



LUT Green Campus and SRI evaluations

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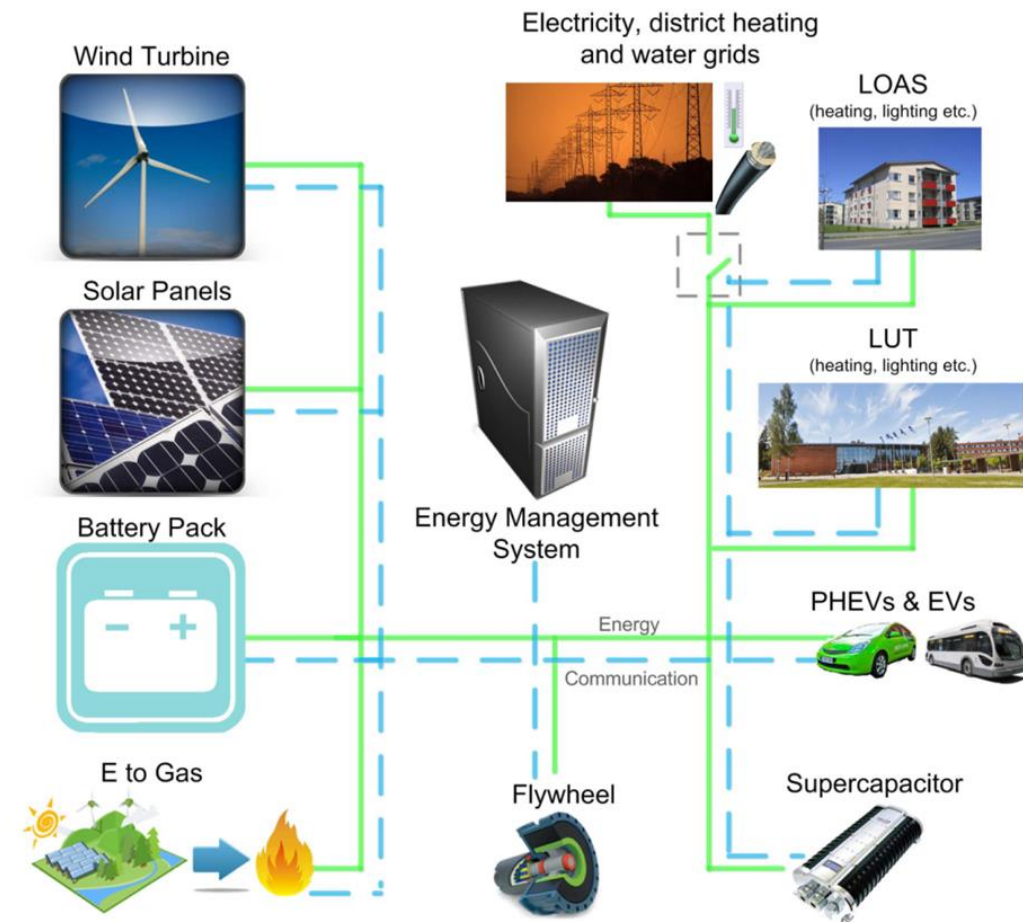
17 June 2020
Virtual Exchange of Experience, South Karelia

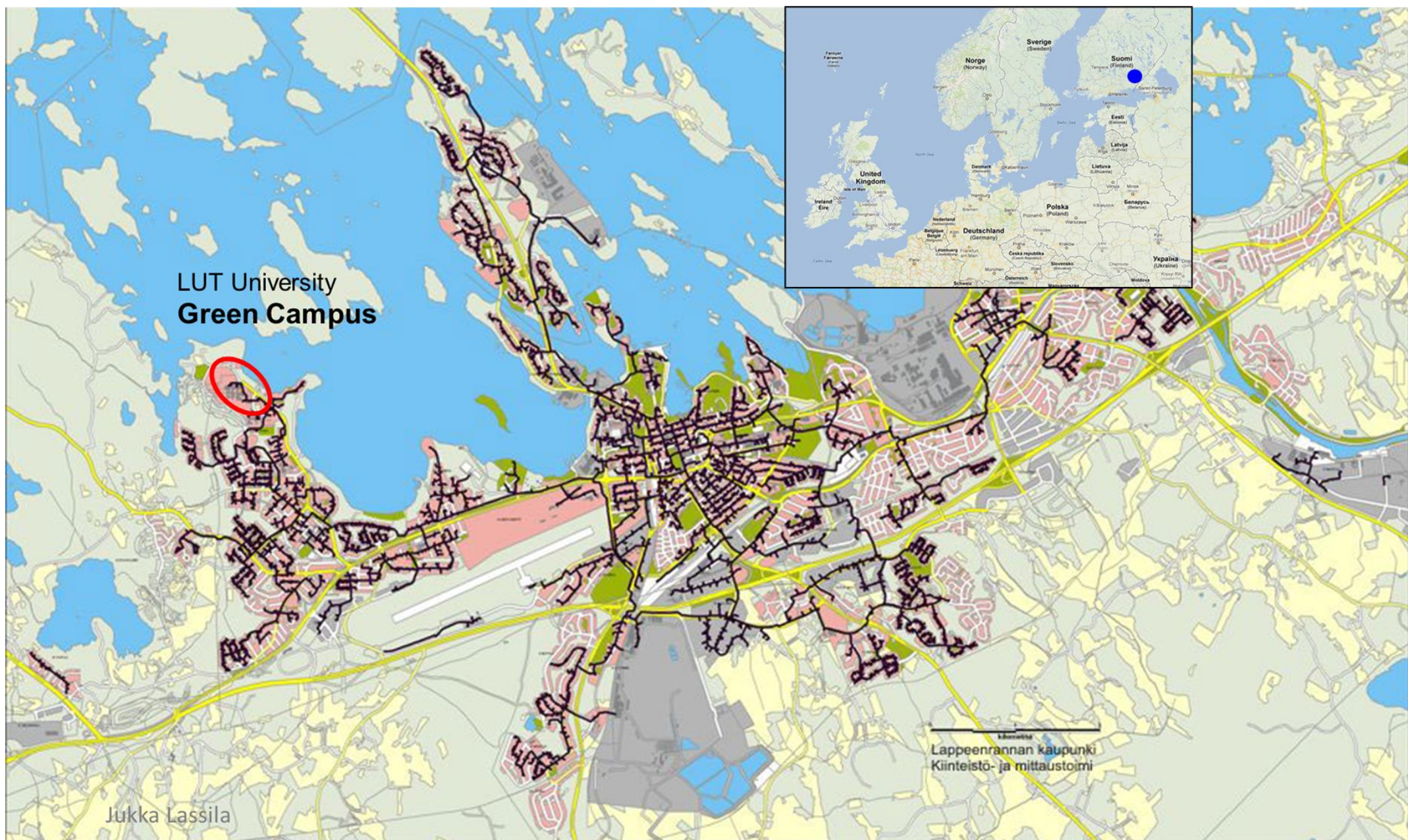
LUT Green Campus

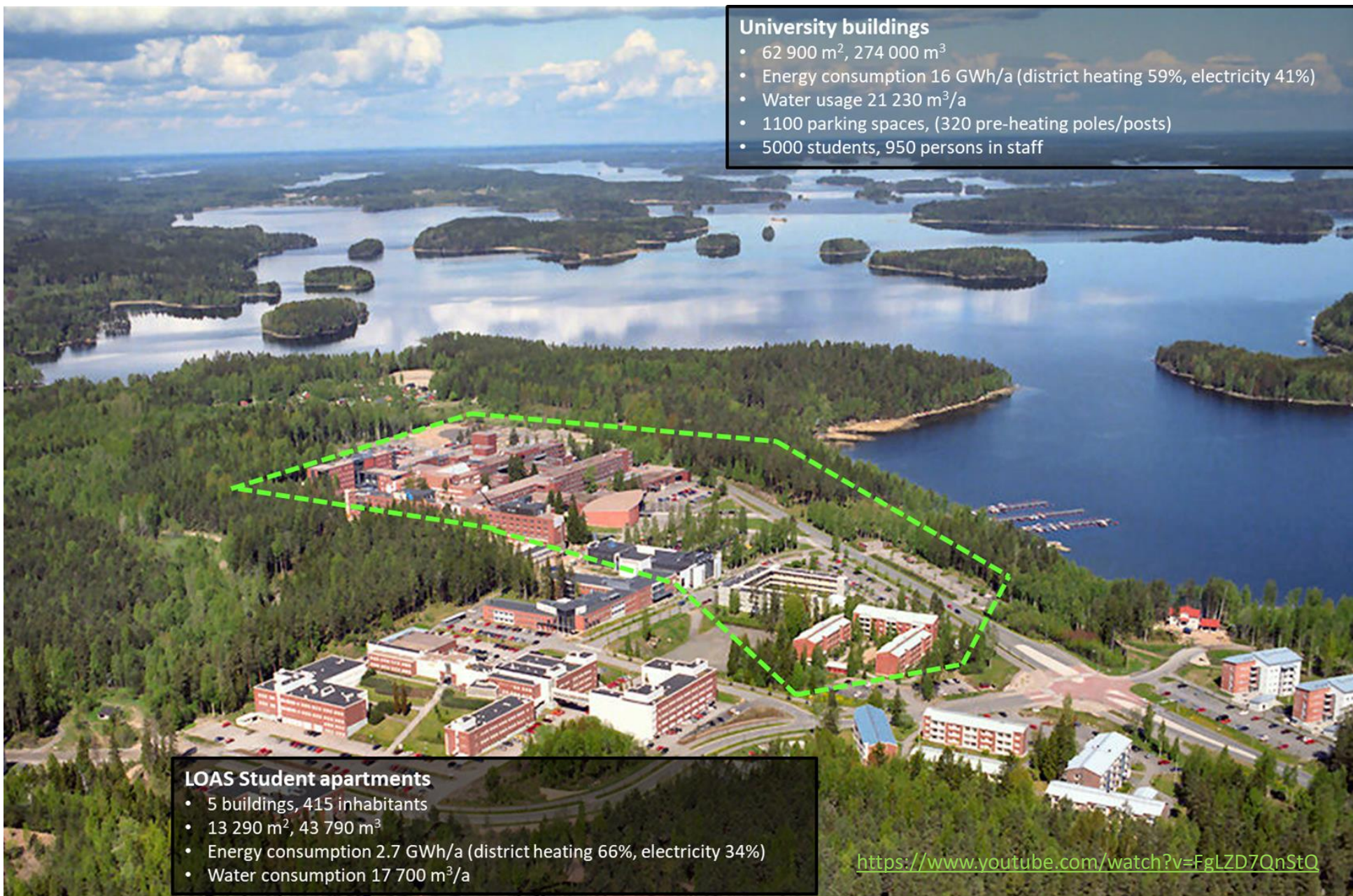
Targets and tasks of the Energy Management System:

- Processing of measurement data and background information → ICT in critical role
- Cost efficient and optimized operation of active resources (DG, ES, DR, EV, ...)
- Platform for energy business activities
- Energy balance in Green Campus
- Negative carbon emission balance by 2024

<https://www.youtube.com/watch?v=wUt3fuepXvM>







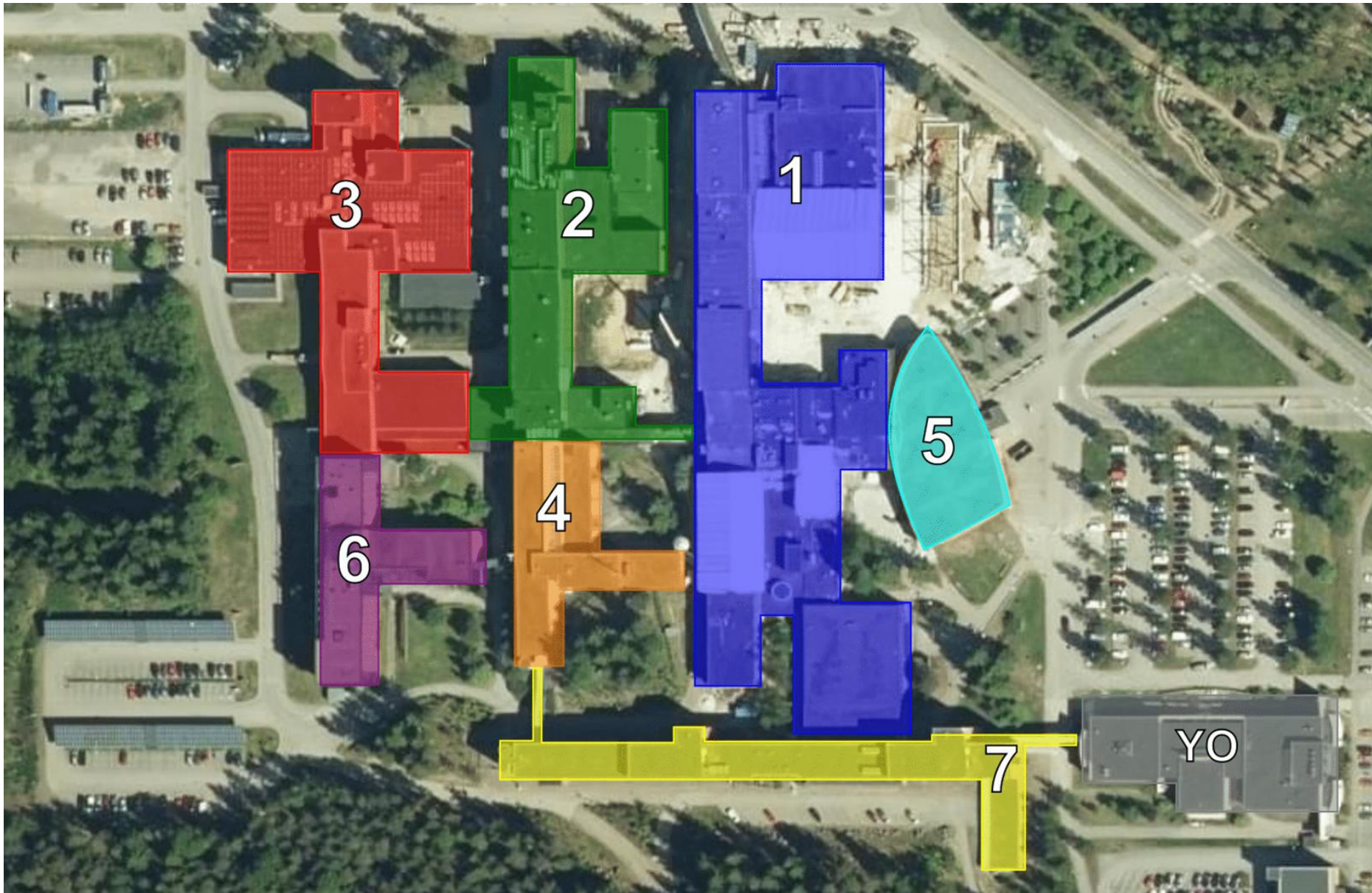
University buildings

- 62 900 m², 274 000 m³
- Energy consumption 16 GWh/a (district heating 59%, electricity 41%)
- Water usage 21 230 m³/a
- 1100 parking spaces, (320 pre-heating poles/posts)
- 5000 students, 950 persons in staff

LOAS Student apartments

- 5 buildings, 415 inhabitants
- 13 290 m², 43 790 m³
- Energy consumption 2.7 GWh/a (district heating 66%, electricity 34%)
- Water consumption 17 700 m³/a

<https://www.youtube.com/watch?v=FgLZD7QnStQ>



National Land Survey of Finland, 2020. MapSite. <https://asiointi.maanmittauslaitos.fi/karttapaikka/?lang=en>

Smart Readiness Indicator

LUT University campus

Overview: Smart Readiness Indicator (SRI)

- Project launched by the European Union (2010/31/EU, EPBD)
- *Smartness*: capability of the building to adapt functions to the needs of occupants and energy grids
- Enablers: building sector digitalization and technical systems
- Aims:
 - Increased awareness of smart solutions' value
 - Increased energy and overall performance
 - Long-term energy, emission and cost savings
- SRI result on scale 0–100 %

SRI case study: LUT Lappeenranta campus

- Campus buildings (1–7) were assessed in one remote meeting
- SRI service catalogue, 54 services, checklist approach
<https://smartreadinessindicator.eu/milestones-and-documents>
- Comments and discussion on interpretation
- Key knowledge necessary for the assessment:

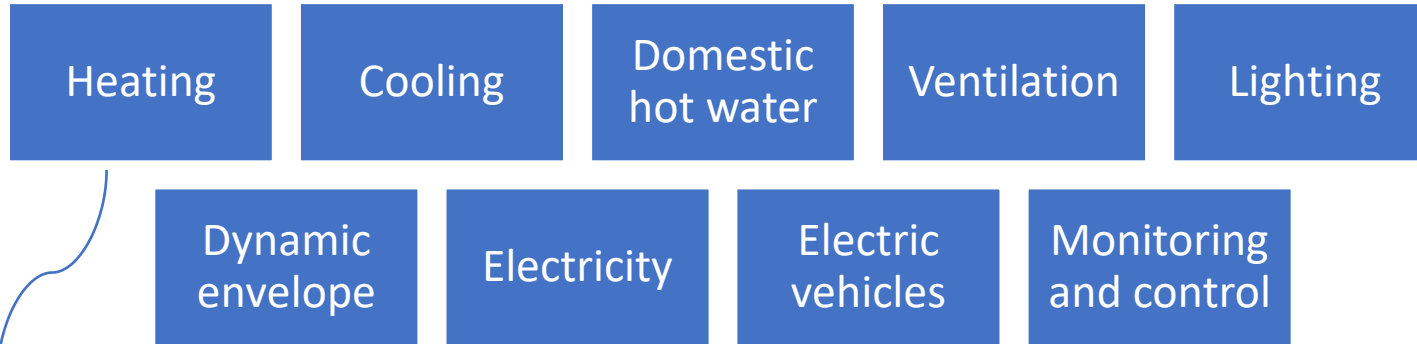
HVAC

Electricity and
automation

Interoperability
and big picture

SRI domains and impacts

9 service domains



54 services

code	service	1						
Heating-1a	Heat emission control	Service group: Heat control - demand side						
Functionality levels		IMPACTS						
		Energy savings on site	Flexibility for the grid and storage	Comfort	Convenience	Health & wellbeing	maintenance & fault prediction	information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	Central automatic control (e.g. central thermostat)	1	0	1	1	1	0	0
level 2	Individual room control (e.g. thermostatic valves, or electronic controller)	2	0	2	2	2	0	0
level 3	Individual room control with communication between controllers and to BACS	2	0	2	3	2	1	0
level 4	Individual room control with communication and occupancy detection	3	0	2	3	2	1	0

7 impact criteria

Code	Smart ready service	Functionality level 0	Functionality level 1	Functionality level 2	Functionality level 3	Functionality level 4
Heating-1a	Heat emission control	No automatic control	Central automatic control (e.g. central thermostat)	Individual room control (e.g. thermostatic valves, or electronic controller)	Individual room control with communication between controllers and to BACS	Individual room control with communication and occupancy detection
DHW-3	Report information regarding domestic hot water performance	None	Indication of actual values (e.g. temperatures, submetering energy usage)	Actual values and historical data	Performance evaluation including forecasting and/or benchmarking	Performance evaluation including forecasting and/or benchmarking; also including predictive management and fault detection
Cooling-1f	Interlock: avoiding simultaneous heating and cooling in the same room	No interlock	Partial interlock (minimising risk of simultaneous heating and cooling e.g. by sliding setpoints)	Total interlock (control system ensures no simultaneous heating and cooling can take place)		
Ventilation-1a	Supply air flow control at the room level	No ventilation system or manual control	Clock control	Occupancy detection control	Central Demand Control based on air quality sensors (CO2, VOC, humidity, ...)	Local Demand Control based on air quality sensors (CO2, VOC,...) with local flow from/to the zone regulated by dampers
Lighting-1a	Occupancy control for indoor lighting	Manual on/off switch	Manual on/off switch + additional sweeping extinction signal	Automatic detection (auto on / dimmed or auto off)	Automatic detection (manual on / dimmed or auto off)	
DE-1	Window solar shading control	No sun shading or only manual operation	Motorized operation with manual control	Motorized operation with automatic control based on sensor data	Combined light/blind/HVAC control	Predictive blind control (e.g. based on weather forecast)
Electricity-2	Reporting information regarding local electricity generation	None	Current generation data available	Actual values and historical data	Performance evaluation including forecasting and/or benchmarking	Performance evaluation including forecasting and/or benchmarking; also including predictive management and fault detection
EV-15	EV Charging Capacity	not present	ducting (or simple power plug) available	0-9% of parking spaces has recharging points	10-50% of parking spaces has recharging point	>50% of parking spaces has recharging point
MC-4	Detecting faults of technical building systems and providing support to the diagnosis of these faults	No central indication of detected faults and alarms	With central indication of detected faults and alarms for at least 2 relevant TBS	With central indication of detected faults and alarms for all relevant TBS	With central indication of detected faults and alarms for all relevant TBS, including diagnosing functions	

SRI results: building 1 (renovated in 2018)

Domain-impact scores

	Energy performance and operation		Respond to user needs				Energy demand flexibility	Domain average
	Energy savings on site	Maintenance & fault prediction	Comfort	Convenience	Health & Wellbeing	Information to occupants	Flexibility for the grid and storage	
Heating	71 %	80 %	83 %	73 %	80 %	100 %	36 %	65 %
DHW	100 %	100 %		100 %		100 %		100 %
Cooling	87 %	50 %	75 %	63 %	67 %	100 %	17 %	54 %
Ventilation	93 %	50 %	100 %	100 %	100 %	67 %		82 %
Lighting	83 %		100 %	100 %	100 %			92 %
Electricity	75 %	50 %		22 %		100 %	22 %	49 %
Dynamic envelope	33 %		33 %	33 %	0 %			28 %
Electric vehicles				83 %		100 %	50 %	71 %
Monitoring & control	75 %	91 %	100 %	88 %	100 %	100 %	78 %	86 %
Impact average	78 %	80 %	86 %	76 %	79 %	97 %	43 %	
Function average	79 %		85 %				43 %	
Total	69 %							

SRI results: LUT campus

Building	Impacts							Domains							Total		
	Energy savings on site	Maintenance & fault prediction	Comfort	Convenience	Health & Wellbeing	Information to occupants	Flexibility for the grid and storage	Heating	DHW	Cooling	Ventilation	Lighting	Electricity	Dynamic envelope		Electric vehicles	Monitoring & control
1	78 %	80 %	86 %	76 %	79 %	97 %	43 %	65 %	100 %	54 %	82 %	92 %	49 %	28 %	71 %	86 %	69 %
2	78 %	86 %	71 %	77 %	68 %	93 %	42 %	56 %	100 %	54 %	70 %	59 %	47 %	0 %		92 %	67 %
3	75 %	76 %	68 %	71 %	68 %	89 %	39 %	50 %	100 %	41 %	70 %	59 %	65 %	0 %		86 %	63 %
4	74 %	78 %	68 %	72 %	68 %	87 %	38 %	50 %	100 %	47 %	70 %	44 %	47 %	0 %		86 %	63 %
5	76 %	77 %	72 %	70 %	67 %	88 %	35 %	54 %	100 %	36 %	70 %	79 %	47 %	0 %	21 %	86 %	62 %
6	70 %	78 %	66 %	61 %	64 %	94 %	12 %	50 %	100 %	55 %	64 %	59 %	26 %	0 %	71 %	63 %	52 %
7	80 %	86 %	81 %	80 %	77 %	93 %	38 %	56 %	100 %	53 %	82 %	79 %	47 %	28 %		86 %	68 %
Total	77 %	81 %	76 %	75 %	73 %	93 %	38 %	57 %	100 %	51 %	75 %	73 %	49 %	13 %	30 %	85 %	66 %

Differences in energy flexibility capabilities

Motorized window blinds not common in Finland

Total campus score

Observations

- Applicability
 - Suitability for local conditions?
 - Comparability between different areas?
 - Implementation pathways?
- Potential benefits
 - Usage in building development?
 - Energy, emission and cost savings?
- Full report is in progress
 - Case study results
 - Discussion on applicability



S3UNICA

Interreg Europe



Questions?
Comments?

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