forum connecting industries, inspiring actions and helping Europe evolve into one decarbonised and digitalised energy system for the energy transition. HEDGE-IoT project was presented at the event with a joint booth with other EU-funded projects (i-STENTORE, WeForming, AGISTIN, EVELIXIA, META BUILD, ENERGATE). HEDGE-IoT team was represented by our consortium partners TRIALOG and NTUA. TNO further represented Hedge-IoT in a panel on energy data spaces organized by the Int:NET project.

Figure 12: Photo of the HEDGE-IoT booth and team at Enlit Europe 2024

- **WEBIT 2024** - organised in Sofia, Bulgaria was an event focused entirely on Innovations and Technology Trends that set the future in the main industries, business and Future of humanity as well as advancements and improvements at global level achieved through technology. HEDGE-IoT was showcased at this event alongside our partner F6S Innovation and their several groundbreaking EU-funded sustainability and technology projects.

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Figure 13: Photo of F6S team promoting HEDGE-IoT at WEBIT 2024

This proactive participation highlights the commitment of HEDGE-IoT partners to sharing knowledge, building collaborations, and establishing the project as a leading initiative in energy system digitalization. The following section provides details about the specific conferences and events attended during this period.

2.2.2.2 Targeted Meetings and Initiatives

During the first year of the HEDGE-IoT project, the consortium engaged with EU-funded projects, European clusters, and working groups to foster collaboration and establish meaningful connections. These activities aimed to position HEDGE-IoT within the broader ecosystem of energy and IoT innovation, leveraging synergies to enhance the project's impact and ensure alignment with European strategies and goals. These meetings and activities are fully described in section 5, which is dedicated to the stakeholder engagement activities.

2.2.2.3 Thematic Workshops

HEDGE-IoT partners organised and participated in a number of thematic workshops in the first year of the project's lifetime:

- **Final workshop of DOITSMARTER project** – This workshop focused on showcasing the partners' achievements and cost-effective solutions for residential and public buildings. TUC, one of the partners in both DOITSMARTER and HEDGE-IoT projects, presented the HEDGE-IoT project.
- **AIE Workshop** - The 2024 International Workshop on Artificial Intelligence and Machine Learning for Energy Transformation (AIE) delved into the cutting-edge applications of AI and ML within contemporary engineering, with a primary focus on the critical domain of energy transformation. HEDGE-IoT partner VTT presented "The Role of Machine Learning Algorithms in Smart Grid Cybersecurity" and the project itself.

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- **Workshop on Cross-Domain Standardisation and Architecture for IoT and Edge Computing** held on 26-27 November in Brussels, Belgium. TRIALOG, one of the HEDGE-IoT partners has represented the HEDGE-IoT project.

2.2.2.4 Publications in Scientific Journals

During the first year of the HEDGE-IoT project, the consortium adhered to the FAIR principles, ensuring all research outputs are findable, accessible, interoperable, and reusable. These principles guided the management of publications and data, aiming to maximize the visibility, impact, and utility of the project's research outcomes.

Key activities in this regard included:

- Assessment of research outputs: The consortium conducted regular evaluations of the project's research outputs to determine the most appropriate type of access, including scientific publications, datasets, or other forms of information dissemination.
- Integration of open science principles: Methodological aspects of open science were incorporated into the planning, management, and monitoring of research under WP1(Project Management and Administration).
- Open-access dissemination: To promote accessibility to the scientific and technological community, HEDGE-IoT prioritized publishing all research papers in fully open-access journals and platforms.
- Outreach to start-ups and SMEs: Particular efforts were made to disseminate knowledge generated by the project to start-ups and SMEs, fostering innovation in the private sector.

The following table outlines the specific publications produced during the first year of the HEDGE-IoT project:

#	Partner	Title of the Journal	Publication Title & Link
1	TUC	Smart Cities	Edge Offloading in Smart Grid
2	TUC	Applied Sciences	Deep Q-Learning-Based Smart Scheduling of EVs for Demand Response in Smart Grids
3	VU	Zenodo	OfficeGraph
4	TUC	Biomimetrics	Whale Optimization for Cloud–Edge-Offloading Decision-Making for Smart Grid Services
5	INESC	Computing Surveys	Databases in Edge and Fog Environments: A Survey
6	IDSA	Zenodo	Making the Dataspace Protocol an

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			INTERNATIONAL STANDARD
7	TAU	APPLIED ENERGY	MARKET INTEGRATION AND TSO-DSO COORDINATION FOR VIABLE MARKET-BASED CONGESTION MANAGEMENT IN POWER SYSTEMS

Table 2: Summary of the Hedge-IoT Publications published until M12

2.3 MONITORING AND IMPACT

Monitoring has been carried out continuously and systematically during the project, not only to ensure that the project gathers the sufficient a relevant data and insights from the project implementation but also to help assess whether the Dissemination and Communication activities were carried out properly and successfully.

Several methods have been used so far:

- Excel file, shared with all the partners, to monitor and track the most relevant CD KPIs: scientific publications, participation in events, communication activities carried out, etc.
- Email exchange to collect inputs from project's partners
- Document and correspondent folder to plan and archive of Social media posts (Figure 6), serving as a central resource, containing essential details such as draft descriptions of social media posts, their scheduled posting dates, and whether the posts have been pre-scheduled.

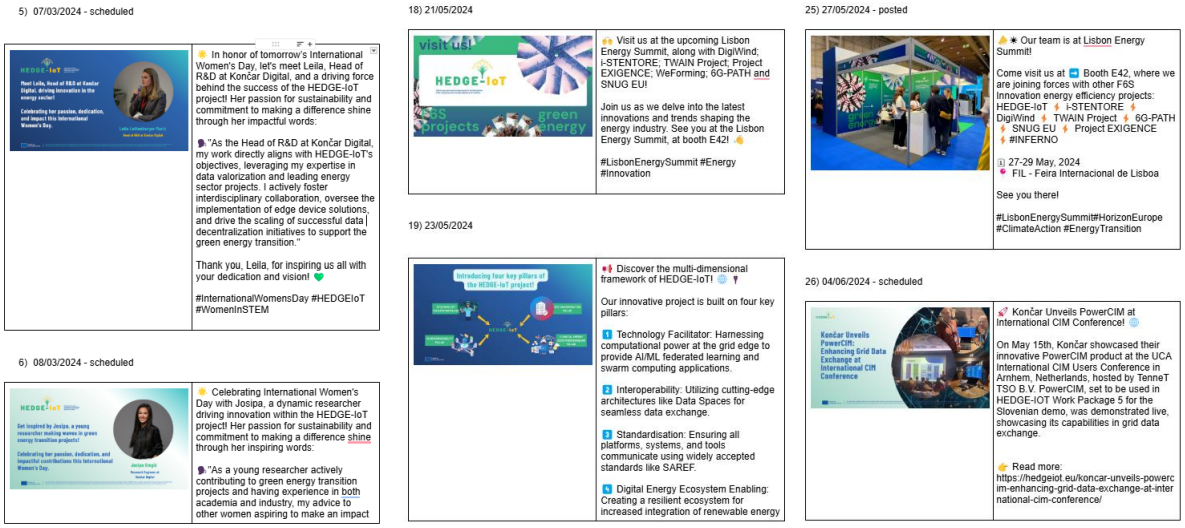

Figure 14: Snippets of a Word document used for planning and scheduling social media posts for the HEDGE-IoT social media networks

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2.3.1 KPIS AND DC INDICATORS

Communication and Dissemination KPIs are well defined both in the Grant Agreement and in the DC Plan. Progress has been made in the majority of these indicators, and more is expected in the months to come.

Table 3 shows the progress in KPIs so far:

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TYPE	EXAMPLES	TARGET	PROGRESS YEAR 1
COMMUNICATION ACTIVITIES			
Project website	Reports announcements, photos, news and links to downloads. An overall editorial plan, including the website, special articles and interviews.	1	1
Social media	Strictly authorised discussions/exchanges with online communities (LinkedIn, Twitter)	> 500	100
Brochure	Electronic and hard copies of the project brochure comprehending a general overview of the project, its challenges and expected impacts	4	1
Posters	A set of posters will be designed and printed to exhibit at partners' premises and use at events where the project takes presence.	> 4	1
Institutional presentation	Project Presentation will be created at the beginning of the project, containing basic information about the project (activities, objectives, partnerships, events).	1	1
Trial videos	A set of videos will be orchestrated, describing the trials of HEDGE-IoT, their scope and the HEDGE-IoT technologies tested and evaluated.	>=4	0
Infographics	Production of infographics to show the results in a clear and simple way. It is foreseen that during the project implementation phase, 10 infographics presenting various outcomes will be produced.	10	0
Banner	An attractive large size banner and one stand-up presenting a general image of the project aiming to capture a first interest/attention.	1+1	1 (Roll-up)
Final Publishable Report	A Final Publishable Report will be developed to summarise the project's objectives, activities, and achievements. This report will be result-oriented, it will present the tangible results of the project, lessons learnt, and impacts achieved, to convince and guide other regions and countries to engage in similar actions.	1	0
Articles	Tailor-made articles and interviews for publications and other targeted media channels (e.g. EC newsletters, specialised national magazines etc.). Focus will be on IoT- Cloud/Edge technologies and integration of such systems and trial results of AI/ML.	>= 5	2
Newsletter	Periodic newsletters development, publication, and distribution to all the participating partners, conference attendees, website visitors, and other perceived stakeholders.	>4	0
Press releases	Press releases will be issued to specialised and general media channels at key project milestones (kick-off, major achievements, etc.). A press/media kit will be developed containing detailed press releases, videos (e.g. of project demos), publishable images from the project, few short papers (devoted to some key theme/topic of the project).	>= 2	1
Talks in workshops	Invited talks in workshops and international events of reference as to communicate the project experimentation platform and solutions.	On invite	3
Innovation Events	Events in European cities with strong start-up community	>= 1	0
Market Uptake	Market Uptake Launch-Event, with guided presentation of selected results.	>= 1	0

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TYPE	EXAMPLES	TARGET	PROGRESS YEAR 1
DISSEMINATION ACTIVITIES			
Exhibition stands in industry innovation fairs	BILT Europe (Digital Built Week Europe); European Sustainable Energy Week; ENLIT Europe; IDSA conferences; IoT conferences	> 5	3
Publication in international journals and magazines	Applied Energy; Energy; Energy Policy; IEEE Transactions on Smart Grid; IEEE Transactions on Power Systems; IEEE Transactions on Power Delivery, Energy Policy; IEEE Transactions on Industrial Informatics	> 15	7
Contributions in international peer-reviewed conferences	IEEE Innovative Smart Grid Technologies; Power Systems Computation Conference; IEEE Power and Energy Society for Innovative Smart Grid Technologies Conference; Conference on European Energy Market	> 10	3
Thematic Workshops	Organisation of dedicated workshops to engage specific target groups.	>= 4	2
Cluster of European projects and other initiatives	DG Energy, BRIDGE WGs; AIOTI; European Energy Alliance Task Forces; IDSA General Conferences; ETIP SNET, European Smart Grid Technology Platform, WG4 Digitisation, FIWARE Summit.	> 20	8
Meetings with policy makers	Meetings with regional/national data and energy policy-makers and regulators.	> 6	0
Targeted Meetings with industry and society	Participation in industrial and trade events; press releases and articles in specialised trade newspapers & magazines; Organising focused workshops and public relations events, and inviting European/ international community	>5	0

Table 3: Communication and Dissemination KPIs

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2.4 STRATEGY FOR YEAR 2

In the second year of the HEDGE-IoT project, dissemination and communication activities will build upon the foundation established in the first year while expanding our efforts to align with the project's progress and growing visibility.

We will continue implementing well-thought-out campaigns to achieve digital and social media-related KPIs. The "Meet Our Partners" and "Partners Articles" campaigns will remain central to our strategy, offering engaging insights into consortium members, their expertise, and their contributions to the project. Additionally, greater emphasis will be placed on promoting scientific publications, partner activities, and initial results generated by the consortium, showcasing the project's impact and achievements to both the scientific community and industry stakeholders.

Dissemination and Communication efforts will continue to balance raising general public awareness with targeting specific audiences and stakeholders who can benefit from HEDGE-IoT outcomes but are not directly involved in the project. These efforts will involve communicating early results in a way that resonates with these groups, helping to foster understanding of the project and the innovative technologies being developed. Plus, it will allow for a full perception of the project and its outcomes within the industry.

In Year 2, specific emphasis will be given to the launching, promotion and communication of the Open Calls and related activities, such as webinars, info days, etc.

To achieve these goals, WP7 will maintain close coordination with other WP leaders to ensure timely and effective communication of results and milestones. It will closely follow the technical developments to ensure the open dissemination of knowledge and technology, by enforcing the HEDGE-IoT consortium's determination to open access publishing, open-source code and designs, open data, and open models. Activities will include leveraging social media to promote project-related events, scientific contributions, and new publications, ensuring the steady visibility of HEDGE-IoT in the digital space.

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3 EXPLOITATION AND MARKET EXPLORATION

3.1 STRATEGY FOR YEAR 1

In the first year of the HEDGE-IoT project, the exploitation strategy focused on establishing a strong foundation for the short and long-term utilisation of project results.

The primary objective was to ensure that the technical developments align with market demands, regulatory requirements, and societal needs. By doing so, the project's outcomes aim to deliver measurable impact, commercial value, and widespread adoption.

The approach combined robust identification of exploitable results, stakeholder engagement, intellectual property management, and targeted market research.

3.1.1 COMPREHENSIVE KER IDENTIFICATION AND ANALYSIS

The identification and analysis of Key Exploitable Results (KERs) during Year 1 constituted a highly collaborative effort, emphasising the synergies between consortium partners and their combined expertise. Each partner had to contribute their distinct knowledge and capabilities to define individual KERs, while collectively exploring opportunities for integration and mutual exploitation. This collaborative approach ensured that the project's outcomes aligned with diverse market requirements and stakeholders' expectations, as delineated in the Grant Agreement and Deliverable 7.2.

A primary objective was to assess the market relevance of each KER to ensure their applicability to critical challenges in the energy and IoT sectors. Specifically, the project focused on areas such as grid resilience, renewable energy integration, and AI-enabled optimisation of energy systems. The partnership underscored the necessity for solutions that address both technical and operational challenges, including real-time data analysis, interoperability of systems, and enhanced decision-making capabilities for Transmission System Operators (TSOs) and Distribution System Operators (DSOs). This emphasis on practical, market-driven solutions enhanced the overall value proposition of HEDGE-IoT's outputs.

Mapping KERs to the needs of stakeholders was a central component of this strategy. The consortium prioritised engaging energy providers, TSOs, DSOs, and their partners to ensure that the project's outcomes would meet real-world requirements. This mapping process not only guided the prioritization of KERs for individual and joint exploitation efforts but also ensured alignment with regional and local needs across the six pilot sites. Additionally, partnerships with standardisation bodies, such as AIOTI and ETSI for SAREF, were initiated to promote interoperability and enhance market readiness for HEDGE-IoT technologies.

By fostering collaboration across partners, focusing on market-driven innovation, addressing potential risks, and engaging stakeholders, the consortium established a robust foundation for the effective exploitation of project results. This approach positions HEDGE-IoT to deliver impactful and scalable solutions in subsequent phases of the project.

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The risks associated with the development and deployment of these KERs were systematically evaluated. Deliverable 7.2 identified potential barriers, including the regulatory complexity of the energy sector, the interoperability challenges of integrating IoT solutions across heterogeneous systems, and uncertainties in market adoption rates. To mitigate these risks, the consortium developed strategies such as fostering early stakeholder engagement, aligning solutions with existing industry standards, and conducting scalability assessments at pilot sites.

3.1.2 STAKEHOLDER-CENTRIC APPROACH

Continuous collaboration among stakeholders is crucial for the success and longevity of the project. Ongoing engagement ensures that all parties remain aligned with the project's objectives, to address challenges promptly, and to adapt to changing circumstances or requirements. By fostering an environment of open communication and shared responsibility, stakeholders leverage their diverse expertise and resources to drive the project forward effectively. Moreover, this collaborative approach extends beyond the project's immediate timeline, facilitating the seamless transition from development to implementation and long-term sustainability.

In the first year of the project, the exploitation strategy encompassed several key components designed to maximise the project's impact and ensure its widespread adoption. By forging partnerships with industry bodies and policy groups, the project will gain valuable insights, access to resources, and potential avenues for implementation. Targeted outreach to pilot site stakeholders is essential for tailoring the solution to local needs and contexts, thereby increasing its relevance and effectiveness.

Additionally, establishing connections with standardisation organisations like ETSI and AIOTI is a proactive step towards ensuring the interoperability of IoT solutions. This focus on standardisation not only enhances the project's compatibility with existing systems but also positions it for broader integration and scalability in the future, potentially influencing industry-wide practices.

3.1.3 PREPARATION OF IPR FRAMEWORK

During its initial year, the HEDGE-IoT project developed an Intellectual Property Rights (IPR) framework. This framework was designed for utilising the project's outcomes. As the HEDGE-IoT project progresses, the IPR framework is anticipated to evolve, incorporating advanced features to address the complexities of IP management, exploitation, and commercialisation, while ensuring adherence to the GA and Consortium Agreement terms. The framework's establishment was of a strategic necessity, offering the essential structure to enable effective utilisation of KERs in later project stages.

The framework's main purpose is to establish clear ownership and accountability for intellectual property among consortium members. It outlines detailed guidelines for assigning ownership of project results based on each partner's input, as stipulated in the GA. The framework's approach ensures clear delineation of IP arising from collaborative efforts, such as jointly developed algorithms or methodologies, to prevent future disputes among consortium organisations. The

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framework also provides initial strategies for managing individual KERs, including tools, technologies, or datasets independently developed by specific partners.

Another crucial aspect of the IPR Framework is the definition of mechanisms for protecting innovations. The framework includes guidelines for evaluating whether project's outcomes that fall under the scope of an innovation should be safeguarded through patents, copyrights, or other formal IP instruments. For instance, technical innovations demonstrating substantial commercial potential were identified as prospective subjects for patent protection, pending a thorough assessment of their eligibility under applicable intellectual property laws and the strategic objectives of the consortium.

The framework also offers preliminary considerations for open-source contributions, ensuring that any open-access releases would align with the project's exploitation objectives while maintaining proper credit to contributing partners.

The framework has been developed in strict conformity with the regulatory and contractual obligations prescribed under the GA and the Consortium Agreement, ensuring full compliance with the European Union's IP management standards, particularly those applicable to Horizon Europe projects. Moreover, it anticipates and addresses potential complexities inherent in the regulatory frameworks governing the energy and IoT sectors, thereby providing a structured and legally sound foundation for the efficient and compliant administration of intellectual property moving forward.

Although the framework does not encompass the implementation of licensing agreements, commercialisation strategies, or patent filings, it establishes a structured and systematic foundation for assessing and developing these opportunities as the project progresses. Its formulation was informed by initial consultations with consortium partners to harmonise expectations and ensure the framework effectively addresses the collective and individual interests of all project stakeholders.

The IPR framework as developed in Year 1 has established a clear foundation for managing and protecting the intellectual property generated within HEDGE-IoT. It provided the necessary structure to guide the project's future exploitation efforts, ensuring that all innovations are well-positioned for impactful and sustainable utilisation in the energy and IoT sectors. The framework will evolve in later stages of the project as specific results mature and become ready for commercial or collaborative exploitation.

3.1.4 MARKET EXPLORATION

The preliminary market exploration highlighted the increasing reliance on IoT and AI solutions for optimising energy systems, particularly in addressing challenges such as renewable energy integration, distributed energy resource management, and real-time grid operations. The findings underscored the relevance of HEDGE-IoT technologies, specifically in delivering scalable and secure solutions tailored to the evolving needs of the sector.

The exploration emphasized the demand for tools that overcome interoperability challenges and facilitate the integration of diverse energy systems. While IoT-enabled solutions are widely

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available, gaps persist in advanced, AI-driven platforms designed for decentralised architectures. HEDGE-IoT's focus on edge computing and federated learning positions uniquely address these challenges and meet market needs effectively.

Insights from the project's pilot sites highlighted the importance of tailoring solutions to regional market and regulatory conditions. In regions with high renewable energy adoption, the priority lies in enhancing grid resilience and integrating DERs, while in emerging markets, the focus is on affordable and scalable IoT solutions. This localized approach ensures that HEDGE-IoT technologies align with specific infrastructure needs and regulatory frameworks.

3.2 ACTIVITIES IMPLEMENTED IN YEAR 1

During its first year, the HEDGE-IoT project efforts concentrated on creating robust groundwork for leveraging, circulating, and standardising its preliminary developments. These endeavors, in line with Deliverable 7.2, were vital to ensure the project's objectives will address societal requirements, market needs, and stakeholder anticipations.

A significant accomplishment was the joint identification of KERs. Project partners collaborated to outline their expected outcomes. Even though the project is yet in a very early stage and the partners have not yet constructed a clear and precise exploitation plan, each partner submitted their specific exploitation plans, target audiences, and anticipated impacts, reflecting the collaborative approach of the project. The submitted tables are presented in the ANNEX. For example, partners emphasised IoT solutions and edge intelligence (KER#1) for improving grid resilience and real-time management, while tools like the service orchestration (KER#2) were aimed to optimising computation resource sharing between cloud and edge systems. The plan also showcases preliminary strategies for synergies with other HEDGE-IoT partners and EU initiatives, showcasing efforts to integrate AI/ML tools (KER#3), develop open app repositories (KER#5), and advance interoperable data governance solutions (KER#7). Partners identified market barriers, such as cost sensitivity and interoperability challenges, alongside strategies for overcoming these through pilot demonstrations, licensing, and collaborative frameworks, these inputs underscore the strategic alignment of KERs with market and stakeholder needs and also establishes an initial path for their future exploitation and scalability.

One of the key achievements was the development of stakeholder engagement activities to promote future joint exploitation of the project's results. HEDGE-IoT engaged in activities through platforms such as the BRIDGE initiative and collaborations with related projects like ODEON. Moreover, the Kick-off and General Assembly meeting served as a forum for project-wide collaboration and updates, promoting communication and ensuring all partners were united in their goals. The participation in those events ensure alignment with industry practices, regulatory frameworks, and stakeholder expectations.

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3.3 STRATEGY FOR YEAR 2

The second year of HEDGE-IoT will emphasize scaling the exploitation efforts and transitioning from foundational activities to more targeted actions.

3.3.1 ADVANCING KER EXPLOITATION

Each consortium partner in the first year of HEDGE-IoT developed preliminary plans for their respective KERs. In the same direction, moving forward each partner will further improve their individual KERs including business models tailored to specific markets, technical development roadmaps for scaling and possible licensing and collaboration frameworks. Partners will seek joint exploitation opportunities by leveraging synergies among partners to co-develop solutions, especially in areas like IoT standardization and interoperability.

3.3.2 ENHANCING STAKEHOLDER COLLABORATION

In the context of the HEDGE-IoT project, stakeholder collaboration is a cornerstone for ensuring the successful exploitation and sustainability of the project's outcomes. By engaging a diverse range of stakeholders—spanning energy providers, grid operators, standardization organizations, venture capitalists, and industrial alliances—the project seeks to build a robust ecosystem that supports the seamless adoption and scaling of its innovations. These collaborations are not only vital for aligning the project's technological advancements with market and regulatory needs but also for fostering trust, inclusivity, and a shared commitment to the digital transformation of the energy sector. Stakeholder engagement efforts are designed to create iterative feedback loops, where stakeholder insights refine and enhance project outputs while fostering early buy-in from key market players.

To deepen these partnerships, the following actions will be prioritised:

- **Strengthening Industry Relationships:** Engaging with energy providers and grid operators to showcase the potential of HEDGE-IoT solutions in addressing real-world challenges such as grid resilience, energy efficiency, and renewable energy integration. These discussions will focus on collaborative pilot projects, tailored use cases, and mutual learning opportunities.
- **Facilitating Knowledge Exchange through Workshops:** Organizing targeted workshops and knowledge-sharing events at regional levels to present findings from the six pilot sites. These events provide a platform for stakeholders to review pilot results, share insights, and offer feedback on the replicability and scalability of HEDGE-IoT solutions.
- **Engaging Stakeholders through General Assembly Meetings:** GAs can have a pivotal effect for advancing the project's exploitation efforts and ensuring strategic alignment. Partners will establish a unified focus on aligning technical developments, pilot activities, and stakeholder engagement with market needs and will evaluate early pilot outcomes, refine the exploitation roadmap, and emphasize scalability and market impact.

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These efforts are instrumental in ensuring that HEDGE-IoT outcomes are not only technically robust but also aligned with the needs and expectations of the broader energy ecosystem, paving the way for impactful and sustainable exploitation.

3.3.3 MARKET ANALYSIS

The HEDGE-IoT project is uniquely positioned at the convergence of IoT and energy markets, both of which are experiencing rapid growth and innovation. Below an updated market analysis is presented, enriched with quantitative insights to contextualize the project's opportunities and potential impacts.

- IoT adoption in the EU has been steadily growing, with 29% of enterprises utilizing IoT technologies in 2021[6]. Among these, 30% employed IoT for energy consumption management, such as through smart meters and smart thermostats. The adoption of IoT for energy management was particularly prominent in the accommodation sector (48%) and real estate activities (45%). Geographically, Austria led with over 50% of enterprises employing IoT solutions, followed by Slovenia (49%), Finland, and Sweden (both 40%). Conversely, lower adoption rates were observed in Romania (11%), Bulgaria (15%), and Estonia (17%).[7]
- The EU has demonstrated a strong commitment to integrating AI into various sectors, including energy. In 2020, investments in AI ranged between €12.7 billion and €16 billion, reflecting a growth rate of 20-28% from the previous year. This investment trajectory aligns with the EU's objective to reach €20 billion in annual AI investments by 2030.[8] AI applications in energy management encompass predictive maintenance, fault detection, and energy demand forecasting, all aimed at enhancing the performance and reliability of energy infrastructure. [9]
- The EU is actively pursuing the digital transformation of its energy systems to improve efficiency and sustainability. The "Digitalization of the energy system" action plan outlines key initiatives, including the establishment of the Smart Energy Expert Group (SEEG) to guide the sustainable digital transformation of the energy sector.[10] Additionally, the EU's energy statistical pocketbook indicates that the share of renewable energy in the energy mix rose to 25% in 2022, up from 19% in 2021, underscoring the progress in integrating digital solutions to support renewable energy adoption. [11]
- The EU's regulatory framework is conducive to the digitalization of the energy sector. The "Digitalization of the energy system" action plan emphasizes the development and deployment of smart energy solutions aligned with the goals of the twin green and digital transition. Furthermore, the EU energy statistical pocketbook provides comprehensive data

[6] https://www.eca.europa.eu/en/publications?ref=sr-2024-08
[7] https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20220609-1
[8] https://ai-watch.ec.europa.eu/publications/ai-watch-estimating-ai-investments-european-union_en
[9] https://ses.jrc.ec.europa.eu/ai-and-energy-sector
[10] https://energy.ec.europa.eu/topics/energy-systems-integration/digitalisation-energy-system_en
[11] https://energy.ec.europa.eu/news/eu-energy-figures-statistical-data-eu-energy-sector-2024-10-14_en

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to inform policy decisions, highlighting the increasing share of renewable energy in the energy mix.

The convergence of IoT and AI within the EU's energy sector presents a fertile landscape for the HEDGE-IoT project. With robust investments, supportive regulatory frameworks, and a clear trajectory toward digitalization and sustainability, the project is well-positioned to contribute to and benefit from the ongoing transformation of Europe's energy systems.

This and other themes will be further detailed and developed during Year 2.

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4 STANDARDIZATION

Standardization is one of the pillars of HEDGE-IoT. The project has two main objectives on this topic. Firstly, to make sure that the project is aligned with already published and/or currently under development standards. Secondly, to contribute to new standardization activities based on project results. For this, the project will identify the relevant results and patterns that respond to actual needs and create have added value for stakeholders in the standardization ecosystem.

The implementation of standardization-related activities has not yet started, as this task is foreseen to be initiated on M12. This chapter outlines the high-level strategic approach for standardization for the project lifespan.

4.1 STRATEGY

The strategy of HEDGE-IoT will be driven by partners with extensive experience in standardization, actively contributing to and often leading initiatives in this area. The main idea behind the HEDGE-IoT strategy is to start working on standardization in early stages of the project to integrate this aspect into each task and ensure proper contributions. Hedge-IoT partners were already deeply involved in standardization efforts before the project began and will remain engaged afterwards.

Hedge-IoT strategy to make sure that the project is aligned with standardization could be split into the following two main elements:

- **Identification of the relevant standards and standardization groups** will be achieved at the beginning of the task. The selected standards will be then linked to the corresponding tasks of the projects to ensure alignment when possible.
- **Continuous alignment with standardization all along the project**. Follow standardization activities, new standardization projects as well as project activities to identify alignment needs. Keep track of the partners' involvement and their contribution.

Hedge-IoT strategy to contribute to standardization based on project results could be split into the following elements:

- For each project results, identify what could be the contribution to standardization could be as well as the relevant Standardization Developing Organizations (SDOs). To achieve this, it is important to identify small modules also called patterns which are relevant for contributing to standardization. A pattern is a characteristic arrangement of modules, recognized as good practice for solving a problem. It describes a generic solution that can be reused.
- While contributing to standards development, disseminate project results when it is relevant to support the content.

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4.2 TARGETED SUBJECTS AND GROUPS

HEDGE-IoT scope is very large in terms of technical subjects. The following ecosystems were identified as relevant:

- Energy and Smart Grid
- Artificial intelligence
- Edge/cloud computing
- Data spaces
- Interoperability
- Data
- IoT
- Digital twin
- Privacy
- Security
- Trustworthiness
- Architecture

Here is the first list of standardization groups to be targeted:

- CEN-CENELEC JTC21 Artificial Intelligence
- CEN-CENELEC-ETSI CG (Coordination Group) on SG (Smart Grids)
- IEC SyC (System Committee) Smart Energy
- ISO/IEC JTC1 SC27 Information security, cybersecurity and privacy protection
- ISO/IEC JTC1 SC42 Artificial Intelligence
- ISO/IEC JTC1 SC41 Internet of Things and digital twin
- ISO/IEC JTC1 SC32 Data management and interchange
- ISO/IEC JTC 1 SC 7 Software and systems engineering
- ISO/IEC JTC1 SC38 Cloud computing and distributed platforms
- ETSI SmartM2M (Smart Machine-to-Machine Communications)
- BRIDGE Standards user group
- ISO/IEC JTC 1 WG 13 Trustworthiness

This list is not exhaustive and will be updated throughout the project based on the HEDGE-IoT scope and results.

4.3 STANDARDS OVERVIEW BY TOPICS

The following Figure 15: , Figure 16: Standardization Perspective on Privacy (created and presented by Antonio Kung (Trialog) to a DIM meeting), **Σφάλμα! Το αρχείο προέλευσης της αναφοράς δεν βρέθηκε.**, and **Σφάλμα! Το αρχείο προέλευσης της αναφοράς δεν βρέθηκε.** provide an overview of some relevant standards considering HEDGE-IoT scope. Some of the depicted standards are still under development.

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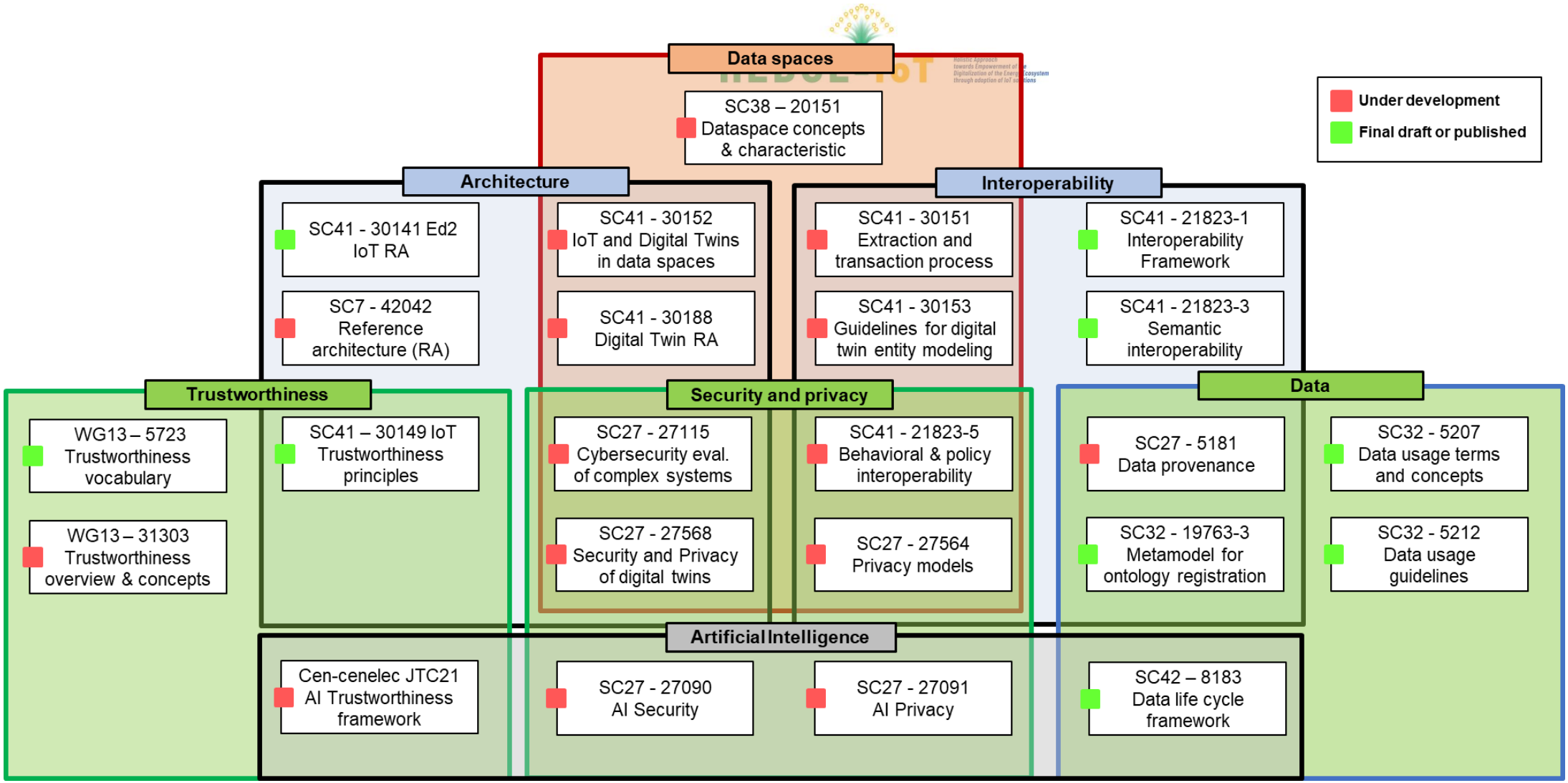

Figure 15: Standardization Perspective on Data Ecosystem (created and presented by Antonio Kung (Trialog) to a DIM meeting)

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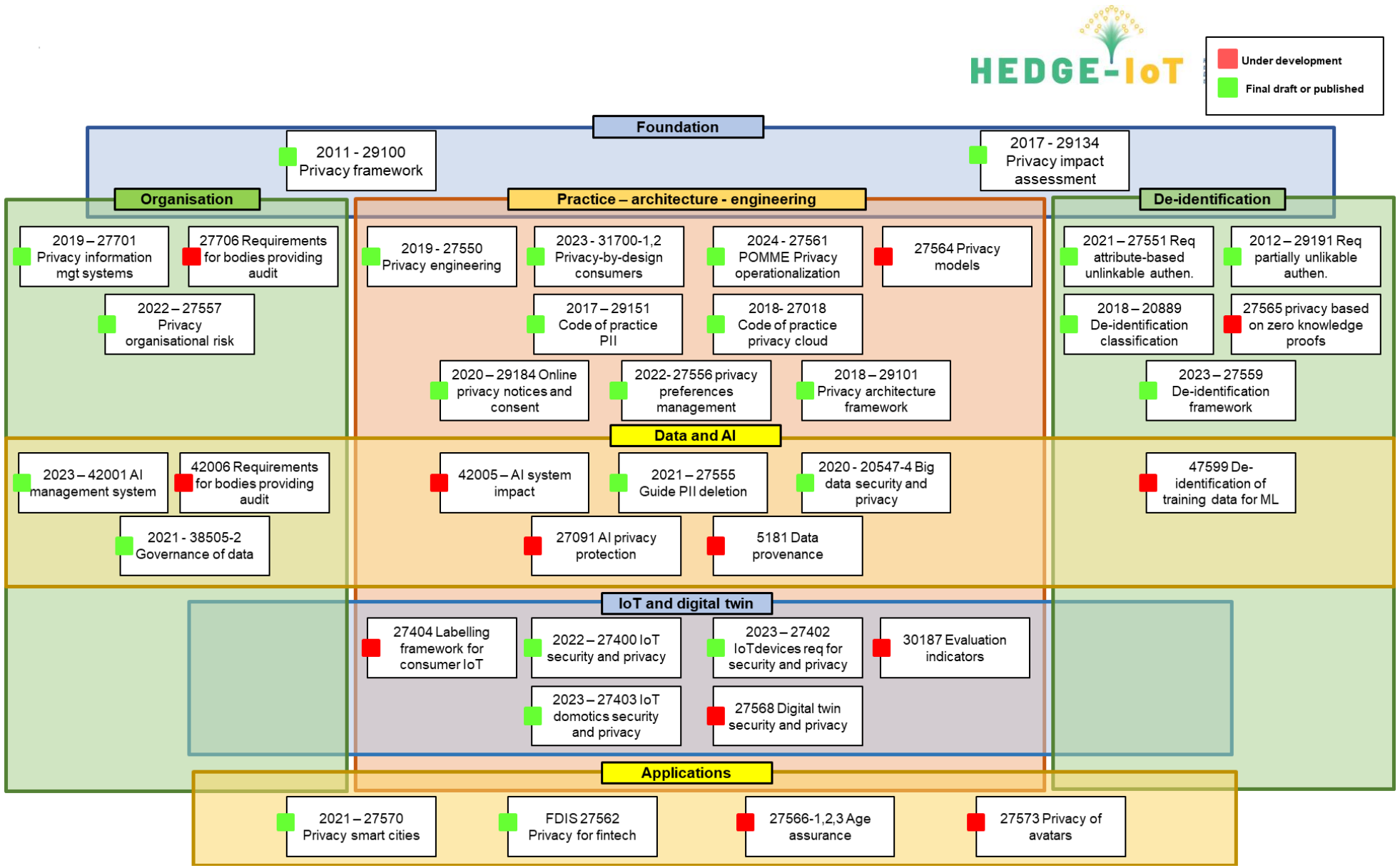

Figure 16: Standardization Perspective on Privacy (created and presented by Antonio Kung (Trialog) to a DIM meeting)

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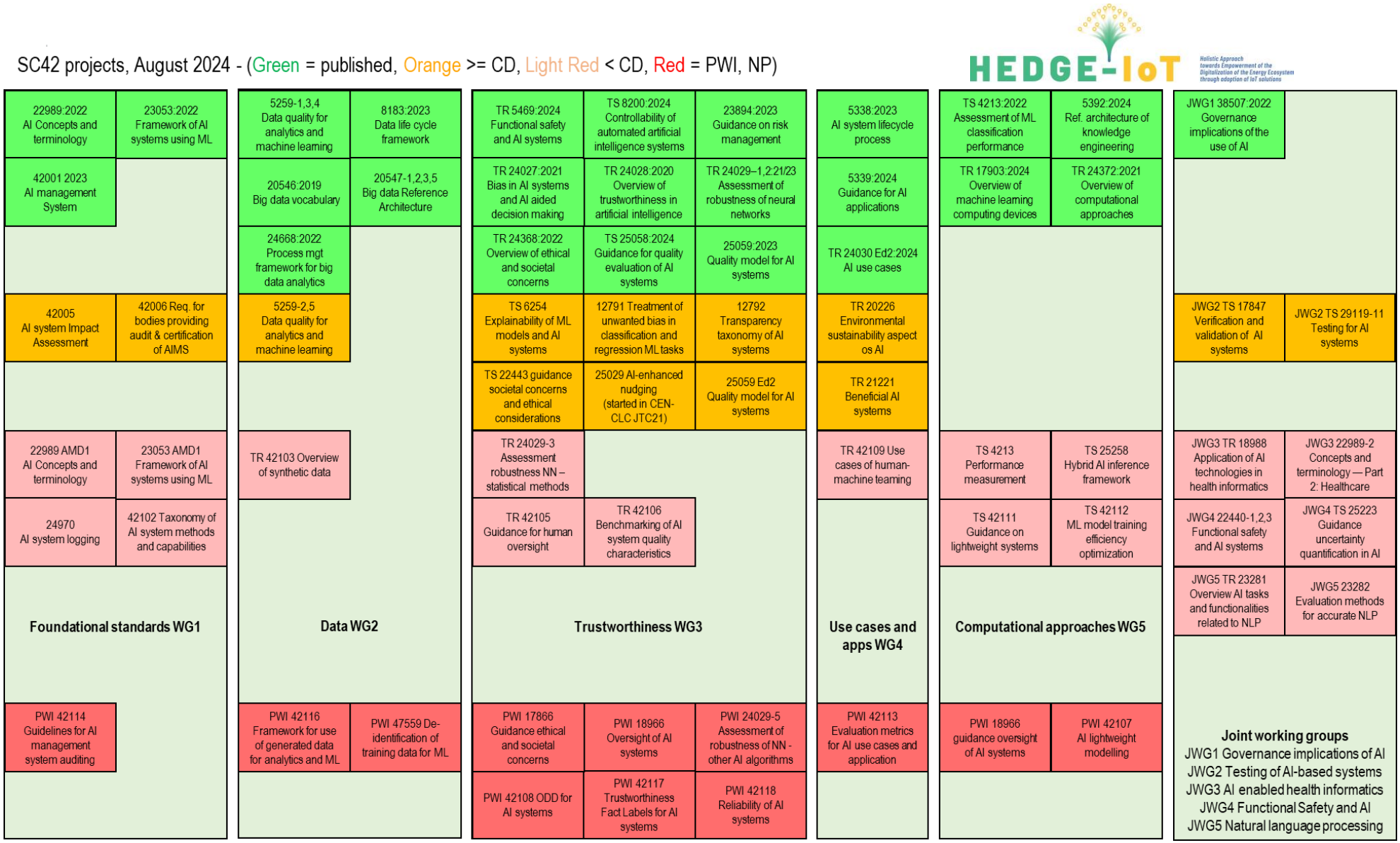

Figure 17: Standardization Perspective on AI (prepared by Antonio Kung (Trialog) in the context of the SC27 and SC42 liaison)

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Trustworthiness related projects, March 2024 (Green = published, Orange >= CD, Light Red < CD, Red = PWI, NP)

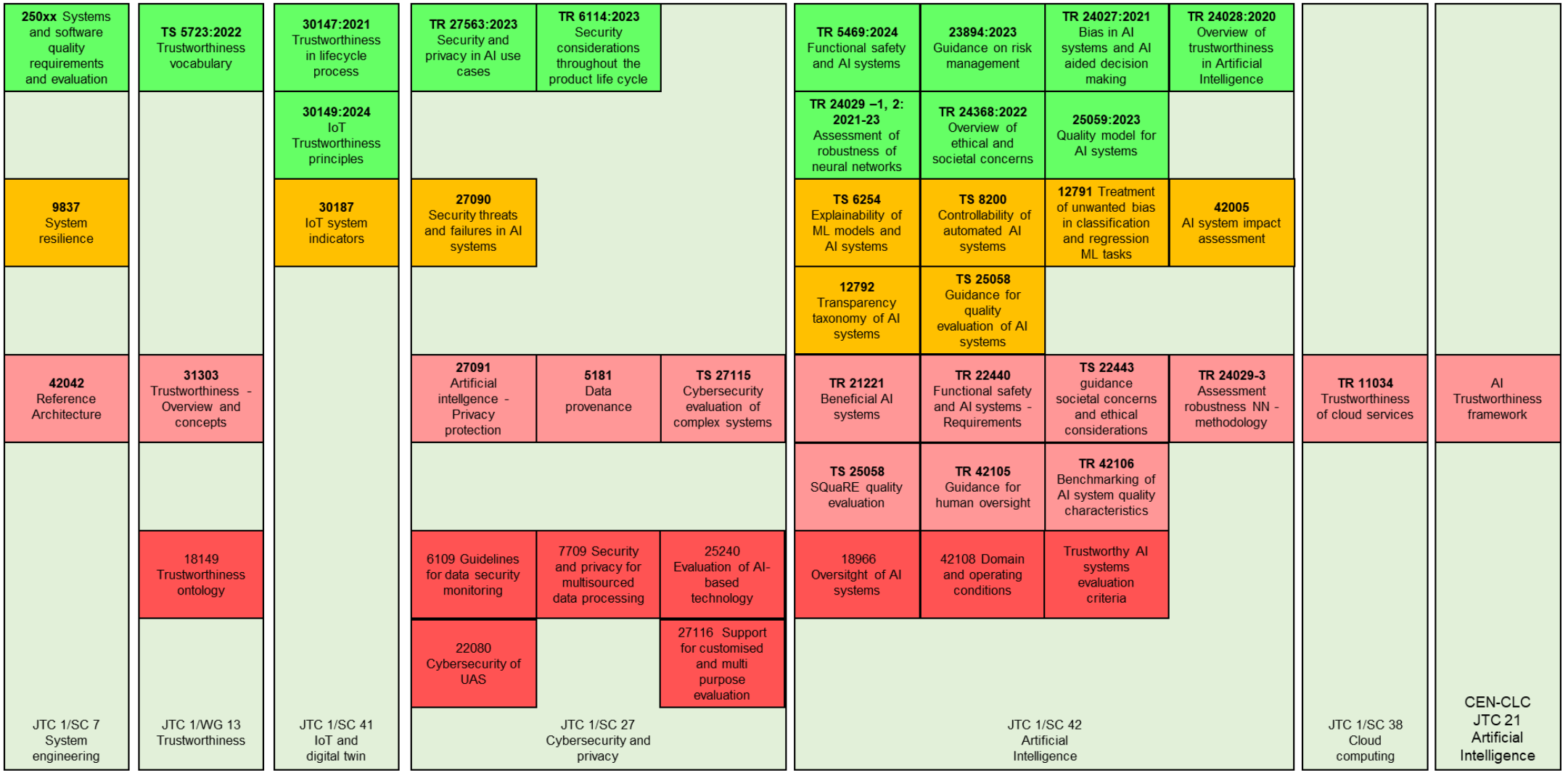

Figure 18: Standardization Perspective on Trustworthiness (prepared by Antonio King (Trialog) in the context of a standardization meeting)

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5 COMMUNITY BUILDING AND STAKEHOLDER ENGAGEMENT

This section outlines the community-building and stakeholder engagement strategies and activities undertaken by the HEDGE-IoT project during its first year, including plans for the upcoming year. These efforts aim to foster collaboration, knowledge sharing, and alignment with other projects and initiatives, thereby strengthening the European ecosystem for energy and IoT innovation.

5.1 STRATEGY FOR YEAR 1

The primary strategy for Year 1 included mainly the identification of the focus pillars identifying and engaging with relevant projects and European initiatives aligned with the goals of HEDGE-IoT. Key elements included:

- **Collaborating with ODEON:** Leveraging ODEON's innovations in decentralized energy systems and edge intelligence, including its Cloud-Edge Data and Intelligence Platform and P2P energy trading solutions, to align efforts on federated energy ecosystems. ODEON is the sister project of HEDGE-IoT. Both projects were funded under the same call.
- **Participating in the BRIDGE Initiative:** Engaging in Working Groups (WGs) to align with best practices in data management, regulatory frameworks, customer engagement, and business models for IoT-enabled energy systems.
- **Engaging with AIOTI:** Aligning HEDGE-IoT's efforts with AIOTI's Reference Architecture and standards for security, interoperability, and scalability in IoT deployments.
- **Integration with CEEDS Projects:** Collaborating with projects such as Int:NET, OMEGA-X, and Enershare to develop federated energy data spaces that support secure data sharing and stakeholder empowerment.
- **Collaborating with MetaOS for the Edge Projects:** Engaging with projects like Nemo, AerOS, and Nephele to explore advanced orchestration tools and edge computing solutions for scalable IoT systems.
- **Engaging with Swarm Projects:** Connecting with initiatives like OASEES and OpenSwarm to adopt decentralized programmability and real-time network optimization for collaborative IoT systems.
- **Participating in CSAs:** Collaborating with CSAs such as UNLOCK-CEI and Open Continuum to support cloud-edge-IoT integration, enhancing market readiness and interoperability.
- **Aligning with CEF Digital ODPs and collaborating with the TEF for the energy sector:** Identifying synergies in retrofitting energy infrastructures with digital capabilities to support scalable and secure IoT systems. HEDGE-IoT will liaise with TEF projects in order to exploit the knowledge generated.
- **Creating TwinEU synergies**: Drawing from TwinEU's digital twin ecosystem to enhance real-time data sharing, adaptive operations, and resilience in energy systems.

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The overarching goal was to establish a network of stakeholders for continuous experience exchange, leveraging their expertise to advance HEDGE-IoT's objectives while contributing to broader European energy and IoT goals.

The following subsections are an overview of key projects and initiatives identified for collaboration, which are relevant to HEDGE-IoT:

5.1.1 ODEON

The ODEON project [1] addresses Europe's need for a decentralized, renewable energy-based, and resilient infrastructure by integrating renewable energy sources across electricity, transport, and building sectors. It creates a data-driven ecosystem that empowers stakeholders like DSOs, LECs, prosumers, and energy market participants to actively contribute to the energy transition. Key innovations include a Cloud-Edge Data and Intelligence Service Platform for federated energy data spaces, a Catalogue of AI Artefacts for optimizing energy operations, and tailored services to promote network resilience, self-consumption, and P2P energy trading. Demonstrated across five countries, ODEON's scalable solutions aim to reduce peak demand, network losses, and carbon emissions while enhancing energy efficiency and data transparency.

As a sister project to HEDGE-IoT, ODEON shares its goals of decentralized energy management and edge intelligence, leveraging IoT, AI, and edge computing to create interoperable and sustainable energy ecosystems aligned with Europe's green and digital transitions.

5.1.2 THE BRIDGE INITIATIVE

The BRIDGE Initiative [2] is a European Commission-supported program designed to foster collaboration and knowledge exchange among projects funded under Horizon 2020 and Horizon Europe. Its overarching goal is to advance the transition toward a low-carbon energy system in Europe through a collective approach to innovation and problem-solving.

Key objectives of the BRIDGE Initiative include:

- **Facilitating cooperation**: Acting as a collaborative platform for sharing experiences, best practices, and lessons learned among projects to avoid duplication of efforts and foster synergies.
- **Knowledge sharing**: Disseminating results and findings to a broader audience, including policymakers, industry stakeholders, and the public.
- **Addressing cross-cutting issues**: Tackling common challenges such as regulatory barriers, consumer engagement, data management, and new technology integration.
- **Supporting policy development**: Informing and shaping European energy policies and regulations with insights and recommendations derived from project outcomes.
- **Promoting innovation**: Encouraging the adoption of innovative solutions and technologies to achieve the European Green Deal's objective of climate neutrality by 2050.

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BRIDGE operates through four Working Groups (WGs):

1. **Data Management**: Focuses on interoperability, privacy, and cybersecurity in energy project data sharing.
2. **Regulation**: Examines regulatory frameworks to facilitate the integration of innovative energy technologies.
3. **Customer and Citizens Engagement**: Develops strategies to involve consumers in the energy transition.
4. **Business Models**: Explores sustainable economic frameworks for the widespread adoption of energy innovations.

BRIDGE's collaborative ecosystem provides HEDGE-IoT with access to a network of expertise and best practices. By participating in its WGs, HEDGE-IoT can contribute to and benefit from insights into IoT-enabled energy systems, enhancing its solutions for data management, citizen engagement, and regulatory compliance.

5.1.3 AIOTI

The Alliance for AI, IoT and Edge Computing Innovation (AIOTI) [3] is a collaborative initiative dedicated to defining a standardized Reference Architecture for IoT systems and deployments. This framework provides reusable interfaces and structures, streamlining the integration and implementation of IoT solutions. AIOTI also plays a critical role in harmonizing established standards and protocols, ensuring consistency and efficiency across the IoT ecosystem.

In addition to its Reference Architecture, AIOTI addresses key architectural considerations essential for effective IoT deployments. These include interoperability, data security, privacy, edge and cloud computing, virtualization, data marketplaces, and big data analysis. By incorporating these elements, AIOTI ensures that IoT systems are not only efficient and scalable but also secure and aligned with market demands. The AIOTI Working Group (WG) on Standardization, including its expert group on semantic interoperability, and the WG on Energy are especially relevant for the Hedge-IoT project.

5.1.4 CEEDS DIGITAL EUROPE DEPLOYMENT

The Common European Data Spaces (CEEDS) [4] initiative is central to the European Commission's strategy to harness the potential of data for innovation and economic growth. By establishing secure, interoperable, and privacy-preserving environments, CEEDS facilitates the pooling, accessing, sharing, and reusing of data across strategic sectors, including energy. This unified framework, supported by robust data governance mechanisms, enables stakeholders to derive value from their data while adhering to EU regulations on personal data protection, consumer rights, and competition.

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In the energy sector, CEEDS plays a transformative role by integrating renewable energy sources, optimizing grid management, and enabling advanced energy services. Projects like Int:NET, OMEGA-X, and Enershare exemplify how CEEDS fosters collaboration among stakeholders through secure and scalable data exchange platforms. These energy data spaces promote transparency and trust across the energy value chain, supporting innovation in demand-response systems, energy marketplaces, and decentralized energy management. The interoperability and governance frameworks provided by CEEDS ensure that diverse energy data sources are effectively leveraged to accelerate Europe's energy transition and decarbonization goals.

5.1.4.1 HORIZON EUROPE PREPARATION ACTIONS FOR THE COMMON EUROPEAN ENERGY DATA SPACE (CEEDS)

Int:NET [5]: Establishes the Interoperability Network for Energy Transition, uniting stakeholders to develop standardized, cross-domain energy services. It includes a FAIR knowledge platform and assessment methodologies to harmonize energy services, fostering consensus among regulatory and standardization bodies

Omega-X [6]: Creates a federated Energy Data Space for secure, sovereign, and scalable data sharing across the energy sector. It implements a data and service marketplace aligned with European standards, enabling stakeholders to leverage diverse datasets for AI-driven innovation and service enhancement

ENERSHARE [7]: Develops a Common European Energy Data Space to support the digitalization and decentralization of energy systems. It defines a Data-Driven Reference Architecture aligned with FIWARE, IDSA, and GAIA-X standards, ensuring interoperability and trust across the ecosystem.

5.1.5 METAOS FOR THE EDGE PROJECTS

NEMO [8]**:** NEMO establishes itself as the gamechanger of the AIoT-edge-cloud continuum by introducing an open source, modular and cybersecure meta-operating system, leveraging on existing technologies and introducing novel concepts, methods, tools, testing and engagement campaigns. This project will bring intelligence closer to the data and make AI-as-a-Service an integral part of network self-organisation and micro-services execution orchestration. Its widespread penetration and massive acceptance will be achieved via new technology, pre-commercial exploitation components and liaison with open-source communities.

aerOS [9]**:** The project will deliver common virtualised services to enable orchestration, virtual communication (network-related programmable functions), and efficient support for frugal, explainable AI and creation of distributed data-driven applications. aerOS will be based on continuum infrastructure elements like smart devices, tiny/far/near edge computing nodes, and public/private clouds (including virtual services and NetApps), providing scalable and secure access to applications and services while keeping its data autonomy. The solution will be generic and directly applicable to any vertical, cross-vertical business process, and several different physical or virtual platforms.

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Nephele [10]**:** The NEPHELE project aims to revolutionize IoT-edge-cloud orchestration by enabling efficient, reliable, and secure end-to-end management of hyper-distributed applications. Through its innovative IoT and edge computing software stack, NEPHELE ensures device-independent virtualization and interoperability without middleware, while its synergetic meta-orchestration framework coordinates cloud and edge computing platforms using a "system of systems" approach. Demonstrated in diverse use cases such as smart energy management, disaster response, and remote healthcare, NEPHELE's solutions leverage 5G and distributed AI technologies to break barriers in openness and automation, aligning with HEDGE-IoT's goals of seamless edge intelligence integration.

FluiDOS [11]**:** FluiDOS will deliver a fluid, dynamic, scalable, and trustworthy computing continuum, spanning across devices and unifying edge and cloud in an energy-efficient manner. This project will build on consolidated operating systems and orchestration solutions, resource sharing in the computing continuum, AI-based optimization for cost and energy, and a zero-trust paradigm to enable an open, collaborative ecosystem that will support European digital autonomy. Stakeholders will be involved through pilots and demonstrators in the fields of agriculture, energy, and logistics, challenging the project's ability to adapt to different environments and operating conditions, showcasing its true innovation potential.

ICOS [12]**:** This project will cover challenges of the IoT-edge-cloud paradigm, proposing an approach to embed a set of functionalities, defining an IoT-Cloud Operating System (ICOS). Its aim is to design, develop and validate a meta-operating system by addressing the challenges of device volatility and heterogeneity, continuum infrastructure virtualization and diverse network connectivity, optimized and scalable service execution and performance, as well as resources consumptions. It will also cover security, privacy, and trust, and reduce integration costs and effective mitigation of cloud provider lock-in effects, in a data-driven system built on openness, adaptability, data sharing and a future edge market scenario for services and data.

NebulOuS [13]**:** NebulOuS will contribute to research in cloud and fog computing brokerage, by introducing advanced methods to enable secure and optimal application provisioning, resource adaptation and reconfiguration. It will contribute to the cloud computing continuum through the development of a meta-operating system and platform to exploit edge and fog nodes, in conjunction with multi-cloud resources, to cope with requirements posed by low latency applications.

5.1.6 SWARM PROJECTS

OASEES [14]**:** Develops an open-source, secure, and decentralized programmability framework for edge devices, leveraging AI/ML accelerators like FPGAs, spiking neural networks, and quantum computing. It addresses challenges in managing distributed infrastructures and ensures secure data handling through a privacy-preserving Object ID federation process

TaRDIS [15]**:** Simplifies the development and management of heterogeneous swarms and decentralized systems by introducing an event-driven, language-independent programming model with built-in distribution abstractions and decentralized machine learning primitives. It emphasizes

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correctness-by-design principles and develops decentralized algorithms and runtime protocols to support its programming model.

P2CODE [16]**:** Aims to create a secure, open, and trusted IoT-to-edge-to-cloud compute continuum, unlocking the full potential of edge intelligence. By developing an innovative programming platform, P2CODE enables dynamic and efficient deployment of collaborative applications across heterogeneous infrastructures. With applications in logistics, utilities inspection, worker assistance, and public protection and disaster relief (PPDR), the project drives advancements in edge computing, fostering seamless interoperability, scalability, and reliability in diverse operational environments.

Open Swarm [17] [18]**:** Aims to revolutionize low-power wireless technology by developing collaborative and distributed smart nodes that balance high-quality communication with energy efficiency. It focuses on efficient networking, energy-aware AI, and swarm programming, enabling advanced swarms of smart nodes to address complex challenges in sectors like renewable energy, environmental monitoring, health, and mobility.

SmartEdge [19]**:** Focuses on achieving dynamic, decentralized edge intelligence with an emphasis on reliability, security, privacy, and scalability. It utilizes a semantic-based interplay of edge devices, enabling real-time distribution of autonomous intelligence swarms across diverse sensors and devices. The solution includes a low-code programming environment with tools for seamless device interaction, real-time swarm networking, and multimodal stream fusion across the edge-cloud continuum.

5.1.7 COORDINATION AND SUPPORT ACTIONS

The Coordination and Support Actions (CSAs) play a pivotal role in advancing the European Cloud-Edge-IoT (CEI) Continuum by fostering collaboration, innovation, and interoperability across the ecosystem. These CSAs—UNLOCK-CEI, Open Continuum, NexusForum.EU, and CEI-Sphere—address both supply and demand challenges, facilitate stakeholder engagement, and promote the adoption of cutting-edge technologies. Together, they provide the foundation for a cohesive European computing ecosystem, enhancing strategic autonomy, interoperability, and long-term innovation.

UNLOCK-CEI: This project accelerates the deployment of the Cloud-Edge-IoT (CEI) continuum by assessing Europe's current CEI demand, defining market scenarios, and developing a CEI Readiness Framework. It fosters a CEI Industry Constituency to aggregate demand needs and identify adoption drivers, enhancing market readiness and innovation in demand value chains.

Open Continuum: Supporting the CEI ecosystem, Open Continuum addresses the supply side by promoting strategic autonomy through open-source technologies and standards. It fosters a European industrial open ecosystem, maps the supply-side landscape of the computing continuum, and engages EU industrial and research actors to build an interoperable cloud-edge-IoT ecosystem.

NexusForum.EU: This project consolidates European research, innovation, and regulatory activities within the Cognitive Computing Continuum. It aligns research priorities with EU policies,

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fosters collaboration between scientific communities, industry, and standardization organizations, and facilitates international engagement, particularly with Japan and South Korea.

CEI-Sphere: Launched in 2024, CEI-Sphere addresses emerging CEI challenges through Large-Scale Pilots (LSPs). It establishes inter-LSP cooperation by creating "Spheres" around key sectors, fostering interoperability, and promoting collaboration. The project supports market insights, enhances privacy-preserving open-edge ecosystems, and develops toolkits with standards and certification frameworks to ensure scalable solutions.

5.1.8 CEF DIGITAL OPERATIONAL DIGITAL PLATFORMS

The CEF Digital Operational Digital Platforms (ODPs) initiative, part of the European Commission's Connecting Europe Facility – Digital (CEF Digital) [20] program, aims to modernize Europe's energy networks by integrating cross-border digital capabilities. This initiative supports the EU's environmental, energy, and digitalization goals by enabling a secure Internet of Energy. ODPs function as ICT resources that facilitate the flow, storage, processing, and analysis of energy data, integrating with existing and emerging European data, cloud, edge computing, and connectivity infrastructures. The implementation follows a two-phase approach: an initial Coordination and Support Action (CSA) launched in 2022 with a €4 million budget, and a subsequent works phase anticipated in 2024, focusing on deploying the necessary digital infrastructure. By bringing together stakeholders from digital and energy sectors, the ODPs initiative supports a secure, interoperable, and efficient digital framework for Europe's critical energy networks.

HEDGE-IoT will establish close connections and collaboration with the EnerTEF project that kicked-off in November 2024, exploiting the fact that ICCS (a core partner in HEDGE-IoT) is the coordinator of the EnerTEF project, while ED (the coordinator of HEDGE-IoT) is also a core partner in EnerTEF.

5.1.9 TWINEU

The TwinEU project [21] leverages Digital Twin (DT) technology to create a federated ecosystem of interoperable solutions, addressing Europe's need to accelerate energy transition and build resilient energy systems. By enhancing grid reliability, cybersecurity, and flexibility, TwinEU supports renewable energy integration, reduces operational costs, and fosters innovative business models. With deployment across 15 European countries, the project aligns with the REPowerEU framework, delivering scalable solutions for a sustainable, low-carbon energy future.

TwinEU's strategic objective is to develop a pan-European digital twin ecosystem, enabling real-time, collaborative, and adaptive representations of energy systems. Its federated approach allows operators, including transmission and distribution system operators and market players, to implement tailored DT solutions while ensuring interoperability.

The project emphasizes innovation across several critical areas:

- **Interoperable DT Architectures:** Ensures reusable, scalable, and interoperable DT implementations to avoid fragmented solutions.

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- **Adaptive DT Systems:** Develops closed-loop adaptive DTs that synchronize with real-world assets, self-learn, and autonomously optimize operations.
- **High-Performance Computing (HPC) Integration:** Enables scalable simulations and real-time decision-making through advanced AI and HPC capabilities.
- **Metaverse-oriented Immersive DTs:** Utilizes XR technologies for immersive environments to enhance asset planning and operational workflows.

5.2 ACTIVITIES IMPLEMENTED IN YEAR 1

During the first year of the HEDGE-IoT project, significant progress was achieved on key collaborations with sister and other relevant projects, active participation in BRIDGE and AIOTI initiatives, and initial synergies with CEF Digital platforms, setting the stage for deeper engagement and alignment with Europe's energy and IoT objectives. The activities are outlined in the subsections below.

5.2.1 PARTNERSHIPS AND COLLABORATIONS WITH PROJECTS:

ODEON: HEDGE-IoT and ODEON established a close partnership through mutual participation in their respective Kick-Off Meetings (KOMs). Both projects provided brief presentations to introduce their objectives, methodologies, and potential synergies. These exchanges facilitated a shared understanding of their complementary focuses on federated ecosystems and edge intelligence, laying the groundwork for future collaboration in advancing Europe's energy transition goals.

CEEDS projects: HEDGE-IoT actively collaborated with CEEDS projects by participating in a joint session during ENLIT 2024 in Milan. This session, organized by Int:Net and the Data Space Cluster projects, provided a platform to showcase HEDGE-IoT's objectives while exploring synergies in federated data spaces. Additionally, HEDGE-IoT contributed to the Energy Data Space Cluster Meeting held in Brussels in January 2024. During this meeting, the project team presented its approach and engaged in discussions with other stakeholders, fostering connections and aligning with broader European data-sharing initiatives.

META-OS and Swarm projects: In April 2024, HEDGE-IoT participated in a physical workshop organized by the META-OS projects cluster in Brussels. The workshop provided an opportunity for HEDGE-IoT to present its vision and contributions, as well as to engage in discussions on advanced orchestration tools and edge-cloud continuum solutions. While no direct activities have yet been undertaken with the Swarm projects, HEDGE-IoT recognizes their potential for future collaboration and plans to establish connections in the coming phases of the project.

Twin-EU: HEDGE-IoT shares several common partners with TwinEU, which has helped establish a strong relationship between the two projects. While no concrete joint activities have occurred yet, discussions are underway to identify areas of collaboration. This partnership holds significant promise for aligning efforts in leveraging digital twin ecosystems for data sharing and adaptive operations, with planning for future engagement already in motion.

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5.2.2 PARTNERSHIPS AND COLLABORATIONS WITH INITIATIVES:

BRIDGE: HEDGE-IoT actively participated in the BRIDGE General Assembly held in Brussels on April 9-10, 2024. This engagement provided a valuable platform to attract visibility and align with the broader plans of the BRIDGE community. In addition, project partners regularly participated in virtual meetings of the BRIDGE Working Groups, contributing to discussions and exchanging insights on key topics such as data management, regulatory frameworks among others. HEDGE-IoT also supported the WGs by responding to surveys, ensuring its perspectives and methodologies were integrated into ongoing collaborative efforts.

AIOTI: Many members of the HEDGE-IoT consortium are active participants in the AIOTI (e.g. RWTH, ICCS, TRIALOG, INESC, TNO), leveraging their involvement to establish strong liaisons with this key initiative. These connections are fostering alignment with AIOTI's frameworks and standards, particularly in areas such as IoT architecture, security, and scalability. This collaboration ensures that HEDGE-IoT benefits from AIOTI's extensive expertise while contributing its own advancements to the IoT ecosystem.

5.2.3 ENGAGEMENT ACTIVITIES AND PLATFORMS

Participation in CSAs: No direct activities with CSAs have been undertaken in the first year. However, the project remains aligned with CSA initiatives and plans to engage in collaborative opportunities as they arise in the subsequent phases.

Synergies with CEF: Efforts to establish synergies with the CEF Digital Operational Digital Platforms are underway. The project will establish close links with the Testing and Experimentation Facility for the Energy sector, particularly through the collaboration EnerTEF Horizon Europe project, which has recently commenced. Active links are being developed via shared consortium partners, laying the groundwork for future collaboration and alignment of objectives. More specifically, ED and ICCS are involved in both projects, ED being the coordinator of HEDGE-IoT and ICCS the coordinator of EnerTEF. These connections aim to strengthen HEDGE-IoT's integration within Europe's broader digitalization efforts in energy systems.

5.3 STRATEGY FOR YEAR 2

In Year 2, HEDGE-IoT will build on the progress made so far by expanding its partnerships, strengthening collaborations, and increasing community engagement. The focus will be on using project results to drive joint activities, share knowledge, and address gaps identified in the first year.

HEDGE-IoT will deepen its partnership with ODEON project by identifying more opportunities for coalitions and collaborative work. Collaborations with CEEDS projects will continue, including more participation in joint events and meetings on federated energy data spaces. Plans are in place to

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work more closely with META-OS and Swarm projects, focusing on orchestration tools and edge intelligence. Early connections with TwinEU will be developed into joint activities, leveraging shared digital twin expertise.

The project will increase its involvement in the BRIDGE Initiative, contributing more actively to Working Groups on data, regulation, business models and consumer engagement. Engagement with AIOTI will also grow, aligning HEDGE-IoT's work with established IoT standards for security and scalability.

HEDGE-IoT will strengthen its links with CEF Digital ODPs, particularly through the EnerTEF project, by contributing to cross-border energy data sharing efforts and distributed processing through federated and ML AI algorithms. The project will also prioritize collaboration with CSAs like UNLOCK-CEI to support cloud-edge-IoT integration.

Year 2 will see the launch of more events, such as webinars and workshops, to showcase results and build connections with new stakeholders. The project will also engage with standardization bodies to align its innovations with broader European goals.

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6 CONCLUSIONS AND RECOMMENDATIONS

In these first 12 months of the project, the DC Plan and materials have been created and many communication activities were implemented, monitored and adjusted. HEDGE-IoT brand and visual identity were strengthened throughout the year and several graphic materials were to accommodate every need communication- and content-wise. These materials were shared among the consortium partners and used across different platforms and events, ensuring that the project would reach out to its stakeholders.

The main tools and channels were defined and have been successfully used during the first twelve months, as is the case of the website, social media channels, and email. These channels have seen a continuous growth over time, meaning that HEDGE-IoT is building a strong, growing community and having an impact on the target ecosystem.

HEDGE-IoT has created a strategy to be close to its audience, mainly through social media and events, ensuring a continuous relationship with its followers and stakeholders. Synergies, partnerships and collaborations with other projects have been initiated and matured over time, particularly with other EU Projects and Initiatives.

A more targeted approach towards stakeholder engagement will be applied in Year 2. As the results start to become public, the focus will be on using those results to drive joint activities, share knowledge, and address gaps identified in the first year. Clustering activities with sector-related initiatives and with other EU Projects will be crucial to promote the understanding of the project's technologies but also the early adoption of the technologies, standards or methods, in full alignment with the upcoming exploitation strategy and the standardization activities.

Through these initiatives, the second year of HEDGE-IoT will see a dynamic blend of continuity and adaptation, positioning the project for even greater reach and impact.

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7 APPENDIX A – KER ANALYSIS PER PARTNER

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Table 4: KER#1 A set of IoT solutions deployed across the energy system offering intelligence at the edge level

Partner	Value proposition	Future exploitation strategy	Target Audience	Synergies with other HEDGE-IoT partners	Synergies with other EU researchers/SEMs	Impact on EU and local/regional policies	Market barriers	IPR measures	Possible Exploitation Risks
ED	The KER creates a technical foundation for future research and development in IoT, AI/ML, and edge computing.	ED can leverage the IoT solutions of HEDGE-IoT in order to incorporate it into existing IoT platforms that ED is developing. It can allow the creation of market-edge intelligent services (e.g. predictive analytics, demand response schemes, etc.)	TSO/DSO, Aggregator, Market Operator, Energy End-Users, Energy Communities, Prosumers, Consumers	Not yet clearly defined. To be explored.	Use the generated knowledge an expertise to attract more clients and to better position ED in future innovation projects	ED can utilize the KER to build federated applications that bridge the edge and cloud layers, contributing to projects focused on the Next Generation Internet (NGI) and the development of European Data Spaces.	Interoperability barriers Scalability limitations Cost sensitivity Return on investment uncertainty Standardization and harmonization	To be defined. Most likely open-source for research purposes, not open-source for commercial purposes	Lack of user engagement and adoption
DST	The HEDGE-IoT solutions developed for the edge level are a critical asset for DST, delivering advanced capabilities for local monitoring and management that significantly enhance energy grid resilience while reducing response times to critical events. These innovations strengthen DST's position in the energy digitalization, empowering the company to offer scalable, interoperable solutions designed to meet the evolving	If applicable, DST plans to use the KER by integrating edge intelligence capabilities into existing products to expand its service offerings, promoting these solutions as key components in energy sector packages, particularly for system operators and local infrastructure managers, while also developing additional applications to address resilience, efficiency, and	The end-users and direct beneficiaries will include: 1) TSO/DSO requiring edge solutions for real-time monitoring and management. 2) Energy communities and aggregators seeking to optimise the local management of distributed resources. 3) Technology companies incorporate IoT solutions into their ecosystems. 4)Regulatory bodies in need of tools for advanced and	DST will collaborate with ED, ICCS, and INESC to integrate the tools that improve intelligence at the airborne level, while working with TNO and other partners to ensure that IoT solutions comply with interoperability standards such as SAREF. In addition, DST will participate in pilot demonstrations to test these solutions in real-world scenarios, supporting pilot	Based on this KER, we may consider participating in other EU projects (yet to be defined and selected) to facilitate further development and collaboration.	At the moment, there are no concrete plan. In case, DST will use the KER in the following ways: 1) Green Deal, DST aims to integrate renewables through IoT tools that improve energy flexibility. 2) EU Digital Strategy, DST will promote interoperable solutions that comply with European standards, advancing the digitalization of energy networks. 3)In regional pilot projects to boost energy resilience and efficiency.	- Lack of awareness among potential users about the added value of edge IoT solutions. - High initial implementation costs for clients, particularly for small businesses and local communities. - Cultural resistance to adopting new technologies from traditional operators.	NDAs will be used to protect know-how and intellectual property during collaborations. Where applicable, licensing agreements will be implemented for third-party use of IoT solutions. Where applicable, patents will be secured for the developed IoT technologies.	- During the project: Difficulty in integrating with existing infrastructures. Mitigation: Conducting in-depth pilot testing with technical partners. - After the project: Ensuring long-term compatibility with evolving infrastructures. Mitigation: Continuous updates and support to maintain integration with new systems. Likehood: medium

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	needs of industrial partners and clients.	advanced energy management needs in new European markets.	compliant energy management.	partners, with a focus on the Italian pilot					
OPR	We aim to validate the effectiveness of the SUMO Edge Dynamic Line Rating (DLR) solution for our customers, including Transmission System Operators (TSOs) like ELES and Distribution System Operators (DSOs) like EG. By testing the feasibility of porting our DLR algorithm and computations to the edge, we can ensure real-time, accurate capacity assessments of overhead lines and transformers. Additionally, we are exploring the integration of this edge-based solution with protective relays to introduce dynamic overcurrent protection capabilities. This enhancement will allow for frequent updates to safe operational limits, thereby improving the reliability and safety of the energy system.	By offering the SUMO Edge DLR device as an additional solution to our customers. Furthermore, we will provide integration options with protection relays, enhancing our product portfolio with dynamic overcurrent protection capabilities. This strategy will not only expand our market offerings but also improve the safety and efficiency of our customers' energy systems.	TSOs, DSOs	The Finnish and Italian demonstrations are also considering the implementation of Dynamic Thermal Rating technology. We plan to collaborate with these partners by providing our SUMO Edge DLR solution to support their initiatives. This collaboration will enhance the overall project outcomes and foster innovation across the HEDGE-IoT network.	If the project is successful, we look forward to advancing our collaboration with our HEDGE-IoT partners in future projects. This will help us achieve a higher Technology Readiness Level (TRL) for our edge solution developed during the HEDGE-IoT project. By leveraging the expertise and resources within our network, we aim to enhance the capabilities and applications of our IoT solutions. This collaborative approach will not only accelerate innovation but also ensure that our solutions are aligned with the latest industry standards and regulatory requirements. Additionally, we plan to explore new EU initiatives	Dynamic Line Rating (DLR) technology inherently supports the objectives of the Green Deal by increasing the safe loading capacity of the existing grid, thereby reducing the need for new power line construction and increasing the hosting capacity for renewable energy sources. This aligns with the EU's goals of promoting sustainability and efficient resource use. Additionally, our DLR solution contributes to the EU Digital Strategy by integrating advanced IoT and edge computing technologies, fostering innovation and digital transformation within the energy sector.	Our market research indicates several potential barriers to the market penetration of our exploitable result. Firstly, Transmission System Operators (TSOs) and Distribution System Operators (DSOs) often prefer sensor less solutions for Dynamic Line Rating (DLR) to minimize the need for extensive hardware installations. This preference is driven by the desire to avoid the significant time and monetary investments associated with hardware-related activities. Additionally, there may be a lack of awareness about the benefits and necessity of our DLR solution, as well as potential resistance from	The background IP was defined in the consortium agreement. IPR Provisions in the Consortium Agreement will be included. New IP (foreground IP) created during the project will be identified and evaluated. Appropriate form of protection (patents, trademarks, copyrights, trade secrets) for each new IP asset will be determined. Possible joint ownership and related commercialization strategies and licensing will be handled in bilateral agreements between involved partners.	One potential risk is the possibility of integration complications with devices at the substation level. These complications could arise due to compatibility issues or the complexity of integrating new technology with existing infrastructure. Mitigation Strategies: - Strict adherence to standards (e.g. IEC 61850) - Conduct thorough compatibility testing with a variety of substation devices before deployment. - Develop detailed integration guidelines Estimated Likelihood: Medium: While integration challenges are common, proactive testing and support can significantly reduce the likelihood of severe issues.

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					and funding opportunities to further support the development and deployment of our edge technologies across various energy systems.		users who are accustomed to traditional methods of operation under the Static Line Rating (SLR).		

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Table 5: KER#2 A service orchestrator to facilitate computational sharing between the cloud and edge levels

Partner	Value proposition	Future exploitation strategy	Target Audience	Synergies with other HEDGE-IoT partners	Synergies with other EU researchers/SEMs	Impact on EU and local/regional policies	Market barriers	IPR measures	Possible Exploitation Risks
TUC	The KER aligns with TUC's cutting-edge research areas of cloud computing, IoT, and sustainable energy systems, enhancing the university's research output, education, and application potential. It offers a foundation for new publications, attracting new research grants, and for new partnerships with energy companies, utility providers, and companies involved in edge computing or IoT.	The exploitation strategy is focused on technology transfer and academic activities. TUC aims to improve the education and capabilities of students concerning edge orchestration in smart grid. TUC plans new courses on edge/fog/cloud computational orchestration within the Computer Science department. In terms of technological transfer of research into the economy, TUC expects to be involved in the future with consultancy activities in the IoT and energy domains contributing to the adoption and advent of edge computing and edge orchestration in smart grid. Finally, it will serve as a foundation for future collaborations with EU partners to scale these innovations.	Energy stakeholders, tech companies, policy makers and researchers.	Future projects on IoT and edge computing and their applications in the energy domain may leverage the service orchestrator to deal with computational task offloading.	Future projects on IoT and edge computing and their applications in the energy domain may leverage the service orchestrator to deal with computational task offloading.	We plan to use the orchestrator in EU-aligned projects to contribute to the digital and green transformation of Europe's energy landscape while securing potential funding and research collaborations. Each new project will offer opportunities for deployment, testing, and scaling, allowing the demonstration of significant impacts on computational continuum smart energy grids and environment.	Regulatory challenges related to the energy domain and computational orchestration toward the edge.	Open-source licensing	Risk: Potential users may lack the technical skills required to manage and maintain a cloud-edge orchestrator. Mitigation: provide training programs and user guides. Risk: integration challenges with existing grid infrastructures. Mitigation: modular design, pilot testing, technical support, etc.

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DST	The KER will facilitate better resource allocation, real-time data processing, and enhanced scalability of IoT solutions. It supports our long-term vision of building flexible, scalable, and interoperable solutions that can adapt to future advancements in cloud and edge computing, improving the efficiency and reliability of energy systems.	DST will explore its use in future EU-funded projects that focus on energy optimisation and digital grid initiatives.	TSO/DSO, Industrial clients	ED, ICCS and INESC to integrate the service orchestrator with advanced tools, enabling smarter resource allocation and real-time analytics across both cloud and edge environments.	DST will may consider participating in other EU where the orchestrator can play a fundamental rolein addressing the growing need for seamless cloud-edge communication in energy networks, offering new opportunities for collaboration in digital grid, renewable integration, and smart city initiatives.	The service orchestrator supports EU and regional policies like the Green Deal and EU Digital Strategy by facilitating renewable energy integration and advancing the digitalization of energy networks, promoting efficient use of computational resources and laying the groundwork for future grid modernisation.	Lack of awareness among potential users about the added value of edge IoT solutions. High initial implementation costs for clients, particularly for small businesses and local communities. Cultural resistance to adopting new technologies from traditional operators.	NDAs will be used to protect know-how and intellectual property during collaborations. Where applicable, licensing agreements will be implemented for third-party use of IoT solutions. Where applicable, patents will be secured for the developed IoT technologies.	- Technological Risk: Integration challenges with existing infrastructure. Mitigation: Extensive pilot testing and collaboration with technical partners. Likelihood: Moderate. - Economic Risk: Slow market adoption due to high initial costs or limited budget for small-to-medium enterprises (SMEs). Mitigation: Offering flexible pricing models such as SaaS or subscription-based services. Likelihood: High, but manageable with targeted marketing and support. - Regulatory Risk: Changes in energy or data privacy regulations could require adjustments. Mitigation: Ongoing monitoring of regulatory developments in the EU and updating solutions as needed. Likelihood: Low, with proactive strategy in place.

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Table 6: KER#3 A set of AI/ML tools for edge and cloud levels towards optimised planning, operation, resilience of interconnected assets

Partner	Value proposition	Future exploitation strategy	Target Audience	Synergies with other HEDGE-IoT partners	Synergies with other EU researchers/SEMs	Impact on EU and local/regional policies	Market barriers	IPR measures	Possible Exploitation Risks
ED	Offering these AI/ML tools positions ED organization as a leader in cutting-edge digital energy solutions, attracting partners and clients in the energy sector.	Offer AI/ML-powered tools as part of turnkey solutions for clients, such as DSOs, TSOs, and energy-intensive industries. Demonstrate leadership in digital transformation for the energy sector.	TSO/DSO, Aggregator, Market Operator, Energy End-Users, Energy Communities, Prosumers, Consumers	Not yet clearly defined. To be explored.	Use the generated knowledge an expertise to attract more clients and to better position ED in future innovation projects	Enhancing Renewable Energy Integration, energy efficiency optimisation, electrification of transport and industry, enable data-driven decision making, digitalizing the enrgy transition and supporting the circular economy	Data availability and quality Lack of trust in AI solutions Computational resource constraints	To be defined. Most likely open-source for research purposes, not open-source for commercial purposes	Integration Complexity Model generalization and adaptability
DST	AI/ML tools enhance decision-making, operational efficiency, and resilience of interconnected assets, supporting DST in delivering scalable and adaptive energy solutions.	Integrate AI/ML tools into existing products to optimise energy management systems. Market tools to energy operators, grid managers, and other stakeholders.	TSO/DSO and energy aggregators	Work with WP3 and WP4 partners to ensure interoperability and compliance with energy industry standards.	Participate in Horizon Europe and other EU initiatives to refine and expand AI/ML toolsets.	Support Green Deal goals by enhancing grid management and renewable integration. Align with the EU Digital Strategy to drive the digitalization of energy infrastructure and meet sustainability goals.	Limited awareness of the advantages AI/ML offers for energy optimisation. Significant upfront implementation costs, particularly for smaller utilities or regional operators. Concerns regarding data privacy when integrating AI/ML tools with	NDAs will be used to protect know-how and intellectual property during collaborations. Where applicable, licensing agreements will be implemented for third-party use of IoT solutions. Where applicable, patents will be secured for the developed IoT technologies.	Technological Risk: Integration challenges with existing systems. Mitigation: Pilot testing and collaboration with partners. Economic Risk: Market resistance due to high costs. Mitigation: Flexible pricing models and user training. Regulatory Risk: Changes in data privacy or AI regulations. Mitigation: Ongoing monitoring of legal

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							sensitive operational information.		frameworks for compliance.
ABB	The developed tools enable DSOs to improve efficiency and reliability of their supply service. This extends ABB's possibilities for new products and services.	ABB will examine the productisation potential of the developed tools and environments as well as identify related future research needs.	The tools are mainly for DSOs but they will, naturally, benefit all the DSO customers through higher reliability of the network (less outages) and increased DER hosting capacity.	Demo Finland is built in close collaboration between ABB, TAU, VTT, JSE and ENERV. The objective is that as large portion of the solutions as possible will remain in operational use after the project in JSE's network which is operated by ENERV.	The tools and the demo area can be utilised in further development activities and possibly also new EU projects.	The results obtained will be widely disseminated to raise awareness of the potential of new functionalities and can also serve as a starting point for new development activities.	It always takes time to raise awareness and gain acceptance of new functionalities. Regulation can also pose some challenges if it does not encourage taking new functionalities into use. The costs naturally are also a significant factor.	Licensable product, patenting where applicable, NDAs in place where needed, keeping selected know-how company secret	Technological risk always exists when developing new solutions. Business cases need to exist before large-scale deployment of new solutions will happen. Regulation should enable using the new functionalities.
VU	As a scientific entity, the added value will consist of developing novel techniques for and insight into the KER's use case and applicability. Future work can build upon the KER, extending and/or otherwise improving it.	If applicable, the KER can be used by others in our organisation for similar use cases or adapted for use in other ones.	The target audience consists of energy grid owners and/or maintainers.	This KER is designed to operate on graph data provided by the TNO's Knowledge Engine.	There are no concrete plans at this point, but, as a scientific and open-source application, the KER will be made available for reuse by our network and future EU projects	As a scientific and open-source application, the KER will be made available for reuse by future EU initiatives.	VU is a scientific partner and does not aim to commercially drive KER's to the market.	Not applicable; the KER will be made available under a permissive license.	The KER will not directly act upon other agents; a human is always kept in the loop to assess and act on the KER's output. An incorrect interpretation of this output can, at most, result in a less efficient operation of an energy grid. All responsibility lies with the human operator.
HSE	By leveraging our existing strengths in cloud technologies, open-source software, and data analytics it enriches our technological capabilities, broadens our market reach, and strengthens our potential for future innovation and	Expand our offerings and enter new markets within the energy sector. We intend to integrate these tools into our existing products and	TSO/DSO, Aggregator, Market Operator, Energy End-Users, Energy Communities, Prosumers, Consumers	Not yet defined	We aim to support co-creation of advanced solutions that address shared challenges in the energy sector. This collaboration will involve knowledge	HSE plans to leverage KER3 in new projects that directly support and advance EU initiatives like the Green Deal and the EU Digital Strategy. Through	High initial costs associated with implementing these technologies might deter organisations, particularly	To be defined	The main potential risk is market acceptance and user resistance. Potential clients may be hesitant to adopt advanced AI/ML solutions due to a lack of awareness or reluctance to change established practices. Mitigation

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	collaboration in the rapidly evolving energy sector	services, enhancing their capabilities and providing added value to our clients. Specifically, we aim to support and enhance the following activities: development of new solutions, enhance existing services, expand market reach, offer consultancy services, participate in future projects and engage in additional research and development initiatives, collaborate with partners to strengthen our network of industry and academic partnerships.			exchange, joint development efforts, and the integration of complementary technologies to enhance the functionality and applicability of related to the KER. Through these partnerships, we intend to participate in future EU initiatives, contribute to standardisation efforts, and foster innovation that supports a more resilient and efficient energy ecosystem across Europe	active participation in EU-funded projects and collaboration with other stakeholders, we intend to exploit our involvement in the development of the KER to support design and implementation of scalable, sustainable solutions that support policy goals at both regional and European levels	smaller enterprises Resistance to change from stakeholders accustomed to traditional methods may result in reluctance to embrace new solutions Concerns over data privacy and security, especially when dealing with sensitive energy infrastructure information, could impede acceptance Integration challenges with existing legacy systems and navigating complex regulatory compliance requirements		strategies include demonstrations and pilot programs to showcase the tangible benefits, thereby increasing acceptance. Another risk involves technological integration challenges with existing systems, which could lead to implementation delays. Mitigation strategies include the development of modular and interoperable solutions, providing thorough documentation, and offering technical support. Regulatory and compliance hurdles, such as adhering to data privacy laws like GDPR, could also impact exploitation. Mitigation strategies include the implementation of privacy-by-design principles and staying updated on regulatory changes to ensure full compliance.
QUE	QUE has already developed a tool which processes and contextualizes IoT data from households and by leveraging machine learning algorithms, it builds a comprehensive profile of the "consumer," capturing the characteristics of the individuals or groups	Deploy, test and fine-tune the incorporated algorithms by applying the solution into various demonstration cases	Energy Market Actors (Utilities and Energy Providers and Retailers), Smart Energy Solution Providers Smart Building Operators and Facility Managers	Not yet defined	Increase the tool's technology readiness level towards transforming it to a commercialized solution and try to use EU R&D funding to support this process	Leverage the KER to optimize household and building energy consumption Implement the KER in projects focused on smart grids and energy communities to	High implementation costs due to the broad IoT infrastructure demanded to capture the necessary information for occupants	To be defined	Competition from Established Players (high) High Implementation Costs (medium) Limited Market Adoption (medium) Dependence on Data Quality (High)

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	residing in a specific building.					support local energy trading and self-sufficiency Reduce carbon footprints by enabling market actors to design carbon-neutral strategies based on extracted insights into energy consumption	profiling Difficulties in adoption (potential users might prefer legacy solutions over innovative solutions) Fragmented market across countries and regions with varying regulations		
UNIZG	The goal of this KER is to develop different AI/ML algorithms that will enable advanced calculations in distribution grids by exploiting the potential of installing IoT devices in secondary substations. The installation of IoT devices will create a lot of new data and measurements and AI/ML algorithms have shown the ability to deal with big data and the challenges it introduces to planning and everyday operation of power systems. The solutions aim to enable new calculations that will allow DSO a better insight into dynamic changes in distribution networks. With ever ever-increasing integration of low-carbon units, it is important to provide a solution that will identify the capacity of installed units and assess how they can contribute to the system's flexibility. Developed AI/ML	The set of AI/ML tools that will be developed within this project can be extended in future. Initial functionalities are designed to work in the defined environment and with data collected in the specific demo-site. However, future work will be oriented towards upgrading the existing algorithms and creating new ones, that will create new opportunities and alleviate emerging challenges power system entities need to face.	DSOs	One of the main goals of the project is to create a set of AI/ML tools, i.e., this will be the specific tasks of many other HEDGE-IoT partners. This enables the exchange of experience and sharing the good practice among the partners. More experience partners can offer guidance and help achieving the set goals.	The experience gained by accomplishing the goals of the KER will be helpful in other projects dealing with the similar problem.	The goal of KER is to develop new AI/ML tools that will be used in planning and operation of new power systems. Such a solution relies on digitalization of the power system and exploits potential of installed IoT devices to address the topics of relevant European regulation and directives such as Green Deal. The main goal of the EU is to ensure an increase in the share of renewable energy, energy efficiency and slow down climate changes. This KER is	The proposed solution is relatively known, and it still has not been widely implemented. Therefore, there might be a lack of awareness of the product need. Also, some potential users might not accept the product in case its importance is not well-presented.	There are not any specific issues regarding IPR in this stage of the project. However, we will closely monitor the situation and clearly define ownership and usage right, sign NDAs and do other similar measures when needed.	The biggest risk is related to integrating IoT devices in the locations that are part of the demo-site. To train and validate the algorithms, it is necessary to ensure the adequate set of measurements collected during a longer period to cover differences in specific time periods. The way to mitigate the risk is to continuously inform about the integration of the status and to maintain the contact with the partner responsible for the IoT devices installation. Also, the solutions will be implemented and tested on a set of data collected on other locations, meaning that the time for modifying the algorithms once dome- site data is available will be shorter.

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	algorithms are oriented towards securing the mentioned functionality.					oriented on ensuring the specified goals and to create opportunities for different entities to play a pivotal role in energy transition.			
JSI	The KERs provide a foundation for scalable solutions that can be adapted and expanded as new requirements and technologies emerge.	By deploying AI/ML models at the edge, we plan to leverage real-time analytics and decision support software, especially in context of DLR and DTR.	Transmission system operators, distribution system operator	Jointly developing and testing AI/ML models with modular architectures that can be easily adapted to different edge or cloud environments.	Jointly developing and testing AI/ML models with modular architectures that can be easily adapted to different edge or cloud environments.	The developed tools will enable the implementation of AI-driven real-time monitoring and analytics of the thermal state of assets, providing decision support for grid planning and optimization, which directly supports EU Green Deal objectives.	Limited Understanding of AI/ML Benefits, lack of available data.	JSI plans to secure its potential intellectual property rights through agreements that specify the ownership and usage terms of the developed solutions.	Weather predictions based solely on local data may lack sufficient accuracy, making them unsuitable for practical applications.

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Partner	Value proposition	Future exploitation strategy	Target Audience	Synergies with other HEDGE-IoT partners	Synergies with other EU researchers/SEMs	Impact on EU and local/regional policies	Market barriers	IPR measures	Possible Exploitation Risks
ICCS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TAU	The added value of KERs is to publish top level articles based on field trials.	Results are a starting point for the future research and demonstration projects at national and EU levels.	DSO, automation system manufacturers	Results will be part of Demo Finland.	Open-source licensing enables utilisation of source codes in all future projects.	As a university TAU is disseminating results in international journals and conferences, national seminars, and promoting ideas by utilising the developed services as a starting point in the future research projects.	The most serious market barrier is that DSOs continue solving their congestion problems with grid expansion instead of utilising flexibility services or flexible contracts.	Planning to publish the source code as an open-source code with MIT license	Development might take more time than expected, or the final implementation in edge computing platform may start later than expected, and therefore not all services are completely ready for the demonstration.
VTT	We are developing fully new competences and functionalities around AI-based anomaly detection and piloting them for the first time. We are gaining new knowledge on the topic, we are educating our researchers on it, we are gaining real-life experience from field tests, and we are discussing the topic with leading European partners. All this enables	We are taking the first steps within this project and assume the solution to be developed further in following projects, including also more business development oriented actions later in the timeline.	End users will be DSOs, grid maintenance operators, distribution management system providers, grid protection and automation system providers	We are closely collaborating with ABB on building the solution. We are piloting the solution together with JSE and ENERVA.	We are looking to expand the approach to different use cases, and we are collaborating on applications of AI for similar purposes.	We are looking to further develop it in forthcoming EU projects.	The need of computational power on the substation level remains a research question, and it might be considered too heavy in terms of monetary investment compared to benefits achieved. However, research is targeting to demonstrate the benefits but also to optimise the computational power usage, and at the same the tehcnology develops	At this point, the research results are open and will be published. At later phase, the actual business development activities will include IPR measures more closely.	Practical feasibility in DSO daily business: the complexity brought by the solution compared with the benefits gained.

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	us to develop this towards service offering in the future.						towards improved capacitites and reduced costs.		
INESC	This digital platform enables all stakeholders in the value chain for energy flexibility to cooperate. INESC TEC provides digital and energy services for several stakeholders. This platform will act as commercial option for customers, but also serves as on e enabler part of a sandbox for energy services and demonstrations.	This KER is exploited in several projects. This result includes plans to make it available as a service in one cloud provider, or directly to clients wishing to explore the concept. Moreover it will remain in use in sandboxes for demonstration.	Energy Aggregators, System Operators, Flexibility Service Providers, ICT providers.	Yes, the PT pilot cluster: CEVE, SONAE, ELERGONE, REN, RDNESTER	This KER Derives already from the HEU BeFlexible project. The work done in HEDGE.IOT contributes to the development of this solution. It will be explored in other EU initiatives, to support the continuous development of this software.	This software is currently working in the limit of regulation. The results in the dimension of the Aggregator role are expected to contribute to validate / shape changes and adjustments to regulation.	Changes to regulation as to allow the real operational conditions of the software.	Dual License agreement. Open source for research purposes and non-open source license for commerial purposes subjecte to licensing agreement.	The existing Business Model Canvas requires adjustments to the inbound cash flows.
TNO	The added value for TNO of having such a set of services is that we may offer this for clients and other stakeholders, such as policy makers and standardisation bodies.	TNO may use this to better position itself for future innovation actions, thus qualifying for more successful bids.	European and national policy makers, industry and in collaborations with RTO's and (applied) science partners.	To be actively explored during the project, this is not yet clearly defined.	To be actively explored during the project, this is not yet clearly defined.	To be assessed at a later stage of the project (e.g. its final year).	TNO is not a private party aiming to commercially drive KER's to the market. IP that is not in the public plane (e.g. being patented) may limit our intention to encourage free and open use of IP generated by us.	Where relevant by patents, however it is more likely that IP will be addressed in public standards for a greater opportunity of adoption.	Possible patent infringements, however at this stage we estimate this risk to be low at this point.
RWTH	Services for data-driven energy management	Integration of selected services into SOGNO platform	SOGNO users	SOGNO platform is already being used in other projects and organisations, and will provide the selected services to them as part of the larger system	SOGNO platform is already being used in other projects and organisations, and will provide the selected services to them as part of the larger system	SOGNO platform is already being used in other projects and organisations, and will provide the selected services to them as part of the larger system	SOGNO currently not specifically laid out for Energy Communities		Very limited risk due to established exploitation within existing platform

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NESTER	The implementation of the market simulator will facilitate the integration of new participants in the ancillary services of the SO.	R&D NESTER intends to continue developing the market simulator (MS) platform in other projects, working as a testbed for new actors to test their strategies and capabilities to participate in ancillary services markets and/or other Flexibility Markets (e.g. local markets for DSOs). R&D NESTER intends to continue developing the MS for additional products and updating it according to the evolving regulations that will applied.	Stakeholders, focused on potential market participants (e.g. Aggregators, FSPs) and SOs (e.g.TSOs)	At least with all the partners participating in the PT pilot: CEVE, ELERGONE, REN and INESC	R&D NESTER intends to continue developing the MS for additional products and updating it according to the evolving regulations that will be applied.	The MS platform can be adjusted to integrate other flexibility market products. Its use can facilitate the testing and deployment of the future flexibility energy solutions in flexibility markets.	Regulatory changes may result in the need to update the rules of MS. But the architecture should be flexible enough to accommodate these changes.	The Consortium Agreement mitigates this risk and, if necessary, additional agreements can be established after the end of the project.	Appearing of similar alternative platform (low probability). Mitigation action: monitor the appearing of similar solutions.
AE	Acea Energia can become a market leader in local flexibility services, in the role of the BSP, promoting efficient energy practices and guaranteeing inclusive and non-discriminatory access to the market, in line with EU policies	Acea Energia will have the opportunity to use the know-how acquired to offer end-user efficient and profitable solutions.	The focus will be the flexibility provided by the Energy Communities (ECs), with attention of vulnerable users	Acea Energia plans to collaborate with HEDGE-IoT partners in the future to adapt and implement best practices across local energy ecosystems.	Acea Energia will engage with other EU researchers and SMEs to exchange knowledge on improving the efficiency of energy communities	Acea energia will lead projects that promote the optimization of energy communities through local flexibility markets, improving energy efficiency that will contribute to EU policy objectives such as carbon neutrality and resilience of the energy system at local and regional level	Currently only a few end USERS have the tools and knowledge to access flexibility markets and lack awareness of the benefits	Standard IPR protection strategy, including patents and licenses, where applicable.	Risk: resistance to participation by end users due to lack of awareness of the benefits. Mitigation: involve and make users aware of the benefits through advertising awareness campaigns.

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Table 8: KER#5 An Open APP repository to Populate EDGE/CLOUD and FOR Level AI/ML Tools for Energy Stakeholders and SOS

Partner	Value proposition	Future exploitation strategy	Target Audience	Synergies with other HEDGE-IoT partners	Synergies with other EU researchers/SEMs	Impact on EU and local/regional policies	Market barriers	IPR measures	Possible Exploitation Risks
ED	Offering an open app repository positions ED as a pioneer in the digitalization of energy systems. The repository will enable ED to collaborate with external developers, academia, and other stakeholders, which can facilitate knowledge exchange and help build a stronger network.	Development and enhancement of proprietary solutions Collaboration with external stakeholders and developers	TSO/DSO, Aggregator, Market Operator, Energy End-Users, Energy Communities, Prosumers, Consumers, Service Providers and developers	Not yet clearly defined. To be explored.	Use the generated knowledge and expertise to attract more clients and to better position ED in future innovation projects	The open App Repository can house AI/ML tools that support the integration of renewable energy sources (RES) and smart grid management, which are essential for the EU Green Deal's goal of carbon neutrality by 2050 ED can contribute to EU digitalization goals by incorporating edge and cloud-based AI tools from the repository into new projects aimed at optimizing grid operations, managing energy consumption, and improving asset management using AI-driven insights	Energy systems across Europe are highly diverse, with varying technologies, standards, and regulatory requirements in different countries. This makes interoperability a significant challenge for a pan-European app repository. The energy sector is heavily regulated, with strict rules and policies in place for data sharing, AI use, and energy market operations across the EU.	To be defined. Most likely open-source for research purposes, not open-source for commercial purposes	Energy stakeholders, such as TSOs and DSOs, might be reluctant to adopt AI/ML tools from the open repository due to concerns over their reliability, scalability, and suitability for mission-critical applications.
DST	The open App Repository will enhance DST's offerings by providing a flexible, scalable platform for deploying AI/ML	Market the repository as a resource for energy stakeholders to access advanced tools for	Energy stakeholders, including TSO/DSO, energy service providers	Collaborate with partners in WP4 to populate the repository with AI/ML tools for both edge and cloud use.	Encourage collaboration with EU researchers and SMEs to integrate tools into the repository,	Support Green Deal goals by enhancing grid management and renewable integration. Align with the EU Digital Strategy to drive the digitalization	Limited awareness of the advantages AI/ML offers for energy optimisation. Significant upfront	NDAs will be used to protect know-how and intellectual property during collaborations.	Technological Risk: Challenges in ensuring seamless integration of tools. Mitigation: Testing and adherence to interoperability standards. Likelihood: Moderate.

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	tools across edge, cloud and fog level	operational efficiency. Promote the repository in future EU projects for developing innovative solutions and fostering collaborations		Collaborate with partners in WP3 and WP4 to ensure the repository complies with interoperability standards for seamless integration. Develop use cases with partners in WP5 to showcase the repository's capabilities and its practical applications in real-world scenarios.	fostering a robust ecosystem. Use the repository in future Horizon Europe projects to promote shared innovation in energy solutions.	of energy infrastructure and meet sustainability goals.	implementation costs, particularly for smaller utilities or regional operators. Concerns regarding data privacy when integrating AI/ML tools with sensitive operational information.	Where applicable, licensing agreements will be implemented for third-party use of IoT solutions. Where applicable, patents will be secured for the developed IoT technologies.	Economic Risk: Difficulty in monetising the repository due to high costs and market resistance. Mitigation: Flexible pricing models like subscriptions or freemium options. Likelihood: High, but manageable. Regulatory Risk: Changes in data-sharing regulations affecting operations. Mitigation: Continuous monitoring and compliance with legal frameworks. Likelihood: Low.
TNO	The added value for TNO of having such a repository that we may offer this for clients and other stakeholders, such as policy makers and standardisation bodies.	TNO may use this to better position itself for future innovation actions, thus qualifying for more successful bids.	European and national policy makers, industry and in collaborations with RTO's and (applied) science partners.	To be actively explored during the project, this is not yet clearly defined.	To be actively explored during the project, this is not yet clearly defined.	To be assessed at a later stage of the project (e.g. its final year).	TNO is not a private party aiming to commercially drive KER's to the market. IP that is not in the public plane (e.g. being patented) may limit our intention to encourage free and open use of IP generated by us.	Where relevant by patents, however it is more likely that IP will be addressed in public standards for a greater opportunity of adoption.	Possible patent infringements, however at this stage we estimate this risk to be low at this point.

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Table 9: KER#6 An IDS-based data connector to facilitate interconnectivity among distributed systems

Partner	Value proposition	Future exploitation strategy	Target Audience	Synergies with other HEDGE-IoT partners	Synergies with other EU researchers/SEMs	Impact on EU and local/regional policies	Market barriers	IPR measures	Possible Exploitation Risks
ED	ED has already worked on Data connectors in the past and can use HEDGE-IoT to build new more advanced solutions, based on the knowledge and expertise already gained.	ED will position itself as a pioneer in the Data Spaces field. Through HEDGE-IoT we can advance our preexisting solutions and leverage that for future Innovation project but also commercially	TSO/DSO, Aggregator, Market Operator, Energy End-Users, Energy Communities, Prosumers, Consumers, Service Providers and developers, Technology Providers	Not yet clearly defined. To be explored.	Use the generated knowledge and expertise to attract more clients and to better position ED in future innovation projects	The Data connector can contribute to the digitalisation of the energy sector It can support the provision of flexibility though seamless data exchanges	Data security and privacy concerns, complexity of multi-stakeholder collaboration, integration with legacy systems	To be defined. Most likely open-source for research purposes, not open-source for commercial purposes	There could be issues around ownership of the data and the intellectual property. Data privacy and security risks regulatory compliance risks
DST	The KER could enable secure and efficient interconnectivity between distributed systems, enhancing DST's ability to offer scalable, interoperable solutions. Strengthens DST's position as a provider of secure data sharing and interoperability solutions in the digital energy sector.	Integrate the data connector into existing services, focusing on secure data transfer and system integration for energy management solutions.	TSO/DSO SMEs	IoT partners: integrate the data connector with their platforms, focusing on security and interconnectivity and as well as ensure compliance with interoperability standards and smooth integration	Use the data connector in collaboration with EU researchers and SMEs to promote secure data exchange in future projects. Incorporate the connector into upcoming EU initiatives, especially in areas such as smart grids and renewable energy.	Support renewable energy integration by enabling secure data exchange. Promote digitalization, enhancing data interoperability and security. Facilitate secure, scalable energy systems to support regional energy goals.	Lack of awareness regarding the importance of secure data interoperability.	NDAs will be used to protect know-how and intellectual property during collaborations. Where applicable, licensing agreements will be implemented for third-party use of IoT solutions. Where applicable, patents will be secured for the developed IoT technologies.	Technological Risk: Challenges with compatibility between the data connector and legacy systems. Mitigation: Testing and adaptation with partners. Regulatory Risk: Changes in data privacy or security regulations. Mitigation: Continuous monitoring and adaptation to comply with new standards

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IDSA	An existing Data Connector will be further developed to implement the Dataspace Protocol	The learnings from the development and the specifications will be shared within IDSA and included in the IDS Reference Architecture Model	Data space participants: Data providers and data consumers	To be defined	We will share the learnings and specifications with our community and with partners of new EU projects	The Data Connector can be deployed in any initiative where secure data sharing is required	Lack of understanding of the technology and the features.	All our content is open-source. It will be the decision of the data connector developers.	Technical issues during the development or the implementation phase. Difficulty in the adoption by project partners, that will be mitigated with knowledge transfer.
HSE	Enhance our capabilities in facilitating secure and interoperable data exchange among distributed systems. Enable us to offer innovative solutions that ensure secure interconnectivity, adhering to international data standards and governance models Allow us to expand our service offerings, attract new partners, and participate in future projects that emphasise secure and standardised data exchange.	Integrating knowledge and codebase contributed to the KER into our existing and future solutions to enhance secure and interoperable data exchange among distributed systems. The KER will enable us to develop new products that address the growing need for secure, standardised data sharing, thereby expanding our market offerings. Additionally, we intend to leverage our contribution to the KER in future projects that focus on data interoperability and security, aligning with EU initiatives like the Digital Strategy.	TSO/DSO, Aggregator, Market Operator, Energy End-Users, Energy Communities, Prosumers, Consumers	Not yet defined	We plan to leverage our contribution in the KER to enhance collaboration with other EU researchers and SMEs within our network and through new EU projects. Exploiting our knowledge and codebase from our contribution to the KER we expect to gain expertise in secure and interoperable data exchange among distributed systems, which is essential for collaborative research and development efforts. This collaboration will involve participating in EU-funded initiatives, contributing to the	The acquired expertise from our contribution to the KER can enable us to design and implement seamless communication between energy assets and systems, promoting sustainability and innovation at both local and regional levels. By participating in EU-funded initiatives and collaborating with stakeholders to drive digital transformation, support policy goals, and foster a more interconnected and sustainable energy ecosystem across Europe	Integration complexities with existing legacy systems might deter organizations due to concerns about compatibility and the resources required for implementation. The installation and maintenance of additional infrastructure to deploy IDS-based connectors could be prohibitive for simpler users with limited expertise and budgets. Variations in data standards and protocols across different industries and regions could also hinder adoption, as clients may be uncertain about interoperability	To be defined	A primary risk is technical integration challenges, as clients might face difficulties integrating the connector with their existing legacy systems, leading to implementation delays or additional costs. Mitigation strategies include designing software components for ease of integration, providing comprehensive documentation, and offering technical support. Another risk is market acceptance and awareness; potential users may lack understanding of the benefits of IDS-based interconnectivity or be resistant to adopting new technologies. Mitigation strategies include conducting awareness campaigns, demonstrations, and pilot programs to showcase the value of

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					development of open data standards, and sharing expertise to integrate complementary technologies. Through these synergies, we aim to strengthen our collective capabilities, foster innovation, and support EU digital initiatives				our solution. Additionally, regulatory and compliance hurdles, such as varying data protection laws across regions, may affect adoption. Mitigation strategies include staying updated on regulatory changes, ensuring our solution complies with all relevant standards, and incorporating robust security measures.
QUE	QUE has prior experience with data space ecosystems (design, implementation and deployment). The objective is to develop an open, secure, and trusted platform for data exchange between energy assets and systems, utilizing Decentralized Identifiers (DIDs) and Verifiable Credentials (VCs)	Enhance our existing expertise in data connectivity by developing advanced, secure, and decentralized solutions for energy data exchange	Key beneficiaries include DSOs/TSOs, aggregators, and OEMs	Not yet defined	Elevate collaboration within our network and integrate it into new EU-funded projects by providing a secure, decentralized platform for data exchange	Promote secure and decentralized data exchange, enhance digital transformation, and promote interoperability and trust across stakeholders in the green deal and digital strategy EU initiatives	Lack of Awareness: Potential users may not fully understand the need or benefits of decentralized data exchange platforms Regulatory Uncertainty: Variations in regulatory frameworks across regions may pose challenges to adoption Interoperability Issues: Integration with existing systems and technologies may face technical barriers Fragmented Ecosystem: Limited collaboration	To be defined	Low market adoption Regulatory changes or misalignment Technical challenges in integration Fragmentation of stakeholder interests

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							between key stakeholders, such as DSOs, TSOs, and OEMs, could slow adoption		

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Table 10: KER#7 Interoperable IDS-compliant Data Governance Middleware with a data-service catalogue for service interoperability at edge-fog-cloud layers

Partner	Value proposition	Future exploitation strategy	Target Audience	Synergies with other HEDGE-IoT partners	Synergies with other EU researchers/SEMs	Impact on EU and local/regional policies	Market barriers	IPR measures	Possible Exploitation Risks
ED	Integration into existing solutions. ED has been developing data governance middlewares for many previous projects. The advancements in HEDGE-IoT can enhance the existing solutions and offer more capabilities. This will extend the solutions that already exist	Create new products and services based on the middleware, such as data-as-a-service (DaaS) or interoperability-as-a-service, tailored for the energy sector. Offer tailored solutions to energy stakeholders and system operators (SOs) that emphasize compliance with IDS standards and seamless data sharing. Leverage the middleware to participate in multi-stakeholder projects that require secure, interoperable data exchange	TSO/DSO, Aggregator, Market Operator, Energy End-Users, Energy Communities, Prosumers, Consumers, Service Providers and developers, Technology Providers	Not yet clearly defined. To be explored.	Use the generated knowledge and expertise to attract more clients and to better position ED in future innovation projects	Use the middleware to enhance data exchange between distributed energy resources (DERs), renewable energy providers, and grid operators. Implement the middleware to streamline real-time monitoring and data analytics for energy systems Use the middleware to implement projects that prioritize data sovereignty, ensuring compliance with the EU's European Data Strategy and GDPR.	Ensuring seamless integration with legacy systems, various IoT devices, and proprietary platforms in the energy ecosystem can be technically complex.	To be defined. Most likely open-source for research purposes, not open-source for commercial purposes	Insufficient market adoption Integration challenges with legacy systems
IDSA	Data Governance will be implemented in a technical manner, which extends the work of our IDS-RAM and IDS Rulebook	The specifications of the Data Governance Middleware and the data-service catalogue will serve as input for the IDS-RAM and the IDS Rulebook	Data space participants: Data providers and data consumers	To be defined	We will share the learnings and specifications with our community and with partners of new EU projects	The Data Governance Middleware can be deployed in other EU initiatives where a Data Space is deployed	Lack of understanding of the technology and the features.	All our content is open source. It will be the decision of the developers.	Technical issues during the development or the implementation phase. Difficulty in the adoption by project partners, that will be

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									mitigated with knowledge transfer.
DST	This KER will enable DSTech to offer more robust and secure data management solutions, driving innovation and enabling the company to enter new markets with a focus on data-driven services.	The KER strengthens DSTech's ability to deliver advanced data governance solutions, addressing the rising demand for secure, interoperable data management. It enables integration across industries, enhancing DSTech's product portfolio and broadening market reach.	IoT developers and integrators	DSTech will collaborate with other HEDGE-IoT partners to validate and test the KER in real-world applications, ensuring the middleware works across a wide range of i use cases. If applicable, DSTech will plan to integrate the solution into ongoing and future research projects to further its development and applicability.	DSTech will collaborate with other HEDGE-IoT partners to validate and test the KER in real-world applications, ensuring the middleware works across a wide range of i use cases. If applicable, DSTech will plan to integrate the solution into ongoing and future research projects to further its development and applicability.	Participate in Horizon Europe and other EU initiatives focused on data governance, IoT, and digitalization.	The KER aligns with the EU's Digital Strategy and Green Deal initiatives by enabling secure data exchange and promoting the responsible use of data in digital transformation projects. DSTech will leverage the middleware to support EU and local/regional initiatives focused on smart cities, IoT, and sustainable development.	NDAs will be used to protect know-how and intellectual property during collaborations. Where applicable, licensing agreements will be implemented for third-party use of IoT solutions. Where applicable, patents will be secured for the developed IoT technologies.	Technological Obsolescence: Rapid technological changes in data management and interoperability could make the KER outdated. Mitigation: Regular updates to the solution and active participation in standardization processes.

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Partner	Value proposition	Future exploitation strategy	Target Audience	Synergies with other HEDGE-IoT partners	Synergies with other EU researchers/SEMs	Impact on EU and local/regional policies	Market barriers	IPR measures	Possible Exploitation Risks
ED	ED has been designing RAs for many research projects that focus on interoperability and data exchanges in the energy sector and others. HEDGE-IoT will advance the expertise of ED in this domain	Enhancing products and service offerings Driving interoperability and standardization Aim towards an RA that can be scaled to the whole of Europe	TSO/DSO, Aggregator, Market Operator, Energy End-Users, Energy Communities, Prosumers, Consumers, Service Providers and developers, Technology Providers	Not yet clearly defined. To be explored.	Use the generated knowledge and expertise to attract more clients and to better position ED in future innovation projects	The RA supports the integration of Renewable Energy Sources (RES), enhances grid flexibility, and enables better energy demand-response mechanisms, directly contributing to the EU's climate neutrality goals. By enabling interoperability and leveraging IoT technologies, the RA promotes secure and efficient data exchange, a cornerstone of the EU's vision for a digital, data-driven energy sector.	Limited adoption from energy stakeholders Fast-changing environment	To be defined. Most likely open-source for research purposes, not open-source for commercial purposes	Limited IoT standardization Cyber-security concerns Rapid evolution of standards
RWTH	Structuring work on the application of Data Spaces in the energy domain	Incorporating RA among others to have a foundation of what structures are necessary for Data Spaces in the Energy Domain to be applicatble in reality	Researchers working on Data Spaces		Future projects working on data in the energy domain will look to previous RAs to develop their own	Future projects working on data in the energy domain will look to previous RAs to develop their own	Intended as a mostly academic result		Potential Risk: unclear how applicable the RA will be to other projects / ecosystems - will depend on the final structure

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IDSA	The current work on interoperability will be extended and tested	The RA can provide input for the new version of IDS RAM (v5)	Data space participants: Data providers and data consumers	To be defined	We will share the learnings and specifications with our community and with partners of new EU projects	The RA can be used as basis for other EU initiatives	Lack of understanding of the technology and the features.	All our content is open-source. It will be the decision of the developers.	Technical issues during the development or the implementation phase. Difficulty in the adoption by project partners, that will be mitigated with knowledge transfer.

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Table 12: KER#9 Technological implementation of the RA

Partner	Value proposition	Future exploitation strategy	Target Audience	Synergies with other HEDGE-IoT partners	Synergies with other EU researchers/SEMs	Impact on EU and local/regional policies	Market barriers	IPR measures	Possible Exploitation Risks
ED	ED has been designing RAs for many research projects that focus on interoperability and data exchanges in the energy sector and others. HEDGE-IoT will advance the experise of ED in this domain	Enhancing products and service offerings Driving interoperability and standardization Aim towards an RA that can be scaled to the whole of Europe	TSO/DSO, Aggregator, Market Operator, Energy End-Users, Energy Communities, Prosumers, Consumers, Service Providers and developers, Technology Providers	Not yet clearly defined. To be explored.	Use the generated knowledge an expertise to attract more clients and to better position ED in future innovation projects	The RA supports the integration of Renewable Energy Sources (RES), enhances grid flexibility, and enables better energy demand-response mechanisms, directly contributing to the EU's climate neutrality goals. By enabling interoperability and leveraging IoT technologies, the RA promotes secure and efficient data exchange, a cornerstone of the EU's vision for a digital, data-driven energy sector.	Limited adoption from energy stakeholders Fast-changing environment	To be defined. Most likely open-source for research purposes, not open-source for commercial purposes	Limited IoT standardization Cyber-security concerns Rapid evolution of standards
DST	The KER strengthens DSTech's capabilities in offering advanced data governance solutions, enabling integration across industries and improving the	Plan to integrate the KER into its existing product offerings, explore licensing opportunities, and expand its business by partnering with other companies	IoT developers	Collaboration with HEDGE-IoT partners to validate and deploy the KER in real-world scenarios, enhancing its development and ensuring cross-	DSTech will collaborate with EU researchers and SMEs through future EU projects to advance the KER's application in digitalization, IoT, and data governance.	DSTech aims to support EU initiatives by leveraging the KER to promote secure, interoperable data solutions in smart city and IoT projects.	Barriers include lack of awareness about the KER, high initial costs, regulatory uncertainties, and integration	NDAs will be used to protect know-how and intellectual property during collaborations. Where applicable, licensing agreements will be implemented for third-party use of IoT solutions. Where	Technological Obsolescence: Rapid technological changes in data management and interoperability could make the KER outdated. Mitigation: Regular updates to the solution and

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	company's product portfolio for future innovation.	and research institutions for future collaborations.		sector interoperability.			challenges with legacy systems.	applicable, patents will be secured for the developed IoT technologies.	active participation in standardization processes.
IDSA	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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Table 13: KER#10 Best practices from demonstration of innovative solutions for the digitalization of the energy system

Partner	Value proposition	Future exploitation strategy	Target Audience	Synergies with other HEDGE-IoT partners	Synergies with other EU researchers/SEMs	Impact on EU and local/regional policies	Market barriers	IPR measures	Possible Exploitation Risks
ICCS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
VTT	We are building our solution on new approach where live data stream is shared to third parties for online service provision. We are piloting this in the Finnish case, VTT taking the role of third party service provider.	We are mostly a user for the data. We obviously want to expand to further use cases in which similar approach can be used.	Third parties including different service providers, also start-ups.	We are testing the solution mainly developed by ABB, piloting it together with TAU, JSE and ENERVA.	We are looking to use similar approaches in other EU projects, and follow closely similar developments.	We are looking to further develop it in forthcoming EU projects.	The key question may be how open and standardized the solution can be, or whether it will remain to some extent proprietary, which will limit its replication.	No IPR issues at the moment, we are mainly using the data interface.	Scalability and replicability of the solution - whether it will be fully open and standard or more like proprietary solution.
CLUBE	Provided a framework for leveraging digital technologies to improve efficiency and resilience. CluBE can drive future regional energy system transformations through digitalization, promoting sustainable and efficient energy practices aligned with EU policies	CluBE will integrate best practices acquired by the project to future projects aimed at digitalizing local and regional energy systems. It will serve as a foundation for future collaborations with regional stakeholders and EU partners to scale these innovations	Local energy utilities, grid operators, regional energy policymakers, SMEs involved in energy innovations	CluBE plans to collaborate with HEDGE-IoT partners in the future to adapt and implement best practices across regional energy ecosystems. These collaborations will enable knowledge sharing, co-development of digital tools and application of best practices	CluBE will engage with other EU researchers and SMEs to exchange knowledge of implementation of best practices for energy digitalization to foster a broader adoption of innovative digital solutions in the energy sector.	Results will be used at tools in aligning CluBEs future projects with EU initiatives. CluBE will drive projects that enhance renewable energy integration, improve energy efficiency and contribute to EU policy goals like carbon neutrality and energy system resilience at the local and regional levels	Lack of awareness among regional energy stakeholders of the benefits of energy digitalization. High initial costs for implementing digital infrastructure in legacy energy systems. Resistance to change from traditional energy utilities and local authorities. Regulatory challenges in aligning local energy policies	Standard IPR protection strategy, including patents and licenses, where applicable.	Risk: Resistance to adoption by local stakeholders. Mitigation: Engage stakeholders early in the process through awareness campaigns. Risk: Incompatibility of digital solutions with existing infrastructure. Mitigation: Conduct thorough infrastructure assessments and collaborate with tech providers to ensure compatibility. Risk: Financial constraints. Mitigation: Leverage EU/National funding and public-private partnerships to reduce financial barriers.

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							with digital transformation initiatives.		Risk: regulatory hurdles. Mitigation: Collaborate closely with local and regional policymakers to align with regulations.
CEL	Assessments with respect to ethics and regulatory aspects by adopting the ERGO (Ethics and Regulatory Governance) framework will allow to identify "best practices" to comply with EU values and rules.	CEL will use the ERGO framework, fine-tuned and extended in HEDGE-IoT for assessments in other R&I projects and in consultancy services	Practitioners, Standardisation WGs, Industries, SMEs	ERGO framework is yet a key asset of the CEL portfolio and used in many EU R&I projects and consultancy services.	ERGO framework may be configured and fine-tuned with respect to project needs and context	ERGO framework may be configured and fine-tuned with respect to project needs and context	No market barriers. ERGO is already adopted for consultancy services	ERGO is included in the background of the CA	No risks have been identified
AB	To be able to demonstrate innovation and therefor make the Electricity Campus Arnhem's Buiten a (even) more relevant location for other organizations to become involved (or even become tenant) at the Campus	It can become an integral of the (real life) test/demonstrator location	SME's and RTOs in combination with (national) policy makers and DSO's	In potential with TNO and VU/A	Based on this KER we might consider participating in other (to be defined and selected) of facilitate EU projects	Cause of the specifics of the Campus (not a formal status of Closed Distribution System). Experiments	Potential users not being aware of these solutions and/or not able to use these learnings cause of specific location-based circumstances	Where relevant and possible by patents. However, it should not frustrate the possibility for upscaling	Acceptance and ongoing process of other "competition" of other research campuses/locations

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Table 14: KER#11 A set of recommendations for extended IoT-enabled grid resilience and flexibility and the extension of standards across grid levels

Partner	Value proposition	Future exploitation strategy	Target Audience	Synergies with other HEDGE-IoT partners	Synergies with other EU researchers/SEMs	Impact on EU and local/regional policies	Market barriers	IPR measures	Possible Exploitation Risks
ELES	The added value for ELES includes enhanced grid resilience through IoT-enabled solutions that improve adaptability and reliability, contributing to a stronger infrastructure. It positions ELES as a leader in digital grid transformation by participating in the extension of industry standards. Additionally, the integration of advanced IoT applications, such as dynamic line rating (DLR), optimizes load management and reduces operational costs. The project also enables significant skill development for ELES, providing expertise in AI/ML, IoT, and cloud-edge computing.	Integrating its outputs into ongoing grid modernization efforts. The recommendations and solutions developed will be implemented to enhance dynamic line rating (DLR) capabilities, shifting from centralized systems to a cloud-edge approach for faster and more accurate grid assessments. ELES will apply the new IoT standards and interoperability frameworks to upgrade its SCADA/EMS systems, improving real-time decision-making and grid flexibility. Additionally, the acquired expertise will be incorporated into ELES' strategic planning for future projects, enabling the development of	Direct beneficiaries are grid operators who will gain improved tools for dynamic line rating (DLR) and real-time grid management. The new IoT-enabled standards will also benefit SCADA/EMS users through enhanced interoperability and data insights. Additionally, regulatory bodies can leverage the recommendations to enhance grid stability.	ELES plans to collaborate with HEDGE-IoT partners by sharing real-world data and expertise for testing IoT-enabled solutions like dynamic line rating (DLR) in cloud-edge environments. Joint pilots and demonstrations will help refine the technology and align best practices across TSOs. ELES will also engage in knowledge exchange sessions to ensure mutual skill development and implementation consistency.	Sharing results with regional partners, using the outcomes to enhance future EU project proposals and secure new collaborations in digital grid initiatives	ELES plans to leverage outcomes to align its projects with EU initiatives like the Green Deal and EU Digital Strategy by advancing digital grid technologies that enhance renewable integration and grid resilience. The IoT-enabled solutions and new standards will be key components in projects focused on energy efficiency and sustainability. ELES will use the gained expertise to actively participate in digitalization initiatives, contributing to policy development and EU-wide interoperability efforts.	Limited awareness or understanding of the need for advanced IoT-enabled grid solutions among industry stakeholders. There may be concerns regarding the high initial investment costs and the complexity of integrating new technologies with existing grid infrastructure. Regulatory challenges and differences in standardization across regions might hinder widespread adoption. Finally, data privacy and cybersecurity concerns related to IoT applications might impact user	ELES plans to protect its potential intellectual property rights through robust collaboration agreements that define ownership and usage terms of the developed solutions.	Potential risks include technical challenges in integrating IoT solutions with existing infrastructure, which could delay implementation; ELES plans to mitigate this by conducting extensive compatibility testing. Data privacy and cybersecurity concerns might hinder exploitation; ELES will implement robust data protection measures and comply with EU regulations to mitigate this.

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		innovative digital services.					acceptance and deployment		
NESTER	The added value for R&D NESTER is to promote awareness amongst stakeholders of the possibility of using alternative sources of flexibility to increase the grid resilience both at transmission and distribution levels.	Standardadisation is a key step to ensure interoperability between devices and systems. Most of the times, SOs only adopt standards when they are mature.	Stakeholders, but mostly focused on SOs (e.g.TSOs, DSOs)	NESTER is supporting closely REN and other partners engaged in the PT pilot: CEVE, ELERGONE and INESC.	R&D NESTER will use the expertise acquired in this project to promote further developments in future EU funded projects, and by sharing with our community of industrial and innovation partners both in Portugal and Internationally (e.g. ETIP-SNET).	R&D NESTER will continue supporting new EU initiatives and promoting solutions that help achieving these objectives.	Probably some solutions will still take some time to reach the market. Standardisation, typically, is a marathon process.	The Consortium Agreement mitigates this risk and, if necessary, additional agreements can be established after the end of the project.	The integration of IoT devices by SOs without sufficient testing represents a potential risk. Adopting and implementing cybersecurity standards by-design could mitigate this risk.
REN	The added value for REN is to increase the grid resilience across all levels, enabling also the flexibility of pro-consumers. Future works includes adding more IoT devices in the substations and overhead lines towers to complement the actual SCADA data to support the TSO operators.	Standards are important to guarantee interoperability of devices and systems, and reduce cost in buying and integrating IoT devices in the network. REN is adopting standards when they are mature by the industry.	The direct beneficiaries of the KER are (TSO & DSO) grid operators, based on the enhanced decision support tools develop by the project.	REN is working closely with partner NESTER and other related partners of the Portuguese pilot. We will share the KER with all other HEDGE-IoT partners and ENTSO-e community.	REN will use the expertise gained in this project to promote future EU funded projects, and the research community of the electrical grid in Portugal.	REN is aligned with new EU initiatives and will continue to promote these objectives. We will continue our work on renewable integration while maintaining grid resilience, with advanced IoT-enabled solutions.	Cybersecurity concerns related to IoT applications, the need to keep track of firmware versions and security patches. User data privacy and the value of data. Standardisation of the IT protocol including communication layers. CAPEX and OPEX costs compared with the economic value to use IoT at consumer level.	The Consortium Agreement mitigates this risk and, if necessary, additional agreements can be established after the end of the project. In any case, EU-funded software should be open source.	As REN manages a critical asset such as the TSO network, the integration of IoT devices into the network represents a potential risk. Adopting cybersecurity standards can mitigate this risk.

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HOPS	As a Transmission system operator HOPS oversees balancing the transmission system and enabling secure operation of transmission grid. The new technologies are enabling more observable and controllable grid on distribution level. HOPS will benefit in more resilient and controllable network through improvements of planning and system operation processes. The experience, knowledge and collaboration with different actors in the project is of great value to HOPS.	Experience and knowledge gained in the project will be used in future developments of system operation and planning solutions. HOPS is in a continuous process of improvement of collaboration with distribution system operator. The experience, solutions from pilots will be used to improve the systems, applications and process in HOPS.	Direct beneficiaries of the KER in HOPS will be all system operation and planning department as they will benefit from results of the project and improvement in processes. IT and OT departments will benefit from knowledge and recommendations gained in the projects that will be used in implementation of new algorithms and exchange of information with different grid users and DSO's	HOPS plans to use KER in colorations with other EU transmission system operators through existing working groups in ENTSO-E. We plan to further investigate and upgrade the solutions and recommendations from HEDGE- IoT with universities through pilots and other research projects.	The recommendations from HEDGE-IoT will be used in other EU funded projects where feasible. HOPS especially see benefits in further development of standards, interfaces and solutions that will be the result of Hedge - IoT and their extension to new domains and processes.	Standardization is one of the key prerequisite to digitalization which is necessary for integration of renewables. HOPS will use the recommendation and solutions to promote further standardisation in different in initiatives and working groups contributing to development of new laws, policies and recommendations.	Possible market barriers could be availability of compatible solutions on the market, lack of awareness, coordination and requirements from end users.	HOPS will not have the need to protect intellectual property rights in the project.	Time, effort and resources necessary to implement the solutions and put them into operation is crutial for implementation of recommendations into real life solutions. The clarity of the recommendations is important to implement solutions that can be put into operation. Adoption of technologies and standards from vendors and utilities could be achieved by formal standardisation of recommendations from Hedge-IoT through different standardisation bodies (IEC, IEEE, etc) of relevant independent organisations (ENTSO-E, EU digital stategy, and on regional level).
CEL	Assessments with respect to ethics and regulatory aspects by adopting the ERGO (Ethics and Regulatory Governance) framework will allow to identify "policy options" to comply with EU values and rules.	CEL will use the ERGO framework, fine-tuned and extended in HEDGE-IoT for assessments in other R&I projects and in consultancy services	Policy makers, standardisation WGs, Practitioners	ERGO framework is yet a key asset of the CEL portfolio and used in many EU R&I projects and consultancy services.	ERGO framework may be configured and fine-tuned with respect to project needs and context	ERGO framework may be configured and fine-tuned with respect to project needs and context	No market barriers. ERGO is already adopted for consultancy services	ERGO is included in the background of the CA	No risks have been identified
ARETI	Standard interface and protocol for IoT device connect to the DSO grid, can increase the grid monitoring, observability and can unlock the	The DSO can adapt the standards to enable the interaction with the IoT devices. An onboarding process could be	The DSOs for the Iot devices installed on the grid equipment's, and the end users for the IoT	Leveraging on the previous and ongoing experiences, the standard IoT "smart grid ready"	All the EU projects, the technical committee could be involved in the definition of the	All the devices able to provide services to the network operator, must adopt the IoT "smart grid ready"	The protocol fragmentation currently ongoing in the IoT solutions, creates a lock in condition	The standard has to be an open standard without costs for the users	The standardiztion of the IoT devices is an open issue, so several initiatives are ongoing on this item. To foresee a cooperation between

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	flexibility from the small users, avoiding the grid reinforcement	defined to activate the IoT "smart grid ready"	solutions able to support the smart grid functionalities	could be shared and approved by all the Hedge IoT partners	standard IoT "smart grid ready"	defined in the Hedge IoT project	and hinders the interaction with each other. Moreover, the awareness of the stakeholders about the opportunity on the grid services, have to increase to unlock the end user potential.		the different experience is very important to share and disseminate the work on the Hedge IoT project

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Table 15: KER#12 A set of semantic and ontology standards, for IoT-enabled grid digitalization

Partner	Value proposition	Future exploitation strategy	Target Audience	Synergies with other HEDGE-IoT partners	Synergies with other EU researchers/SEMs	Impact on EU and local/regional policies	Market barriers	IPR measures	Possible Exploitation Risks
TNO	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RWTH	FAIR data, allowance for data exchange between partners	Align with existing standard and reuse in future projects/work	Data manager, backend software developer	To uniform ontology standard within the project	Publication, knowledge transfer	Publication, knowledge transfer	Not-ease-of-use to everyone, user must be an expert	N/A	Possibility of the standard to become outdated after the project
APIO	Adopting semantic standards would standardize communication with other systems and devices, bridging silos with other domains. Then it would also allow data discovery and automated reasoning scenarios, which is something we are looking forward to experiment with.	We plan to use the ontology to enable automated reasoning within the modules of our platform and to increase interoperability with third party systems	End users will be energy market stakeholders as well as energy community members.	These outputs will be used in our platform which will be used as basis for 3 of our SUCs in cooperation with Acea Energia and Areti.	By aligning our products to a set of semantic and ontology standards we will be able to push its adoption throughout our network. Furthermore, it will make it easier to engage new EU projects. We will also use the outputs in upcoming Open Calls (for 2 of them we are in shortlist, not yet winners)	Adopting these standards as first-class models within our platform.	Lack of incentives in adopting a new data model for existing consumers of our platforms. In this case pushing the standard towards them might be difficult.	We do not foresee IPR issues.	Cost benefit ratio might be different from what we anticipate. A mitigation would be to slowly rollout a parallel data interface as we did for a Web Of Things middleware. The likelihood should be low since we are focusing on a specific perimeter for standardization.
KONC	The development of a semantic model of the substation that will enrich time series data collected from edge solutions and IoT devices.	The development of the platform within the project will be used in future projects to accelerate digitalization in line with IEC standards.	Data scientist, DSO.	The exchange of knowledge and technical expertise in solving issues related to semantic interoperability and standardized data exchange.	Publication, technical workshops.	Publication, technical workshops.	Absence of awareness of product need.	License based product.	Some of the data required for developing the model will be collected from technologies also being developed within the project, which poses a risk of technological limitations. Delays or issues with the technology development could impact data availability and model readiness.

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Table 16: KER#13 Increased flexibility incorporation enabled by IoT/Edge technologies for grid security

Partner	Value proposition	Future exploitation strategy	Target Audience	Synergies with other HEDGE-IoT partners	Synergies with other EU researchers/SEMs	Impact on EU and local/regional policies	Market barriers	IPR measures	Possible Exploitation Risks
VTT	Our approach is mainly to monitor the grid status better. This can help to utilize flexibility on right time and on right areas, but the impact is bit indirect.	We foresee that controls towards flexible components could become somewhat integrated with our prediction module, but this is a longer-term vision.	DSOs, grid operators, distribution management system providers	This is related to pilot we have together wit ABB, TAU, JSE, ENERVA.	Use of flexibility is studied in our other EU projects. Combining these with HEDGE developments is an interesting option.	We are looking to further develop it in forthcoming EU projects.	Market risks relate to general regulation and business models around flexibility; how flexibility can be used for DSO purposes, who operates them, what is the position of independent aggregators, etc. There are still many open questions also on national levels.	Early research, no IPR issues so far.	Regulation and local flexibility market development will define the operational circumstances.
ENERV	For Enerva as an independent electricity network operator, IoT/Edge technologies enable the prediction of faults in the electrical network and a faster response, and the service can be duplicated for all our customers. In addition to this, we are able to enable the utilization of congestion	We implement the fault prediction/anomaly detection model in daily operations and develop it further in production. Regarding the congestion management, a model will be created that will enable the conceptualization of a new service in the future that will	Finnish DSOs, electricity production sites and BESS-sites.	The services will be taken in to daily operations together with the JSE (a partner), and further development is possible with other Finnish partners. In addition to this, we need services from, for example, ABB (a partner)	We will offer the service to other Finnish DSOs in the future. We are also looking at the possibilities for further development in other EU projects.	The results of the project will influence the social debate about the introduction of flexibilities together with the JSE. At the distribution network level, new tools are needed for the introduction of flexibilities, and the project will share	Sufficient cost-effectiveness must be achieved in fault prediction so that the large scale implementation and product conception of the service is profitable. Regarding flexibilities, legislation can prevent its use and regulation can make it too expensive to use.	Enerva does not get IPRs directly from the project, but with the project we improve efficiency in the fault management process and gain new products to offer to our customers.	In terms of fault predicting: technological risks (the developed technology does not work), cost-effectiveness risk (the service becomes too expensive), unpredicted technological investments that are too large. Regarding congestion management: legislation prevents large-scale use of the service, regulation does not support local flexibility and makes it unprofitable for the DSO. In general: there is a risk that cyber security is compromised with new

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	management in the electricity network as a service for DSOs, so that the green transition progresses faster.	be available for all DSOs in Finland.		for the materials and components used in piloting.		information about different possibilities.	This is also why it is important to include the project in the national discussion.		software and components, and the risks do not match the benefits obtained.
JSE	IoT/Edge technologies enable prevention and faster reaction to 20kV network outages. Flexibility enable faster grid connection to CO2 neutral energy resources and enhance dynamic grid capacity management.	We implement the fault prediction/anomaly detection model in daily operations and develop it further in production. Regarding the congestion management, a model will be created that will enable the conceptualization of a new service in the future.	Regarding the congestion management. Industrial end-users and the DSO	The services will be taken in to daily operations. We will collaborate at least with control room service supplier witch is Enerva and we will also need technology supplier for example ABB to supply components and data service.	We will use KER's to enhance our operative efficiency. We will also look at the possibilities for further development in other EU projects	The results of the project will influence the social debate about the introduction of flexibilities. At the distribution network level, new tools are needed for the introduction of flexibilities, and the project will share information about different possibilities.	Sufficient cost-effectiveness must be achieved in fault prediction so that the large scale implementation and product conception of the service is profitable. Regarding flexibilities, legislation can prevent its use and regulation can make it too expensive to use. This is also why it is important to include the project in the national discussion.	JSE does not get IPR's directly from the project, with projects KER's we will enhance our processes and efficiency	In terms of fault predicting: technological risks (the developed technology does not work), cost-effectiveness risk (the service becomes too expensive), unpredicted technological investments that are too large. Regarding congestion management: legislation prevents large-scale use of the service, regulation does not support local flexibility and makes it unprofitable for the DSO. In general: there is a risk that cyber security is compromised with new software and components, and the risks do not match the benefits obtained.
PPC	For PPC, as an aggregator and energy producer, IoT/Edge technologies will enhance grid security by enabling precise demand response, optimized energy dispatch, and early detection of potential threats, ultimately leading to a more secure	Real-time Monitoring and Control, Advanced Threat Detection and Response, Enhanced Customer Services	Consumers (Reliable power supply, Lower energy costs), Businesses (Business continuity, Optimized energy usage, new business opportunities), Grid Operators (Improved grid efficiency and security,	Federated Learning for enhanced security analytics, Interoperable data sharing for real-time situational awareness, Joint development of edge computing applications, Coordinated	Within PPC's network, we are thinking of advanced cyber security. In collaboration with HEDGE-IoT partners, we are thinking of federated learning, interoperable data sharing, joint development of edge computing,	Green Deal: Accelerating renewable energy integration, enhancing energy efficiency, circulating economy initiatives. EU Digital Strategy: Cybersecurity and data privacy, digital	High initial investment costs, Complex integration and interoperability challenges, Cybersecurity concerns, Data privacy)	With the use of NDAs, employee training, network security, access controls	Cyberattacks and data breaches, regulatory and policy uncertainties, Public acceptance and technical challenges as delayed deployment, system failures

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	and efficient energy system.		Increased revenue)	demand response and flexibility services	demand response and flexibility services	innovation, digital skills and workforce development			
CEVE	Better grid stability, improved energy distribution efficiency; high level services for all clients; Enhanced demand side participation on grid resilience; Support secure and private data exchange	Scaling these technologies to broader applications;	Renewable energy producers; Energy communities.	By sharing pilot data, conducting joint validation studies, and co-developing best practices for grid security.	Facilitating the development and testing of a flexibility market related to Energy Communities.	By showcase the pilot results to regional and, maybe, EU policymakers, influencing future energy policies and supporting the development of local energy communities.	Resistance to change; Lack of awareness specially related to data sharing.	Confidentiality agreements and Internal protocols.	Bureaucracies; Availability of customer adherence; High associated costs. CEVE will mitigate these by monitor government policies and developing a more attractive adherence plan for clients.
HEDNO	By integrating IoT and Edge computing, this KER helps HEDNO enhance grid resilience. It supports HEDNO's efforts to maintain a resilient, adaptable grid that can respond quickly to demand changes—especially crucial as more Renewable Energy Sources are integrated to the network.	HEDNO plans to explore the use IoT/Edge-enabled flexibility tools for grid monitoring and management. This includes using analysis and ai techniques for energy forecasting based on advanced metering to safeguard the grid and improve the network performance in an evolving environment by the changing demand and fast integration of RES.	Prosumers (Reliable power supply, Lower energy costs, Better exploitation of produced energy), Grid Operators (Improved grid efficiency and security, Increased revenue)	HEDNO plans to collaborate with researchers and industry partners to leverage solutions for grid monitoring and analysis and to implement flexibility services for optimising the network efficiency.	Facilitating the development and testing of a flexibility market that leverages HEDGE-IoT solutions will foster synergies and support ongoing EU research efforts in this area. This initiative aims to advance research and collaboration focused on flexibility markets, contributing to the broader goals of grid modernization and energy sustainability across Europe.	This KER supports EU Green Deal objectives by enhancing digital infrastructure for a more sustainable grid. HEDNO will use this KER to demonstrate the value of grid flexibility in line with EU decarbonization goals, potentially guiding future policy developments.	Challenges may include high deployment costs, adaptation requirements for new technology, and initial resistance from traditional stakeholders.	HEDNO plans to protect intellectual property by implementing confidentiality agreements with consortium partners and establishing data protection measures for IoT/Edge solutions developed within the project. Internal protocols will ensure that sensitive information and innovations remain secure, fostering a trustworthy collaboration environment while safeguarding shared IP rights.	Potential risks include slow adoption, regulatory delays, and insufficient incentives for customer participation. HEDNO will address these risks through outreach efforts, monitoring of policy developments, and responsiveness to market advancements. These risks are considered moderate but manageable.

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IPTO	The incorporation of IoT/Edge technologies significantly enhances grid flexibility, allowing IPTO to dynamically respond to grid conditions. This capability is critical for integrating distributed energy resources (DERs), managing variable renewable energy (VRE) generation, and reducing congestion. By leveraging real-time data from the edge, IPTO can implement adaptive control strategies that improve grid stability and optimize the use of available resources.	IPTO plans to utilize this KER to implement enhanced flexibility services, such as demand response, dynamic load management, and real-time grid reconfiguration. This will be integrated into the existing grid management system, focusing on improved forecasting, flexibility activation, and coordination with DSOs. The IoT/Edge-enabled flexibility will also support IPTO's future projects aimed at increasing the capacity for renewable energy integration and reducing grid bottlenecks	The direct beneficiaries include grid operators and system planners who require improved tools for managing grid flexibility. Indirect beneficiaries encompass renewable energy producers, energy aggregators, and DSOs, who will experience fewer constraints and increased capacity for renewable integration. Ultimately, the end-users (consumers) benefit from a more resilient grid and enhanced service reliability.	IPTO aims to collaborate closely with partners such as ICCS and INESC for predictive analytics and real-time edge computing, focusing on flexibility solutions. Joint efforts with HEDNO and HENEX will involve optimizing flexibility services across transmission and distribution boundaries, utilizing IoT/Edge data to enhance coordination and response capabilities during peak load scenarios.	IPTO will leverage this KER in collaboration with European flexibility research initiatives under programs like Horizon Europe. Engaging with experts in flexibility markets, IPTO plans to further develop ancillary services based on dynamic flexibility activation, which can be extended in projects focused on grid modernization and advanced flexibility solutions	The focus on increased flexibility supports the European Green Deal by facilitating higher integration of renewable energy sources. This KER contributes to achieving the EU's targets for carbon neutrality and enhances the digital transformation of grid operations. It aligns with the EU Digital Strategy by promoting data-driven decision-making and fostering a smart, flexible energy system.	Barriers include the complexity of integrating flexibility services into existing grid operations, high initial deployment costs for IoT/Edge infrastructure, and potential resistance from stakeholders due to a lack of awareness or experience with flexibility solutions. Ensuring interoperability between new and legacy systems is also a potential challenge.	IPTO will implement a combination of data protection strategies and joint IP agreements with project partners. Key innovations related to flexibility algorithms and data analytics tools may be patented, while collaborations will be governed by clear IP sharing agreements.	Risks include the potential for inadequate flexibility response due to unforeseen grid events, cybersecurity threats to IoT/Edge components, and regulatory uncertainties around flexibility services. Mitigation measures involve continuous testing, enhanced cybersecurity protocols, and active participation in regulatory discussions to shape favorable policies for flexibility solutions. The likelihood of these risks is moderate, but mitigation strategies will minimize disruptions.
HENEX	The Local Flexibility Market (LFM) Platform aims to integrate a new product that will enhance resilience and create revenue streams for small market participants.	To utilize KER in our organization and future work, we plan to develop an independent platform as a product for our markets. This platform will focus on: Price Transparency: Ensuring clear and	The end-users and direct beneficiaries of the KER will include: 1. Flexibility Service Providers: Aggregators, industrial electricity customers, and energy	To utilize the KER in collaboration with other HEDGE-IoT partners, we plan to follow a similar approach to our project collaboration with the	To utilize the KER in collaboration with other HEDGE-IoT partners, we plan to exchange ideas with other pilots who also have Local Flexibility Markets (LFM). This will allow us to discuss and	To utilize the KER in new projects that promote and contribute to EU initiatives such as the Green Deal and the EU Digital Strategy, we plan to: 1. Support Sustainability	Several market barriers could potentially affect the market penetration of our exploitable result. One significant barrier is the absence of necessary tools. For instance, if smart meters or	1. Copyright: Research outputs, such as papers, reports, and software developed during the project, are protected by copyright. This ensures that the creators retain control over how their work is used and shared. 2.	Technological obsolescence, regulatory changes, market competition, data privacy breaches, user adoption resistance, financial constraints, operational challenges, and market acceptance

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		transparent pricing for all market participants. Secure Data Exchange and Transaction Validation: Facilitating secure and reliable data exchange and transaction validation between market participants. Increased Assurance and Reduced Risk: Providing a higher level of assurance and reducing perceived risks for System Operators (SOs) when contracting with small-scale assets. Common Data Exchange Point: Establishing a common point of data exchange between Transmission System Operators (TSO) and Distribution System Operators (DSO). Standardization and Harmonization: Facilitating the standardization and harmonization of interfaces and processes in power	communities. 2.System Operators: Both Distribution System Operators (DSO) and Transmission System Operators (TSO). 3. Market Operator 4. Other Research Institutes: Organizations involved in research and development within the energy sector	DSO/TSO for market design. Just as we worked closely with them to develop the market design, we will also collaborate on the final product. This partnership will ensure that the final product is well-integrated, meets the needs of all stakeholders, and leverages the collective expertise of all partners involved.	share insights on both technological aspects and market strategies. For example, the Italian demo, which also has an LFM, can provide valuable perspectives and experiences. In the HEDGE-IoT project, our focus is primarily on residential applications. However, in other projects, we can shift our focus to different areas, enabling us to diversify our approach and solutions. This collaborative effort will help us leverage shared knowledge and expertise, enhancing the overall effectiveness and innovation in our projects.	Goals: By promoting renewable energy sources and improving energy efficiency, we will align with the Green Deal's objectives. The KER will help us integrate more flexible and sustainable energy solutions into our projects. 2. Enhance Digital Integration: Leveraging the KER, we will advance the EU Digital Strategy by incorporating digital technologies into energy markets. This includes investing in digital skills, ensuring trustworthy AI, and using data analytics to optimize energy distribution. 3. Promote Innovation: The KER will foster innovation in energy markets, supporting the development of	monitoring systems are not available, the platform may not function effectively. This lack of essential tools can hinder the platform's ability to provide accurate and real-time data, which is crucial for its operation. Successful implementation of the platform requires collaboration across the entire energy supply chain. If stakeholders such as energy suppliers, system operators, and end-users do not work together, the platform's effectiveness could be compromised.	Collaborative Agreements: Research projects often involve multiple institutions and partners. Collaborative agreements outline the ownership and use of intellectual property created during the project. These agreements ensure that all parties understand their rights and responsibilities. 3. Data Sharing and Management: Research projects generate a lot of data, which needs to be managed and shared responsibly. Data management plans and agreements help protect the integrity and confidentiality of research data. 4. Licensing: Open-source licenses can be used to share software and other research outputs, allowing others to use, modify, and distribute the work while still protecting the original creators' rights. 5. Publication Rights: Researchers often publish their findings in academic journals.	

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		markets to simplify and make trading more efficient. Standardized Risk Management: Implementing standardized risk management processes for wholesale, balancing, and flexibility electricity markets. Market Integration: Integrating markets and related services under a single provider to benefit from economies of scale.				new technologies and business models that contribute to a greener and more digital Europe. 4. Facilitate Collaboration: We will engage with other stakeholders and projects across Europe to share knowledge and best practices, ensuring our efforts are aligned with broader EU initiatives and contribute to a cohesive strategy. Improve Market Efficiency: Implementing standardized processes and platforms through the KER will enhance market transparency and efficiency, making it easier for small-scale and renewable energy providers to participate in the market. 5.		Understanding the publication rights and ensuring that the research can be freely accessed (open access) or used by others is crucial. 6. Ethical Considerations: Research projects must adhere to ethical guidelines, especially when dealing with sensitive data or human subjects. Ensuring compliance with these guidelines protects both the researchers and the participants.	

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						Support Sustainable Mobility: By managing the energy needs of electric vehicles and other sustainable transport options, we will contribute to the Green Deal's goal of promoting clean, safe, and connected transport systems. 6. Encourage Sustainable Industry: The KER will support the transition to a circular economy and reduce industrial pollution by encouraging the use of flexible, clean energy sources.		HEDGE-IoT Holistic Approach towards Empowerment of the Digitalization of the Energy Ecosystem through adoption of IoT solutions	
ARETI	Providing an open source and easy to replicate IoT framework suitable for grid real time measurements, enabling better usage of flexibility resources	Ease of onboarding for new device can provide better data on the current use cases and/or enable new ones	DSOs can leverage the result of our pilots in order to replicate the open-source infrastructure on their grid	Partner experience in their respective areas will be taken as inspiration in pilot development in order to adopt the most suitable solutions	Collaboration with universities lead to innovative algorithms and hardware solutions that can be integrated, either in production environments or as rapid deployment	All the devices able to provide services to the network operator, have to adopt the IoT "smart grid ready" defined in the HEDGE-IoT project	Availability of real time measurements from both DSO and private DERs as a foundation of our pilot may limit widespread adoption	Adopting an open standard may lead to lower development/deployment costs for DSOs, given a wider adoption	The standardisation of the IoT devices is an open issue, so several initiatives are ongoing on this item. To foresee a cooperation between the different experience is very important to share and disseminate the work on the HEDGE-IoT project

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					prototypes for use case validation				
AE	Through flexibility services it will be possible to solve local congestion problems and create a profitable business for BSPs	Acea Energia will integrate the best practices acquired from the project, developing the technologies and exploiting them as a basis for future participation in local flexibility markets	By resolving grid-congestion, and therefore increasing its security, end-users and DSOs will benefit.	Acea Energia plans to collaborate with HEDGE-IoT partners in the future to adapt and implement the best technologies in local energy ecosystems.	Acea Energia will engage with other EU researchers and SMEs to exchange knowledge on improving the efficiency of energy communities	Acea energia will lead projects that promote the optimization of energy communities through local flexibility markets, improving technology through the use of Io-T platforms that will contribute to the objectives grid security.	High initial costs for implementing digital infrastructure	Standard IPR protection strategy, including patents and licenses, where applicable.	Risk: Incompatibility of innovative solutions with existing infrastructure. Mitigation: Conduct thorough infrastructure assessments and colaborate with tech providers to ensure compatibility.
ELES	This KER offers ELES with a comprehensive roadmap for commercializing HEDGE-IoT solutions, helping to bridge the gap between technological innovation and market adoption. It allows ELES to develop new business models and services tailored to digital grid management, expanding its	ELES plans to use KER for potential commercialization by incorporating entry plans for IoT-enabled services which includes integrating them with existing grid management practices for improved flexibility and resilience.	The primary users include transmission and distribution system operators (TSOs and DSOs) who will benefit from the commercialization strategies for digital grid solutions. Energy service companies (ESCOs) are direct beneficiaries, gaining access to new IoT-enabled products and	ELES will work with HEDGE-IoT partners to share best practices and market insights. Collaborative pilots and demonstrations will be conducted to validate business models and gather real-world data. ELES will contribute to joint market	ELES will leverage its strategies to align its network upgrades and offerings with broader EU digitalization goals. The roadmap will be used as a basis for pitching new digital services and solutions to partners and stakeholders within the network.	ELES will align its digital services with the objectives of the Green Deal and the EU Digital Strategy by focusing on solutions that enhance energy efficiency and grid flexibility. ELES plans to use the insights to contribute to digitalization projects that foster interoperability	Market penetration may be affected by limited awareness of the need for digital grid solutions among traditional energy operators. High implementation costs and the perceived complexity of integrating IoT services with legacy systems could pose additional barriers. Additionally, the market's readiness	ELES will safeguard its intellectual property through comprehensive partnership agreements, clearly defining ownership and usage rights for all developed commercialization strategies. Patent applications will be pursued for any novel business models or processes identified in the roadmap. Confidentiality agreements will be enforced with	A key risk is the potential misalignment between the developed commercialization strategies and market needs, which ELES will mitigate by conducting thorough market validation studies; this risk is estimated as medium. Resistance from other energy stakeholders due to high implementation costs may pose a barrier, which ELES plans to counter cost-benefit analyses.

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	portfolio of offerings.		services that enhance grid management.	analyses and regulatory assessments, ensuring a unified approach to market entry. The partnership will focus on aligning product offerings with the needs of various stakeholders across the energy ecosystem. This collaborative effort will help maximize market uptake and scalability of the solutions.		and standardization.	for new business models and services could impact the speed of adoption.	partners during the development phase to prevent unauthorized use.	
NESTER	From R&D NESTER's perspective, the main value is the validation of the economical & technical feasibility of the provision of existing ancillary services by distributed resources resorting to HEDGE-IoT platform /technologies.	R&D NESTER intends to continue developing the market simulator (MS) platform in other projects, working as a testbed for new actors to test their strategies and capabilities to participate in ancillary services markets and/or other Flexibility Markets (e.g. local markets for DSOs). R&D NESTER intends to continue developing the MS	Stakeholders, focused on potential market participants (e.g. Aggregators, FSPs) and SOs (e.g. TSOs)	At least with all the partners participating in the PT pilot: CEVE, ELERGONE, REN and INESC	R&D NESTER intends to continue developing the MS for additional products and updating it according to the evolving regulations that will applied.	The MS platform can be adjusted to integrate other flexibility market products. Its use can facilitate the testing and deployment of the future flexibility energy solutions in flexibility markets.	Market risks relate to general regulation and business models around flexibility; how flexibility can be used for DSO purposes, who operates them, what is the position of independent aggregators, etc. There are still many open questions also on national levels.	The Consortium Agreement mitigates this risk and, if necessary, additional agreements can be established after the end of the project.	Appearing of similar alternative platform (low probability). Mitigation action: monitor the appearing of similar solutions.

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		for additional products and updating it according to the evolving regulations that will applied.							

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Partner	Value proposition	Future exploitation strategy	Target Audience	Synergies with other HEDGE-IoT partners	Synergies with other EU researchers/SEMs	Impact on EU and local/regional policies	Market barriers	IPR measures	Possible Exploitation Risks
F6S	Expanding the network of SMEs and Startups through HEDGE-IoT will increase F6S ecosystem and provide further deal opportunities for F6S to disseminate and sell its services as well as engage new service providers into its platform.	F6S provides value-added services to Founders through its platform. HEDGE-IoT will increase F6S ecosystem and provide further deal opportunities for F6S to disseminate and sell its services as well as engage new service providers into its platform.	SMEs, innovators, and entrepreneurs benefit from funded provided by the Open Calls. Broader communities who will gain from the impact of the digital innovations they will develop.	F6S will collaborate with other HEDGE-IoT partners to maximize impact of the campaign and activate their networks.	F6S will share the opportunity it its EU research and industry networks to promote Open Calls, share best practices, and identify applicants. By doing this, the EU innovation ecosystem will be reinforced and shared progress will be enhanced.	Through the co-creation process, we will make sure that the projects implemented under the Open Calls will help support technologies that contribute to EU environmental and digital transformation goals.	This analysis is dependent on scope of Open Calls, which is not yet defined.	N/A	This analysis is dependent on scope of Open Calls, which is not yet defined.
INCL	This KER enhances our open innovation efforts by engaging SMEs and innovators, fostering collaboration through HEDGE-IoT Open Calls. It supports scalable social innovation and sustainable business models, driving societal impact and long-term value.	We plan to use this KER to build strong partnerships with SMEs and innovators, integrating their contributions into our open innovation initiatives. This will drive the development of scalable solutions, support sustainable business models,	The target audience includes SMEs, innovators, and entrepreneurs who will directly benefit from participating in HEDGE-IoT Open Calls, as well as broader communities who will gain from the societal impact of the resulting digital innovations.	We plan to collaborate with other HEDGE-IoT partners by leveraging their networks, expertise, and resources to maximize the reach and impact of the campaign. Together, we will co-design engagement strategies, share insights to refine the Open Calls,	We plan to utilize this KER by engaging our network of EU researchers and SMEs to promote Open Calls, share best practices, and identify high-potential participants. This collaboration will strengthen ties within the EU innovation ecosystem and serve as a	We will use this KER to drive innovation aligned with EU initiatives like the Green Deal and Digital Strategy, promoting sustainable, data-driven solutions. The Open Calls will help develop technologies that support both environmental and digital	Possible market barriers include lack of awareness about the need for data-driven solutions, high development and implementation costs, resistance to adopting new technologies, and limited understanding of the HEDGE-IoT Framework among potential users. Additionally,	We plan to protect our intellectual property rights by implementing clear licensing agreements, ensuring proper documentation of innovations, and using patents or copyrights where applicable. We will also collaborate with legal experts to monitor and enforce IPR, while ensuring that open	Low adoption rates: Mitigated by targeted marketing and awareness campaigns. Likelihood: Medium. Technology integration challenges: Mitigated by providing technical support and ensuring interoperability. Likelihood: Medium. Regulatory changes: Mitigated by staying compliant with evolving EU regulations. Likelihood: Low. Market competition: Mitigated

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		and enhance the societal impact of digital technologies in future projects.		and ensure that the selected projects align with the overarching goals of the HEDGE-IoT ecosystem.	foundation for partnerships in future projects, driving shared progress in digital and societal impact.	transformation goals.	market fragmentation and regulatory challenges could also hinder widespread adoption.	innovation principles are respected within the HEDGE-IoT ecosystem.	by focusing on unique value propositions and continuous innovation. Likelihood: High.

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Table 18: KER#15 A set of up to 30 Open Call projects offering new data-driven services and functionalities complementing the HEDGE-IoT Framework

Partner	Value proposition	Future exploitation strategy	Target Audience	Synergies with other HEDGE-IoT partners	Synergies with other EU researchers/SEMs	Impact on EU and local/regional policies	Market barriers	IPR measures	Possible Exploitation Risks
ED	ED has previously organized and run Open Call campaigns for research projects. Through the Open Calls ED will gain insights in new services and tools that will complement the HEDGE-IoT framework	More experience in running open calls. To be leveraged in future research actions	Service Developers	Not yet clearly defined. To be explored.	Use the generated knowledge and expertise to attract more clients and to better position ED in future innovation projects	New services towards the digitalization of the grid, increased renewable integration, flexibility provision	Limited interest of service providers, SMEs and startups.	To be defined. Most likely open-source for research purposes, not open-source for commercial purposes	Reluctance to join the HEDGE-IoT Framework
INCL	The added value of this KER lies in fostering the development of innovative, data-driven services that enhance and complement the HEDGE-IoT Framework. These projects will expand our organization's ecosystem, drive technological advancement, and provide actionable insights for scaling impactful digital solutions in future initiatives.	We plan to leverage this KER by integrating the new data-driven services into the HEDGE-IoT Framework, enhancing its functionality and adaptability. These projects will serve as a foundation for developing advanced solutions, scaling innovation, and addressing diverse societal and business needs in future initiatives.	The target audience includes developers, SMEs, and innovators utilizing the HEDGE-IoT Framework to build or enhance their solutions, as well as end-users who will benefit from the advanced data-driven services and functionalities in various applications.	We plan to work closely with other HEDGE-IoT partners to integrate their unique capabilities into the development of data-driven services. By pooling resources and knowledge, we aim to create a diverse set of solutions that extend the functionality of the HEDGE-IoT Framework, fostering innovation and ensuring broad applicability across various industries.	We plan to use this KER to strengthen collaboration with EU researchers and SMEs by sharing insights and expertise to develop innovative, data-driven solutions. This will enable us to align with new EU projects, creating synergies that advance the objectives of the HEDGE-IoT Framework and contribute to the wider EU digital and innovation agendas.	We plan to use this KER to contribute to EU initiatives by developing data-driven services that support the goals of the Green Deal and the EU Digital Strategy. By focusing on sustainability and digital transformation, the Open Call projects will generate solutions that align with EU policy objectives, fostering a greener, more digitally connected future at both the EU and regional levels.	Data privacy concerns: Users may be reluctant to adopt data-driven services due to concerns about data security and privacy. Mitigation: Implement robust security protocols and ensure compliance with data protection regulations. Limited interoperability: New services may struggle to integrate with existing infrastructures or platforms. Mitigation: Focus	Collaborative IP Framework: We will establish a clear framework for joint IP ownership with partners involved in the Open Call projects, ensuring that each party's contributions are protected. Licensing Models: We will explore flexible licensing options, such as open-source or commercial licenses, depending on the nature of the service, to maximize reach while safeguarding core	Evolving Market Needs: Market demands may shift, reducing relevance. Mitigation: Continuously adapt services to emerging trends. Likelihood: Medium. User Integration Challenges: Users may struggle with integrating new services. Mitigation: Provide clear support and integration tools. Likelihood: Medium. IP Conflicts: Disputes over intellectual property could arise. Mitigation: Establish clear IP agreements early on. Likelihood: Low. Partner Dependence: Over-reliance on external partners could limit control. Mitigation:

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							on designing open, interoperable solutions and provide integration support. Regulatory uncertainty: Changing regulations around data usage and digital services could create barriers to market entry. Mitigation: Stay informed on regulatory developments and proactively adjust solutions to remain compliant. Market readiness: The target market may not be ready for advanced data-driven services due to lack of technical expertise or infrastructure. Mitigation: Provide training and support to build market readiness and adoption capacity.	technologies. Confidentiality Agreements: For early-stage developments, non-disclosure agreements (NDAs) will be used to protect sensitive information and proprietary data shared during the project. Innovation Tracking: We will implement internal processes to document and track the development of IP, ensuring early protection through patents or trademarks where appropriate, especially for unique data-driven functionalities.	Build diverse partnerships with contingency plans. Likelihood: Low. Training Gaps: Users may lack the expertise to use the services fully. Mitigation: Offer training and user-friendly interfaces. Likelihood: Medium.

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Table 19: KER#16 A concrete dissemination and communication plan including clustering activities and synergies with relevant European initiatives and projects

Partner	Value proposition	Future exploitation strategy	Target Audience	Synergies with other HEDGE-IoT partners	Synergies with other EU researchers/SEMs	Impact on EU and local/regional policies	Market barriers	IPR measures	Possible Exploitation Risks
F6S	Expanding the network of SMEs and Startups, as partners and beneficiaries but also as future clients. Reinforcing the position of F6S as a expert of Communication and Dissemination in EU Projects	Expanding the network of SMEs and Startups, as partners and beneficiaries but also as future clients. Reinforcing the position of F6S as a expert of Communication and Dissemination in EU Projects	Expanding the network of SMEs and Startups, as partners and beneficiaries but also as future clients. Reinforcing the position of F6S as a expert of Communication and Dissemination in EU Projects	Expanding the network of SMEs and Startups, as partners and beneficiaries but also as future clients. Reinforcing the position of F6S as a expert of Communication and Dissemination in EU Projects	Expanding the network of SMEs and Startups, as partners and beneficiaries but also as future clients. Reinforcing the position of F6S as a expert of Communication and Dissemination in EU Projects	Expanding the network of SMEs and Startups, as partners and beneficiaries but also as future clients. Reinforcing the position of F6S as a expert of Communication and Dissemination in EU Projects	Expanding the network of SMEs and Startups, as partners and beneficiaries but also as future clients. Reinforcing the position of F6S as a expert of Communication and Dissemination in EU Projects	Expanding the network of SMEs and Startups, as partners and beneficiaries but also as future clients. Reinforcing the position of F6S as a expert of Communication and Dissemination in EU Projects	Expanding the network of SMEs and Startups, as partners and beneficiaries but also as future clients. Reinforcing the position of F6S as a expert of Communication and Dissemination in EU Projects
ED	Expand the network of partners and clients	More synergies to pursue future innovation actions	Academia, Industry, Energy Stakeholders, IT partners, Service and Technology Providers	Not yet clearly defined. To be explored.	Use the generated knowledge and expertise to attract more clients and to better position ED in future innovation projects	Exploit the communication and dissemination channels and clusters of HEDGE-IoT in future projects	N/A	To be defined. Most likely open-source for research purposes, not open-source for commercial purposes	N/A

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Table 20 Ker# 17 Development of an AI Plan to ensure that the AI develop in the project are adequately manage and ensure trustworthiness

Partner	Value proposition	Future exploitation strategy	Target Audience	Synergies with other HEDGE-IoT partners	Synergies with other EU researchers/SEMs	Impact on EU and local/regional policies	Market barriers	IPR measures	Possible Exploitation Risks
TRIALOG	Trialog already have a Practice for Privacy and Security. This AI Plan will come to extend it as an add on. The aim of this new cross-domain Plan (Privacy, security, AI) is to be very flexible and to adapt it the needs and target of the project.	The added value for Trialog is that it can be proposed as a service to support AI development.	The direct beneficiary will be organisations developing, managing, maintaining AI systems.	This KER is based on regulation and standardization, and will be enriched by future work and projects.	Communicate and disseminate results of the projects to attract more clients to the Platform and to better position F6S in EU innovation projects	Colaborations to regulation and Standardisation are done by Trialog on this subject.	N/A	N/A	No implication of the pilot participants to provide the necessary inputs for the practice.

Table 21 KER 18 Further development of the ODCT (Ontology-Driven Constraits Tester) tool. New use cases, new features and validation on real data.

Partner	Value proposition	Future exploitation strategy	Target Audience	Synergies with other HEDGE-IoT partners	Synergies with other EU researchers/SEMs	Impact on EU and local/regional policies	Market barriers	IPR measures	Possible Exploitation Risks
TRIALOG	Trialog already has a proof of concept of this ontology tool. The added value within Hedge-IoT is to go further with another version, new features and to validate if with real world data.	This KER will be used by TRIALOG for future work.	The end user is engineers in the industry to support them in the development and the validate of the semantic interoperability of their systems.	The tool will be provided to pilot partners of HEDGE-IoT as well as technical support.	This tool could be further developed and used in other EU projects.	There are discussions with JRC CoC ESA phase 2 to maybe use this tool for semantic ontology testing.	N/A	N/A	N/A

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Table 22 KER 19 A service for flexibility Optimization for Tertiary Buildings.

Partner	Value proposition	Future exploitation strategy	Target Audience	Synergies with other HEDGE-IoT partners	Synergies with other EU researchers/SEMs	Impact on EU and local/regional policies	Market barriers	IPR measures	Possible Exploitation Risks
SONAE	The service will enable the tertiary buildings of having a optimization based on IoT and ML technologies that will provide the best management of its assets.	This new service will be a new adding into our portfolio and will be the first service of this type in the country.	Tertiary buildings, industries, B2B sector.	The other partners will be an active stakeholder of the service, namely INESCTEC, CEVE and REN. INESCTEC will develope EdgeConnect Platform for market participation. CEVE will associate their assets with ours to increase the flexibility portfolio for market participation. REN is the market operator that will requesting flexibility from end-users (B2B or B2C).	The service will demand additional developments from some of our partners' networks. The participation in new EU projects can always be necessary to add new features to the service.	The ability to manage energy consumption and flexibility will be used to optimize management of the energy grid (Green Deal). The management of assets can be used according to different models, either to reduce costs or contribute to reduce CO2 footprint.	A barrier can be the general regulation and business models around flexibility: how flexibility can be used from the aggregator perspective, who operates assets. There are still some open questions on a national level.	The Consortium Agreement mitigates this risk and, if necessary, additional agreements can be established after the end of the project.	Appearing of similar alternative services (low probability). Mitigation action: monitor the appearance of similar solutions. Lack of regulation can be a risk so there is always the possibility of developing a solution that needs to be changed after regulation is released.

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