REVIEW, MAPPING and ASSESSMENT of existing KPIs

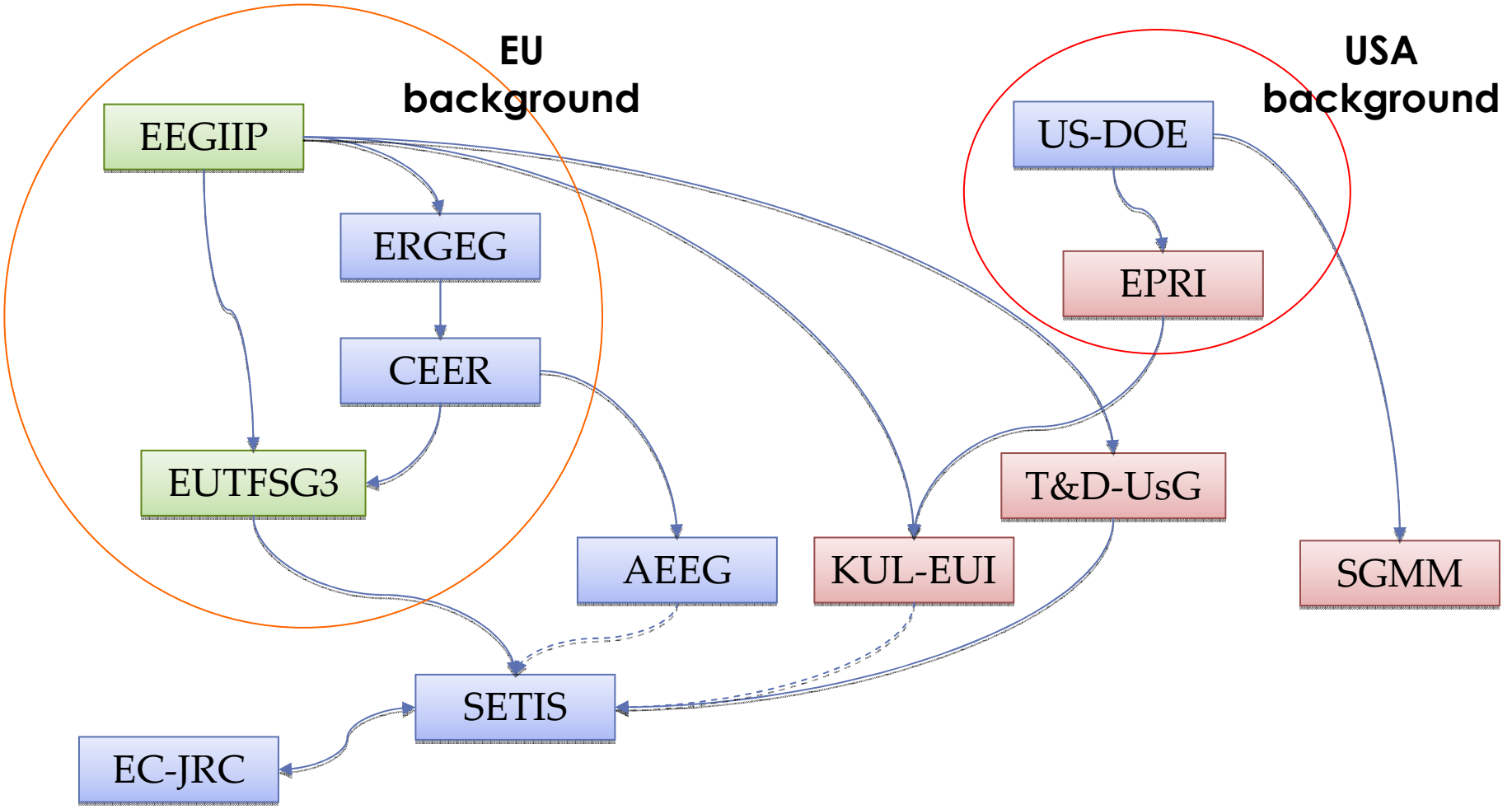
GRID+ consortium

JRC

Presentation of the work

- **Goals of the survey**
  - Collection of worldwide benefits and KPIs proposals
  - Definition of program and project KPIs suited for EEGI initiative (how smart is your project)
  - Extension towards continuous evaluation of grid smartness (how smart is your grid now and how smart is supposed to become)
- **Methodology and approach**
  - Acquisition of benefits
  - Organization into a hierarchy of benefits according to priorities defined by grid actors
  - Definition of reference values and scaling rules to coordinate KPIs defined ad levels
- **Expected results**
  - General consensus on KPI proposals
  - Wide covering of various instances of different grid actors

Evolutionary Flowchart



Documents and connotation

1. From benefits to qualitative/quantitative KPIs:
   - EEGIIP, ERGEG, CEER, EUTFSG3
   - US-DOE, EPRI
2. From qualitative/quantitative to measurable KPIs:
   - SETIS, KUL-EUI
3. Qualitative check-list to rate smart grid evolution:
   - SGMM, KUL-EUI
4. Ranking procedure for smart grid projects:
   - AEEG
5. Procedure to appreciate smart grid evolution and to guide infrastructure modification:
   - T&D-UsG
6. Critical analysis of work done so far:
   - EC-JRC

Most common expected benefits/1

Benefit	Definition
B1	Increased sustainability & environmental benefits
B2	Adequate transmission/distribution grid capacity to bring the electricity generated from all sources to consumers
B3	Harmonization and standardization of grid connection procedures
B4	Higher reliability, security and quality of supply
B5	Enhanced efficiency and better service in electricity supply and grid operation
B6	Support to pan-European electricity markets by load-flow control to alleviate loop-flows and increased interconnection capacity
B7	Coordinated grid planning and development involving joint European, regional and local grid processes

Most common expected benefits/2

Benefit	Definition
B8	Cost efficiency of the deployed solutions (CAPital EXpenditure CAPEX + OPerating EXpence OPEX)
B9	Enabling new business models and development of innovative products and services
B10	Enhanced consumer awareness and participation in the market by new players
B11	Enabling consumers to make informed decisions related to their energy to meet the EU Energy Efficiency targets
B12	Creation of market mechanism for new energy services such as energy efficiency or energy consulting for customers
B13	Reduction of consumer bills or mitigation of upward pressure on them
B14	Electrical energy theft and ICT attacks reduction

Benefits VS. Approaches

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14
EEGIIP	■	■	■	■	■	■	■	■	■					
EUTFSG3	■	■	■	■	■	■	■			■	■	■	■	
SETIS	■	■			■			■						
ERGEG	■	■	■	■	■	■	■			■				
CEER	■	■	■	■	■	■	■			■				
EPRI	■	■		■				■			■			■
KUL-EUI	■	■	■	■	■	■	■	■	■	■	■	■	■	
SGMM	■	■	■	■	■	■	■	■	■	■	■	■	■	
T&D-UsG	■	■		■										
AEEG	■	■		■	■				■	■				

SETIS and GRID+ proposal: goals

- Definition of programme and project KPIs
- More accessible **indices** in **different levels**
- Strong accent towards **quantification and measurability**
- KPIs for **evaluations** based on **power** indices
  - assessment of **capacity or availability**, in a **feed-forward** way
- KPIs for **validation** based on **energy** indices, calculated using historical data collected
  - assessment of **effective use**, in a **feed-back** way
- **Reference values**
  - to be extracted by **proposals data**,
  - **distinguishing between** geographical areas with different load densities (**rural/urban**)

Input for the GRID+ methodology: EEGI-WG and SETIS proposal

- **Level 1 Programme KPIs – overreaching KPIs**
  - Economic KPIs
    - CAPEX/km . customer and OPEX/km . customer
  - Technical KPIs
    - CO_2 emissions avoidable
    - Increased network capacity and technology
- **Level 2 Clusters of Project KPIs**
  - Economic effectiveness
    - CAPEX/km . customer and OPEX/km . customer
  - Technical effectiveness
    - Sustainability and integration
    - Coordination and interconnection
  - Implementation effectiveness
- **Level 3 Project KPIs**
  - Defined on a case by case basis considering possible KPIs categories

Level 1-2 KPIs, technical effectiveness – sustainability and integration/1

KPI	Definition	Reference system and values
Share of RES	(Maximum RES hosting capacity in the grid after project – RES hosting capacity in the grid before the project) / Total load request [%]	set of projects in clusters of projects baseline: value before projects targets to be defined (thanks to R&D projects) for: - different RES technology - different grid densities - different locations (RES potential)
Share of DER (including EV and storage)	(Maximum DER hosting capacity in the grid after project – maximum DER hosting in the grid before the project) / Total load request [%]	set of projects in clusters of projects baseline: value before projects targets to be defined (thanks to R&D projects) for: - different DER technology - different grid densities - different locations (DER potential)

Level 1-2 KPIs, technical effectiveness – sustainability and integration/2

KPI	Definition	Reference system and values
Share of DSM	(Demand shift potential after project - Demand shift potential before project)/ Demand shift potential before project [MW]	set of projects in clusters of projects baseline: values before projects targets to be defined (thanks to R&D projects) for: - different grid densities - different typology of users (household, industry, tertiary)
Power savings	Power saving after project – power losses before project / power request before project [%]	Ex post assessment
CO_2 emissions avoidable	(Weighted?) Sum of four level 2 proposed KPIs	

Level 1-2 KPIs, technical effectiveness – coordination and interconnection

KPI	Definition
Interconnection capacity between and TSOs and DSOs	Transfer capacity of interfaces between TSOs or DSOs [MW]
Inter TSOs and inter DSOs interconnection capacity	Internal transfer capacity between TSOs or DSOs [MW]
Technology	MW of HVDC installed lines after project - MW of HVDC installed lines before project MW of HVAC installed lines after project - MW of HVAC installed lines before project
Increased network capacity and technology	(Weighted) Sum of three level 2 proposed KPIs

Reference systems and values still to be defined

Level 1-2 KPIs, implementation effectiveness

KPI	Definition
Projects launched	Number of projects launched over the total number of projects initially planned
Results delivered	Number of delivered results
Results ready for deployment	Number of delivered results ready for deployment
Number of impacted customers	Share of DSO/TSO customers impacted by the deployed results
Implementation effectiveness index	(Weighted?) Sum of four level 2 proposed KPIs

Conclusions

- For Level 1 and 2:
  - Adoption of SETIS KPIs, with possible integration coming from KUL-EUI
  - Other aspects could be investigated such as ICT security; data privacy issues; funding mechanisms; voltage quality…
- For level 3:
  - The approaches available are base for further discussion and elaboration
  - The subject would deserve specific R&D to determine the required links between project KPIs and higher level KPIs
- Comparative methodology taken from T&D-UsG
- Ranking process inherited by AEEG


Thank You!