DSOs FOR EUROPE

TF DESAP AskMeAnything

10 November

Agenda

No.	Start time	Stop time	Timeframe	Topic	Speaker
1	10:00	10:10	00:10	Welcome & Introduction to the agenda	Stephan
2	10:10	10:30	00:20	General introduction to TF DESAP	Flore
3	10:30	10:50	00:20	Presenting the TF's white paper on "DSO current and future challenges"	Madalena
4	10:50	11:10	00:20	Project plan of the Joint Task Force 2024/2025	Stephan
5	11:10	11:30	00:20	Conclusion and next steps	Ewa

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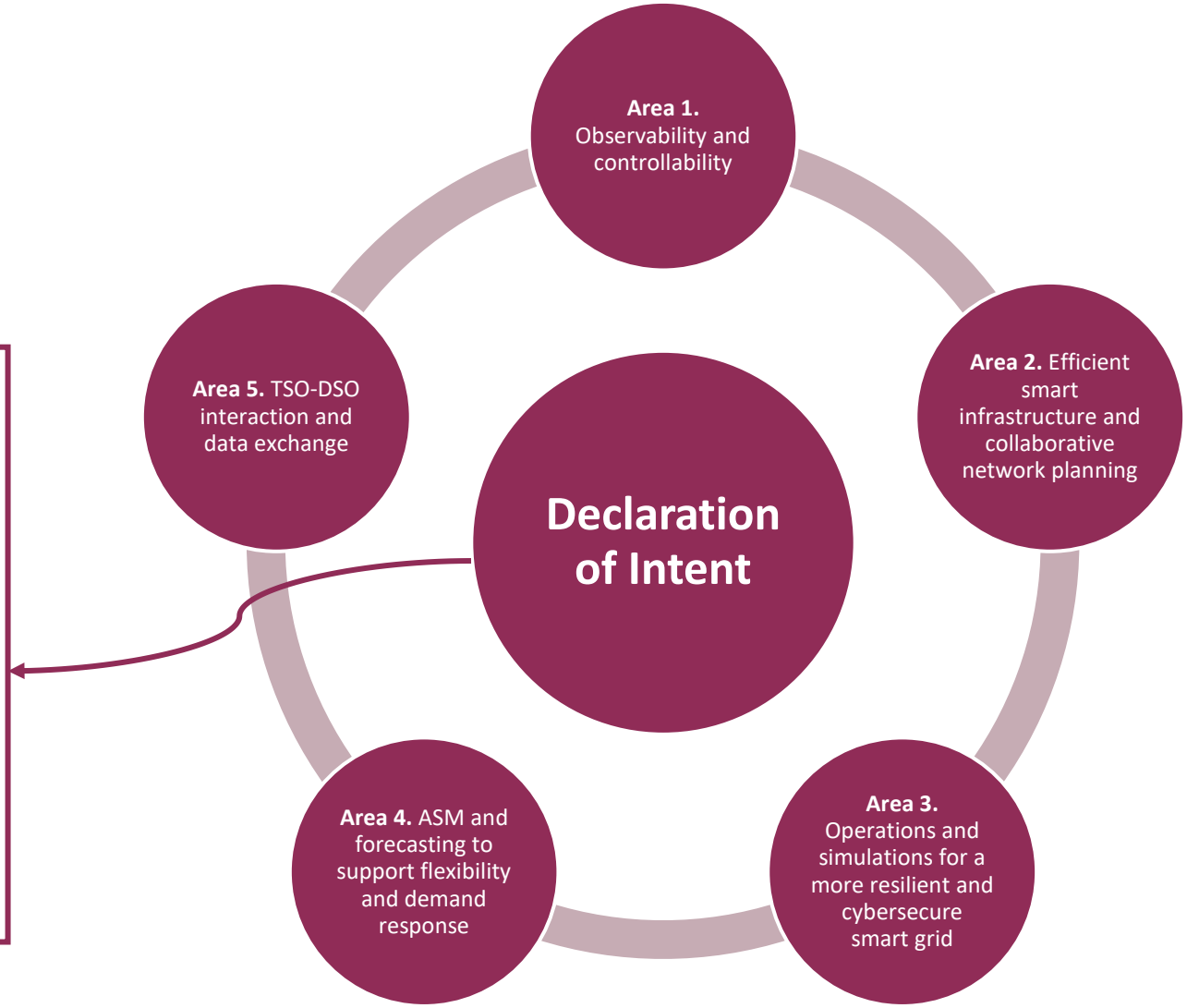
General Introduction: TF DESAP

1. Scope of work

The EC mandates DSO Entity and ENTSO-E to investigate how to **promote the investments in a smart electricity grid with a European Digital Twin and Smart Grid Indicators addressing five working areas,** see (COM(2022)552/2)

DoI signed in December 2022 by ENTSO-E and DSO Entity with the following objectives:

1. **Develop a DT of the EU Electricity Grid** of adequate granularity to enhance the smartness of the grid and support the development of new capabilities by both TSOs and DSOs.
2. **Develop guidance and support for network operators on sustainable and cost-effective smart investments**, framed by a limited set of tailored SGIs composed of input and output indicators through a step-wise and joint learning process, based on Art. 59.1.(I) of Directive (EU) 2019/944.



2. Work structure (1/3)

Joint Task Force

COM(2022)552/2 mandates DSO Entity and ENTSO-E to establish a **comprehensive consultation process** of grid users and other stakeholders on the work of the JTF

2. Work structure (2/3)

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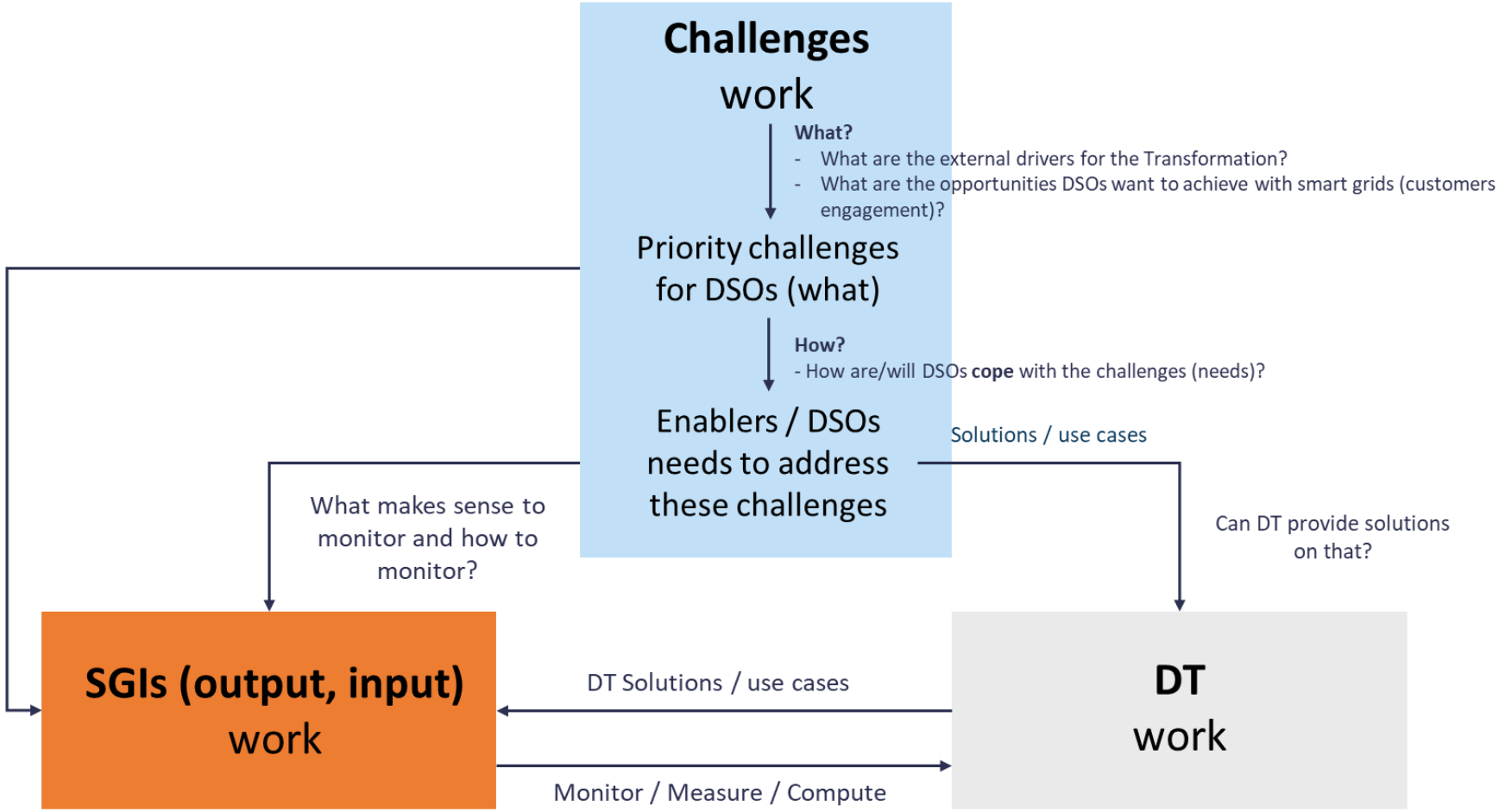

2. Work structure (3/3)

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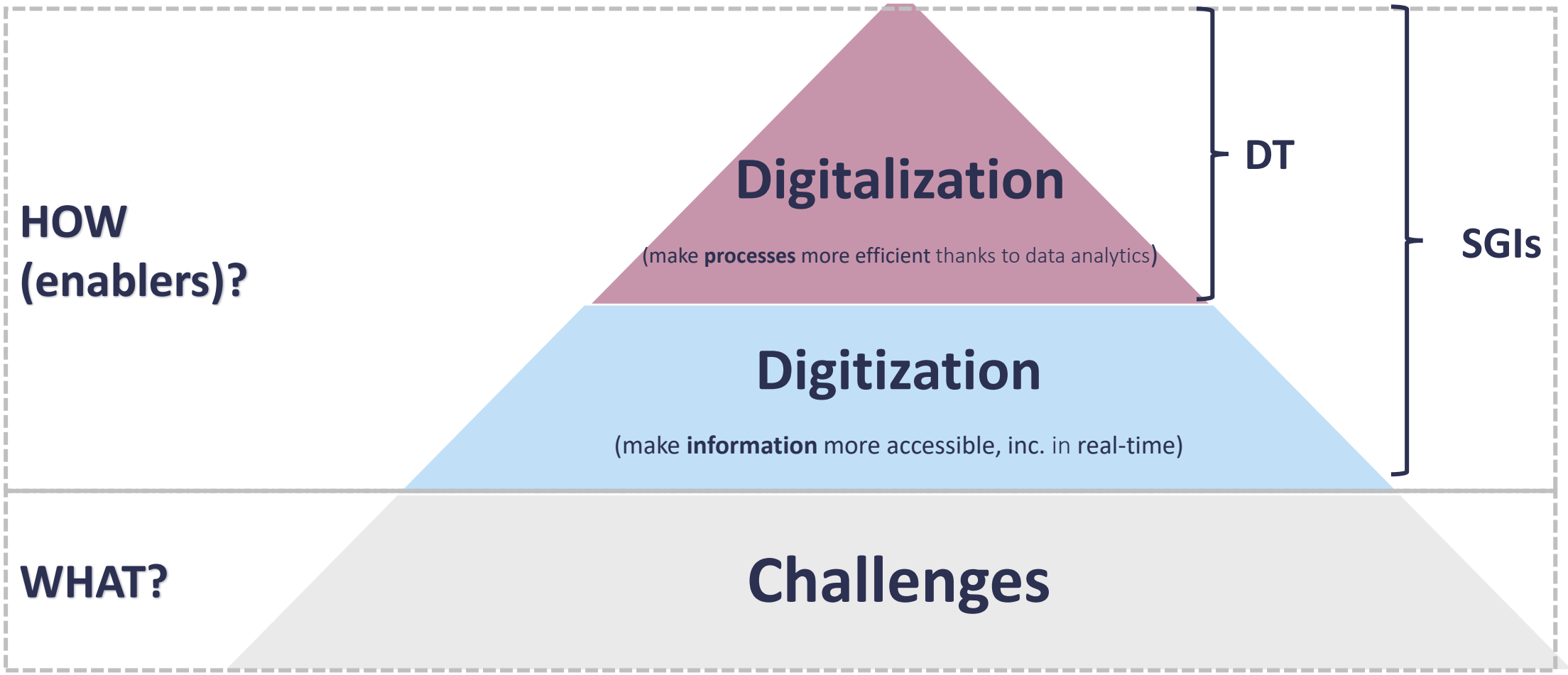

Questions

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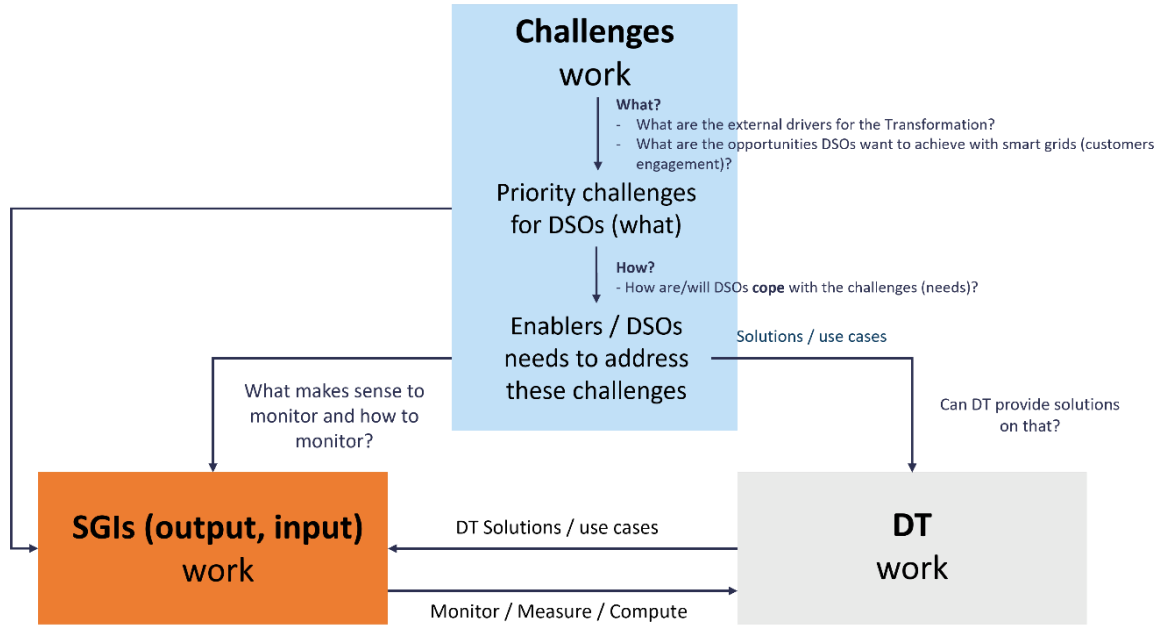
DSO current and future challenges – White paper

Introduction

- **Objective:** To present a comprehensive overview of the DSO's challenges as a steppingstone towards the common conceptualization of a Digital Twin (DT) of the European Electricity Network and Smart Grid Indicators (SGIs).
- **Methodology:** Experts input, Joint Task Force input, literature review.
- **Scope:** Two categories of challenges have been addressed, (1) Drivers - external factors impacting the need for DSOs to act; and (2) Responses - the ways to cope with the drivers.



Challenges – drivers (external factors) 1/2

Electrification

- Shift from conventional, high-emission technologies to zero-emission ones.
- Accelerated proliferation of DERs (e.g., Evs, heat pumps) and challenges associated with integrating these resources, especially concerning **grid availability and timely grid connections.**
- Constrained capacities, leading to extended connection times due to the necessity for network enhancements and expansion.
- Required distribution grid investments: €375-€985 billion by 2030 [1,2]

Decentralization

- Shift from traditionally, centralized energy systems (few large power plants and unidirectional flow) to decentralized energy systems (extensive array of DERs that connect primarily to LV and MV networks).
- Estimated **510 GW of new RES** capacity slated for installation across EU27+UK by 2030, **~70% of which projected to connect to distribution grids.**
- Leads to **pronounced need for smart grids.**

Aging network

- Pressing concern related to the aging of distribution networks, particularly at the MV and LV levels.
- The emerging emphasis on DER requires reconfigurations of cable, transformer, and other system components to cater to this new generation, distribution, and consumption paradigm.
- Projections suggest that **40-55% of these assets could exceed 40 years of age by 2030 across the EU.**

1. DSO investments required for Energy Transition in Europe (deloitte.com)
2. manifesto_being_ahead_of_the_curve_draft_final_version-2022-030-0026-01-e-h-3F43D8A5.pdf (eurelectric.org)

Challenges – drivers (external factors) 2/2

Growing consumer Expectations

- Consumers expect **prompt provisioning of services** accompanied **by timely updates** on service processes.
- **Surge in connection requests and power upgrades**, make it increasingly challenging to align with these evolved customer expectations.
- Divergence: customers with traditional **"connect and forget" mindset**, and group that seeks **active participation in the energy market**, demanding seamless data access and tailored services

Climate change & environmental concerns

- Unprecedented temperature records, underscoring the significance of climate change as a global concern.
- Climate extremes, encompassing severe weather events, wildfires, and flooding, exert **additional pressure on the electricity grid**, necessitating **enhanced measures to bolster network resilience.**
- **Rising environmental awareness** mandates prudent decision-making during network expansion and maintenance operations.

Cyber threats

- **Increasing digitalization of the grid and the integration of more connected assets**, the importance of cybersecurity escalates.
- Safeguard the critical infrastructure against potential cyber threats, ensuring the energy system's reliability and integrity.
- **Preserving the privacy and security of customer data** remains paramount.
- In addition: An escalating concern regarding physical threats, especially in light of the current volatile geopolitical landscape

Challenges - DSO responses

Enable direct involvement of customers

- End-users need to **actively engage in the European energy market** and thus need access to **near real-time information** on their energy consumption and/or generation.
- Such data can be sourced from **smart meters** and supplemented with **dedicated metering devices** for detailed granularity.
- This data availability **enables customers to modify their energy behaviors**, for example, based on signals received from market actors.

Ensure network power quality

- A need to have a **good overview of the assets** with regards to location, dimensions, etc.
- Furthermore, **sensoring and real-time monitoring of the assets** to gain knowledge of the load factors during each day of the year is of utmost importance.
- Also, we need **good models to predict** where to expect the highest increase of DER in our network

Challenges - DSO responses

Support better planning for grid investments

- DSOs need to **foresee future connections and anticipate demand surges** for improved network upgrade planning and to have **accurate asset information**, including specifications of cables, transformers, and other system components, and to understand the load factors impacting these assets.
- Furthermore, **network planning methodologies should be tailored** to champion a **consumer-centric** model.

Ensure better resilience to cope with natural and cyber threats

- Concerns the broader aspects of ensuring **reliable electric power availability for end-users** and **safeguarding against power outages.**
- Presently, DSOs face an evolving set of challenges as they navigate an environment marked by **increasing environmental volatility and the transition from analog to digital operations.**

Challenges - DSO responses

Enhance active system management

- The incorporation of **additional measuring points and devices** yields an **increased volume of data** points.
- These can be employed to discern the **unseen physical states of system components** that are either not directly measured or inherently immeasurable.
- By combining this with **refined weather forecasting**, **customer behavior modeling**, and comprehensive **knowledge of virtually all grid-connected DER** — inclusive of their online status and physical parameters — it becomes feasible to predict day-ahead behaviors with minimal safety margins.

Enable active asset management

- **Pro-active asset management** seeks to preempt incidents, minimizing durations where customers or market participants might be adversely impacted.
- With this approach, **statistical data and predictive models** are utilized to automate the processes of equipment ordering, commissioning, and the necessary civil work for anticipated replacements.

Challenges - DSO responses

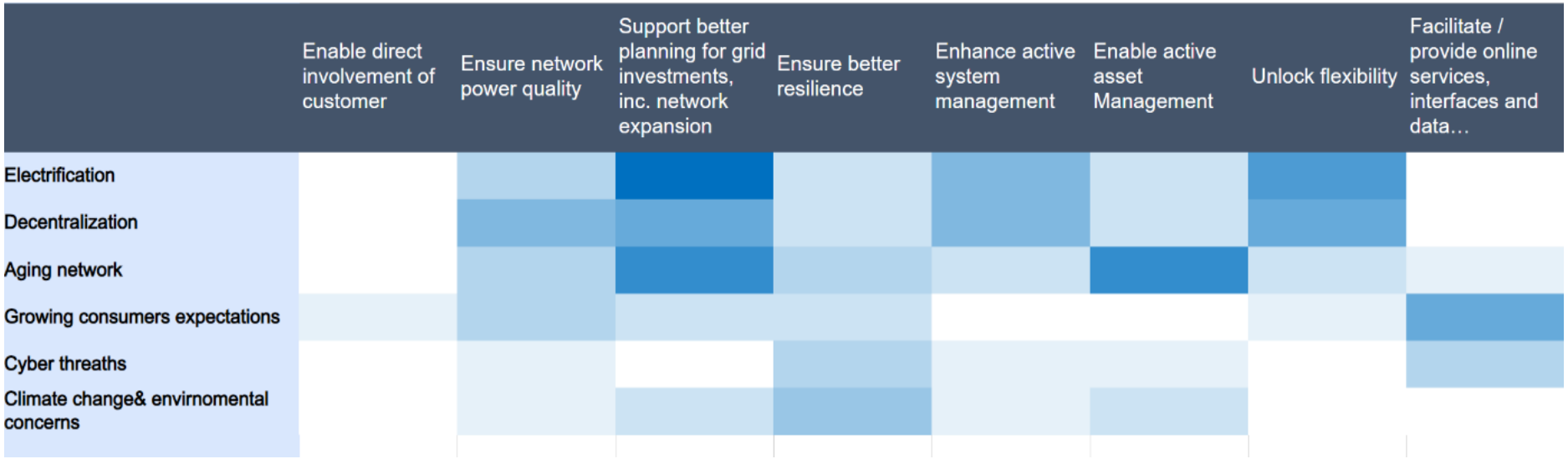
Unlock flexibility

- Unlocked flexibility allows DSOs to reduce safety margins, offering prosumers and end-users **opportunities to contribute and engage in local peak shaving initiatives.**
- Moreover, under specific conditions, flexibility can serve to **defer investments**

Facilitate / provide online services, interfaces and data access for consumers and third-party applications

- This begins with the **online application and ordering processes for all energy-related services.**
- Includes applications for services such as charging points, facilitating easy access to and sharing of meter data, providing direct online access to information regarding application or account statuses, and offering online self-services for service alterations or additions.

Link drivers and responses – heat map



Main responses?

Planning; Flexibility

Planning; Quality; ASM; Flexibility

Planning; Active Asset mgmt

Online services

Resilience; Online services

Resilience

Physical grid investments are clearly more expressive in importance given by DSOs, this emphasises the importance of achieving a **right balance between conventional investments and smart & digital ones.**

Links between responses and sub areas 1/2

	Enable direct involvement of customers	Ensure network power quality	Support better planning for grid investments	Ensure better resilience to cope with natural and cyber threats	Enhance active system management	Enable active asset management	Unlock flexibility	Facilitate / provide online services, interfaces …
Working area 1: Observability and controllability of the grid					↔	↔	↔	
1.1. Innovative tools and solutions for dynamically mapping network and external network connected assets		■		■	■	■	■	
1.2. Innovative tools and solutions to understand, forecast, simulate and optimise power flows		■		■	■	■	■	
1.3. Digitally enabled, interoperable and eco-friendly Internet of Things and network assets	■				■	■	■	■
Working area 2: Efficient smart infrastructure and collaborative network planning			↔	↔		↔		
2.1. Improving assets condition monitoring and risk mitigation for predictive asset management		■	■	■	■	■		
2.2. Planning and optimisation tools and strategies for smart investments and integrated energy systems			■	■		■	■	
2.3. Integrated mapping of grid hosting capacities (installed and projected), and visibility over connected assets			■	■		■	■	
Working area 3: Operations and simulations for a more resilient and cybersecure smart grid				↔				
3.1. Enhanced TSO–DSO interaction for optimal power flow and system security				■	■			
3.2. Establishing standards and requirements for cyber physical security, traceability, confidentiality and redundancy				■				
3.3. Advanced reconfiguration and control of network operation and related assets, and interaction with network connected assets		■		■	■	■		

Links between responses and sub areas 2/2

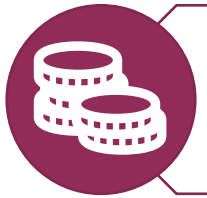
	Enable direct involvement of customers	Ensure network power quality	Support better planning for grid investments	Ensure better resilience to cope with natural and cyber threats	Enhance active system management	Enable active asset management	Unlock flexibility	Facilitate / provide online services, interfaces …
Working area 4: Active System Management and forecasting to support flexibility and demand response					↔		↔	
4.1. Improving flexibility needs assessment through advanced tools and probabilistic models			■		■		■	
4.2. Ensuring coordinated processes and interoperable solutions between TSOs and DSOs and market participants	■				■		■	■
Working area 5: TSO–DSO interaction and data exchange	↔						↔	↔
5.1. Smart metering and behind-the-meter infrastructure and services providing information to users and grid operators	■	■			■		■	■
5.2. Customer and metering data exchange to unlock flexibility potential	■						■	■
5.3. Interoperable solutions for data exchange between sectors	■		■				■	■

Active System Management is a response **transversal to all the 5 working areas!**
Only **one key response was directly linked to the establishment of standards** and requirements for cyber-physical security – note that specifically working on these standards is out of scope.

Key takeaways and way forward…

These challenges will be reflected differently throughout the countries, depending, e.g., on the pace of the energy transition, the age of the network…**There is no one size fits all solution across geographies…**

The challenges and their significance will evolve over time, e.g., a high priority today is handling increased volume of connection requests, and tomorrow, will shift more towards flexibility and active asset and system management.



Increasing the smartness of the network is a means to an end and **should be integrally assessed with the other alternatives** such as network expansion, having the **cost efficiency as one of the prime criteria** for selection.

It is then crucial to be able to **assess the contribution or benefit a certain DSO action can have on the achievement of a certain goal or output** as well as what prerequisites or inputs it needs to be able to carry out those actions → to be answered by SGIs

Questions

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Joint Task Force work plan for 2024/2025

Scope and Limitations

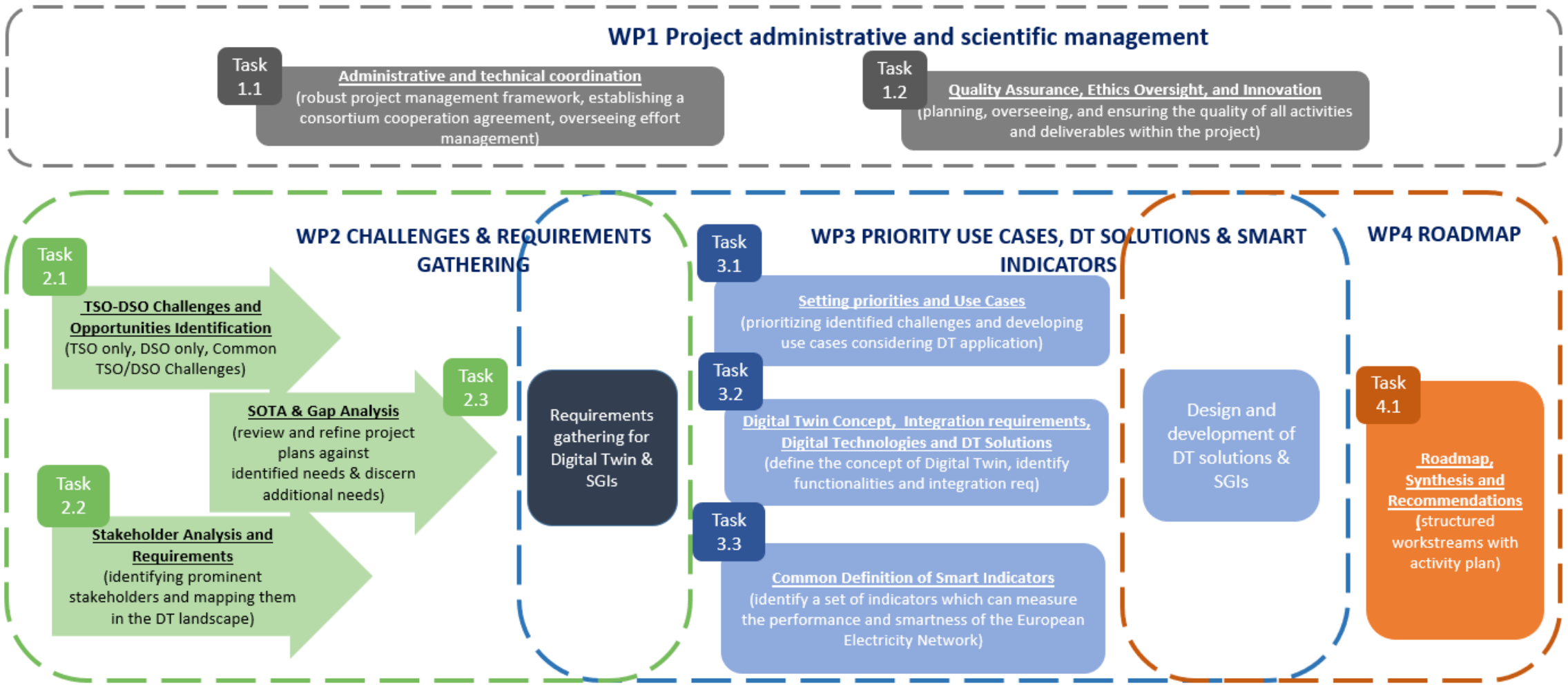
Scope

- This project aims at developing **common workstreams which would allow for the development and implementation of digital twin solutions and system grid performance indicators** helping achieve the ambitious goals of the current European energy policy framework.
- The project will serve as a **reference for future projects** addressing the development of digital twin solutions which are in line with the digitalisation efforts of the European energy system, as per the DoI.
- The scope is **limited to support the digitalisation of the European Electricity Grid by creating the framework/roadmap which will identify workstreams and specify business requirement, enablers, digital solutions and indicators.**

Out of Scope

- The project **does not intend to release digital platforms, network models neither does it intend to release cybersecurity applications or energy data space as final deliverables**. The development of these solutions could, nevertheless, be part of follow up projects which will also address the overarching goals described in the DoI.

Workstreams and structure



Timeline and deliverables

work development period
review period

Task		Timeline																													
WPx Ty	Title	Start	Finish	Q2 2023	Q3 2023	Q4 2023	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24
							Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24	Dec-24	Jan-25	Feb-25	Mar-25	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25
WP1	Project Administrative and Scientific Management																														
Task 1.1	Administrative and technical coordination	M1	M3	Preparatory coordination work					D1.1																						
Task 1.2	Quality Assurance, Ethics Oversight, and Innovation *(planning, overseeing, and ensuring the quality of all activities and deliverables within the DESAP project)*	M1	M24																												
WP2	Screening of Challenges & Requirements Gathering for Digital Twin Solutions																														
Task 2.1	TSO-DSO Challenges & Opportunities Identification	M1	M9	Preparatory work on Challenges																											
Task 2.2	Stakeholder Analysis and Requirements *(identifying prominent stakeholders and mapping their role in the DT landscape)*	M3	M12																												
Task 2.3	SOTA and Gap analysis *(review and refine project plans against identified needs & discern additional needs)*	M3	M12												D2.1																
WP3	Identification of Priority Use Cases for pan-EU Electricity Grid and Design of DT solutions																														
Task 3.1	Setting priorities and Use Cases *(prioritizing identified challenges and developing use cases considering specific scenarios and applications where the Digital Twin solution can provide value)*	M6	M15																												
Task 3.2	Digital Twin Concept, Integration requirements, Identification of Digital Technologies and DT Solutions *(define the concept of Digital Twin, identify functionalities and integration req, identification of digital solutions and technologies that can fulfill the functionalities and integration requirements. This could involve exploring relevant technologies, software platforms, data analytics tools, simulation softwares, visualization tools etc.)*	M9	M18																				D3.1								
Task 3.3	Common Definition of Smart Indicators	M7	M15			Preparatory input in the form of high-level principles for Smart Indicators for T 3.3 as well as Copenhagen Infrastructure Forum															D3.2												
WP4	Monitoring, Evaluation, and Performance Metrics using Smart Indicators and Workstreams Definition																														
Task 4.2	Roadmap, Synthesis and Recommendations	M15	M24																												D4.1

Deliverables List

D1.1: Project Administrative and Scientific Management plan (T1.1)
D2.1: TSO-DSO challenges and opportunities related to present and future needs of EU electricity system (T2.1) and Stakeholder analysis, SOTA and Gap analysis (T2.2 – T2.3)
D3.1: Use Case Prioritization (T3.1) and Digital Twin Solutions and Technologies (T3.2)
D3.2a: Key principles report on smart grid indicators (T3.3)
D3.2: Common definition of smart indicators to measure the performance and effectiveness of the Digital Twin solution (T3.3)
D4.1: Roadmap, synthesis, and recommendations (T4.1)

Questions

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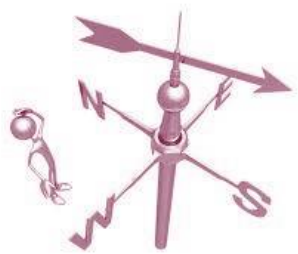
Conclusion and next steps

Conclusions



The TF DESAP address the topics of COM(2022) 552 regarding the EU action plan on Digitalisation of the energy system.

The TF is preparing directions for the development of the electricity system in terms of digitalisation taking into account challanges.

Developing a smart and digital energy infrastructure is a key requirement for Europe's aim to build a digitalized, green and resilient Energy System. Under this goal the ENTSO-E and the EU DSO Entity work together **to develop a concept of digital twin** (DT) of the EU electricity grid and to propose a set of **common smart grid indicators (SGIs)** to monitor and promote smart and digital developments.

Next steps

The outcome of the challenges will be used to define **use cases for DT** and to **define adequate SGIs for DSOs**.

The TF DESAP is working on a position for SGIs solely for DSOs and will work on the DT following a 2-steps approach, focusing first on UC for HV, followed by MV and LV UC

The JTF will deliver to the Copenhagen Forum (mid-2024) on key principles for SGIs and an initial set of qualitative SGIs common between TSOs and DSOs

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Thank you!