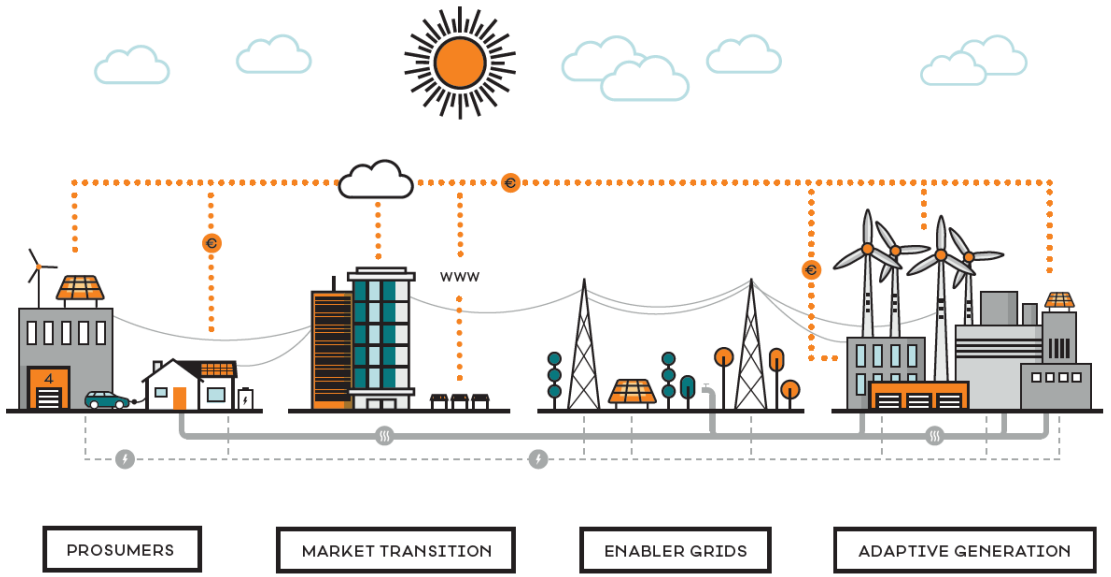
FLEXe – FLEXIBLE ENERGY SYSTEM

(WP2) Enabler Grids

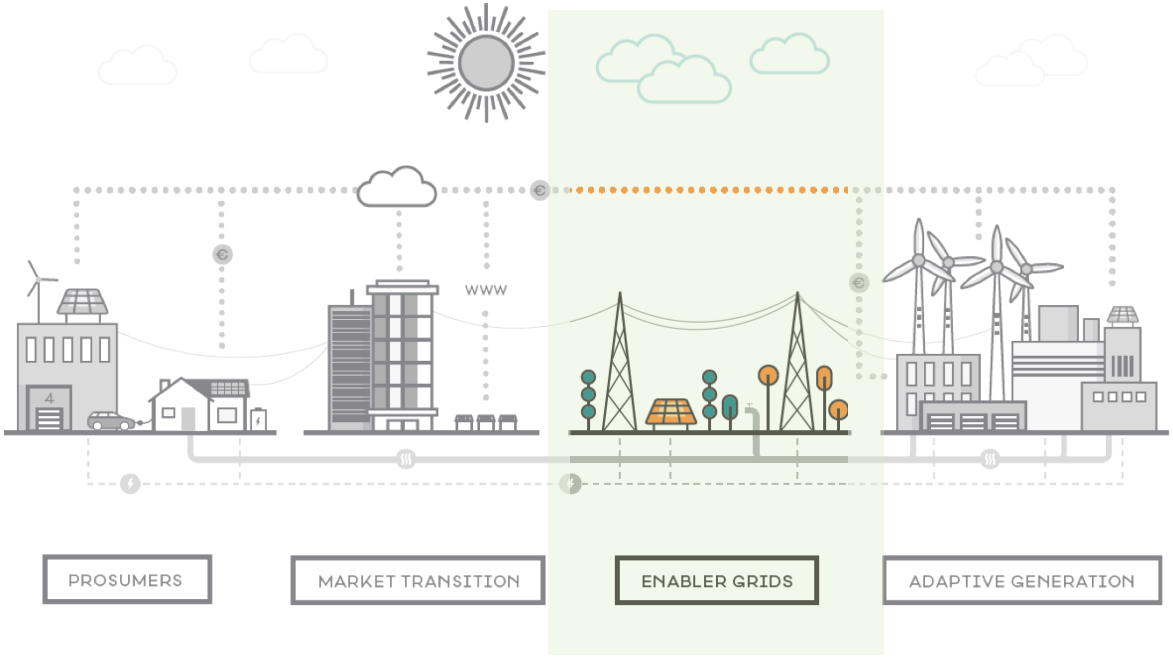
FLEXe
Future Energy System

Jukka Lassila



Solution Architect for Global
Bioeconomy & Cleantech Opportunities

Energy Grids as Enabler?

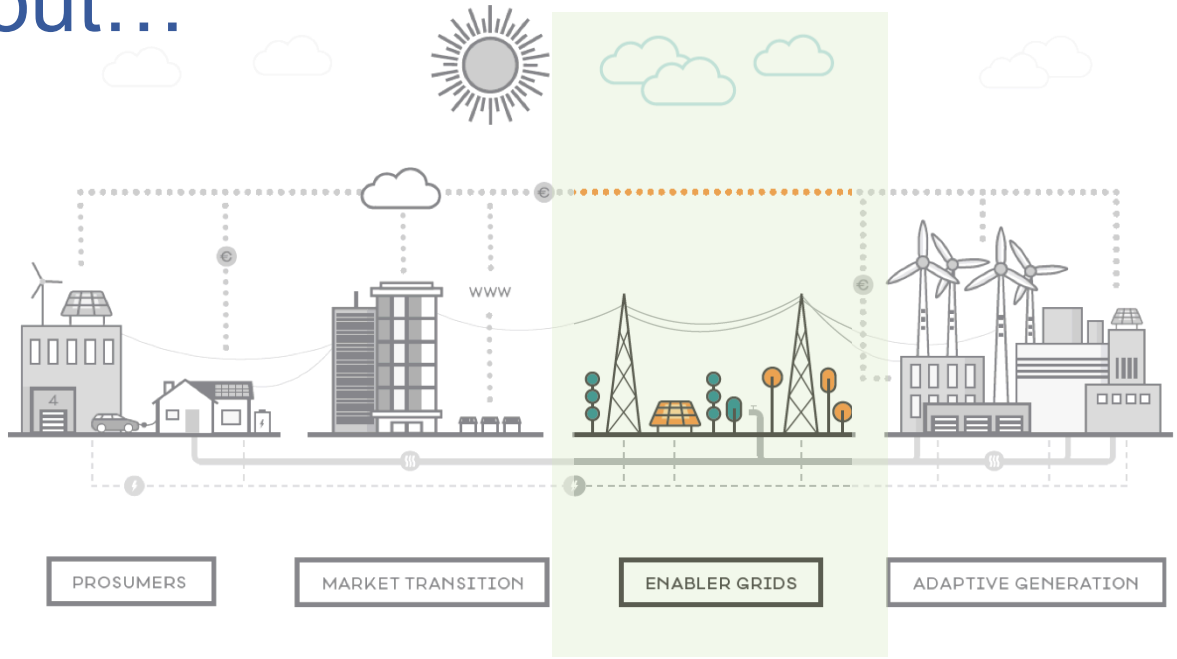


Expectations

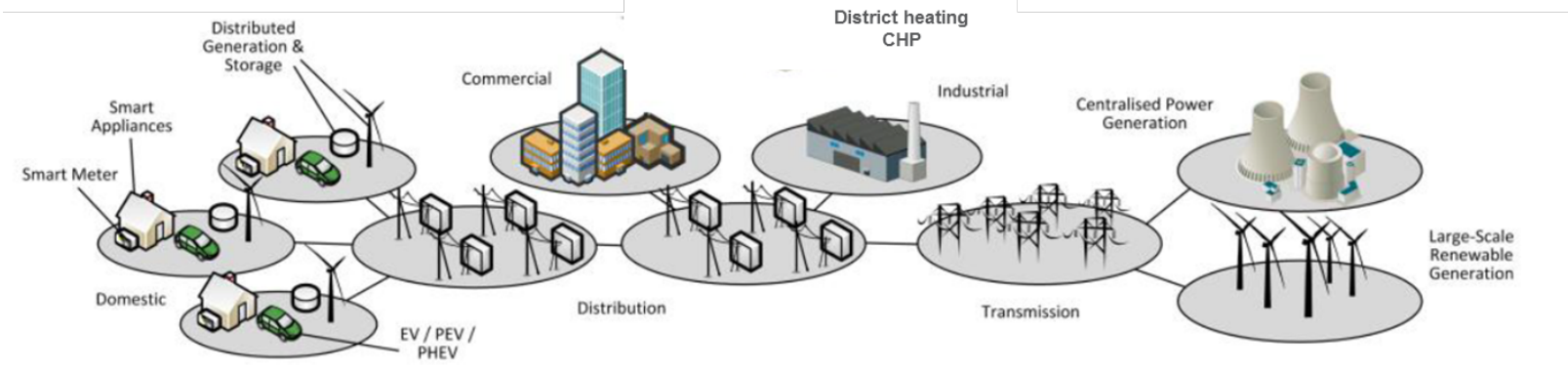
- Reliable and secure
- Cost-effective (investment, operation)
- **Smart, flexible, adaptive…**

Flexibility in Energy Grids?

It's all about…

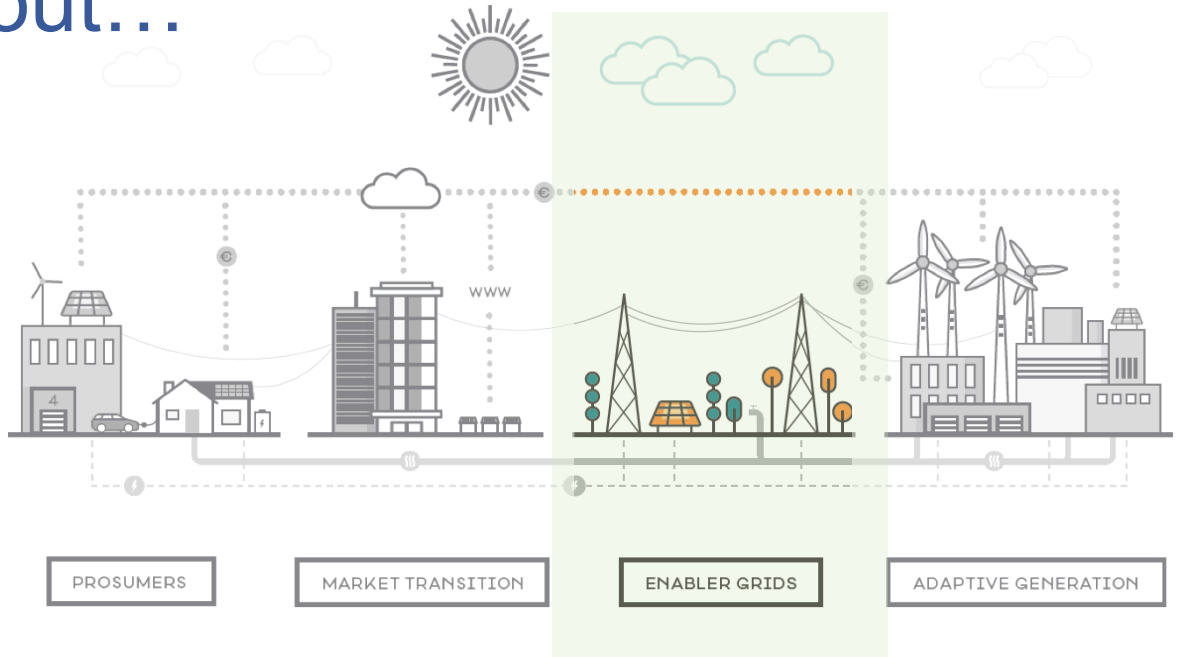


POWER AND HEAT INFRASTRUCTURE…

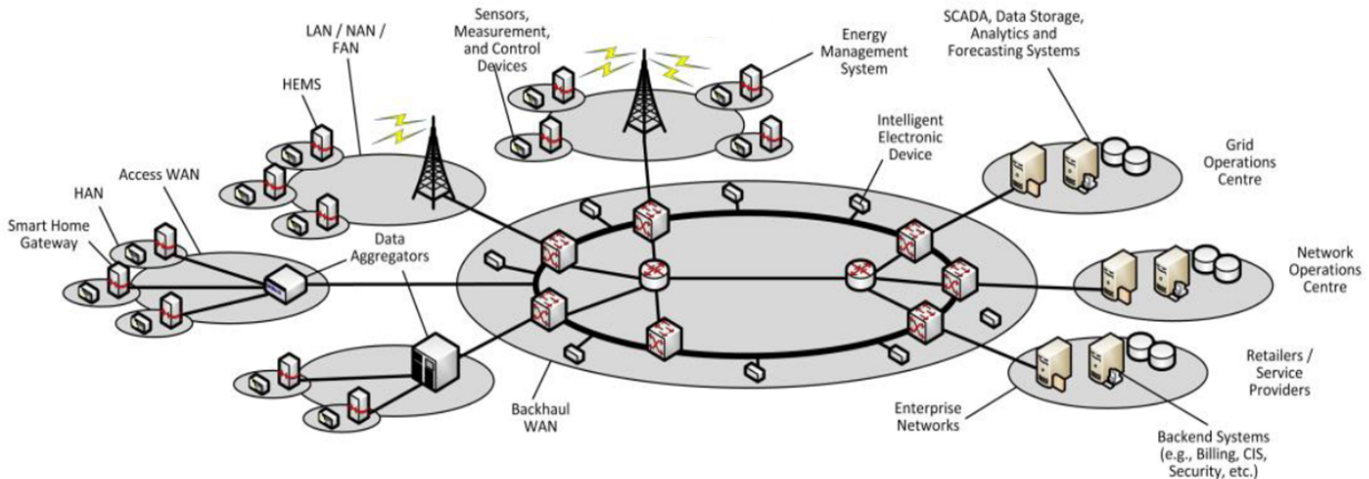


Flexibility in Energy Grids?

It's all about…



ICT INFRASTRUCTURE…



FLEXe

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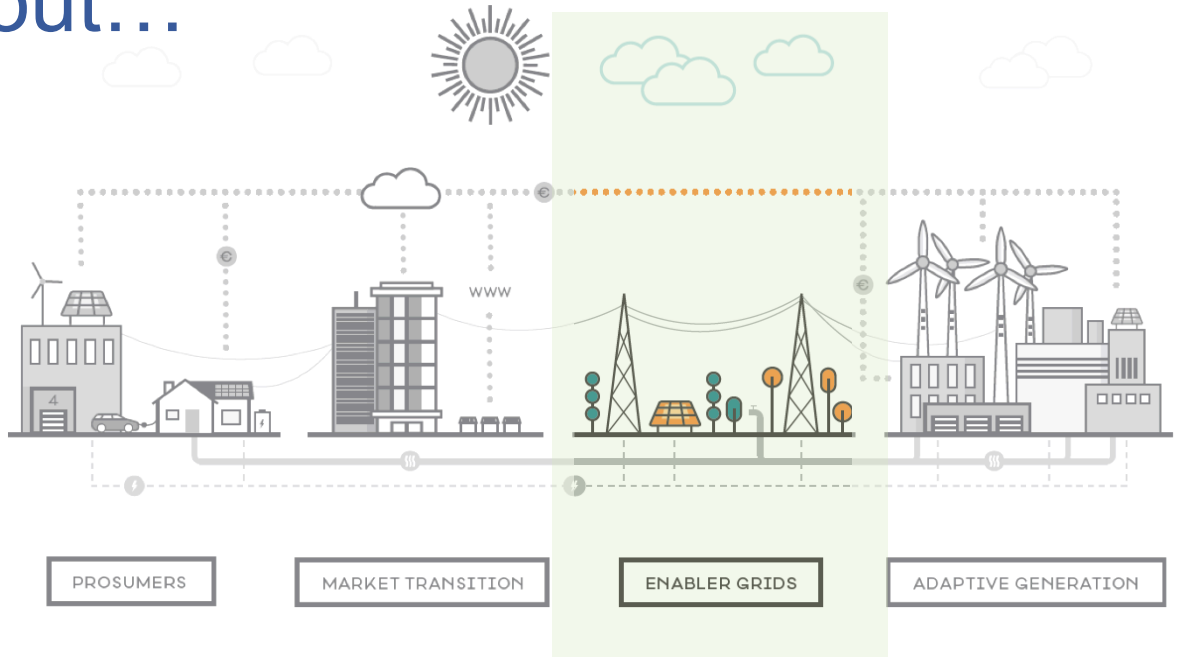
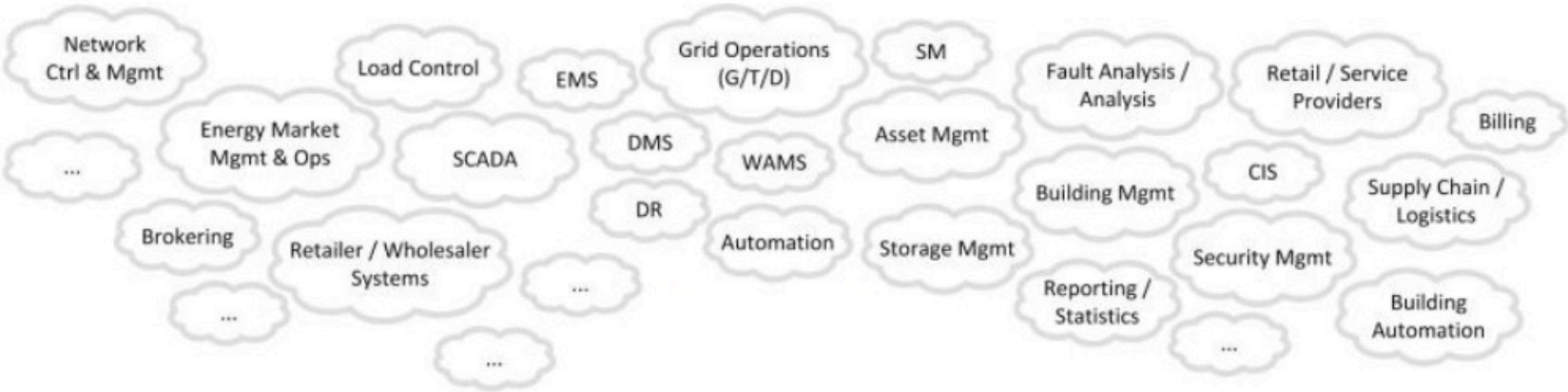
Flexibility in Energy Grids?

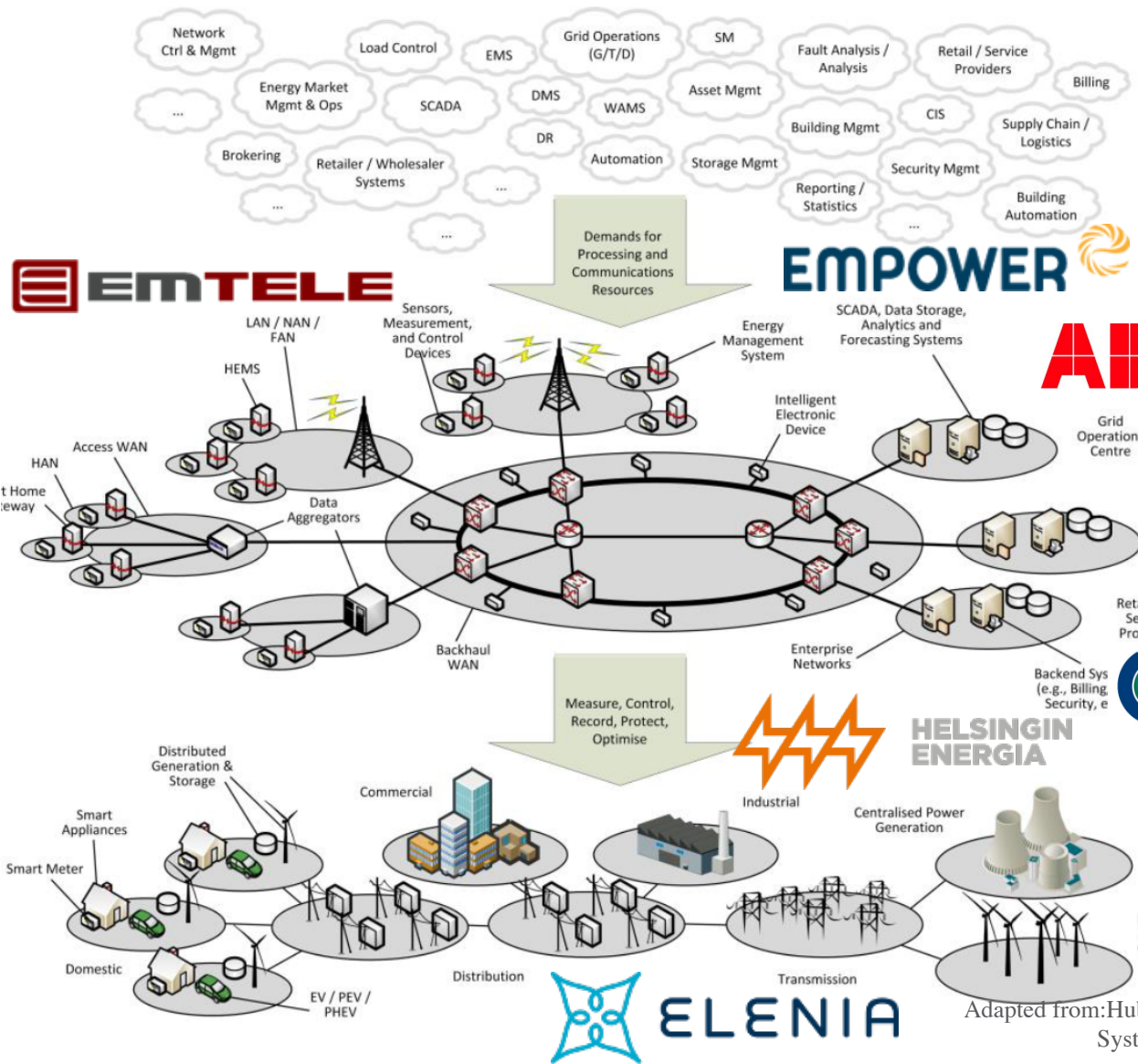
It's all about…



APPLICATIONS AND ALGORITHMS



Flexibility in FLEXe? It's co-operation of all stakeholders in different layers



+100 professionals working in enabling grids

Adapted from:HubNet Position Paper Series, Smart Grids and Communications Systems (www.hubnet.org.uk/filebyid/613/SmartGridComms.pdf)

Expectations for Energy Grids

Case 1: Power Balance and Flexibility

Adaptive generation

Prosumers

Over-frequency = Generation higher than consumption

Under-frequency = Consumption higher than generation

Conventional way: Power balance is guaranteed by the control of generation (generation follows the changes of consumption)

Future flexible solution: Power balance is managed cost-effectively by both solutions: control of adaptive generation as well as flexible load. *Dimensioning and operation of the grids enable this Flexibility!*

Expectations for Energy Grids

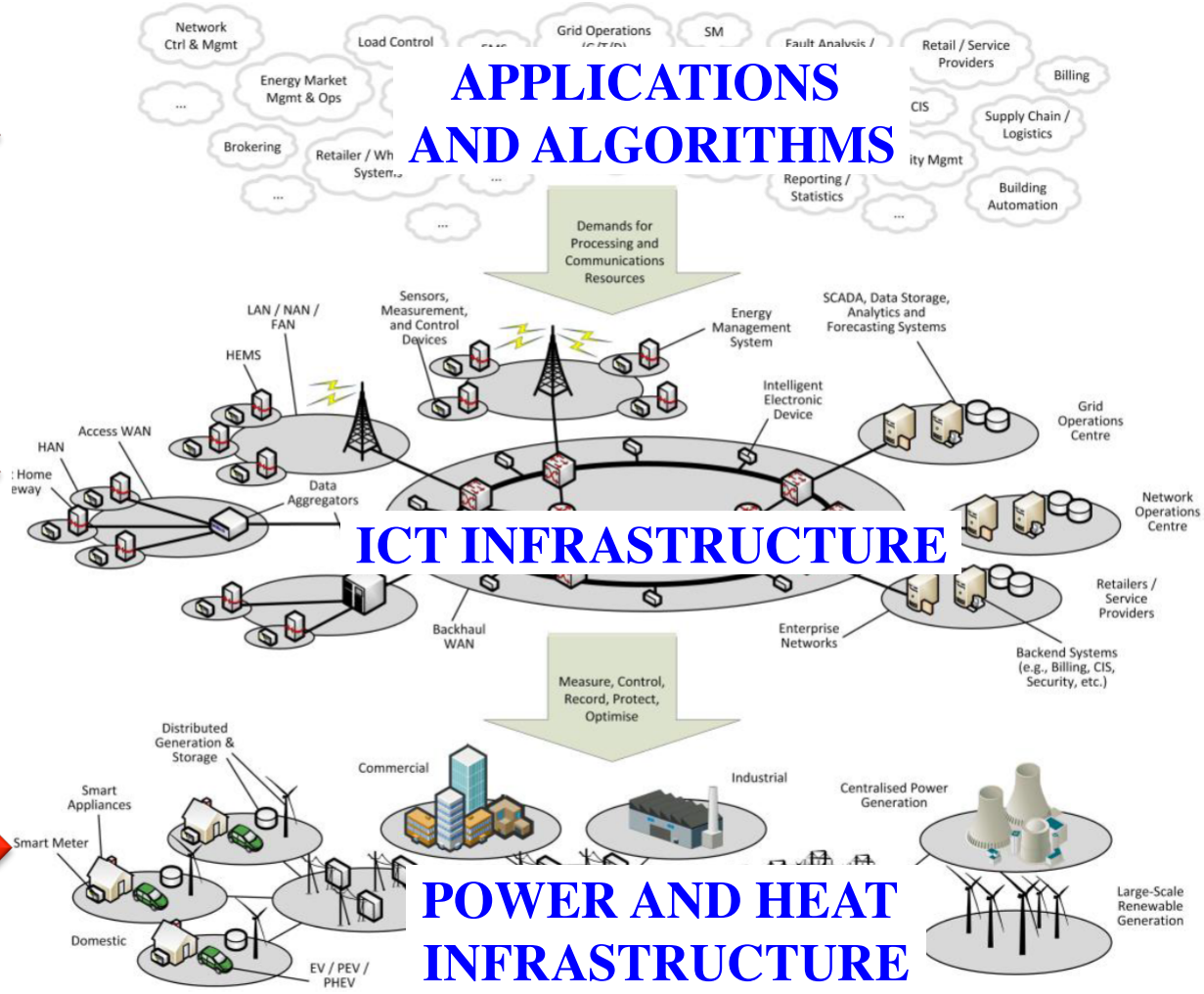
Case 1: Power Balance and Flexibility

Done in FLEXe

Development of load control algorithms, frequency control applications

Development of high quality and advanced measurement, data management and communication systems

Development of methods for optimal dimensioning of energy infrastructure



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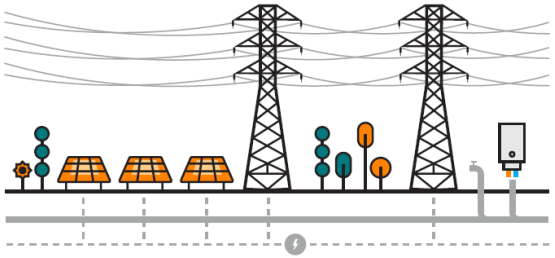
Expectations for Energy Grids

Case 2: Reliable Connection



Conventional way: Reactive operation in interruptions of energy grids, long delays, centralized automation.

Future flexible solution: Proactive planning and management of energy grids utilizing high-quality measurements and Big Data analytics to avoid interruptions and allow flexibility actions in energy system. Advanced protection, fault isolation and supply restoration functions included.

Expectations for Energy Grids

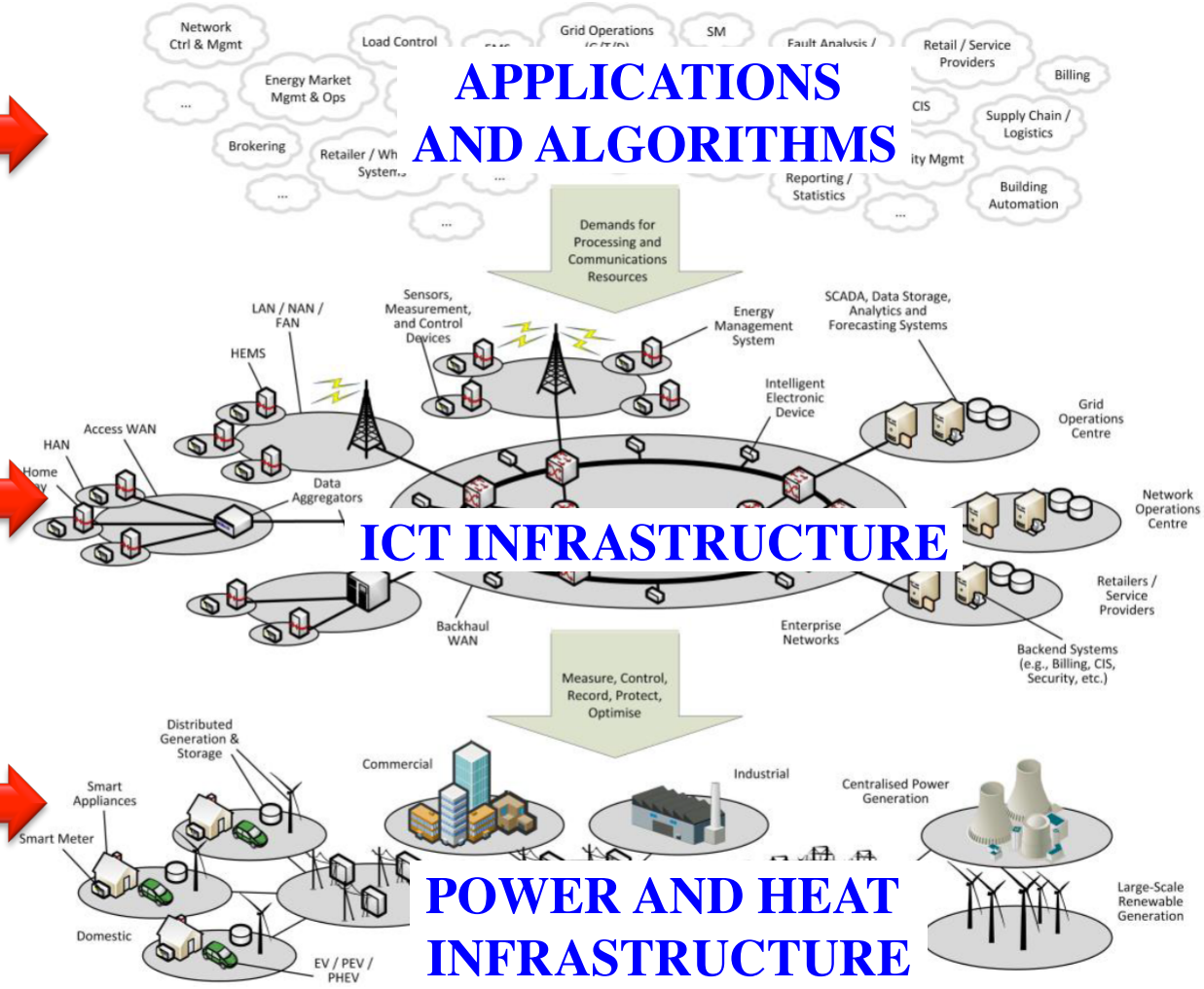
Case 2: Reliable Connection

Done in FLEXe

Development of condition monitoring and fault location algorithms, data management

Development of high-quality and advanced measurement and communication systems

Development of methods for planning and operation of weather resistant infrastructure



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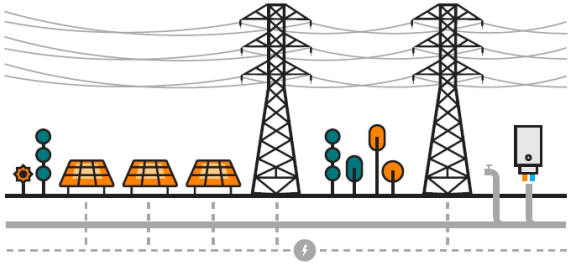
Expectations for Energy Grids

Case 3: Energy Independence (Island Operation)



Conventional way: Energy end-customers are dependent on continuous system level connection (one-direction power flow, no energy storage)

Future flexible solution: Energy end-customers have local resources and solutions to continue energy usage during system blackouts. Local smartgrid solutions (microgrids) enable this!

Expectations for Energy Grids

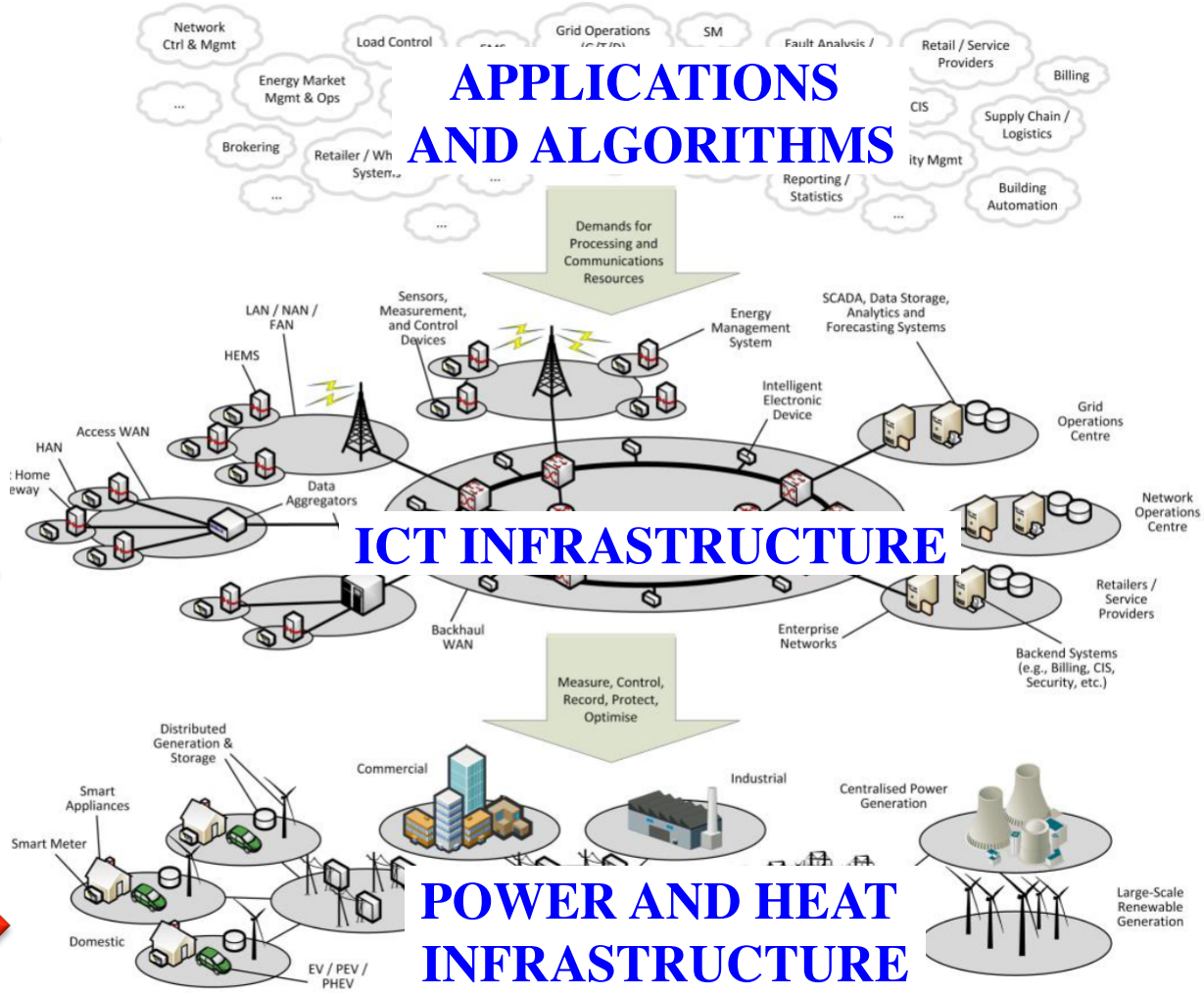
Case 3: Energy Independence (Island Operation)

Done in FLEXe

Development of demand response algorithms (load control), storage management, …

Development of microgrid ICT solutions allowing energy delivery in island mode.

Development of microgrid infrastructure allowing full-scale flexibility in the customer-end



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Results in Enabler Grids

Smart grid telecommunications **architecture design**

Integration of telecommunications and smart grid **testbeds**

Field **measurements**

Diagnostics of LV cables

New **service business models**

Power line monitoring **methodology**

Integration of condition monitoring in network planning

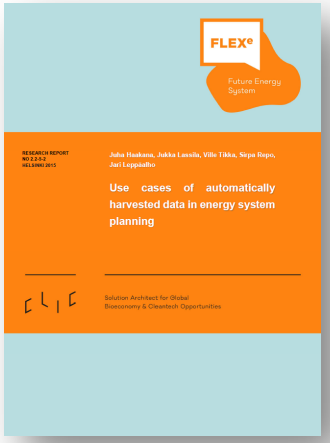
Monitoring and control **algorithms** for CHP and DH network operation

Methods for utilizing long range weather forecasts in management of flexible energy systems

Solutions for network operation and disturbance management

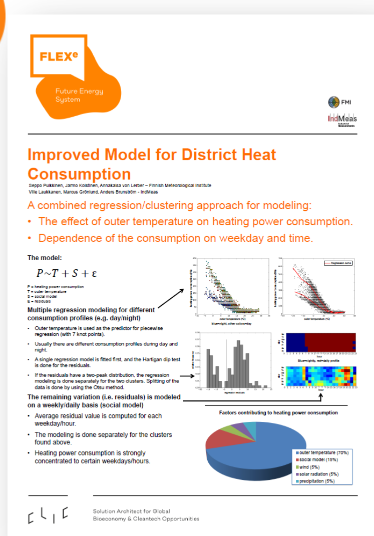
\+

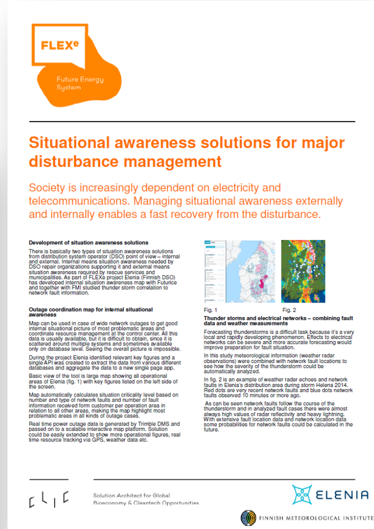
- ✓ Ph.D. thesis
- ✓ M.Sc. thesis
- ✓ B.Sc. thesis
- ✓ Conference papers
- ✓ Journal papers
- ✓ Research reports

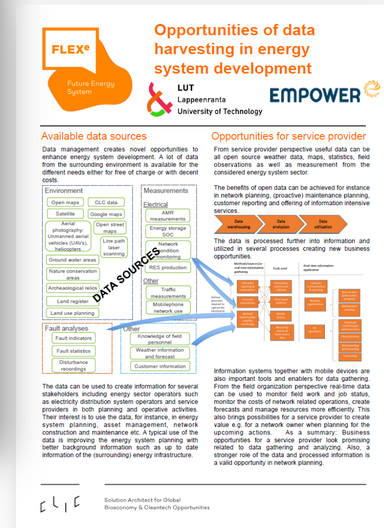


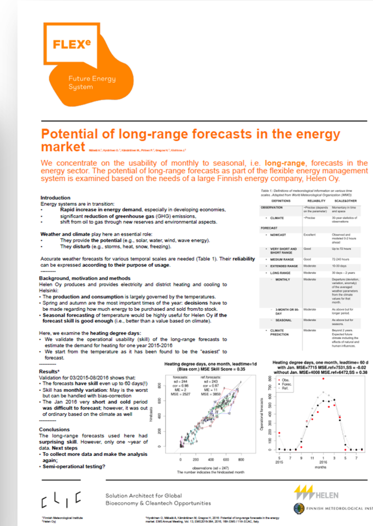
FLEXe Future Energy System

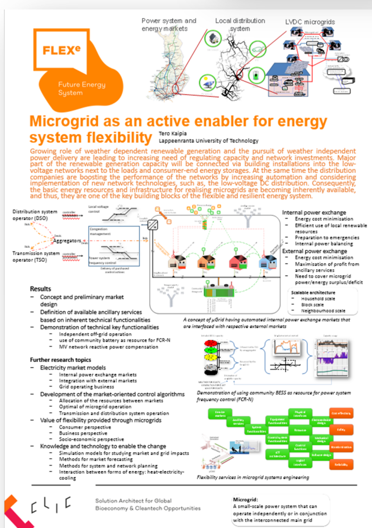
Posters

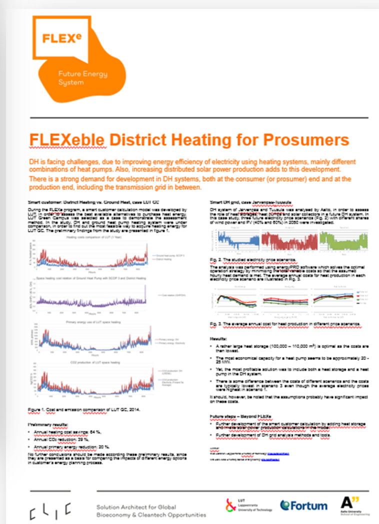


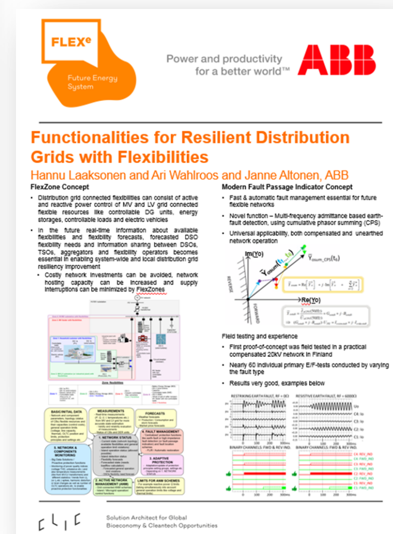






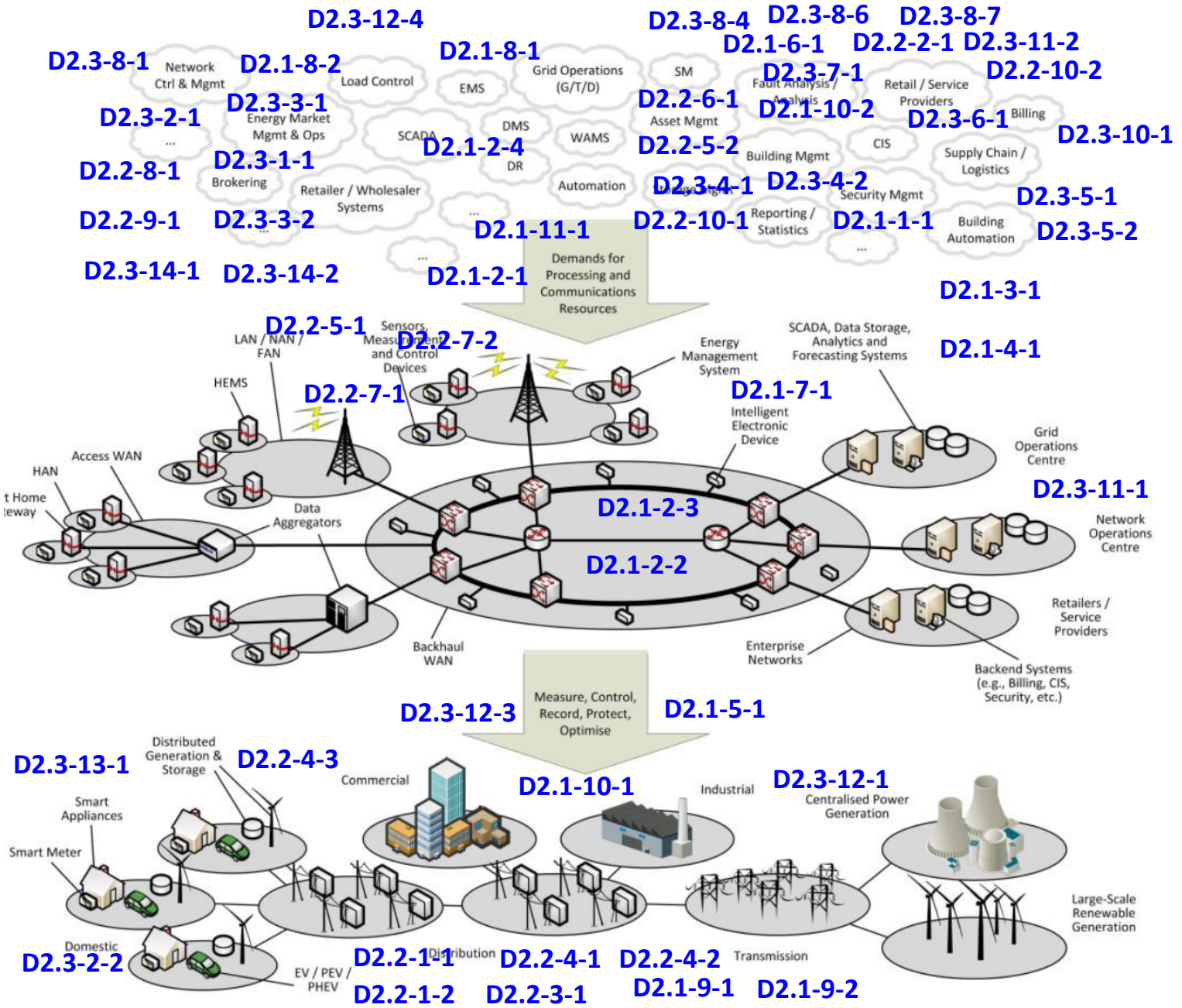






CLIC

Enabler Grids Deliverables



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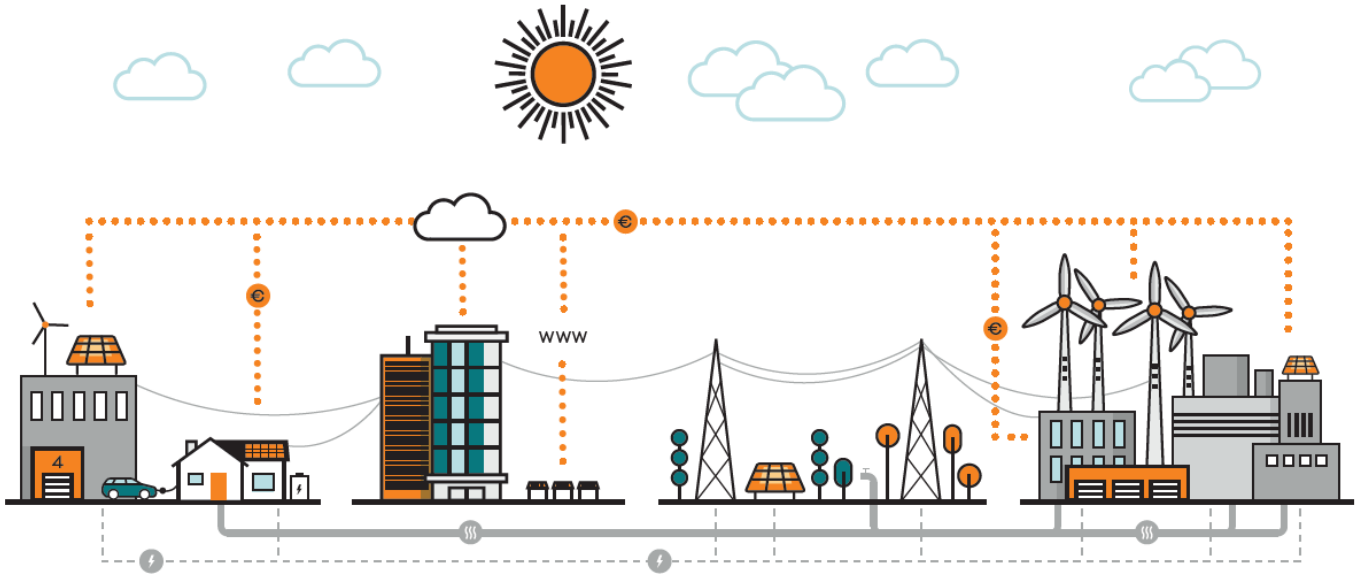
Thank You!



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