PLAN.
INNOVATE.
ENGAGE.

ETIP SNET
EUROPEAN TECHNOLOGY AND INNOVATION PLATFORM
SMART NETWORKS FOR ENERGY TRANSITION

INTERACTIVE ETIP SNET WORKSHOP FOR DEFINING THE UPCOMING ETIP SNET ROADMAP 2020-2030

Objectives

19 June 2019

ETIP SNET Core Team

2050 VISION GOAL

ETIP SNET
PLAN. INNOVATE. ENGAGE.

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.

THREE GOALS OF EU ENERGY POLICY

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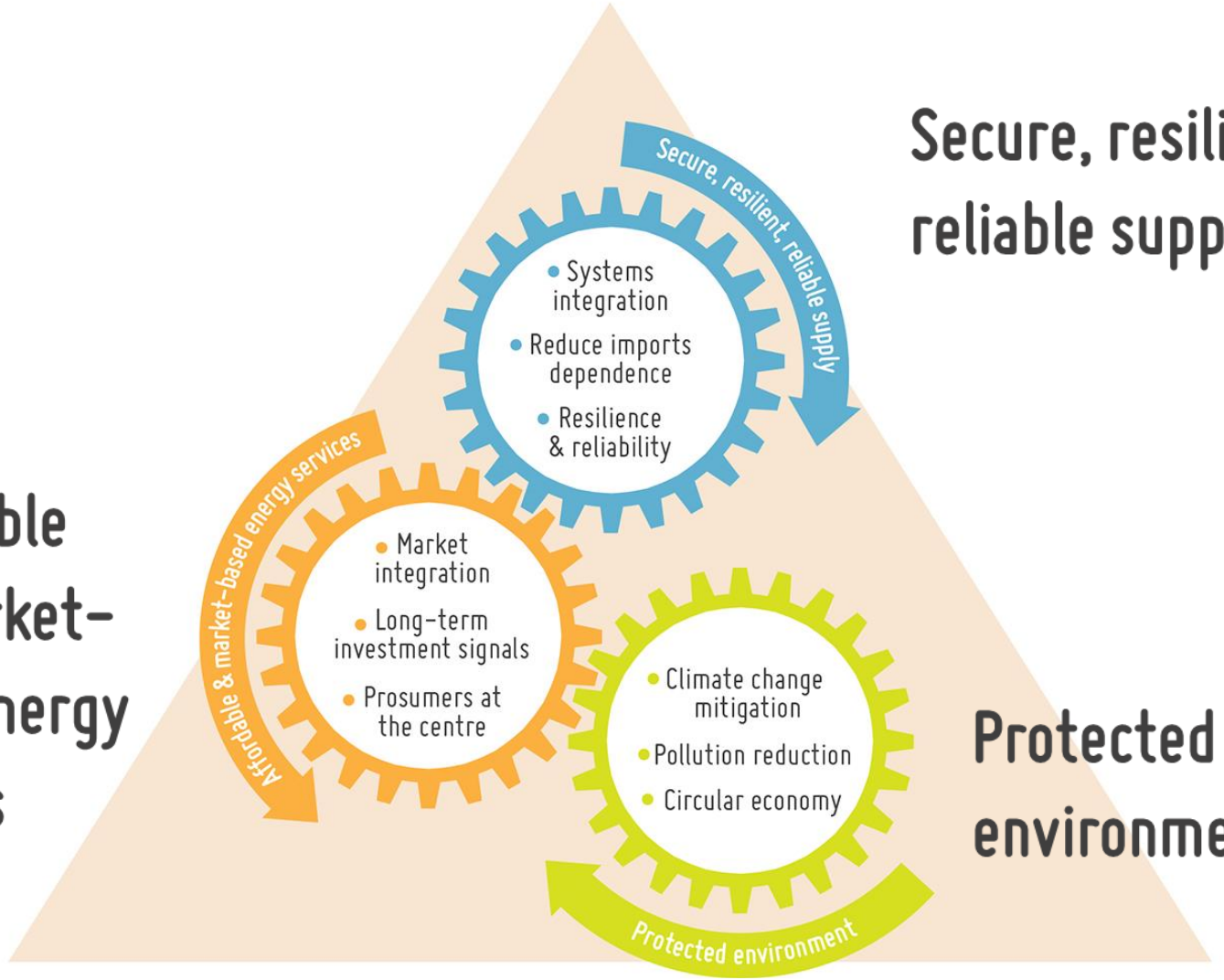
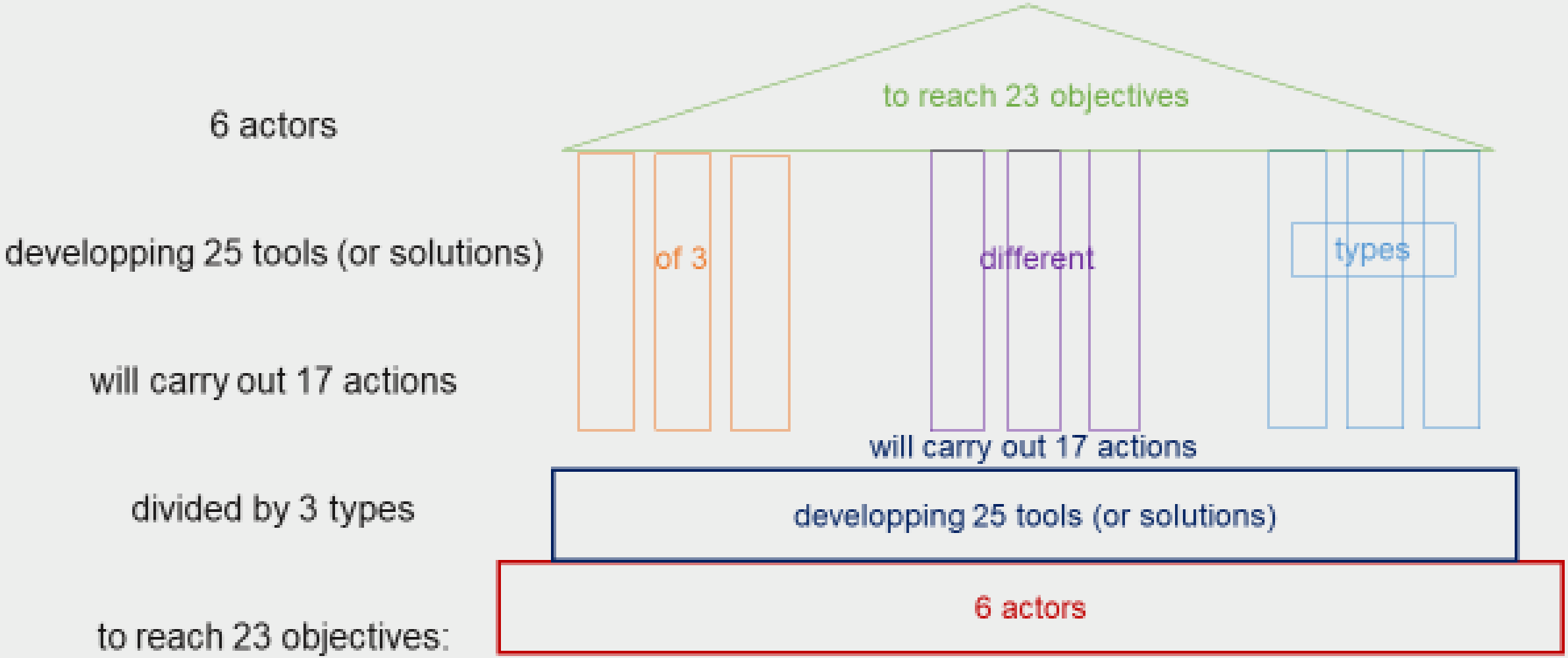
Secure, resilient, reliable supply



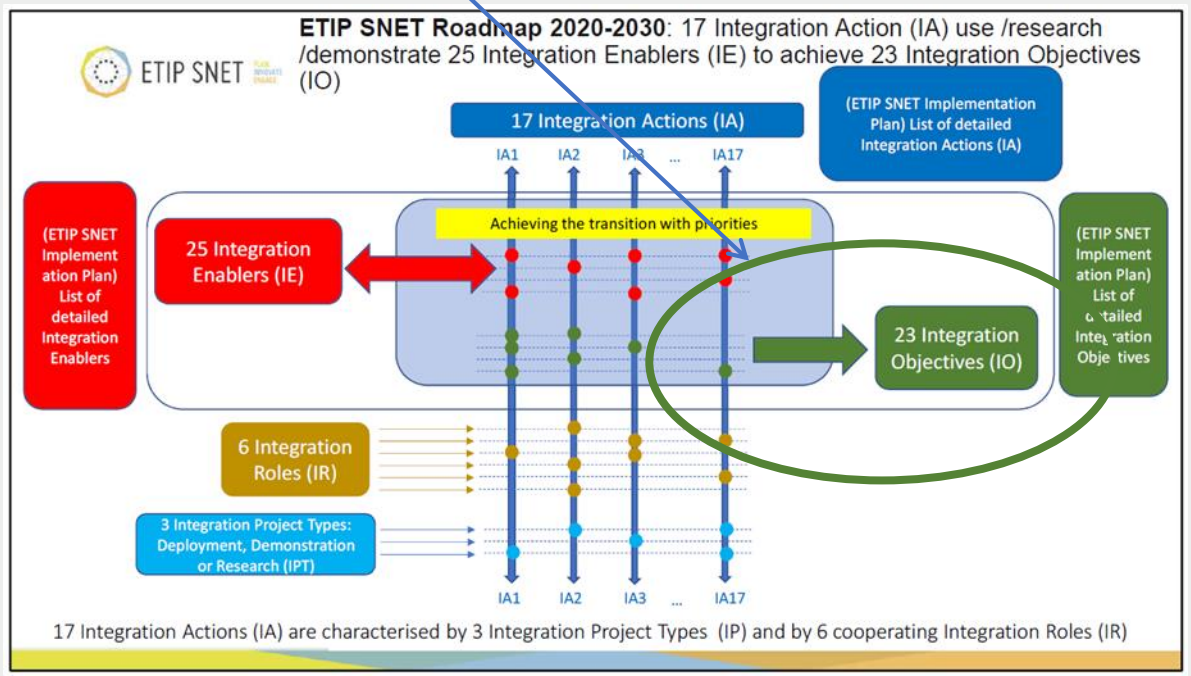
Affordable and market-based energy services

Protected environment

ETIP SNET Roadmap 2030 and Implementation Plan 2023 structure:



Focus of this session



Inputs from consultation (overall concept)

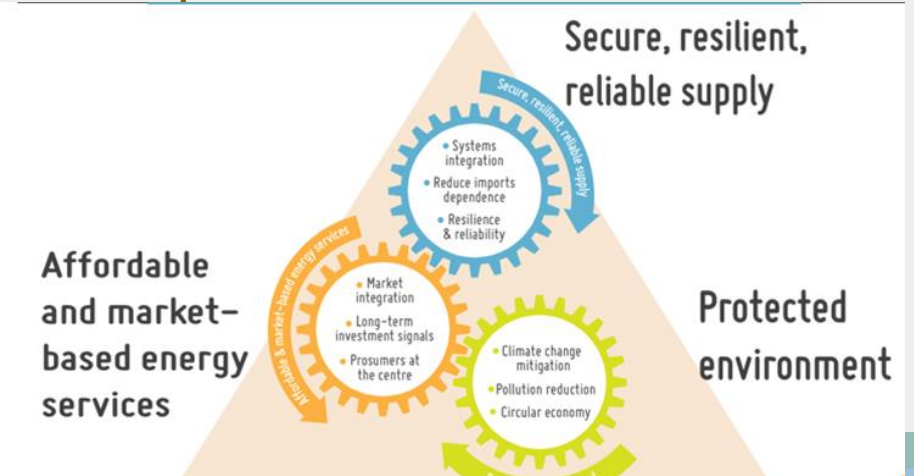
- Wg1:
  - Several **specific comments** in the full reply document
- Wg2
  - **Some IO difficult to grasp**, e.g. "Actor roles, interrelationships, inputs, outputs, time and location dependencies, success factors"
  - Within IO1 (Sustainability and circularity) **add critical raw materials**
  - Minimum resource consumption, **high recycling rate**
  - Change of Citizen behaviour **towards energy saving**

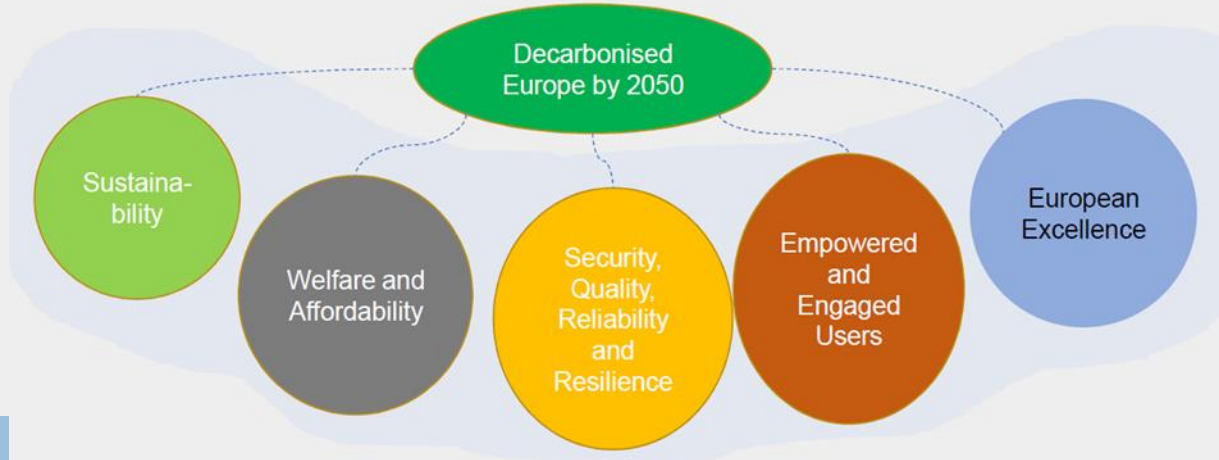
Inputs from consultation (overall concept)

- Wg5:
  - Yes, the concepts explained are clear and understandable.
  - We agree with the basic concept of the ETIP SNET roadmap.
  - However,
  - The Integration **Objectives should in hierarchy terms**, be right at the top and in a separate area from enablers since the objectives are the source for the actions and the source for identifying KPIs for judging actions, identifying gaps and building future editions of the Roadmap.

The architecture of the roadmap

We are happy with the architecture used for the road map, but we would like to see Objectives **to be in line with EU strategy** and system needs and not activity orientated. As indicated earlier, some objectives meet the philosophy approach, but others do not (i.e. sustainability is reflecting protection of environment and security, quality, reliability and resilience reflect secure, resilient and reliable supply). For this reason, **we would recommend approaching the set up using the recommendations of the EPRI** study on Smart Grids which is referred to below. Within that study objectives are referred to as **benefits** (may be a better term to use) and activities are referred as functions. Nevertheless, terms are not critical since these are defined and carry with them the meaning given. However, from project perspective and the R&I agenda the approach that is related to benefits, functions and assets to our understanding are quantifiable and measurable that make them more comprehensible and appealing.





EPRI ELECTRIC POWER RESEARCH INSTITUTE

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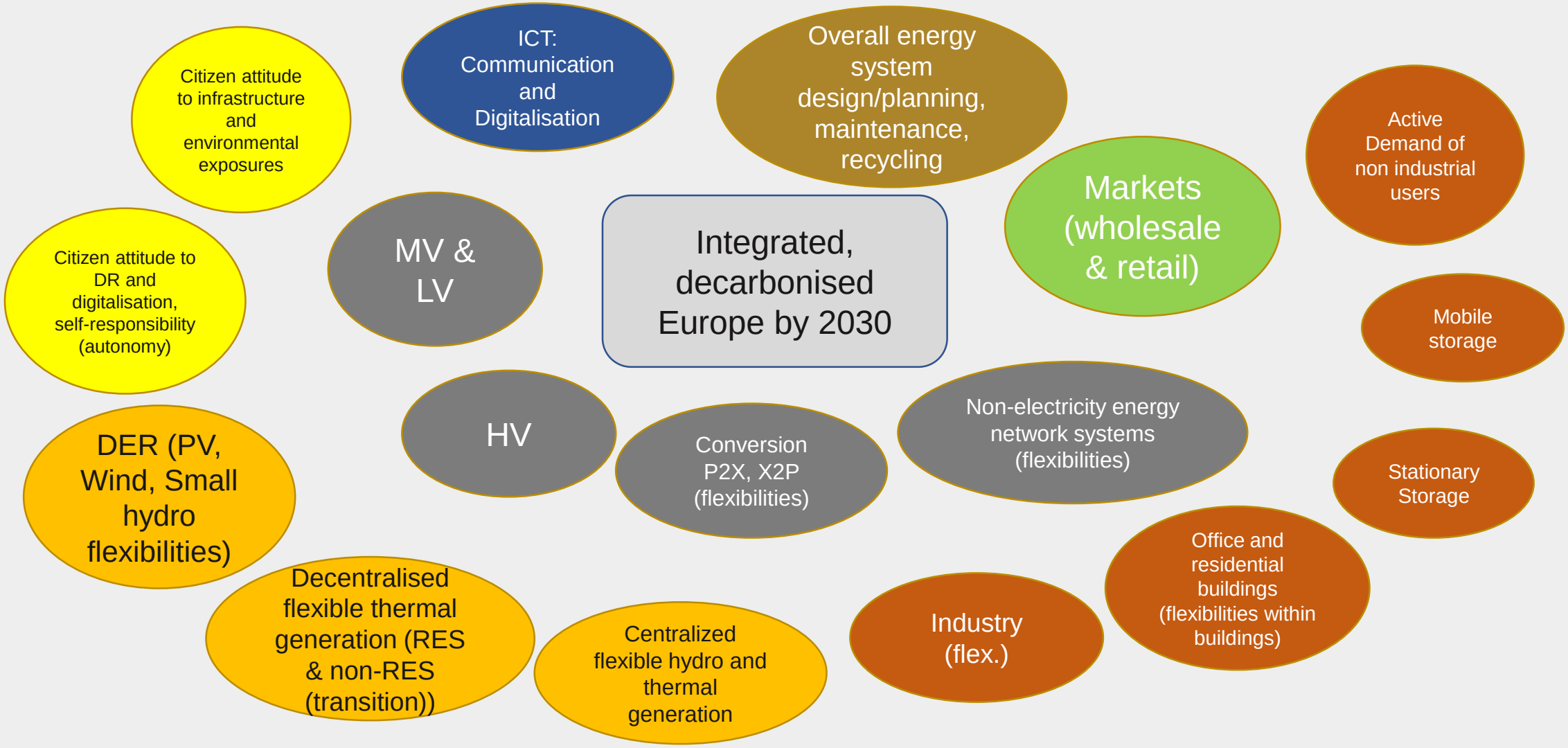
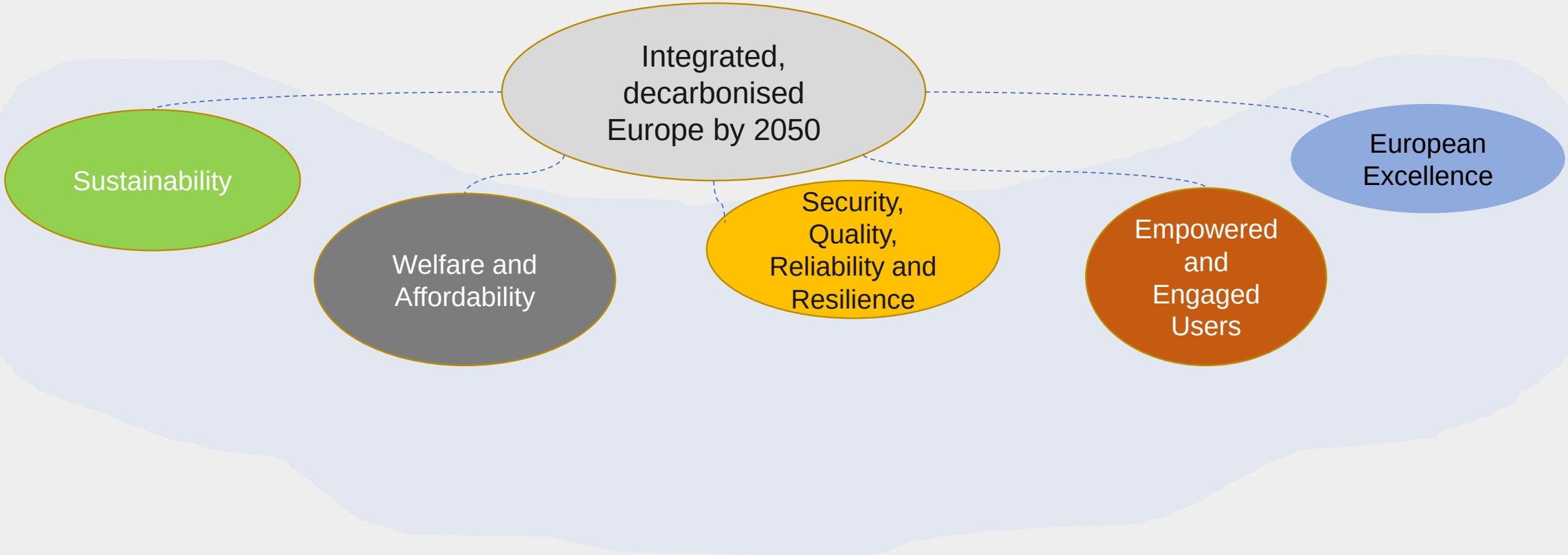
Methodological Approach for Estimating the Benefits and Costs of Smart Grid Demonstration Projects

Benefits			Functions														Energy Resources		
			Fault Current Limiting	Wide Area Monitoring, Visualization, and Control	Dynamic Capability Rating	Flow Control	Adaptive Protection	Automated Feeder Switching	Automated Islanding and Reconnection	Automated Voltage and VAR Control	Diagnosis & Notification of Equipment Condition	Enhanced Fault Protection	Real-Time Load Measurement & Management	Real-time Load Transfer	Customer Electricity Use Optimization	Distributed Generation	Stationary Electricity Storage	Plug-in Electric Vehicles
Economic	Improved Asset Utilization	Optimized Generator Operation		•													•	•
		Deferred Generation Capacity Investments													•	•	•	•
		Reduced Ancillary Service Cost		•						•			•			•	•	•
		Reduced Congestion Cost		•	•	•										•	•	•
	T&D Capital Savings	Deferred Transmission Capacity Investments	•	•	•	•									•	•	•	•
		Deferred Distribution Capacity Investments			•								•	•	•	•	•	•
		Reduced Equipment Failures	•		•						•	•						
	T&D O&M Savings	Reduced Distribution Equipment Maintenance Cost									•							
		Reduced Distribution Operations Cost						•		•								
		Reduced Meter Reading Cost											•					
	Theft Reduction	Reduced Electricity Theft											•					
	Energy Efficiency	Reduced Electricity Losses								•			•	•	•	•	•	
	Electricty Cost Savings	Reduced Electricity Cost													•	•	•	•
Reliability	Power Interruptions	Reduced Sustained Outages					•	•	•		•	•	•			•	•	•
		Reduced Major Outages		•					•				•	•				
		Reduced Restoration Cost					•	•			•	•						
	Power Quality	Reduced Momentary Outages										•					•	
		Reduced Sags and Swells										•					•	
Environmental	Air Emissions	Reduced CO_2 Emissions				•		•		•			•		•	•	•	•
		Reduced SO_x, NO_x, and PM-10 Emissions				•		•		•			•		•	•	•	•
Security	Energy Security	Reduced Oil Usage (not monetized)						•			•		•					•
		Reduced Widescale Blackouts		•	•							•						

ETIP SNET RM
17 Actions **(IA) integrate IO, IE, IR, IPT**



ETIP SNET RM
5 Main Objectives (IO)



ETIP SNET RM
5 Main Objectives (IO)

Objectives

Integrated energy system

Integrated, decarbonised Europe by 2050

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))

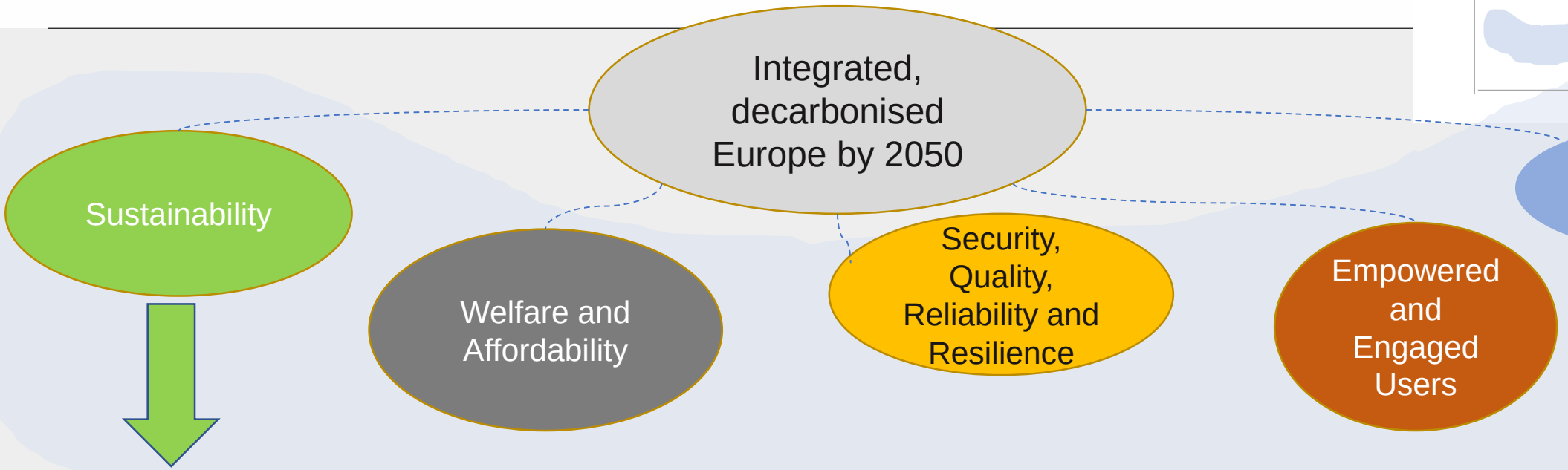
Empowered and Engaged Users

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)

European Excellence

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

ETIP SNET RM
5 Main Objectives (IO)



Objectives

Integrated energy system

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3. Zero CO2 emissions (equivalents);
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5. Environmental Sustainability, compliance with EU environmental policies (birds, water framework directive, …)

Air emissions

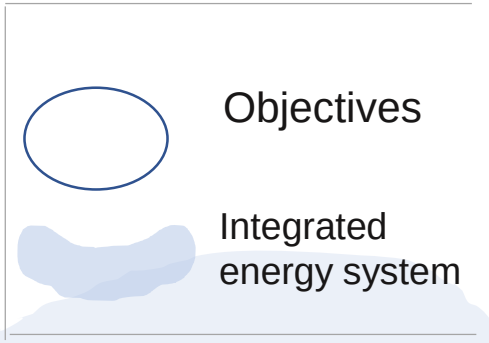
1. Abatement of GHG emissions in atmosphere from energy-related processes
2. Compliance with EU environmental policies and goals (e.g. habitat conservation, natural resources preservation etc.)
3. Circularity (e.g direct recycling of raw and precious materials - metals, indirect recycling of wastes to energy etc.)

Collection of proposals form stakeholders

Benefits defined by EPRI

Proposed synthesis

ETIP SNET RM
5 Main Objectives (IO)



Welfare and Affordability

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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)

1. Improved asset utilisation
2. T&D capital savings
3. T&D O&M savings
4. Theft reduction
5. Energy efficiency
6. Electricity costs savings

1. Welfare: Maximising pan-European Wholesale-Electricity and Gas market-based products and services (businesses)
2. Welfare: maximising local, neighborhood, retail, peer-to-peer market of energy products and sevices (electricity, gas and heat/cooling etc.)
3. Minimum investment costs for overall grid-based energy systems (minimum cost system infrastructure designs)
4. Minimum overall asset management cost (e.g. maintenance, prolonged lifetime) mostly for regulated operators
5. Efficiency

Collection of proposals form stakeholders

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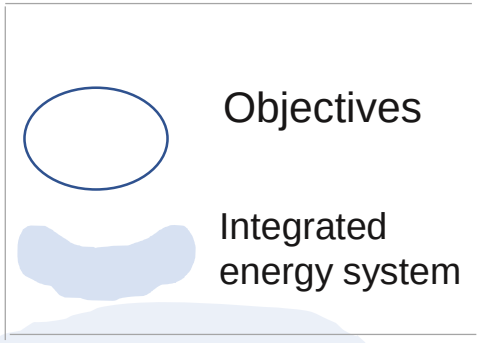

Security, Quality, Reliability and Resilience

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10. Flexible thermal power generator based services (all time scales, including distributed and non-distributed, RES / non RES (transition))

1. Power interruptions
2. Power quality

1. Real-time monitored/observed energy System State to control system operation under all sevice conditions (including severe conditions), using IoT, big data analytics, AI
2. Real-time coordinated, controlled flexibility enablers (in all energy carriers) – (through generation and load forecast, storage control etc)
3. Real-time restoration services after blackouts
4. cybersecurity at all levels of operation

Collection of proposals form stakeholders

Benefits defined by EPRI

Proposed synthesis

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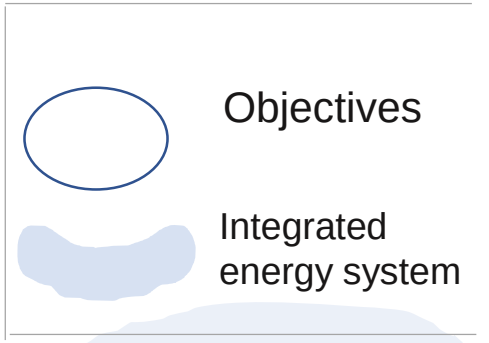

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3. IOT Sensoring (on all that comes in masses)
4. Big data analysed (on all that comes in masses)
5. (Mass) Learning, Replication, Scaling up (deployment, masses)

1. Energy security
2. Efficiency
3. Electricity cost savings

1. Citizen empowered in all energy services choices
2. Change of Citizen behaviour towards energy efficiency
3. (Mass) Learning, Replication, Scaling up (deployment, masses)

Collection of proposals form stakeholders

Benefits defined by EPRI

Proposed synthesis

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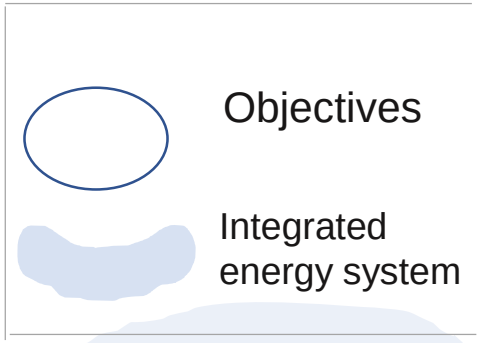

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1. EU technology and local based industry as a world leader

Collection of proposals form stakeholders

Proposed synthesis

Proposed **17 Integration Actions (IA)**

Previous RM: Functional Objective	Integration Action	Integrating enablers of … (see fields below) … with other enablers of the electricity system
T15, T17	**IA1**	Markets (with all participating users)
C2/T6	**IA2**	HV networks (with all connected users and sub-grids)
D8/D9	**IA3**	LV and/or MV networks (with all connected users)
D1/T11	**IA4**	Active Demand of non industrial users (flexibilities within buildings, behind point of common coupling)
D2	**IA5**	Buildings (system flexibilities of buildings) as heat/cold energy consumers
C1/D1/T11	**IA6**	Industry (system flexibilities within industrial processes, behind point of common coupling)
D6	**IA7**	EV (Mobile stored-energy related flexibilities)
D5/T10	**IA8**	Storage (Stationary storage related flexibilities; all types of storages)
D3/D4	**IA9**	DER (PV, Wind, Small hydro flexibilities)
D14	**IA10**	Thermal, decentralised generation (Flexibilities)
T22	**IA11**	Thermal, central (large) generation (Flexibilities)
D7	**IA12**	Non-electricity energy network systems (flexibilities)
T14/New	**IA13**	Conversion P2X, X2P (flexibilities)
New	**IA14**	Overall energy system design/planning, maintenance, recycling
D11	**IA15**	ICT
T4	**IA16**	Citizen attitude to infrastructure and environmental exposures
New	**IA17**	Citizen attitude to DR and digitalisation, self-responsibility (autonomy)

More info about IA

- Proposed 17 Integration Actions (IA) typically use or develop Integration Enablers to achieve Integration Objectives,
- The list of detailed integration Enablers/Objectives and Actions will be in the scope of the Implementation Plan.
- An integration Action is characterised by Integration Roles (IR) – such as market participant - as well as by an Integration Project Type (IP), which is one of Deployment or Demonstration or research and Timeline
- Each integration project type is associated to a year (time frame) within the 10 years 2020-2030 indicating when the Integration Action should start (to be considered in the corresponding Implementation Plan)