VAASA REGION BOOSTING MICROGRID SOLUTIONS

SUVI KARIRINNE & KATJA SIRVIÖ

MICROGRID SYMPOSIUM, FORT COLLINS 11TH AUGUST 2019

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ECOSYSTEM & CO-CREATION

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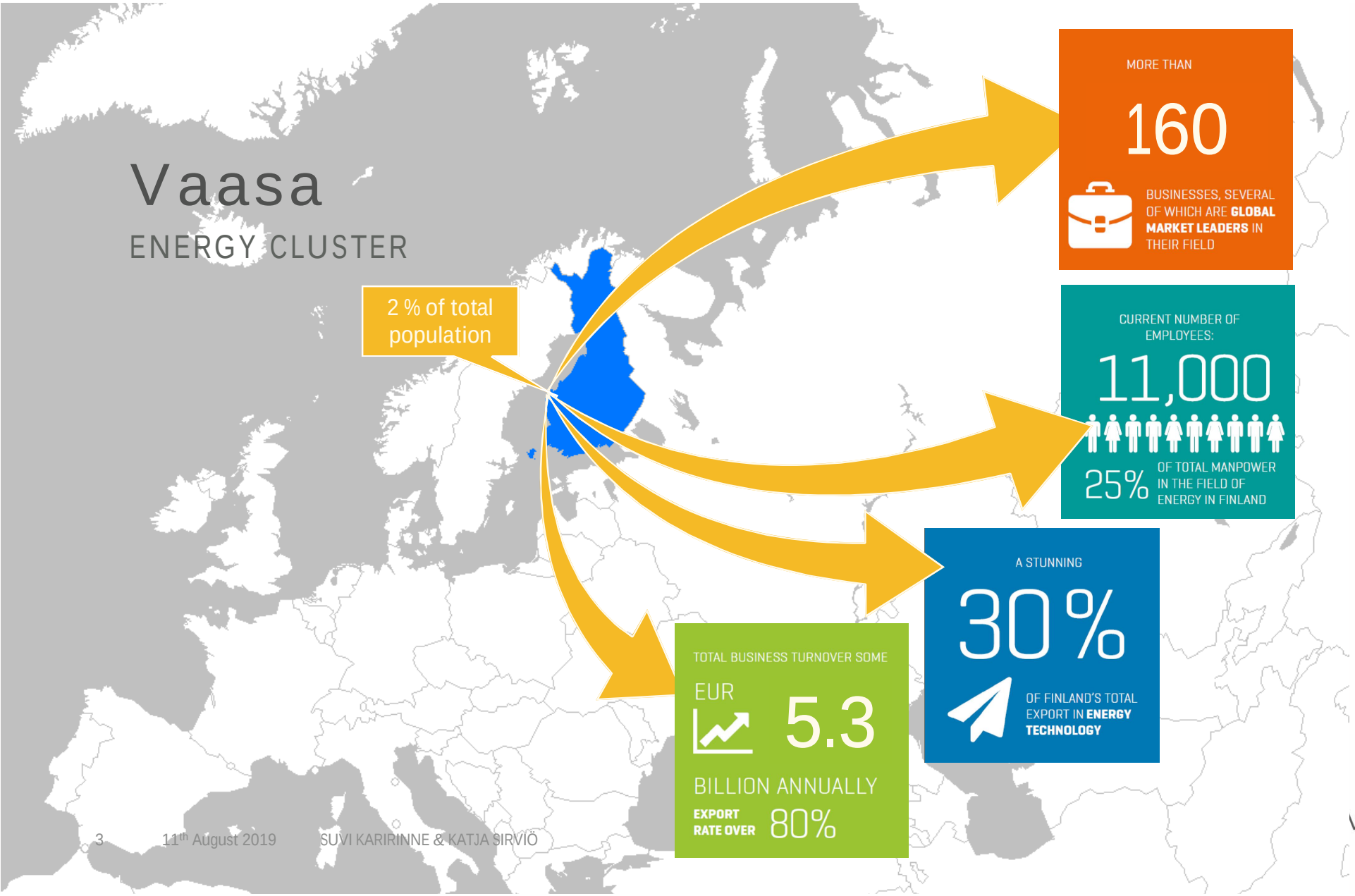
ENERGY CLUSTER



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COMPANIES IN ENERGY CLUSTER

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CO-CREATION VEBIC

Smart Technology Hub

New Ferry

Sundom Smart Grid

Ravilaakso

GigaVaasa

Vaasan Sähkö
Vaasan Sähköverkko

Kvarken Link

NEW FERRY – NORDIC GATEWAY

- Dual fuel and battery solution

Smart Technology Hub

- Wärtsilä's new centre of research, product development and production
- 200 M€ investment to be placed in Vaskiluoto harbour area running 2020
- Smart Partner Campus

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GigaVaasa

BATTERY FACTORY

VEBIC

VAASA ENERGY BUSINESS INNOVATION CENTER

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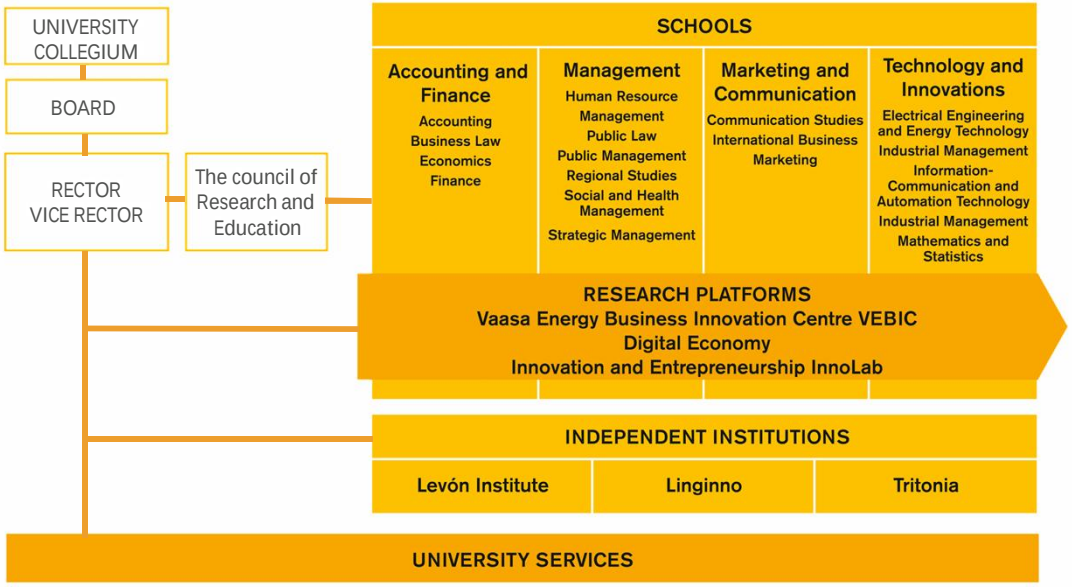
University of Vaasa



VEBIC: director Suvi Karirinne

Research Platform	Research Laboratories	Educational Laboratory
RDI programme 1: Future Energy Business Facilitator: Katja Sirviö RDI programme 2: Industrial & areal ecosystems Facilitator: Karita Luokkanen-Rabetino	ICE lab Fuel lab Smart Grid lab RE and Storage lab	Technobothnia

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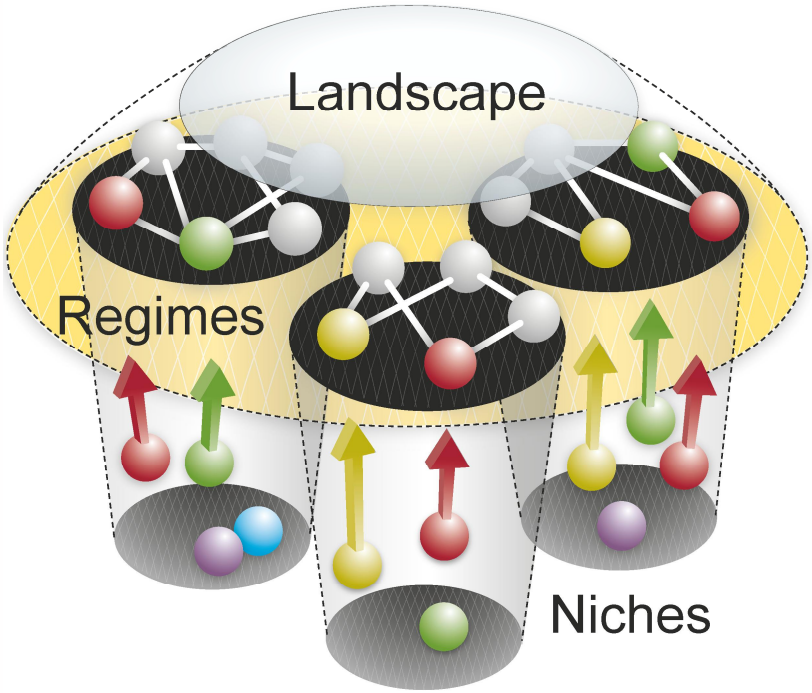
VEBIC – Transition Management (TM)

MULTI-LEVEL PERSPECTIVE (MLP) AND STRATEGIC NICHE MANAGEMENT (SNM)

- Landscape
  - Exogenous context (e.g. climate change) puts pressure on existing regime, opens windows of opportunity for novelties
- Regime
  - Socio-technical: markets, user preferences, industry, policy, technology, science, culture
- Niche
  - Strategic Niche Management: Learning from new novelties / niches



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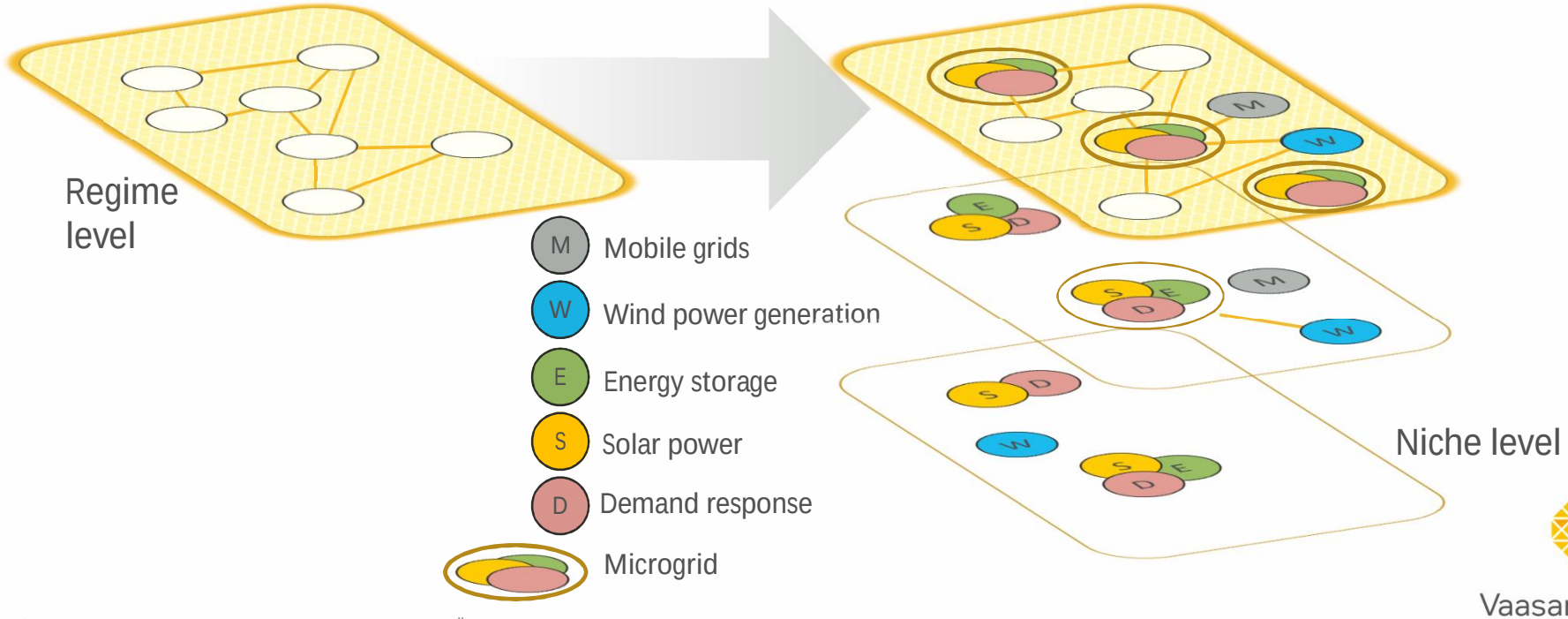
VEBIC – Strategic Niche Management

BOOSTING MICROGRID SOLUTIONS FOR SMART GRIDS



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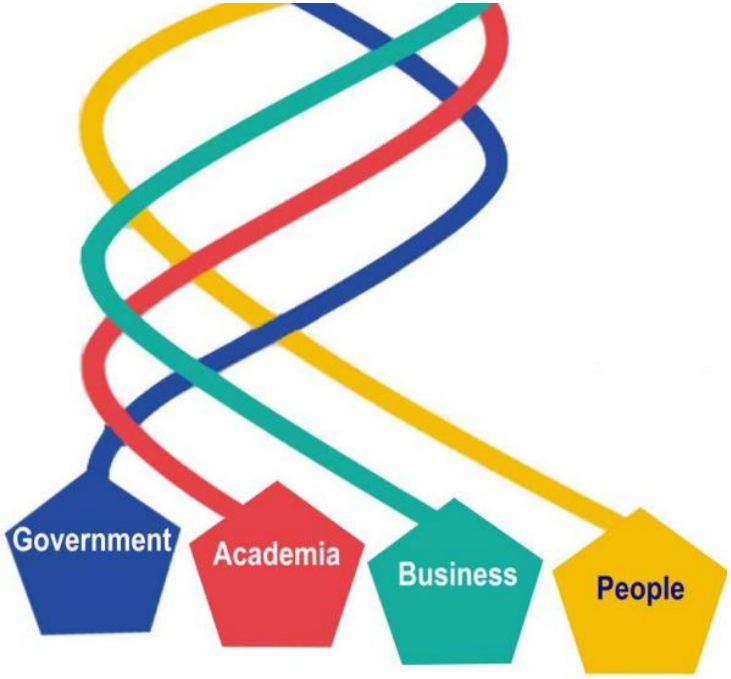
VEBIC – Co-operation with impact

QUADRUPLE HELIX



OPEN EVENTS

CAPSTONE COURSES

WORKSHOPS

MULTIDISCIPLINARY RDI PROJECTS

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Smart Grid laboratory

PAC laboratory

PROTECTION, AUTOMATION AND CONTROL

- IEC 61850 research and training environment
- Interoperability of devices from different vendors

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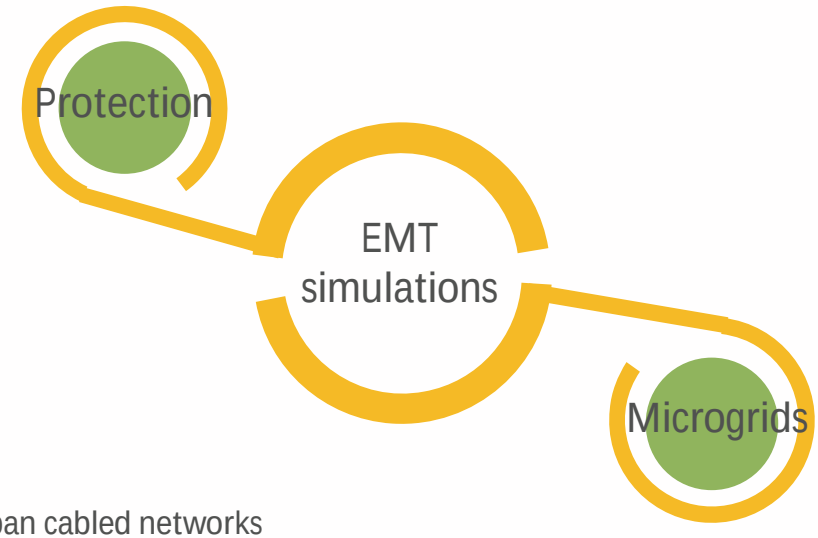
Smart Grid Laboratory 0.x

SIMULATION OF ELECTRIC POWER SYSTEMS

- Electromagnetic Transient Simulation (EMT)
  - Started as a competence building project with ABB in 1996
  - Simulation services provided to companies in cooperation with Vaasa University of Applied Sciences, VAMK
  - Simulation expertise has been used in several national research projects



Urban cabled networks
Large industrial network
Grid of Åland island (1500 m^2)
Grid connection of distributed generation / renewable integration
Energy storage system

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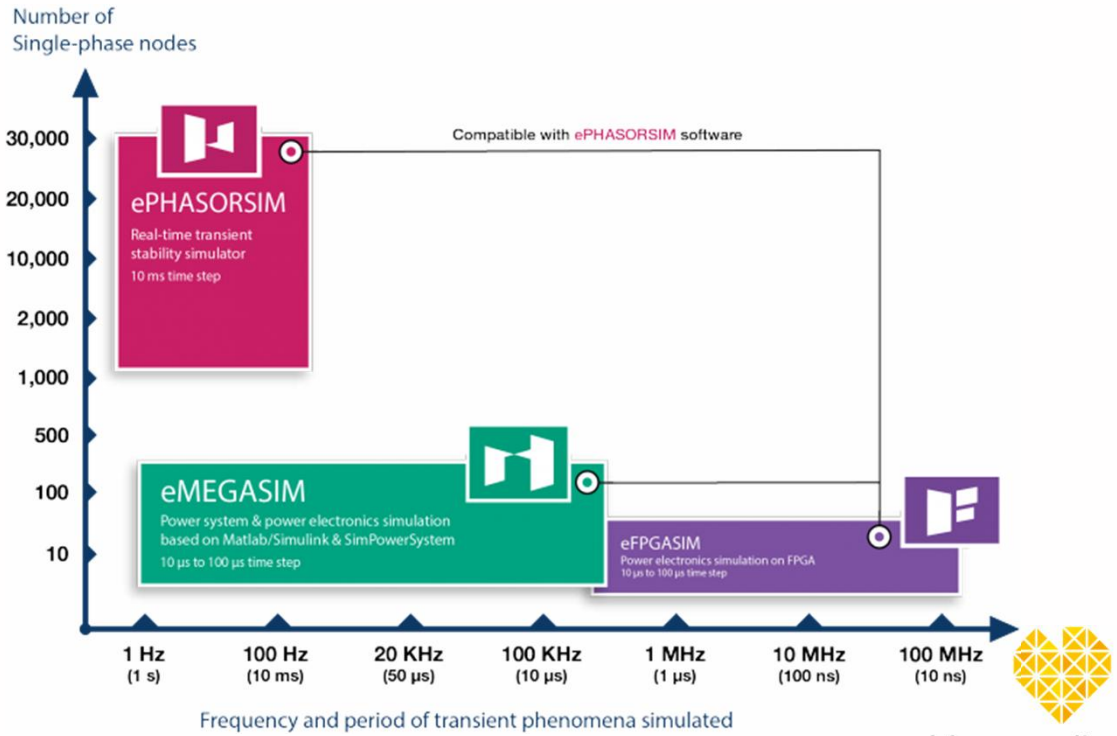
Smart Grid Laboratory 1.0

OPAL-RT'S REAL-TIME SIMULATION PLATFORM

1. Electromagnetic Transient Simulation eMEGASIM
2. Transient stability simulation ePHASORSIM (phasor domain)



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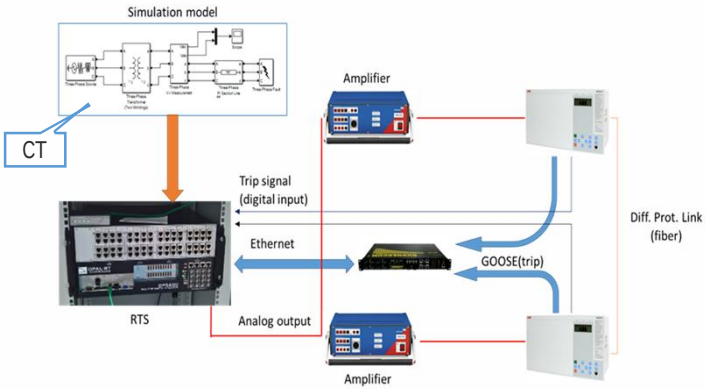
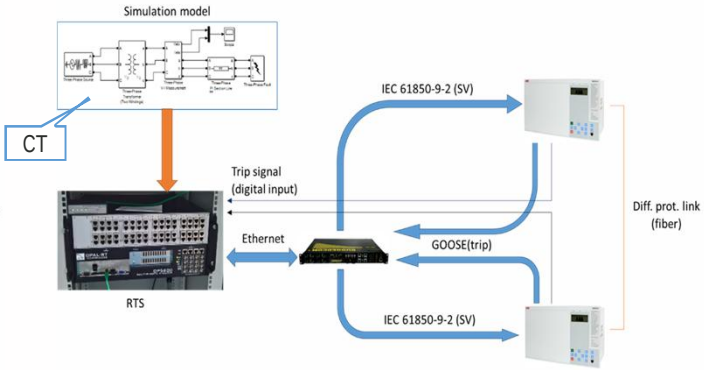
CONTROLLER HARDWARE IN THE LOOP

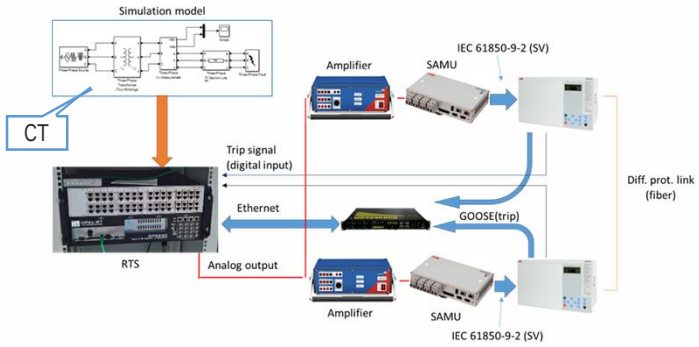
1. Line differential protection in the transmission line



Test case 1



Test case 2



Test case 3

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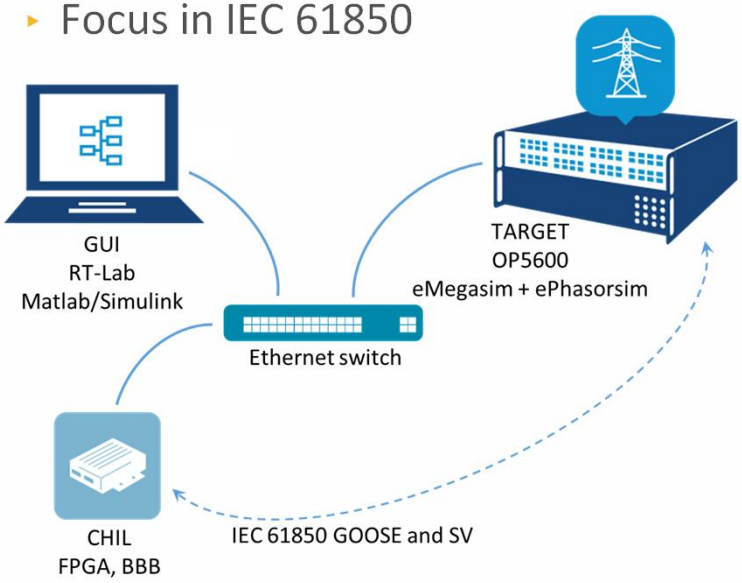
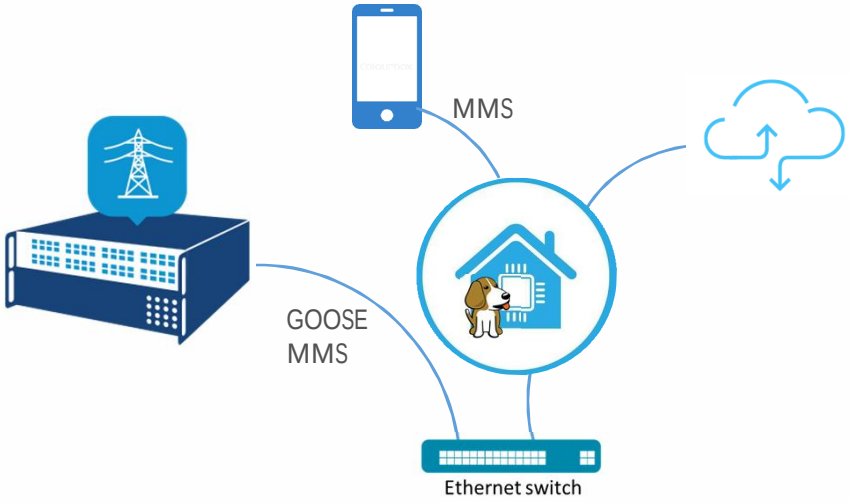
CONTROLLER HARDWARE IN THE LOOP

2. Development of light-weighted IEDs

- Focus in IEC 61850





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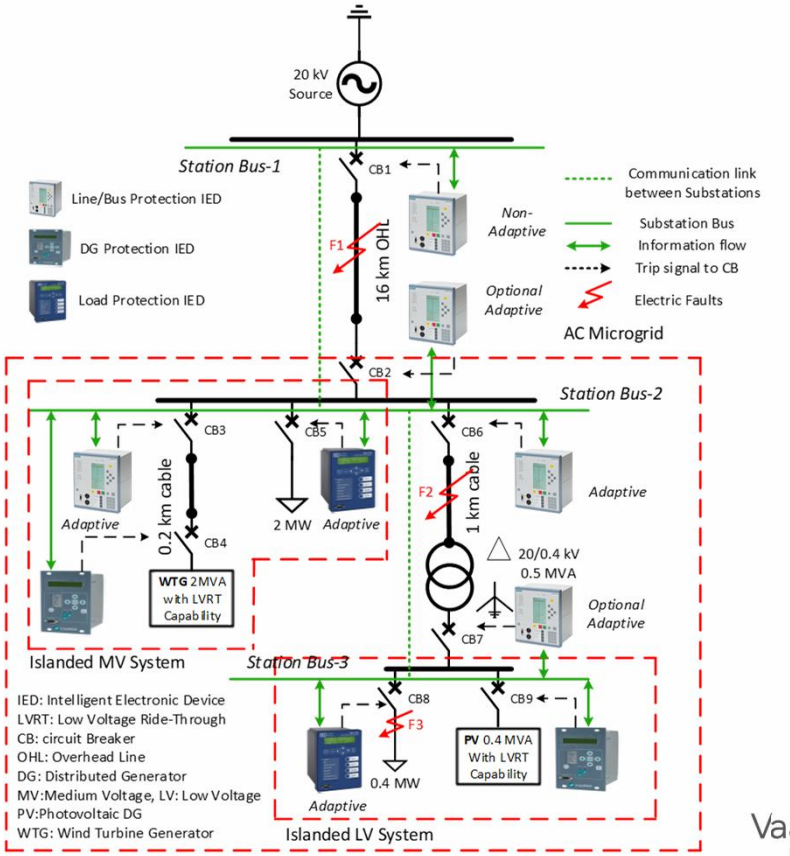
CONTROLLER HARDWARE IN THE LOOP

3. Microgrid modelling

- AC microgrid real-time-modelling and testing platform
- Average type of real-time AC Microgrid models with radial and ring networks are designed
- Models can be used for testing actual IEDs and protection relay models, like:
  - Communication-based adaptive protection
  - Differential protection
  - Distance protection



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Roadmap of the VEBIC laboratories

2018

SESP
VINPOWER

2019

5G campus
VINPOWER
SolarX
Fleximar
FUSE

2020

5G Campus
5G Sundom Smart Grid
5G Vaskiluoto harbour
SolarX
Fleximar

2021

5G Ravilaakso
HASG/Smart Port

2023

Energy storages

2025

Resilient
future
energy
systems

ICE &
Fuel labs

SG lab 1.0
CHIL

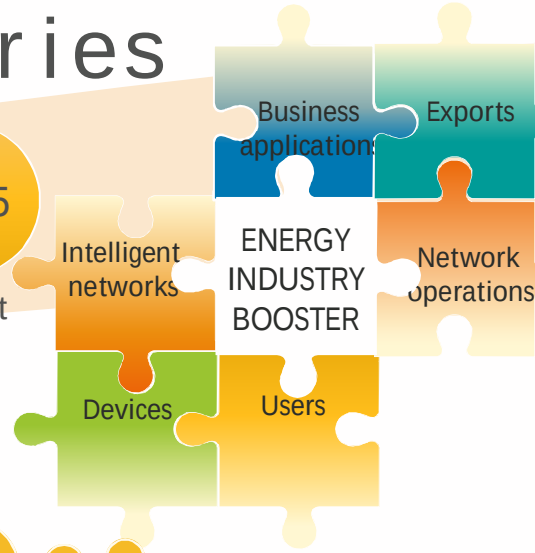
SG lab 1.1
PHIL
mG testbed 1

IoT lab

SG lab 2.0
PHIL
Digital Substation
mG testbeds 2 & 3
Smart home

RES lab

SG lab 3.0
Virtual
energy
systems



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THANK YOU!

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