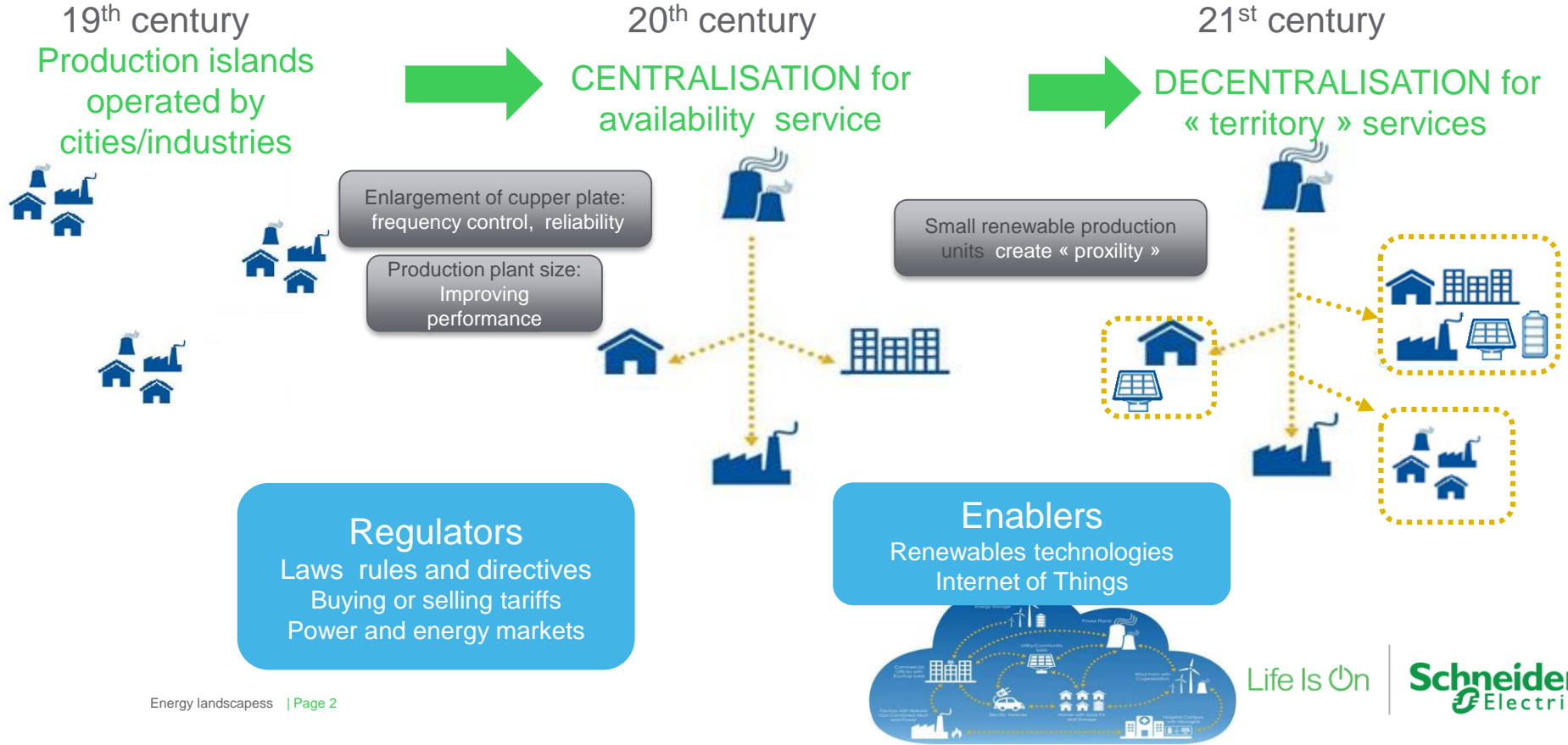# Energy landscapes

(introduction to ENERNET roundtable)

Drivers and functions
Architectures and skills
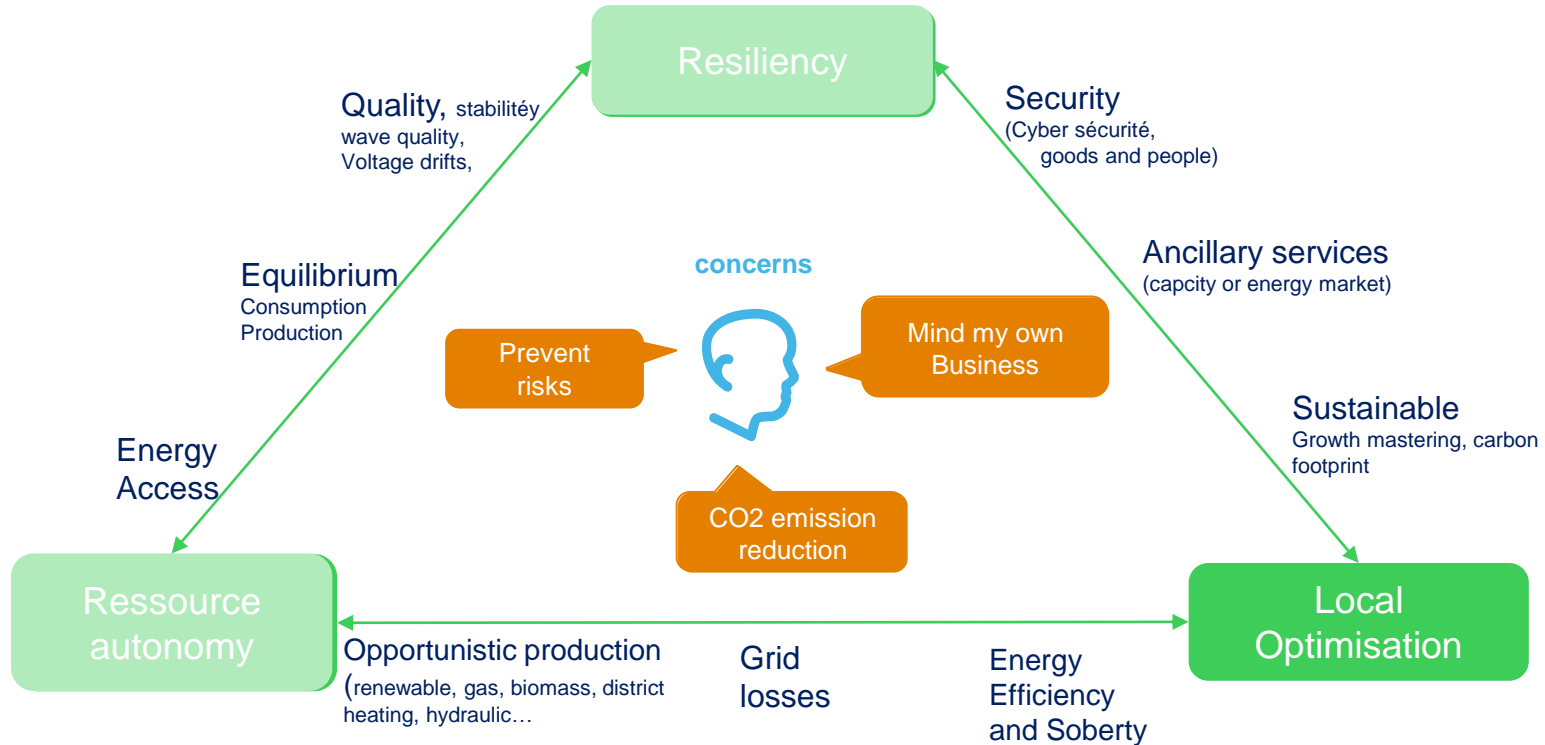**Classification**

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The emergence of local energy ecosystems

19th century
Production islands operated by cities/industries

20th century
CENTRALISATION for availability service

21st century
DECENTRALISATION for « territory » services

Enlargement of cupper plate: frequency control, reliability

Production plant size: Improving performance

Small renewable production units create « proxility »

Regulators
Laws rules and directives
Buying or selling tariffs
Power and energy markets

Enablers
Renewables technologies
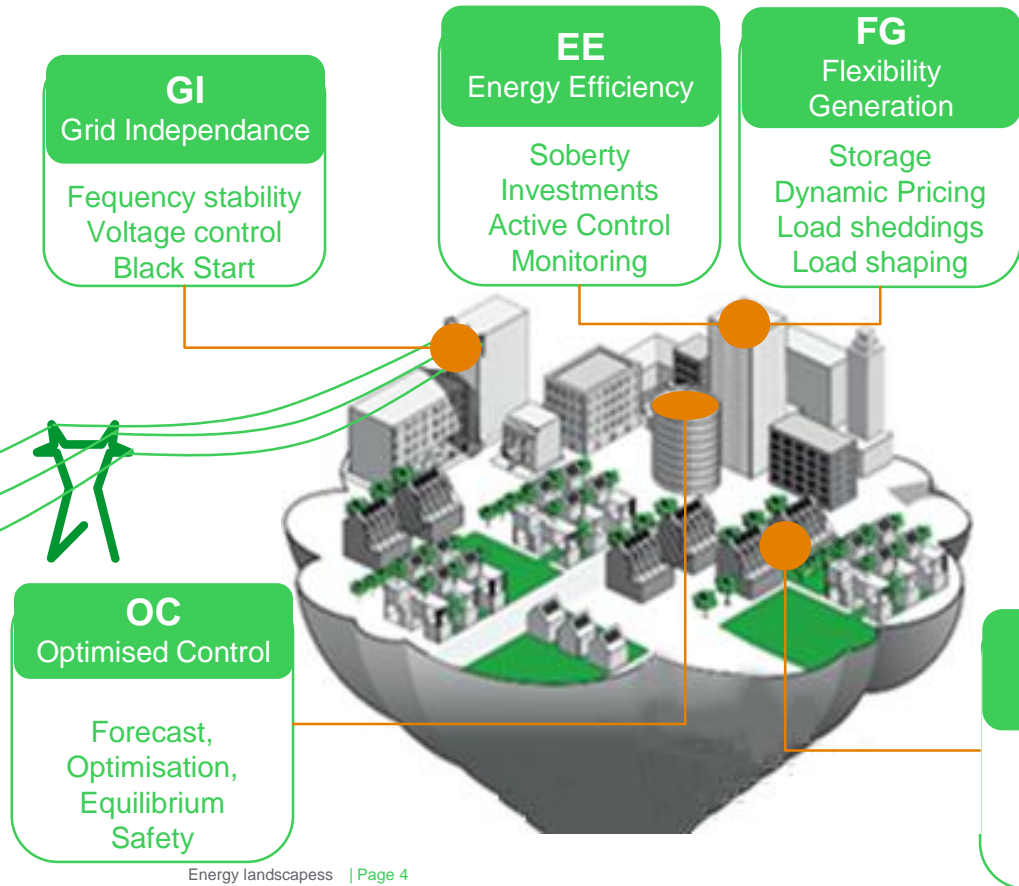Internet of Things

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The changement drivers to « smart districts »

The motivations of big sites, campus, blocks, districts, local authorities, territories stakeholders

Resiliency

Quality, stabilitéy wave quality, Voltage drifts,

Security (Cyber sécurité, goods and people)

Equilibrium Consumption Production

Ancillary services (capcity or energy market)

concerns

Prevent risks

Mind my own Business

CO_2 emission reduction

Energy Access

Sustainable Growth mastering, carbon footprint

Ressource autonomy

Local Optimisation

Opportunistic production (renewable, gas, biomass, district heating, hydraulic…

Grid losses

Energy Efficiency and Soberty

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« Smart districts » are a five functional steps journey …
…..et there is several routes.

GI
Grid Independance

Fequency stability
Voltage control
Black Start

EE
Energy Efficiency

Soberty
Investments
Active Control
Monitoring

FG
Flexibility
Generation

Storage
Dynamic Pricing
Load sheddings
Load shaping

OC
Optimised Control

Forecast,
Optimisation,
Equilibrium
Safety

DG
Decentralised
Generation

PV, wind mill
CHP
District Heating

	DG	EE	FG	OC	GI
Smart grid	X		X		
Positive Energy Buildings or territories	X	X			
Low carbon territory, Sustainable property	X	X		V	
Smart District Microgrid connected	X	X	X	X	
Microgrid OFF	X	X	X	X	X

Buildings
Efficient and Flexible

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Building and sites impact

Demand Side Management (DSM)

Demand Response (DR)		Energy Performance (EP)		
dispatchable	Non dispatchable	Active Energy Efficiency	Energy Soberty	Passive Energy Efficiency

Capacity/bidding	urgency	Dynamic pricing or dynamic carboning	Control and monitoring	Behavior	Quality of assets
curtailments	Selective load shedding	Time of use (TOU), Critical peak pricing (CPP),	Occupancy control	Econometer for individuals	Enveloppe
stimulation	Black out	CO_2 temporal grids	Service and machine control	Infrastructures for collective	Machines
Virtual power plant (VPP)			Stakeholder dashoards		

Energy system control according to external incentive : «Flexible building»

Energy system control in its own environment: « Efficient building »

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Energy and control architectures : a Russian Doll Scheme.

From occupant comfort to smart grids/ cities
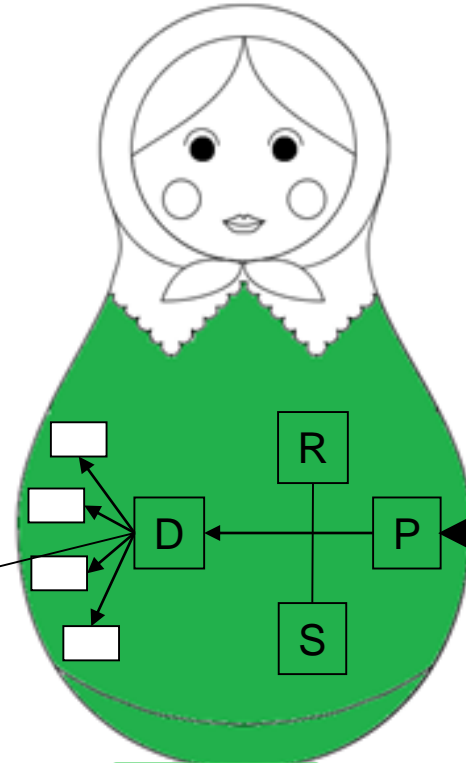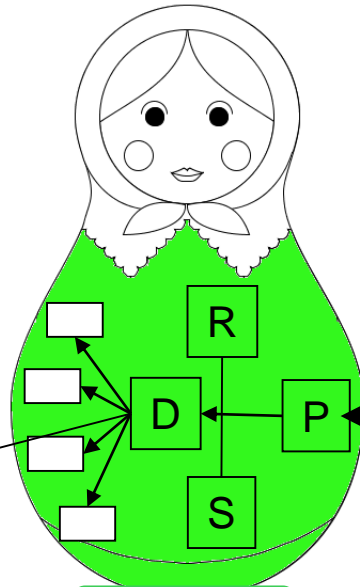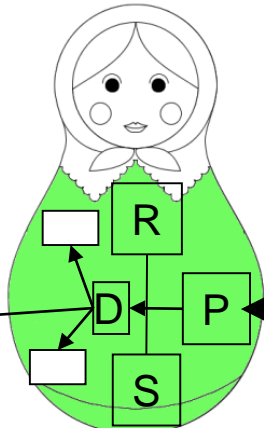
P : Production
R : Renewable
S : Storage
D : Distribution
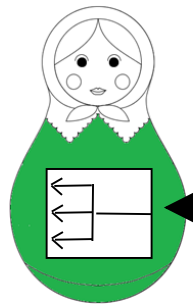
ROOM

Building

DISTRICT

City/ Territory

GRID

Comfort, productivity

Efficient Flexible

Optimised Positive

Autonomous Resilient

Stable Balanced

Impact on needed skills
(universities and engineer schools)
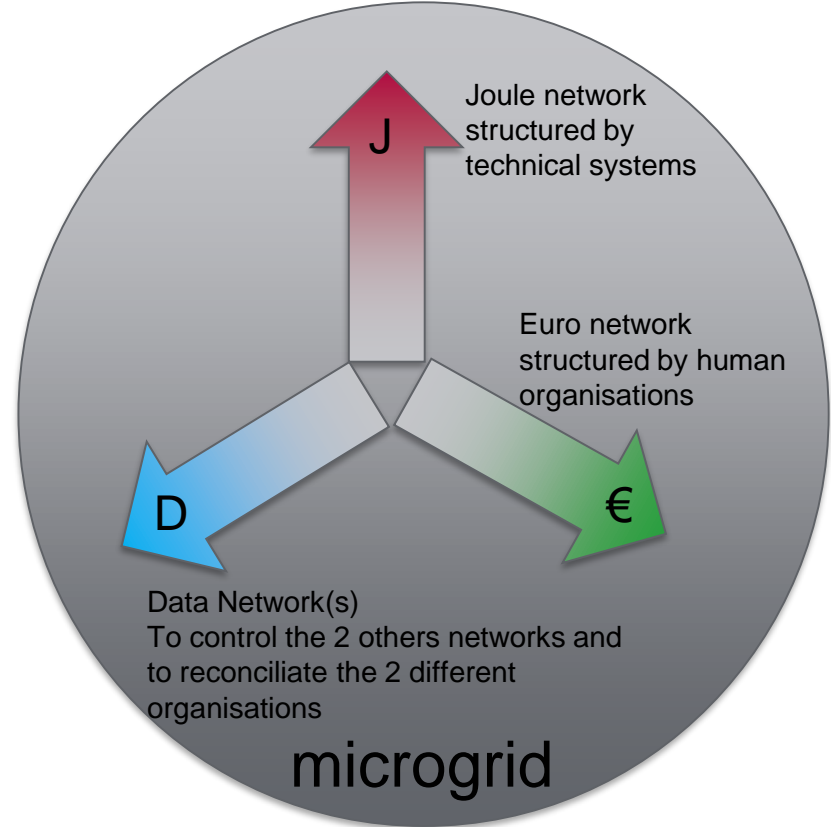
Almost no change on electricity

- but master fundamentals
- but inflate energy
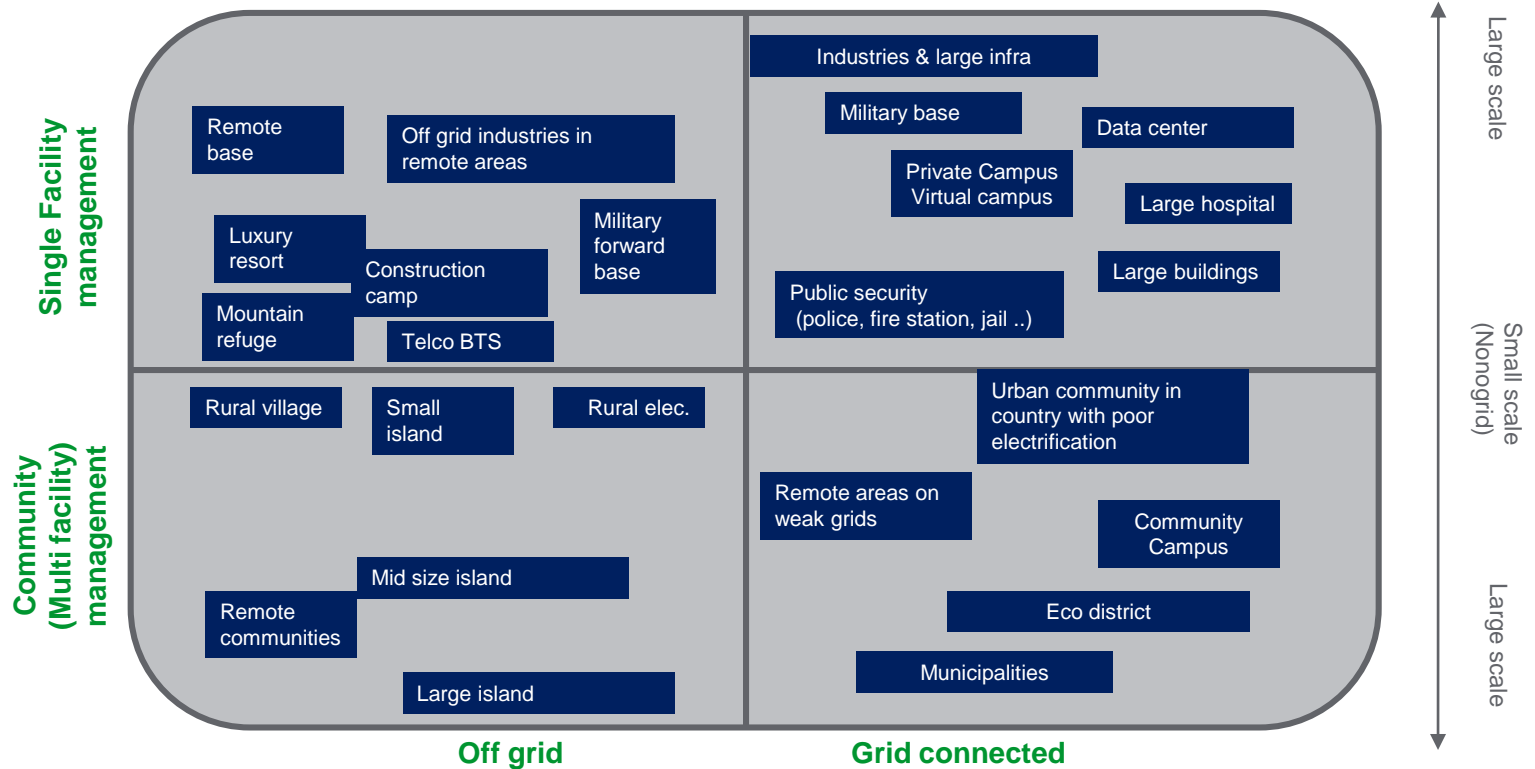- understand flexibility production/consumption

No change in finance

- but insist on « financing », involving grid codes influencing
- but insist on real time « value ».

Some changes in DATAs

- 2 Control architectures
- Property and analytics of datas
- From « big data » to « smart datas »

Joule network structured by technical systems

Euro network structured by human organisations

Data Network(s)
To control the 2 others networks and to reconciliate the 2 different organisations

microgrid

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Microgrids classification (J, €)