

## **Case Slovenia: Alternative Sources in Dispersed Energy Supply**

**Zoran Marinšek**

TN ACT -Technology Network Advanced Control Technologies &  
CoE-NOT Centre of Excellence, SI;

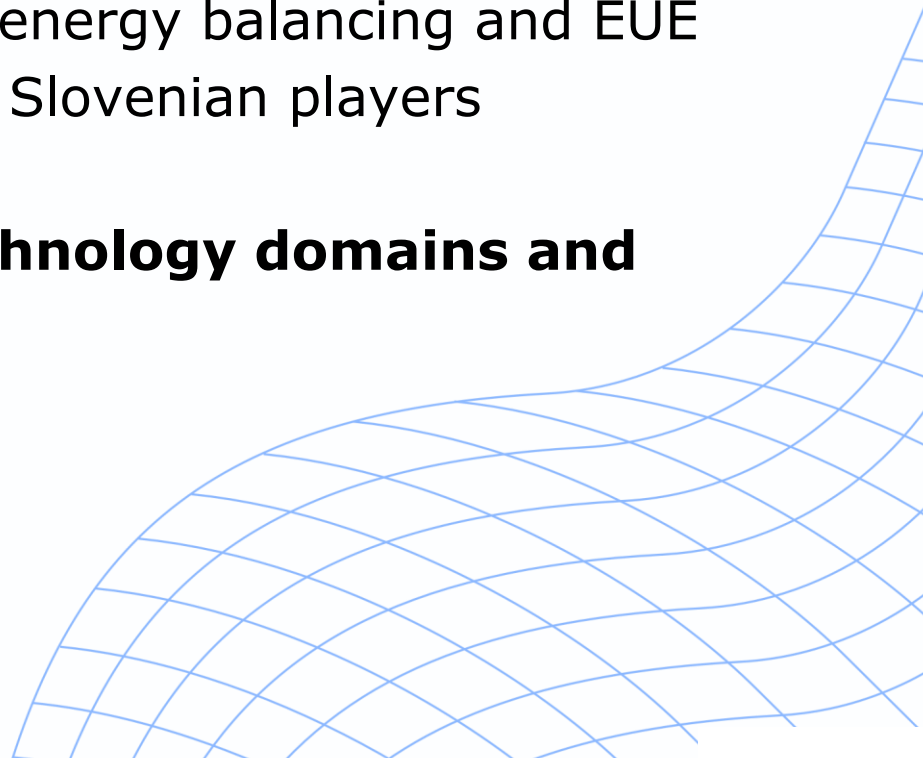
Workshop on Implementation of  
Smart Specialisation Strategy (S3),  
Ljubljana, 7.04.2016

# Alternative energy sources: a pillar in the circulatory economy

## Strategy triangulators

- Renewable energy sources targets
- Dispersed vs concentrated energy production
- Local self-supply: the basis for energy balancing and EUE
- Competencies and capacities of Slovenian players

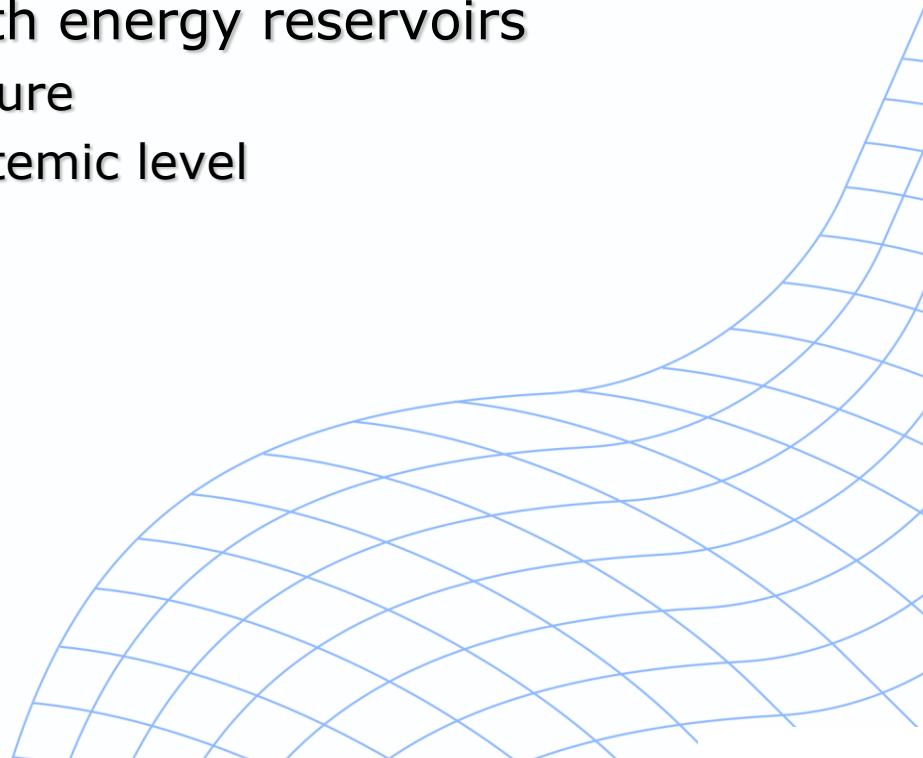
## The resulting strategy and technology domains and product fields



## Renewable energy sources targets

Targets RES and GHG → 2020 → 2030 → 2050

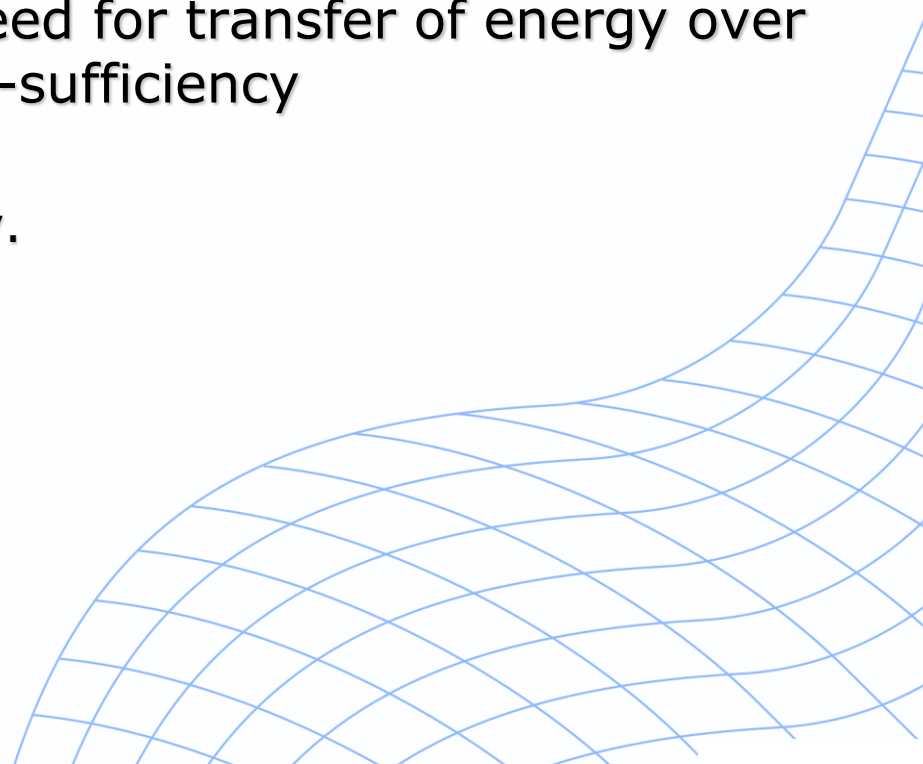
- Direction 100% RES ↔ circulatory economy
- Increasing challenges for balancing the electricity system
- Demand response combined with energy reservoirs
  - is becoming an important measure
  - Works both on local and on systemic level



## Dispersed vs concentrated RES production

Comparison of concentrated and dispersed RES production

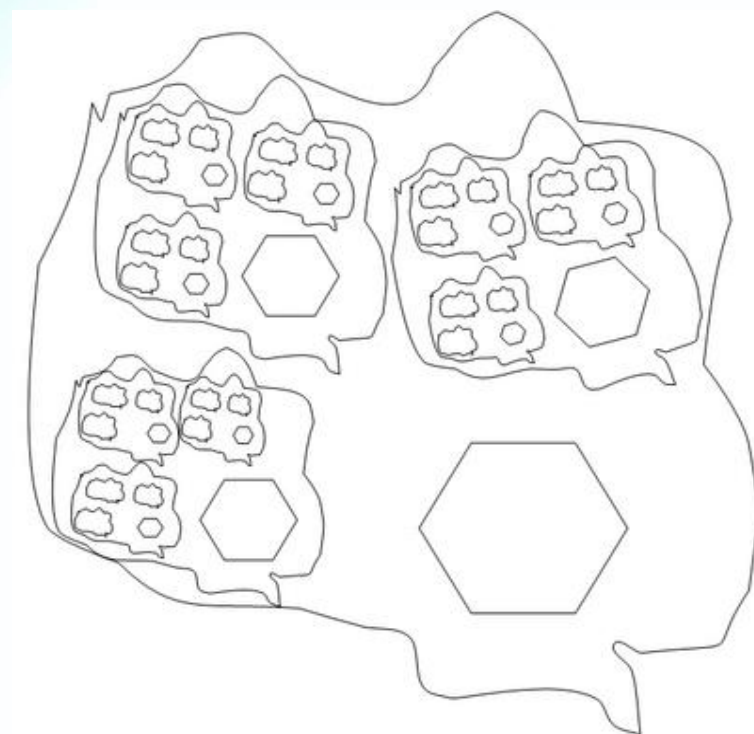
- Concentrated production require transfer of large quantities of energy over long distances,
- Dispersed sources reduce the need for transfer of energy over distances and increase local self-sufficiency
  - Give the end-user an active role
  - Induce local balancing of energy.



## Local Self – supply: the basis for energy balancing and EUE

### The Harmonized Electricity market model in Europe

- Structured the system in vertically nested subsystems with essentially the same functions as „parental“ system
- 4 levels primary subsystems of EMS
  - 1<sup>st</sup> level: Balance Group
  - 2<sup>nd</sup> level: Market Balance Area
  - 3<sup>rd</sup> level: Market area (Local Market Area)
  - (4th level: European)

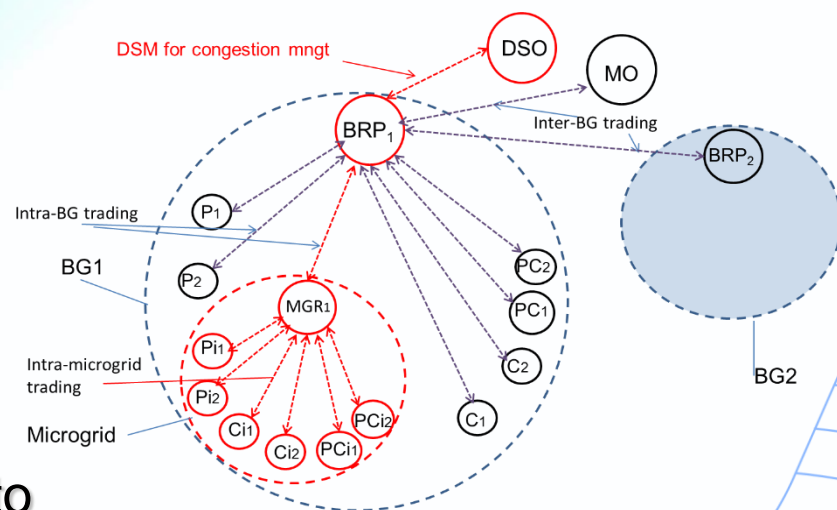


Schematic representation of vertical and horizontal decomposition of electrical grid system into nested subsystems.  
Each subsystem is nested in the „parental“ subsystem on the next level



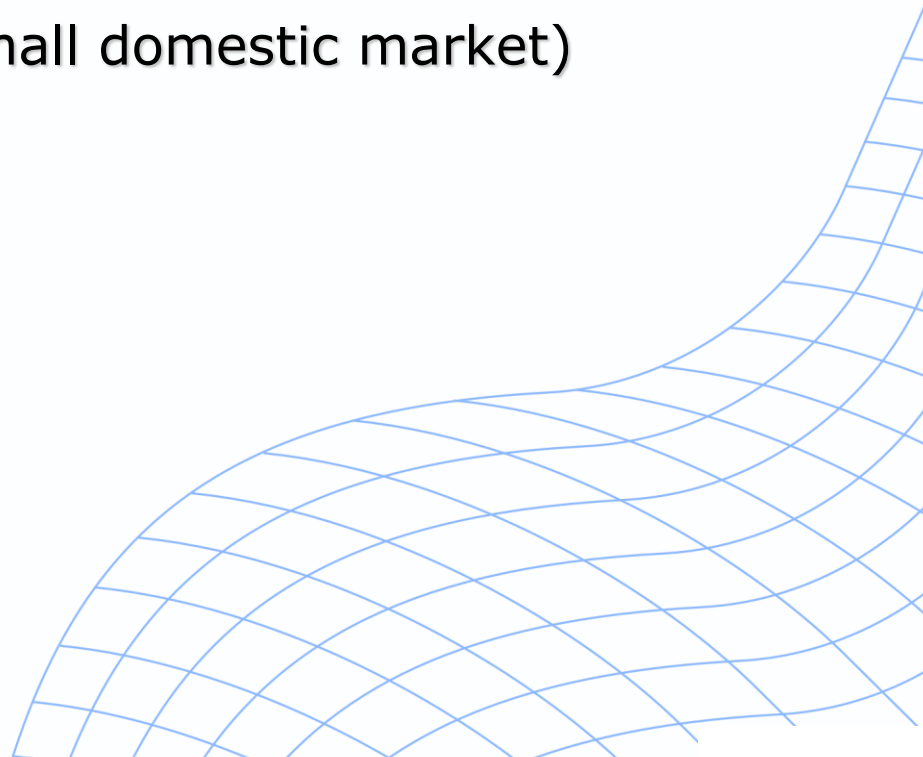
## Local Self – supply: the basis for energy balancing and EUE (2)

- The system can be structured further downwards
  - Sub-balance group
  - Local community micro-grid**
  - Prosumer ← is the lowest level subsystem in electricity supply**
- Due to the concept of trading, the systems tend to organize themselves to operate optimally.
- On prosumer and local level → local self-supply:
  - Efficient use of energy
  - Energy balancing
- Necessary ingredient: energy trading on the prosumer level



## Competencies and capacities of Slovenian players

- Push: good to excellent R&D groups in several tech domains
- Pull:
  - Predominantly SME's and „small large companies
  - Substantial segment: Innovation driven
  - Export oriented as a rule (small domestic market)



# The matrix structure of product fields in Alternative energy

- Vertical: companies competencies and business objectives
- Horizontal: key enabling technologies

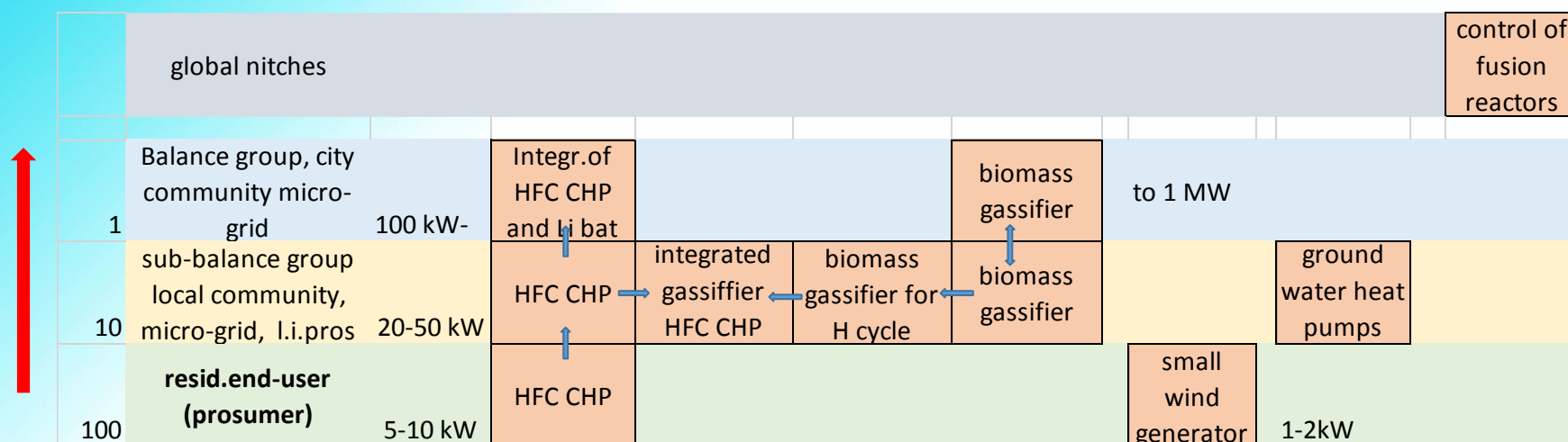
tehnološko področje "Alternativni kemijski viri energije"					
or:	Mihael Sekavčnik			presek z biomaso	presek z biomaso
	Gregor Dolanc	Jure Vindišar	Marko Agrež	???	???
	Dušan Klinar				

## ~~Value chain?~~



## Resulting strategy for Alternative energy sources

- Dispersed energy production
- Concentration on prosumer and local energy supply
- Excursions in to global niche markets
- (mostly) symbiotic business models – domestic and international



Value chain?

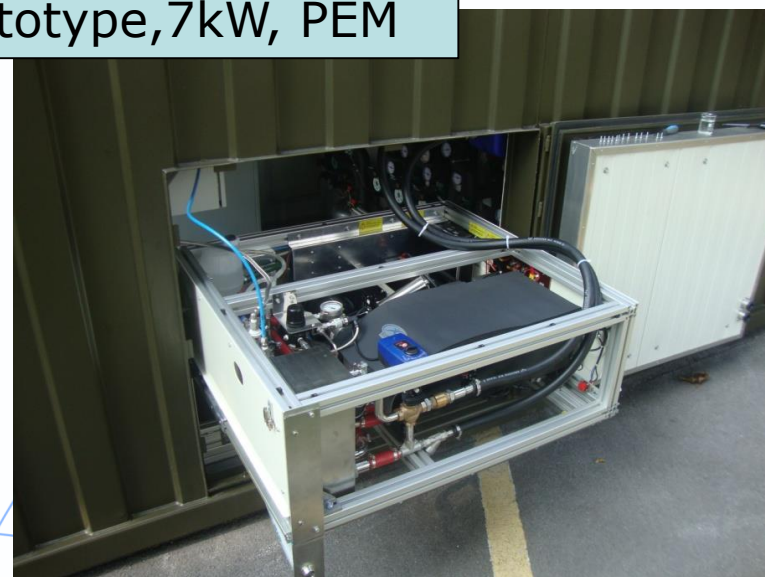
## Technology domains and product fields (1)

Development of stationary HFC  
CHP unit

- 8-10kW, PEM
- Target: prosumer
- Combined systems:
- local community, micro-grid  
„prosumer“



Mobile (container)  
cogeneration unit  
prototype, 7kW, PEM



## Technology domains and product fields(2)

### Biomass gassifier

- For H cycle CHP
- 50 kW
- Target: integrated unit, local communities



Controlbox and reactor

Heat exchangers





## Technology domains and product fields (3)

- wind generator for „In garden“ wind mills:
  - Up to 2kW
  - Low wind speeds ( $\geq 2$  m/s)
  - Integration into electricity network
- Target: residential prosumer

Symbolic views



## Technology domains and product fields (4)

High temperature heat pump for ground water heat

- Low temperature surface and ground water heat extraction
- High temperature heating (85 dgC)
- Target: communities around ground water reservoirs, surface water (rivers)

High Temp heat pump

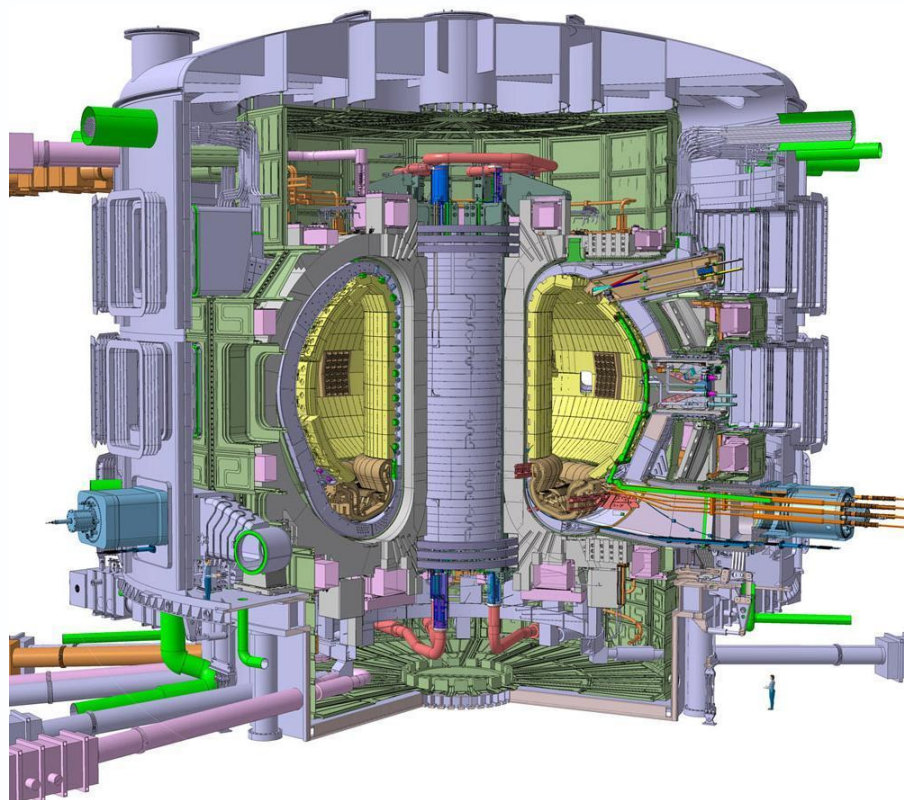




## Technology domains and product fields (5)

- Control system for fusion reactor (Tokamak)
  - Comprehensive system for plasma control

ITER - the world's largest Tokamak\_source  
[www.iter.org](http://www.iter.org)





# Development Centre for Hydrogen Technologies



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**Thank you for your attention!**

Zoran.marinsek@inea.si