INTERACTIVE ETIP SNET WORKSHOP FOR DEFINING THE UPCOMING ETIP SNET ROADMAP 2020-2030
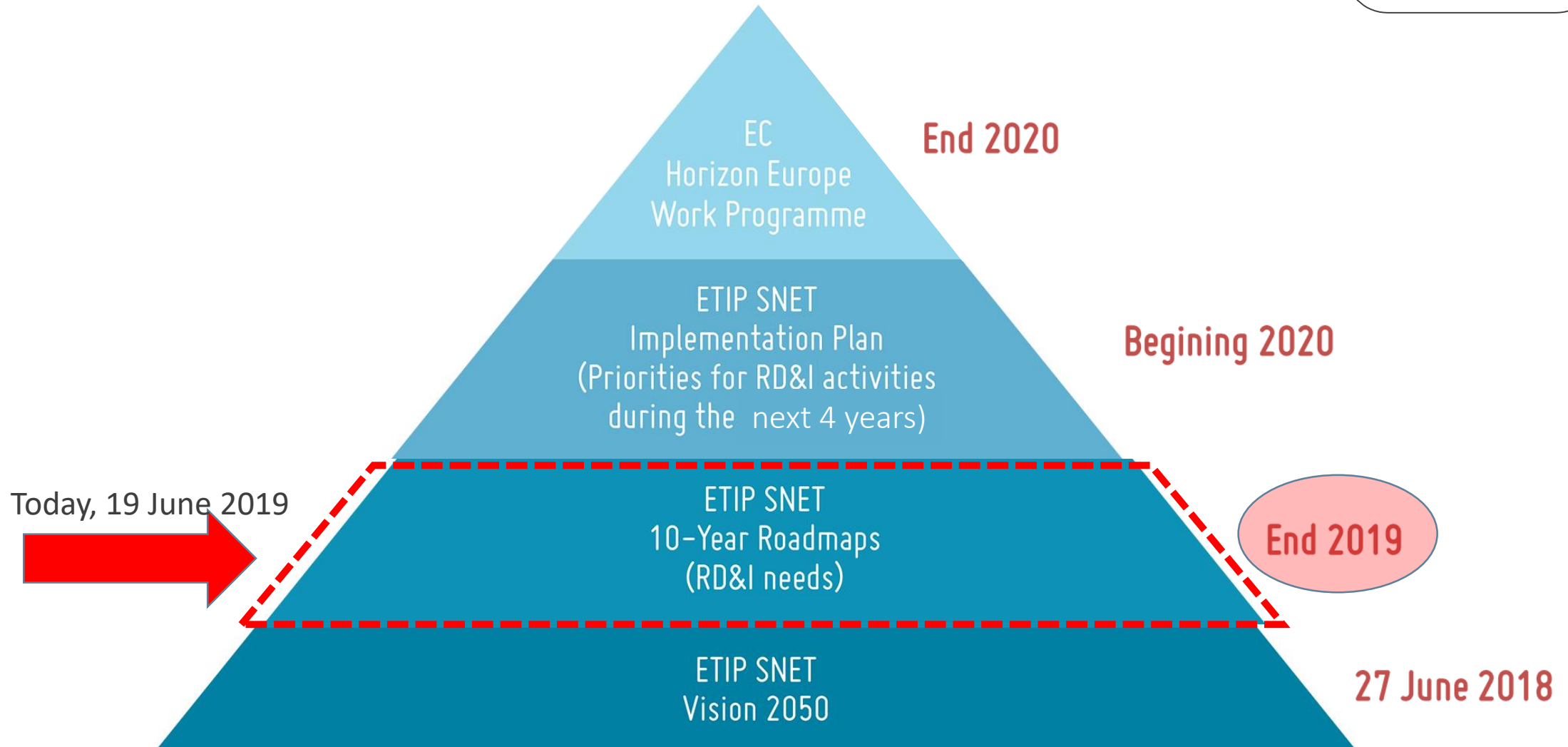
June 19, 2019
NH Hotel
19 Boulevard Charlemagne, 1000 Brussels

ETIP SNET Core Team

ETIP SNET PROCESS

THREE GOALS OF EU ENERGY POLICY

ETIP SNET
PLAN. INNOVATE. ENGAGE.

Secure, resilient, reliable supply

Secure, resilient, reliable supply
- Systems integration
- Reduce imports dependence
- Resilience & reliability

Affordable and market-based energy services

Affordable & market-based energy services
- Market integration
- Long-term investment signals
- Prosumers at the centre

Protected environment
- Climate change mitigation
- Pollution reduction
- Circular economy

Protected environment

2050 VISION GOAL

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A low-carbon, secure, reliable, resilient, accessible, cost-efficient, and market-based **pan-European integrated energy system**

supplying the whole economy and paving the way for a **fully CO2-neutral and circular economy by the year 2050**,

while **maintaining and extending global European industrial leadership** in energy systems during the energy transition.

VISION 2050

A SYSTEM OF SYSTEMS

Wind farm

Cross-border connections

Farm
Biogas production

Carbon capture & use

HV/MV substation

Gas substation

Biogas cleaning

Methanation

Electrolyzer

Pumped Hydro Storage

Underground gas storage

CH4

Positive energy house

grid-forming inverter

100% RES community

small scale battery

Air/air Heat pump

AC/DC Converter station

Nuclear power plant

Off-shore wind farm DC network

Compressor station

Power to gas

CH4

Solar PV plant

Large scale battery

Electric substation

Combined Cycle Gas Turbine

ICT network for digitalization of energy system

H₂O

Zero energy building

Micro CHP

Fast charging station

Hybrid bus
Electric/Hydrogen

Peer-to-peer energy trading

Gas to Power

Gas to Heat

Demand Response

Industry park

Airport

Liquid fuel

Harbour

Electric tram

Peer-to-peer energy trading

Waste heat

Biomass CHP plant

Hydrogen station

Vehicle-to-grid

small scale storage

Solar thermal

H₂

Liquid fuel station

Air/water Heat pump

Geothermal Heat pump

NETWORKS

Electricity

Heating & Cooling

Gas

Data

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Agenda 19 June 2019 08:30-12:15

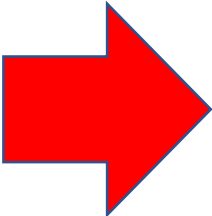| Time	
8:30	Registration – Welcome Coffee
9:00	**Welcome,** Nikos Hatziargyriou, chair of ETIP SNET

9:10	**ETIP SNET Vision and Targets for EUROPE's energy system integration needs**
	- **09:10-09:20 - From ETIP SNET Vision towards the ETIP SNET Roadmap** 2020-2030 **and the ETIP SNET Implementation Plan 2020-2023 (**Rainer Bacher, Bacher Energie / INTENSYS4EU)
	   ○ Integration Actions by using Integration Enablers for achieving Integration Objectives; by Integration Roles (Actors) in three different Integration Project Types
	- **09:20 – 11:00 Consultation in May 2019: Views of the ETIP SNET WGs on the proposed structures, elements and action needs**
	(Chairs/co-chairs of ETIP SNET WG 1, 2, 3, 4 and 5)
	   ○ WG1 (Antonio Iliceto): 09:50-10:05 (+ 5' Q&A)
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11:00	**COFFEE BREAK – Schuman Lobby**
11:30	Draft conclusions of the core team on the consultation
11:45	Free discussion about the overall concept of the roadmap

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6

	Morning Parallel sessions on the **inputs and outputs** of the Integration Actions in the upcoming ETIP SNET Roadmap 2020-2030	
	1.1 Integration Objectives (Outputs of Integration Actions)	**1.2 Integration Enablers (Inputs to Integration Actions)**
12:15	Room 1 *Moderator: Michele de Nigris (ETIP SNET Core team)* *10': view of ENTSO-E (Norela Constantinescu) on the topic* *Interactive discussion forum on the detailed specification of the Integration Objectives and the related milestones of Integration Actions*	Room 2 *Moderator: Rainer Bacher (ETIP SNET Core team)* *10': view of EDSO (Florian Gonzalez) on the topic* *Interactive discussion forum on the detailed specification of the Integration Enablers and the related milestones of Integration Actions*
13:00	**NETWORKING LUNCH – Schuman Lobby**	
14:00	Parallel sessions on the **inputs and outputs** of the Integration Actions in the upcoming ETIP SNET Roadmap 2020-2030 ⇨ **Same rooms and switch of moderators and subjects (Room 1 Enablers and Room 2 Objectives)**	

	Afternoon parallel sessions on **the Integration roles and Project Types** of the integration actions in the upcoming ETIP SNET Roadmap 2020-2030	
	2.1 Integration Roles (in Integration Actions)	**2.2 Integration Project Types (for Integration Actions) and Priorities**
14:45	**Room 1** *Moderator: Antonio Negri (ETIP SNET Core team)* *10': view of EASE (Yves Schlumberger) on the topic* *Interactive discussion forum on the detailed specification of the Integration Roles and the related milestones of Integration Actions*	**Room 2** *Moderators: Coralie Badajoz (ETIP SNET Core team)* *10': view of EERA on the topic* *Interactive discussion forum on the detailed specification of the Integration Project Types and their priorities and the related milestones of Integration Actions*
15:30	**COFFEE BREAK – Schuman Lobby**	
16:00	**Concluding session – next steps** *ETIP SNET Core team*	
16:30	**End of Event**	

Agenda 19 June 2019 08:30-12:15

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	ETIP SNET Vision and Targets for EUROPE's energy system integration needs
	
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Goals for 19 June 2019

Verify updating principles of RM and IP and interfaces to related documents, inputs, outputs

Confirm / change / update new proposed RM structure

- **Verify Roadmap transition**
  - **From current RM 2017-2026**
    - Clusters, 36 Functional objectives (FO), each with tasks
    - TOPICS from previous IP
  - **To NEW Roadmap 2020-2030 with** 5-dimensional Hyper Matrix
    - 36 FO mapped to three main dimensions: => Actions, Objectives, Enablers
    - Two additional dimensions: Actors (Roles) and Project Types

Table 3: list of clusters and functional objectives for transmission system.

Cluster	FO ID	Functional Objectives
C1 – Modernization of the network	T1	Optimal grid planning
	T2	Smart asset management
	T3	New materials and technologies
	T4	Environmental challenges and stakeholders
C2 – Security and system stability	T5	Grid observability
	T6	Grid controllability
	T7	Expert systems and tools
	T8	Reliability and resilience
	T9	Enhanced ancillary services
C3 – Power system flexibility from generation, storage, demand and network	T10	Storage integration
	T11	Demand response
	T12	RES forecast
	T13	Flexible grid use
	T14	Interaction with non-electrical energy networks
	T22**32** **33**	Flexible thermal power generation
C4 – Economic	T15	Market-grid integration
	T16	Business models
	T17	Flexible market design
C5 – Digitalization of power system	T18	Big data management
	T19	Standardization and data exchange
	T20	Internet of Things
	T21	Cybersecurity

Table 6: Distribution system clusters and FOs of the RIR (new FOs as well as extended cluster and FO coverages are indicated by underlined text).

Cluster		Functional Objectives
C1 – Integration of smart customers and buildings	D1	Active demand response
	D2	Energy efficiency from integration with smart homes and buildings
C2 – Integration of decentralised generation, demand, storage and networks	D3	System integration of small DER
	D4	System integration of medium DER
	D5	Integration of storage in network management
	D6	Infrastructure to host EV/PHEV – Electrification of transport
	D7	Integration with other energy networks
	D14 **37** **38**	Integration of flexible decentralised thermal power generation
C3 – Network operations	D8	Monitoring and control of LV network
	D9	Automation and control of MV network
	D10	Smart metering data processing and other big data applications
	D11	Cyber security (system approach)
C4 – Planning and asset management	D12	New planning approaches and tools
	D13	Asset management

And:; 300+ Tasks for the 36 Objectives

Agenda 19 June 2019 08:30-12:15

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- Goals: **RM structure** should be
  - Simple enough for quick understanding by wide audiences
    - ✓ETIP SNET Stakeholders, EC and national policy stakeholders
  - Detailed enough for researchers, demonstrators
    - ✓a robust reference for state of the art monitoring of RD&I projects actions with inputs and outputs

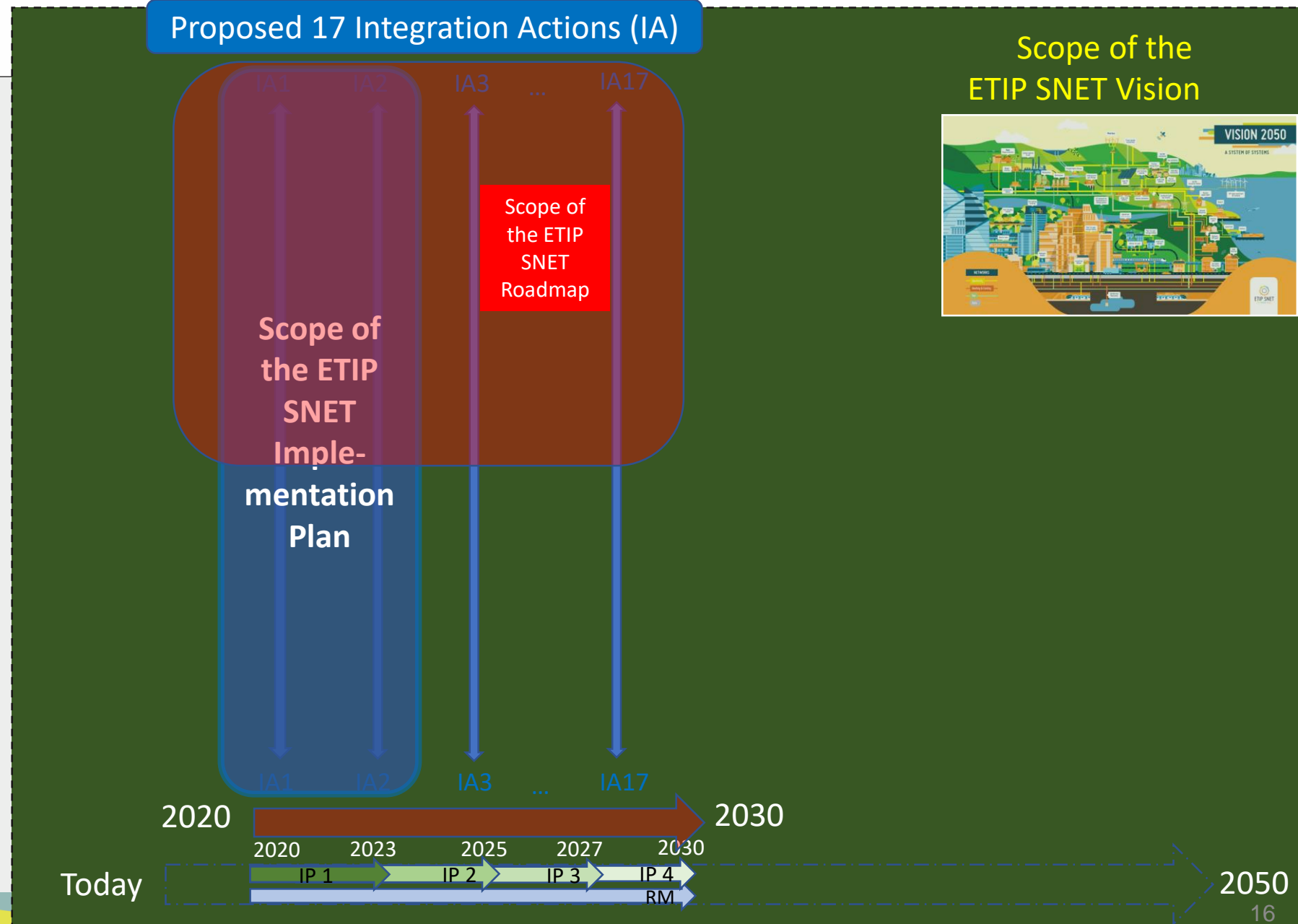# With Roadmaps (RM) and Implementation Plans (IP) towards a realized ETIP SNET Vision
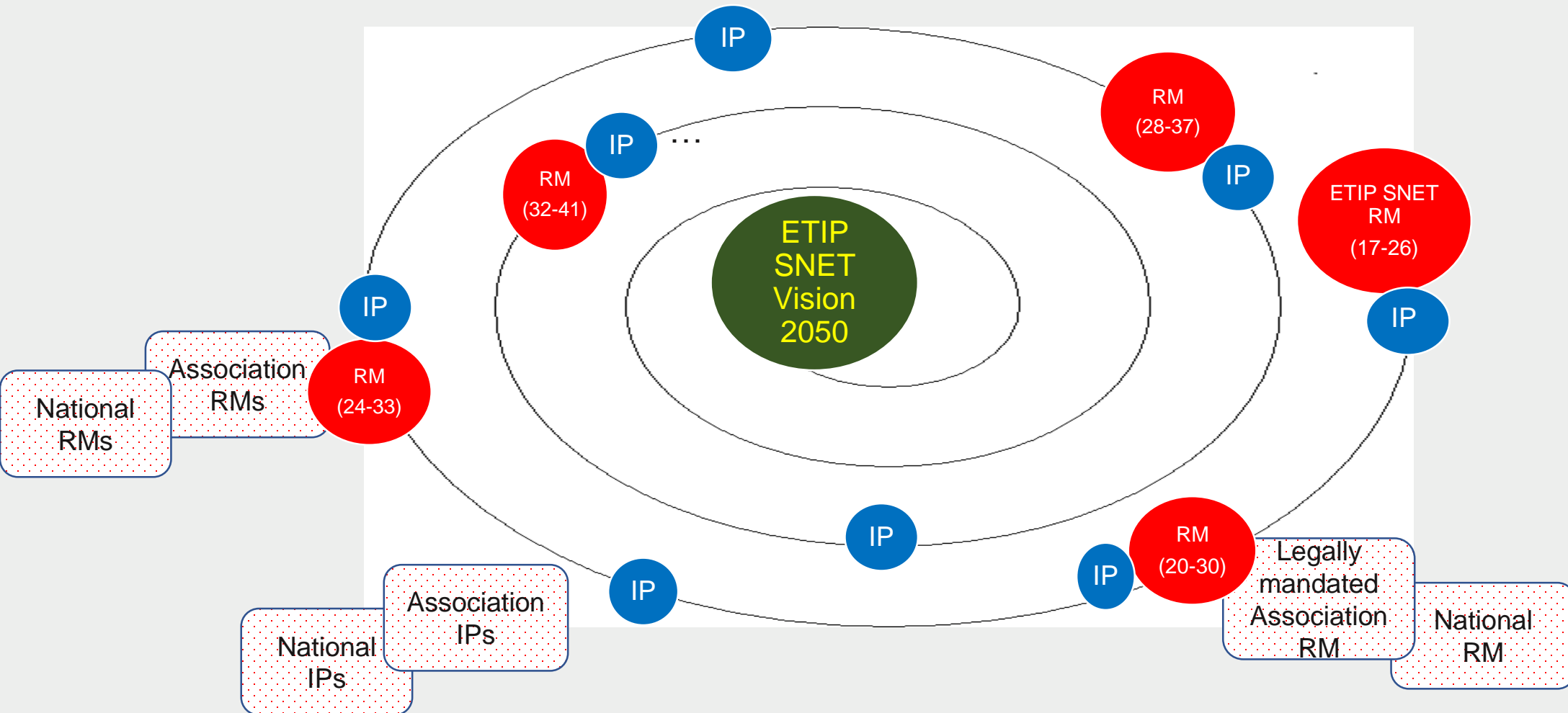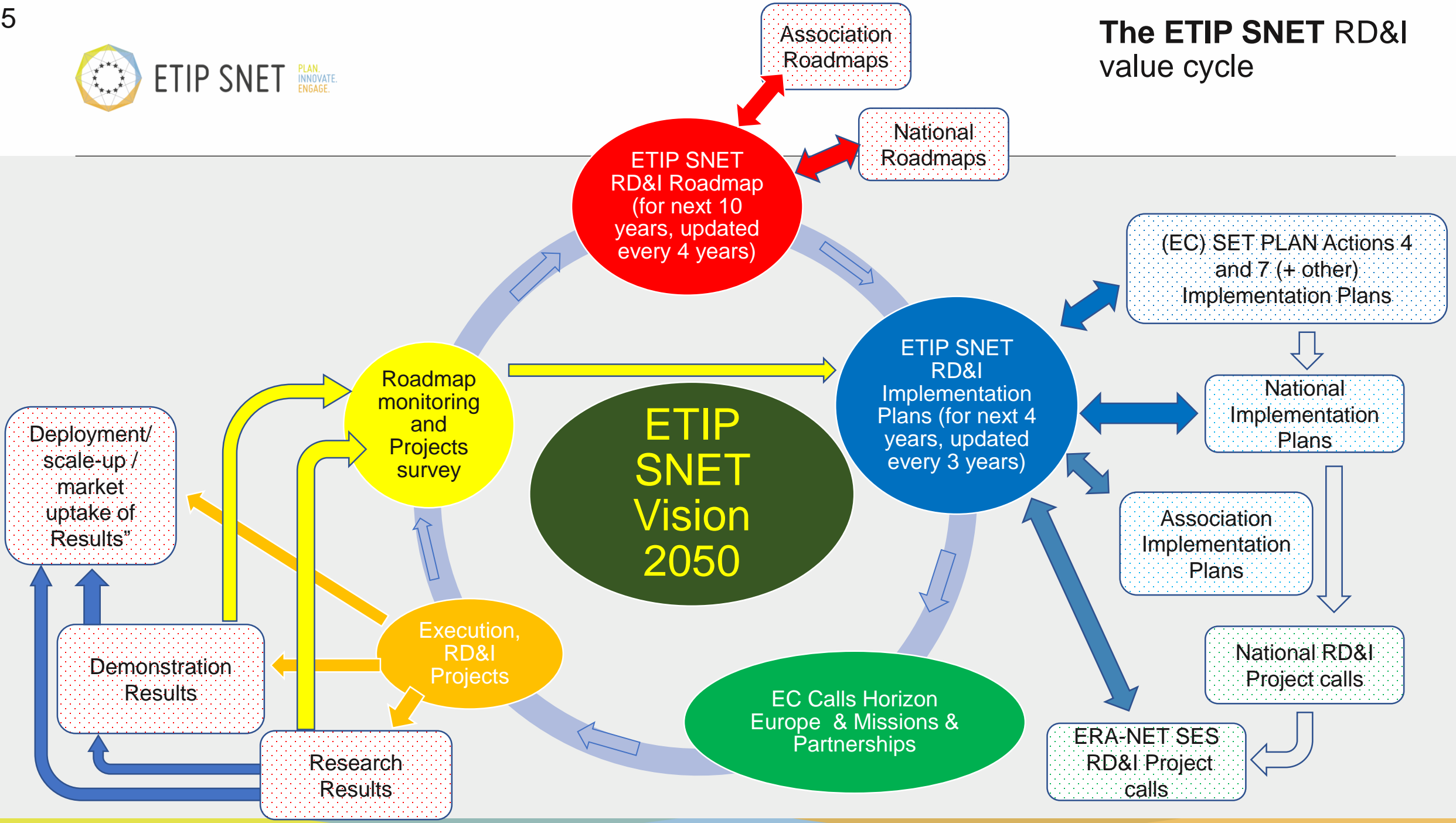
Proposal from consultation

ETIP SNET Integration Actions within the framework of Vision 2050, Roadmap 2020-2030 and Implementation Plan 2020-2023

Implementation Plan:
Integration Actions 1-2

All necessary details to be compatible to EC calls and to allow high quality project versus RM requirements monitoring

Road Map: *1-17*
Integration Actions 3-17

Higher granularity. Frameworks. Structures .. For all stakeholders

Vision

2020   2023   2030   2050
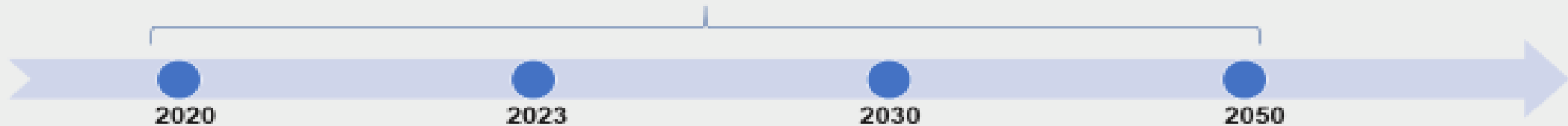
Mapping Functional Objectives of previous ETIP SNET Roadmap to "Integration Objectives" (IO) and "Integration Actions" (IA) in new ETIP SNET RM

Why change «Functional Objectives» (FO) of previous RM to «Actions» (IA) and «Objectives» (IO) and «Enablers» (IE) in new RM?

- Some of the 36 FO were
  - Energy system integration related <u>Objectives</u> ➔ IO
  - RD&I <u>Action</u> related objectives ➔ IA
  - RD&I related to <u>Enablers</u> as objective ➔ IE

- ETIP SNET Roadmap defines <u>Actions</u> with <u>Enablers</u> (inputs) contributing towards energy system, environmental and societal <u>Objectives</u> (outputs).
  - Continued focus on Electricity system <u>integration</u> RD&I needs
  - RD&I for Energy System <u>Integration Enablers in non-electricity </u>energy systems and social/economical enablers is very important.
  - Reuse of previous 36 Functional Objectives, as IA, IO or IE (allows mapping of 300+ tasks in Implementation Plans with corresponding ETIP SNET monitoring)
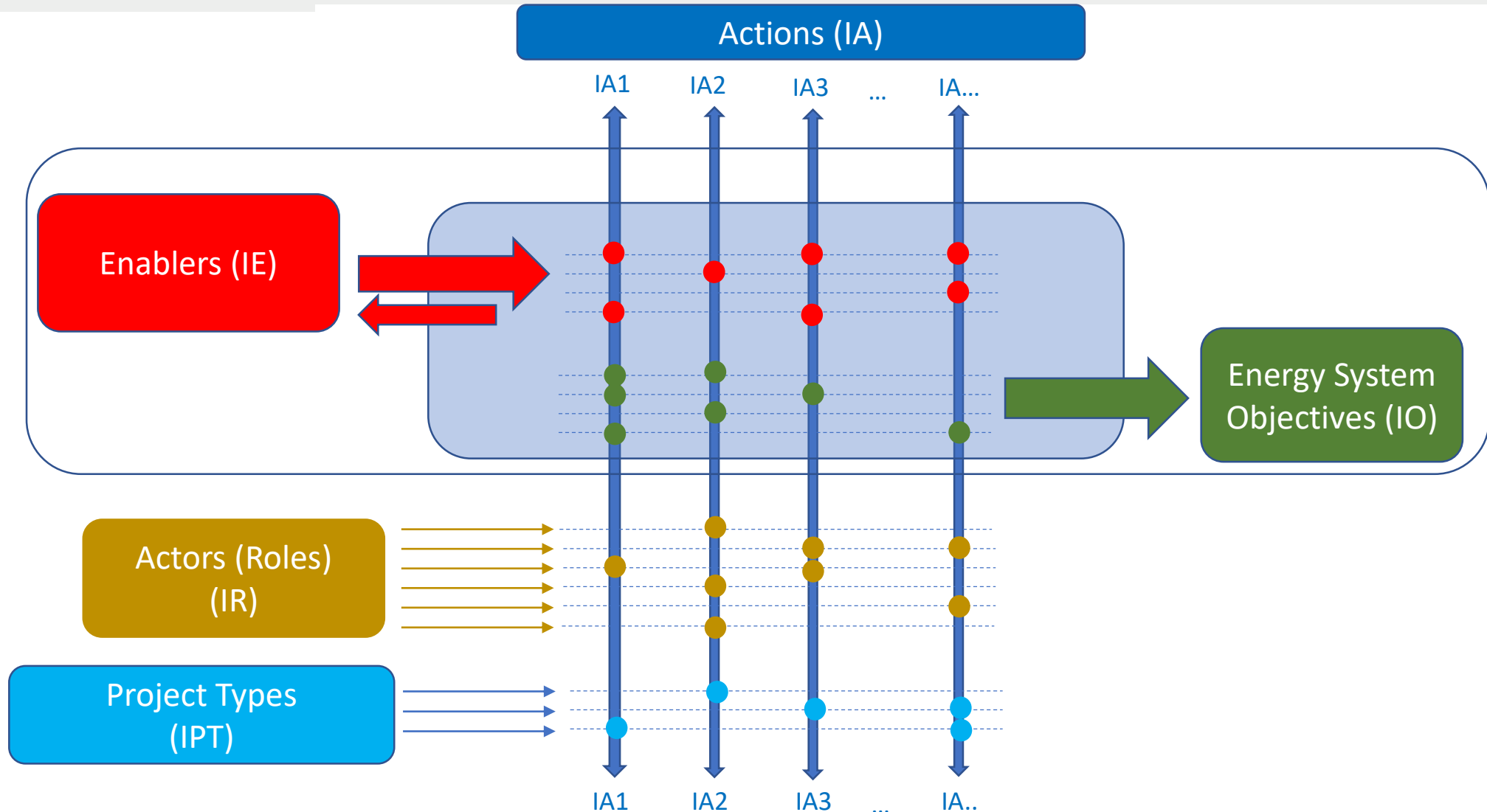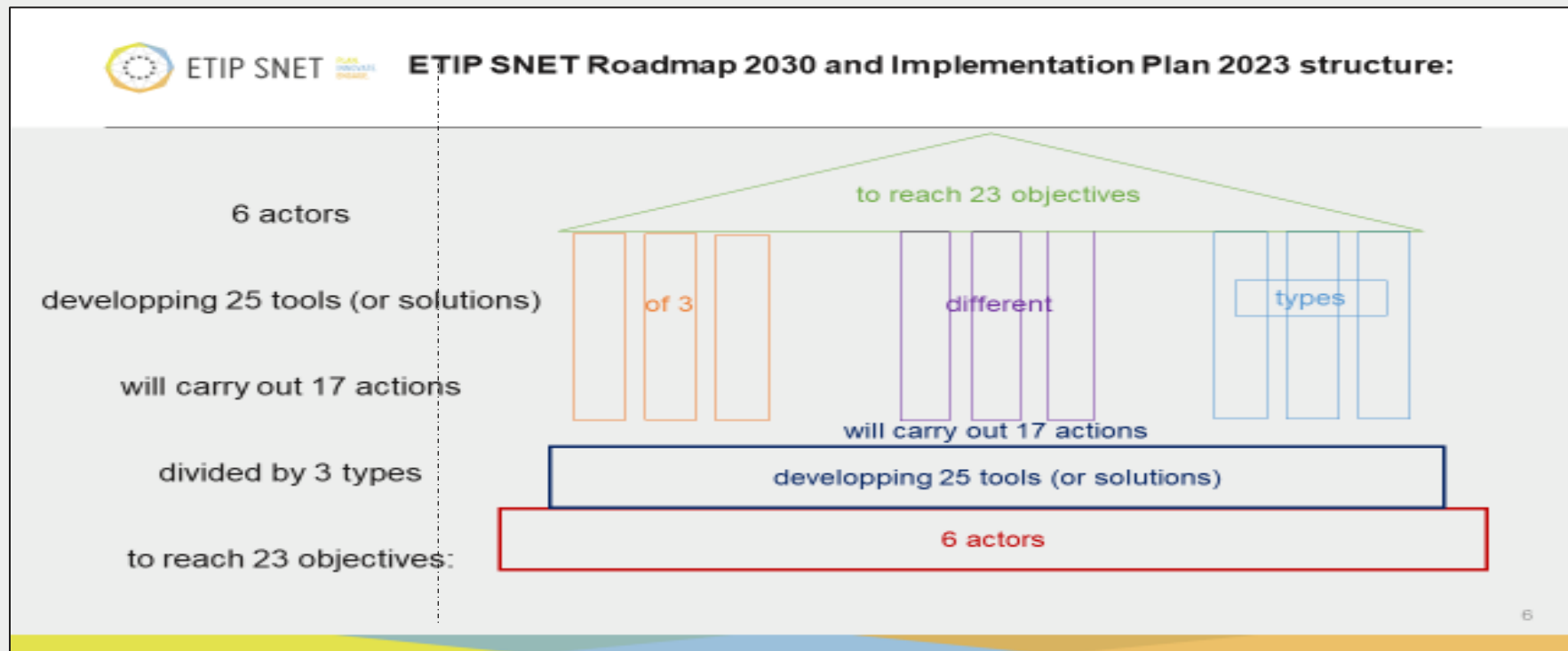
Proposal from consultation

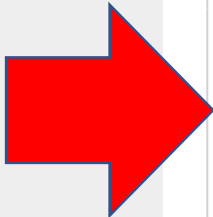6 actors develop 25 tools (or solutions) by carrying out 17 actions of 3 different types to reach 23 objectives

- **Key topic: "Enablers"**
  - [**From Consultation**] Enablers = <u>intermediate Objectives</u>, necessary to achieve the major <u>final Objectives</u>;
    - Criterion: impacting final users or not.
    - Distinguish:
      - ✓ Internal to the energy (or only power) system
      - ✓ External needs from collateral/overarching Actors (Regulators, Policy settings, non-energy sector, …);

19 June Process: Steps
- Actions => Enablers => Objectives;
  - ✓ #1 consolidating the structure ➔ HyperMatrix
  - ✓ #2 completing/modifying the list of IO, IE, IA, IR IPT to avoid gaps and overlaps

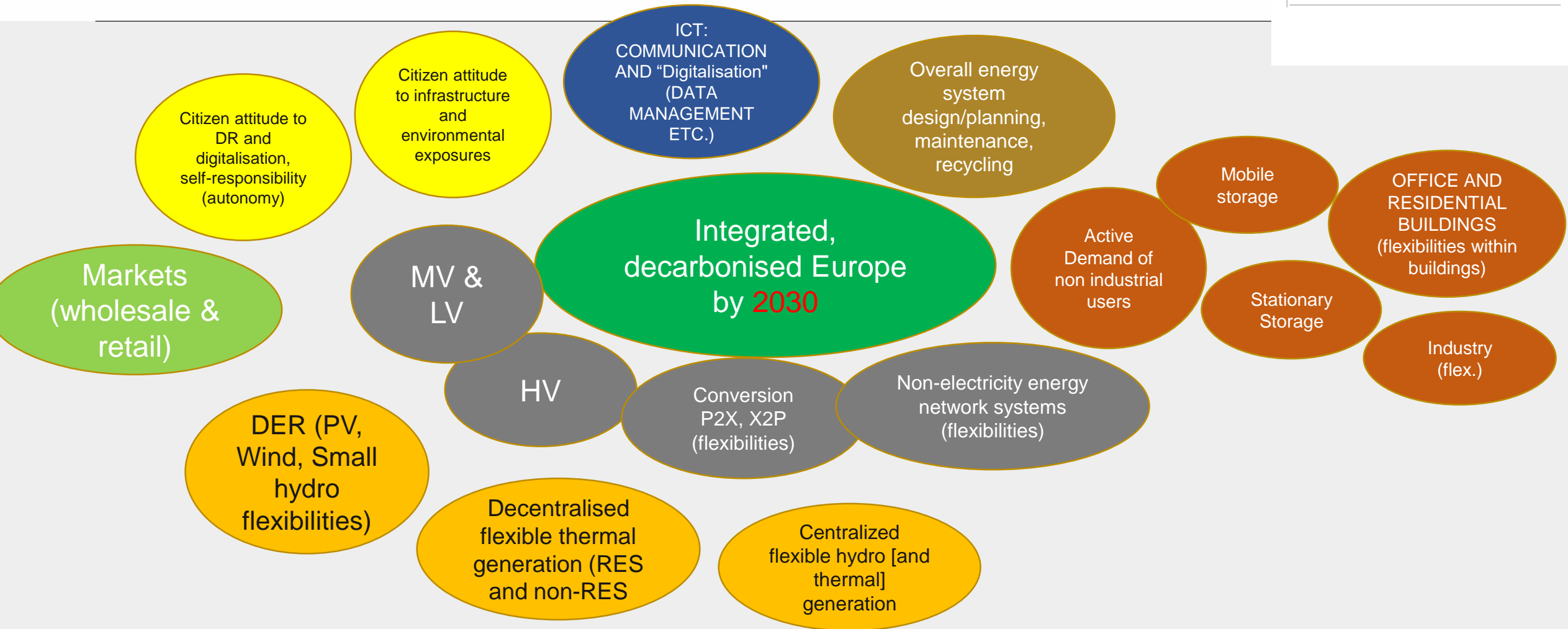|	Morning Parallel sessions on the inputs and outputs of the Integration Actions in the upcoming ETIP SNET Roadmap 2020-2030	
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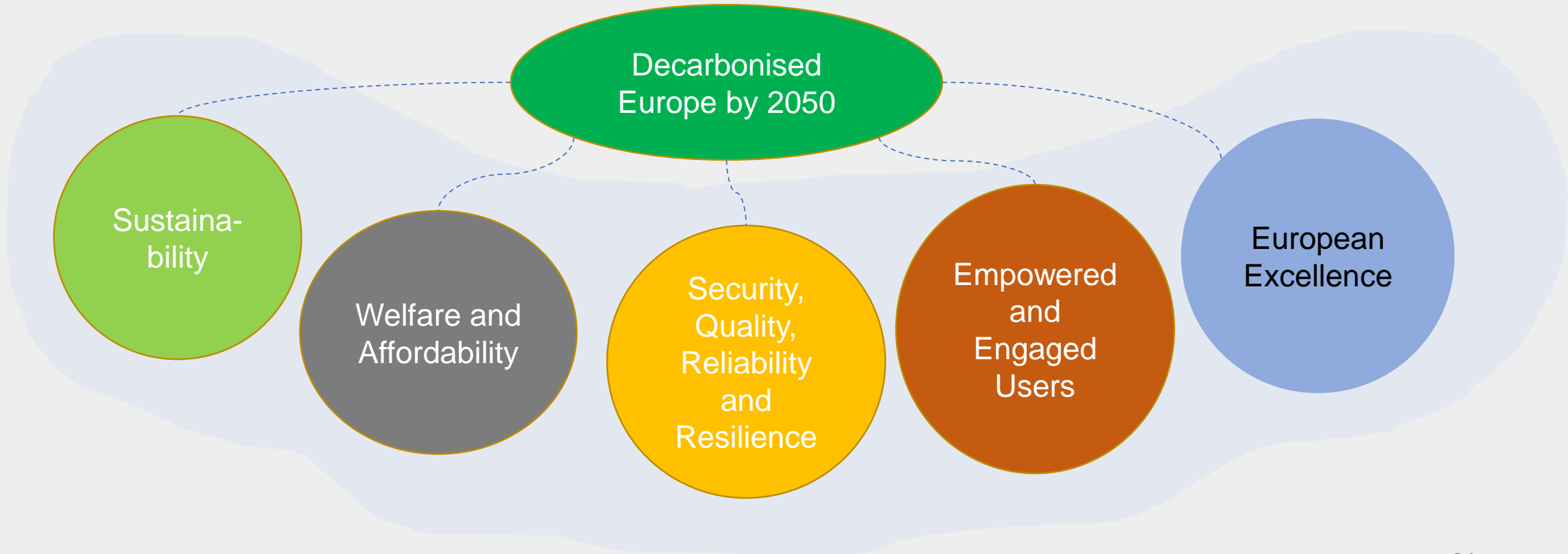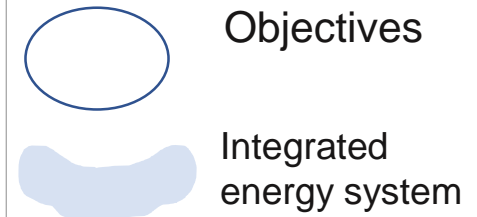ETIP SNET RM
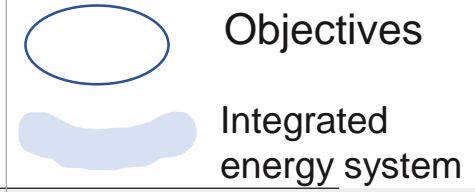Actions **(IA) bring together IO, IE, IR, IPT**

ETIP SNET RM
5 Main Objectives (IO)

ETIP SNET PLAN. INNOVATE. ENGAGE.

Objectives

Integrated energy system

Integrated, decarbonised Europe by 2050

European Excellence

Sustainability

1. Constant (low) CO2 in atmosphere, low GHG, now critical raw materials
2. Minimum resource consumption, high recycling rates
3. Zero CO2 emissions (equivalents);
4. Circularity (waste/sludges to energy and recycling of materials, such as metals or phosphor)
5. Environmental Sustainability, compliance with EU environmental policies (birds, water framework directive, …)

Welfare and Affordability

1. Optimum Life-cycle costs, asset maintenance costs, maximum lifetime
2. Optimum investment costs for overall grid-based energy systems (optimum cost system infrastructure designs)
3. Efficiency
4. Welfare maximising local and neighborhood / retail-market-based electricity, gas and heat/cooling products and services (businesses)
5. Welfare-maximising pan-European Wholesale-Electricity and Gas market-based products and services (businesses)

Security, Quality, Reliability and Resilience

1. Real-time monitored/observed Electricity System State
2. Real-time coordinated, controlled flexibility enablers (in all energy carriers)
3. Cybersecure equipment and systems
4. Accurate RES forecast and response (all times)
5. Accurate Demand (Electricity, Gas, Heat/Cooling) forecast and response (all times)
6. Storage-based services (all times) of all types
7. RES-based services (all time scales, distributed and non-distributed; including hydro, PV, Wind), including ancillary services
8. Demand response services (all time scales)
9. Real-time restoration services after blackouts
10. Flexible thermal power generator based services (all time scales, including distributed and non-distributed, RES / non RES (transition))

Empowered and Engaged Users

1. Change of Citizen behaviour towards energy efficiency
2. Standardized data exchange
3. IOT Sensoring (on all that comes in masses)
4. Big data analysed (on all that comes in masses)
5. (Mass) Learning, Replication, Scaling up (deployment, masses)

1. EU technology and local based industry as a world leader
2. DC and hybrid AC/DC grid elements
3. Replicability and Scalability
4. Value of storage, flexibility and other ancillary services
5. Business case: Actor roles, interrelationships, inputs, outputs, time and location dependencies, success factors
6. Flexibility-enabled new materials and new technologies

Enablers

Integrated energy system
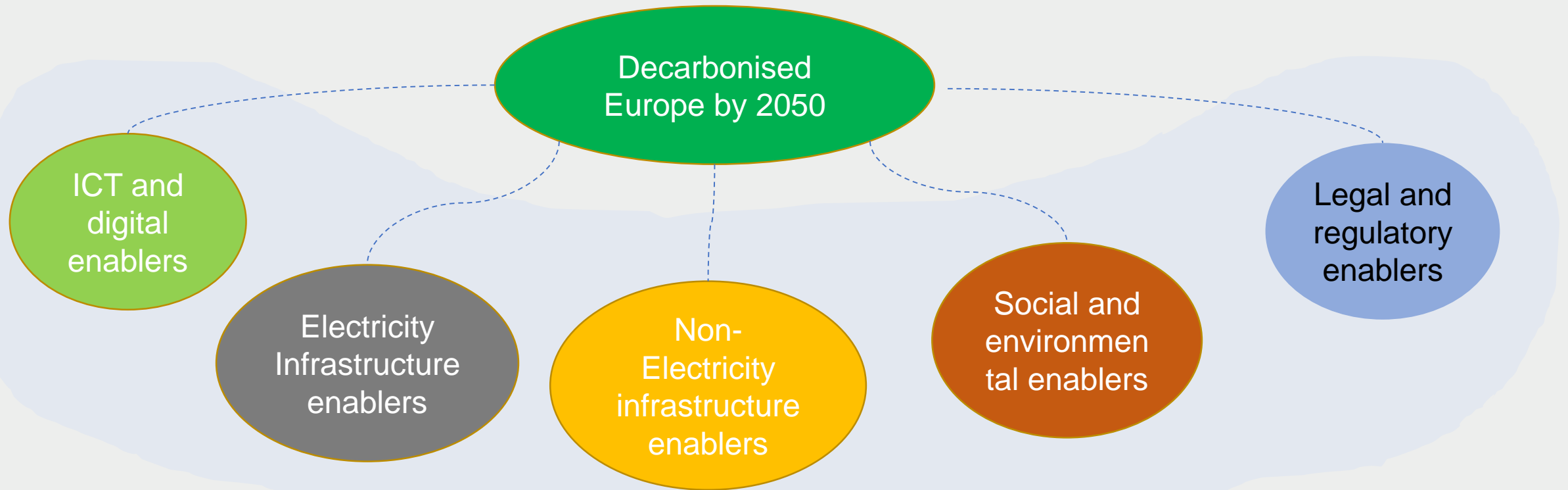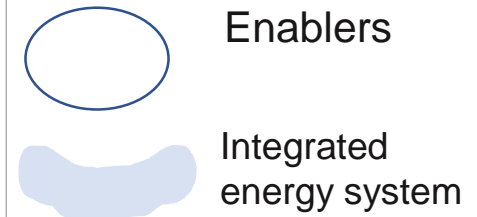
Integrated, decarbonised Europe by 2050

ICT and digital enablers

1. Interoperability and standards enablers;
2. Monitoring, control and automation enablers;
3. Critical infrastructure protection (CIP) enablers;
4. Cybersecurity enablers;
5. ICT infrastructures related enablers
6. Data Management enablers;

Electricity Infrastructure enablers

1. Renewable generation enablers
2. Storage (with electricity release) flexibility enablers (Hydro storage, Battery storage, Gas storage, Heat/cooling storage)
3. Electricity Transmission enablers
4. Electricity Distribution enablers
5. Conversion (PtX, XtP [Generation]) related enablers
6. Flexible Load Enablers
7. Non-renewable generation enablers (transition)

Non-Electricity infrastructure enablers

1. Storage (Non-electricity release) enablers (Heat storage, Gas storage including Hydrogen, Liquids storage)
2. Conversion (GtH, GtL) enablers
3. Heating and Cooling network enablers
4. Gas Network flexibility enablers

Social and environmental enablers

1. Renewables enablers (for increased RES Siting, RES capacity)
2. Adaptive behaviour related enablers (for Efficient use, Knowledge)
3. CO2 capture and utilization enabler (enables Circularity)
4. Energy transmission and distribution, storage and conversion related acceptance enablers (for visibility, perceived dangers, costs, etc.)
5. Circularity enablers

Legal and regulatory enablers

1. Energy and Capacity Market rules as enablers
2. Subsidiarity related enablers (for self responsibility)
3. Grid rules as enablers
4. End-Use Sector rules as enablers (for small and large users, for prosumers)
5. EC and National Acts, Directives and Regulations as enablers

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Agenda 19 June 2019 14:45-15:30, 16-16:30

<table>
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10': view of EASE (Yves Schlumberger) on the topic

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Moderators: Coralie Badajoz (ETIP SNET Core team)

10': view of EERA on the topic

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