



INTRODUCTION AND DEMONSTRATION OF THE SMART GRID LAB

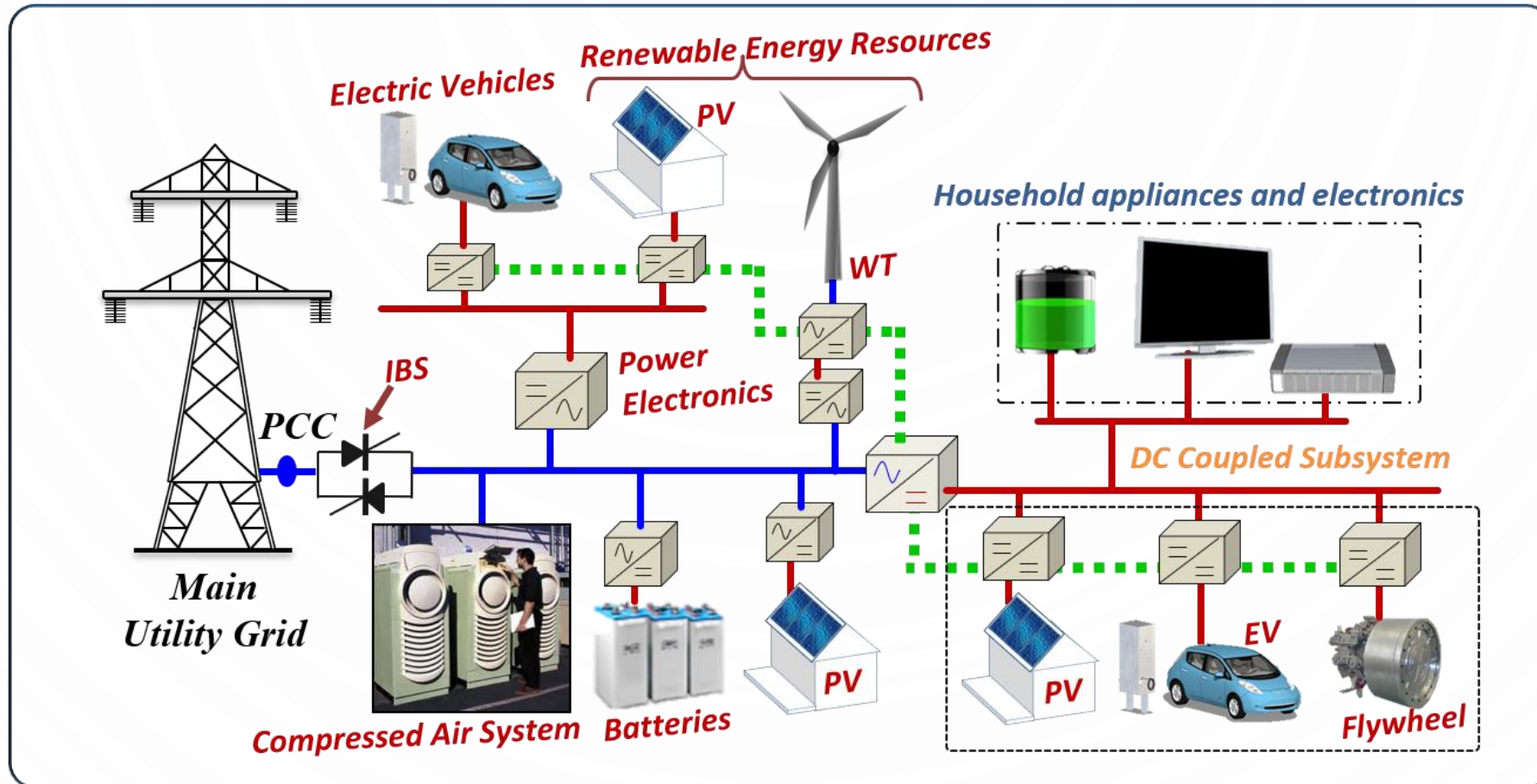
Workshop on Demand Response and Energy Storage Modelling,
Zagreb, June 19, 2018

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OUTLINE

- Microgrid Definition
- Smart Grid Lab components
- Smart Grid Lab research activities

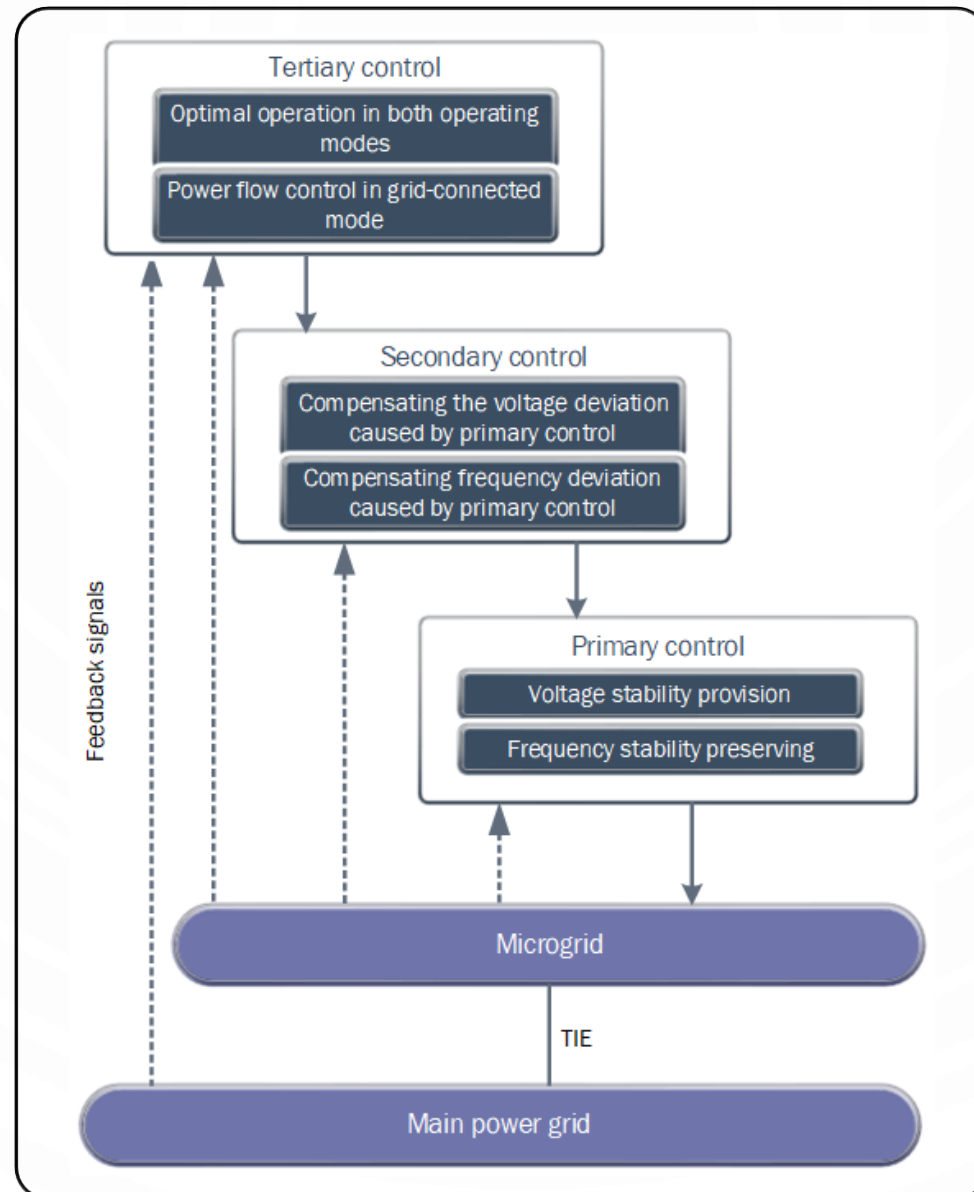
GENERAL ASPECTS OF MICROGRID - DEFINITION



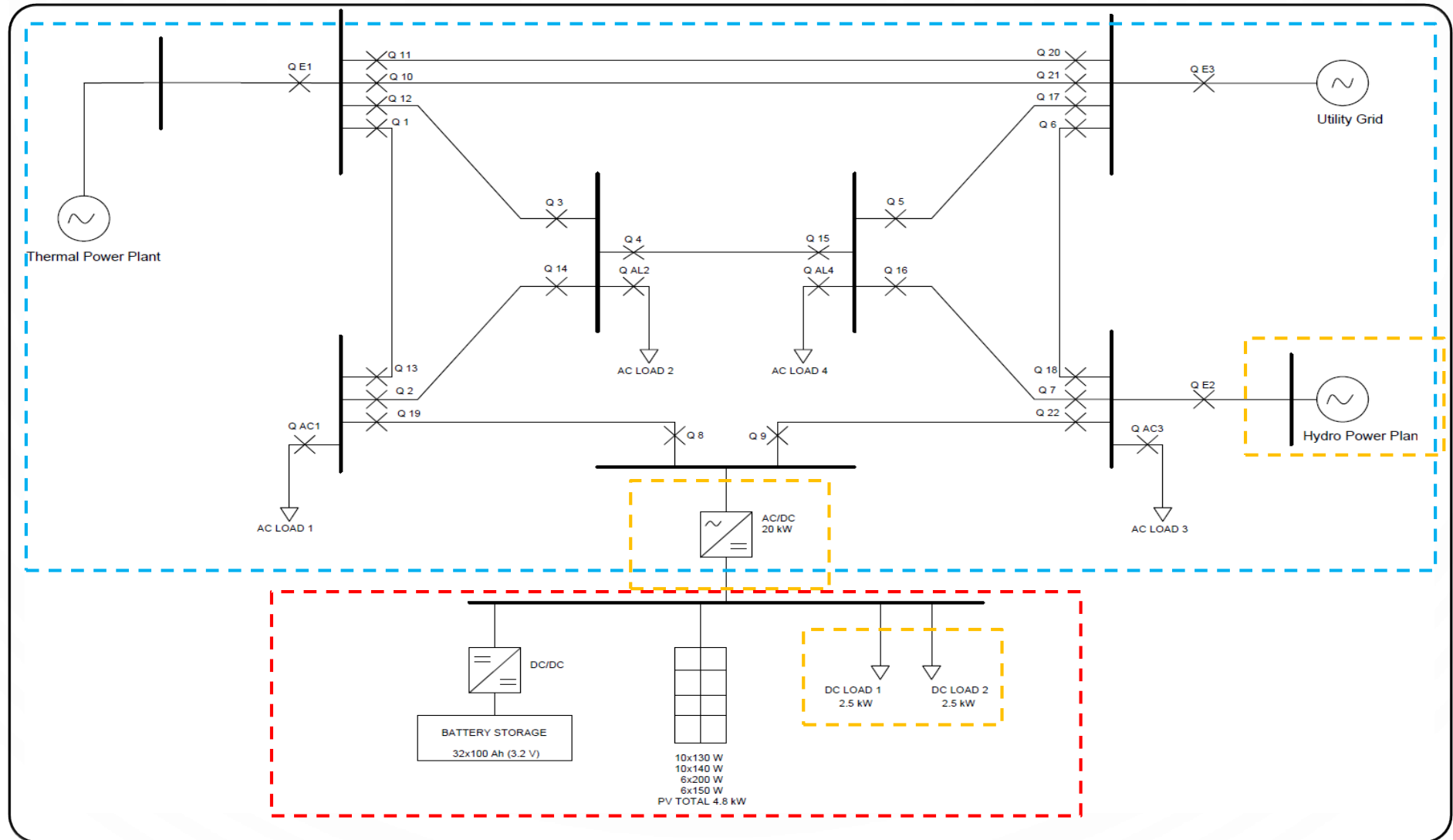
MAJOR COMPONENTS OF MICROGRIDS

- Energy Supply System
 - Distributed Generation
- Energy Storage
 - Batteries, flywheels, etc.
- Demand Response and Efficiency Measures
 - Minimize overall Energy use
- Energy Management Systems
 - Real-time response, Predictive and Forecasting analysis
- Utility Grid Interconnection (PCC)

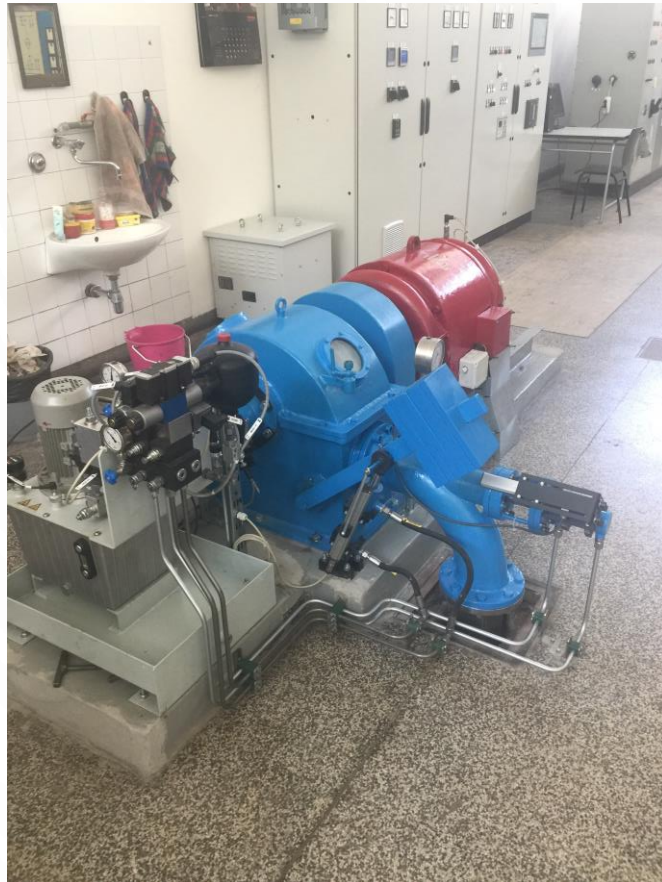
HIERARCHICAL CONTROL LEVELS OF A MICROGRID



SG LAB - MICROGRID TOPOLOGY



HYDRO POWER PLANT MODEL



THERMAL POWER PLANT MODEL

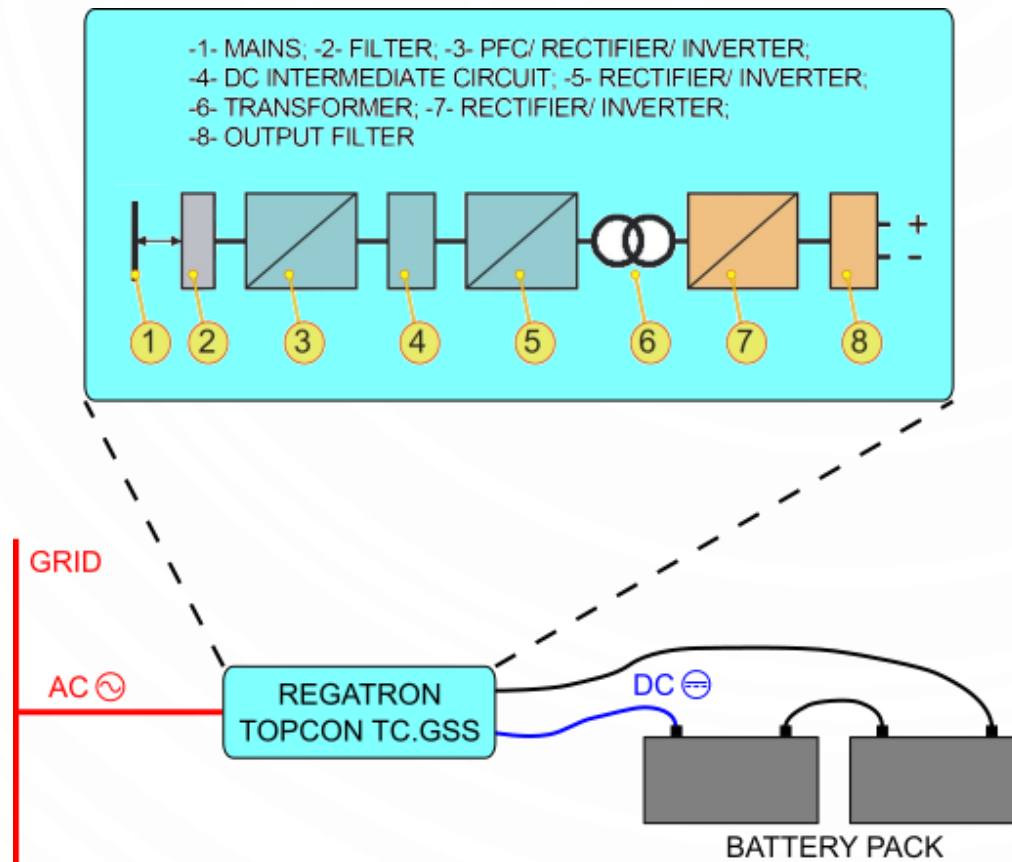


REGATRON CONVERTER

- Professional controllable bidirectional converter made by Swiss company Regatron
- Specifications:
 - Rated lineside AC voltage:
400 V, 50 Hz, three-phase
 - Power span on the DC side:
0-20 kW
 - Voltage span on the DC side:
0-400 V
 - Current span on the DC side:
0-63 A



REGATRON CONVERTER



Demonstration

BT-HSE-150-12

PHYSICAL SPECIFICATIONS		
Nominal Voltage		12V
Nominal Capacity (20HR)		150AH
Dimensions	Length	482±2mm
	Width	171±2mm
	Container height	240±2mm
	Total Height (with terminal)	240±2mm
Weight		Approx. 45.5 Kg(100.32lbs)
Internal Resistance(In full charge status)		≈3.46mΩ
Standard Terminals		F23(standard)

Constant – Voltage Charge	
Cycle application	1. Limit initial current less than 30A. 2. Charge until battery voltage (under charge) reaches 14.1V to 14.4V at 25°C(77F). 3. Hold at 14.1V to 14.4V until current drop to under 0.9A for at least 3 hours. 4. Temperature compensation coefficient of charging voltage is -30mV/°C.
Standby service	1. Hold battery across constant voltage source of 13.6to 13.8 volts with current limit 30A continuously .When held at this voltage , the battery will seek its own current level and maintain itself in a fully charge status. 2. Temperature compensation coefficient of charging voltage is -18mV/°C
NOTE: The battery should be charged within 6 months of storage ,Otherwise , permanent loss of capacity might occur as a result of sulfation	



DC ELECTRONIC LOAD

- Professional controllable DC electronic load made by German company Elektro-Automatik
- Specifications:
 - AC mains supply voltage:
90-264 V, 45-65 Hz, single-phase
 - Power span on the DC side:
0-2.4 kW
 - Voltage span on the DC side:
0-400 V
 - Current span on the DC side:
0-50 A



SG LAB RESEARCH PROGRAM

SG Lab Research
Program **Areas**

{ **AC** MicroGrids
DC MicroGrids }

- ✓ Modelling
- ✓ Control & Operation
- ✓ Energy Storage
- ✓ Protection
- ✓ Power Quality
- ✓ Standard-based ICT
- ✓ EMS & Optimization
- ✓ Power System Stability

ACKNOWLEDGMENT

- This workshop has been supported in part by the Croatian Environmental Protection and Energy Efficiency Fund under project Microgrid Positioning – uGRIP, as well as by Croatian Science Foundation under project FENISG.

