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UNIVERSITY POLITEHNICA OF BUCHAREST SMART GRID MICROGRID PILOT PROJECT

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3rd UNI-SET Energy Clustering Event

Universities in the Energy Transition: Focus on Smart Energy Systems and Communities

21-23 November 2016, University Politehnica of Bucharest (UPB)

- In the last years initiatives on smart energy systems have been growing in number and scope all over the world. A variety of projects has been deployed with different aims and results and substantial public and private investments have been committed to research & development, demonstration and deployment activities.

- The University POLITEHNICA of Bucharest provides a perfect opportunity to improve the operational efficiency of its internal energy infrastructure by deploying Smart Energy System and intelligent building technologies throughout its campus.

- The project is planned to be performed in two stages:
  - a feasibility study
  - full implementation at UPB

Feasibility Study scope is to:

identify and evaluate

the appropriate smart grid and intelligent building technologies for UPB (including extension of the production system, energy storage technologies, building energy efficiency measures, energy distribution system monitoring and control systems, lighting technologies and electric vehicles applications);

remodel

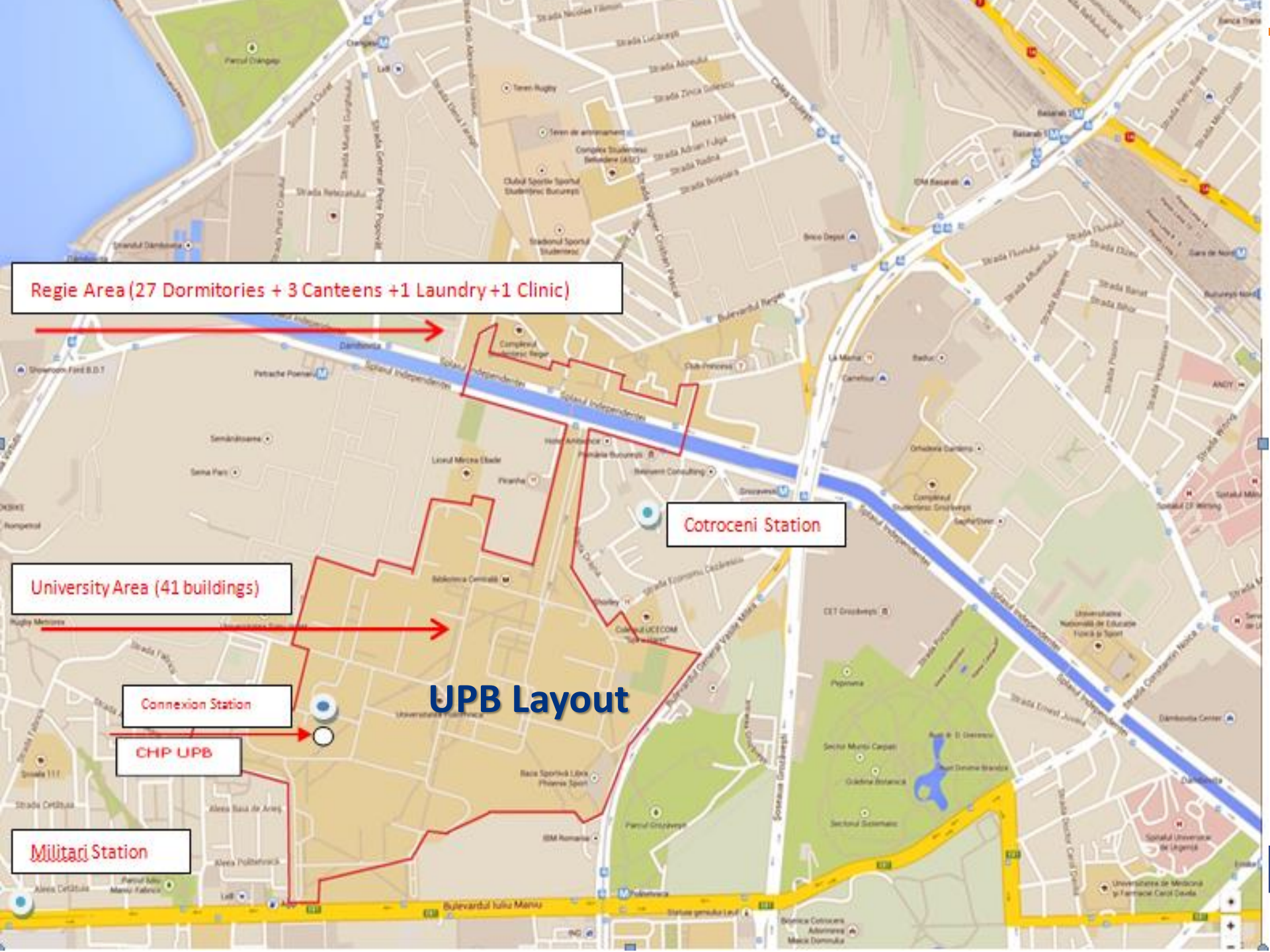
energy and communications infrastructure throughout UPB to accommodate smart grid and intelligent building technologies;

define

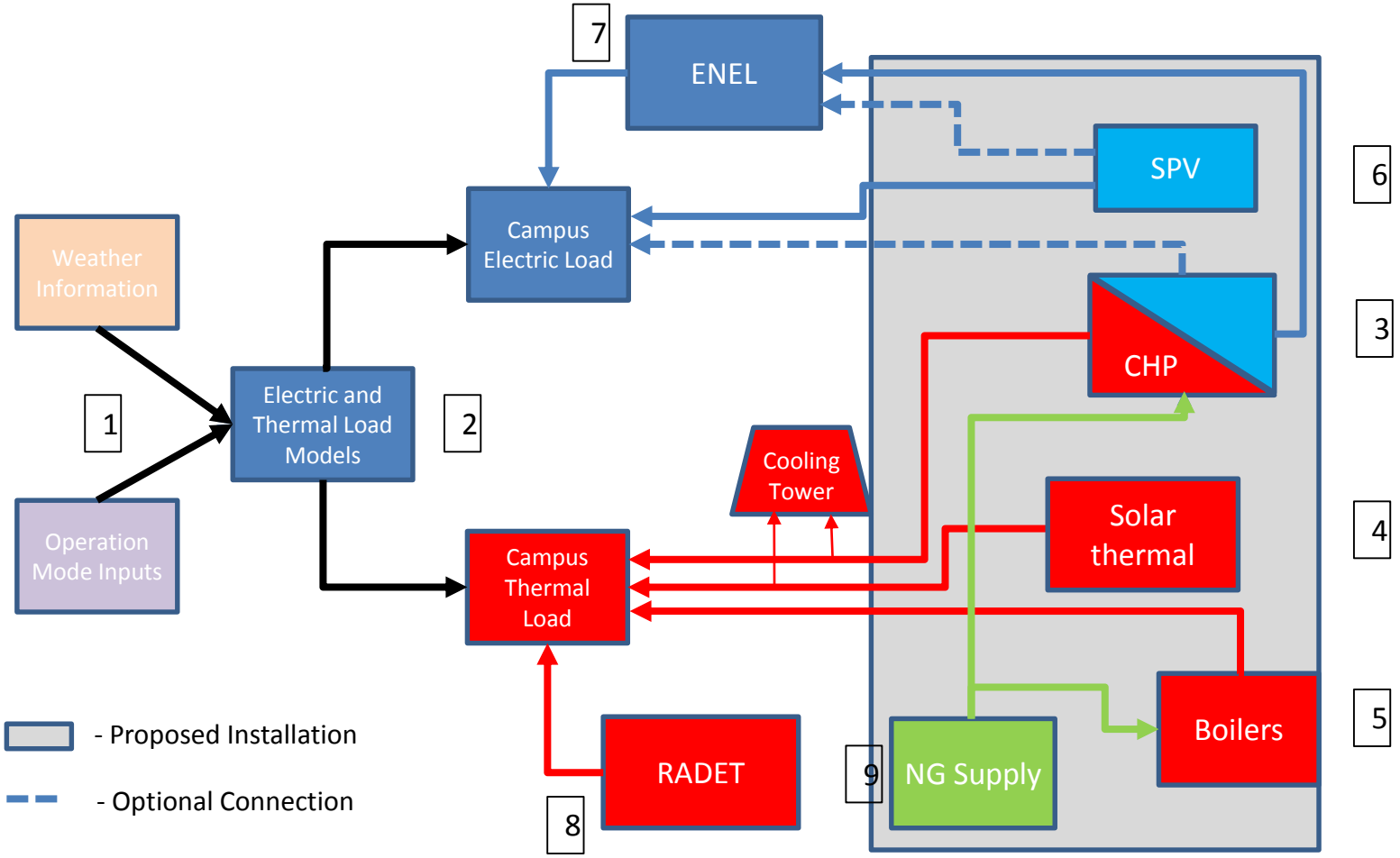
the optimum configuration and operation of these assets to minimize energy costs to UPB;

develop

the scope for an implementation phase of the project.


Regie Area (27 Dormitories + 3 Canteens +1 Laundry +1 Clinic)
Cotroceni Station
University Area (41 buildings)
UPB Layout
Connexion Station
CHP UPB
Militari Station
Bulevardul Iuliu Maniu

UPB ENERGY ANALYSIS MODEL - Sequence of Calculations for UPB Campus



The assessment of distributed generation opportunities involves determining the following:

- **Preliminary siting and sizing for additional distributed generation (DG) assets to meet UPB current and future base load and peak load (both electricity and heat), including renewable options;**

- **Assessment of siting issues for solar, assessment of the roof systems;**
- **Extension of the energy production system, distribution and storage of electricity and heat to ensure reliable, energy efficient , environmentally clean and cost-effective operation of the UPB energy system;**

- **Assessment of any energy storage technologies that could reduce UPB energy demand charges and/or increase reliability and resilience based on UPB interest and need, as well as the ability to provide demand management;**

- **Estimation of investment costs, operation and maintenance costs for the distributed generation opportunities.**

Electric and Thermal Load Reduction Opportunities

Lighting Technology	Potential Load Reduction of Lighting Load
Replacement of T8 Lamps to T5	15-16%
Replacement of T8 Lamps to LED	25-30%
Implementation of Daylight Harvesting Technology with T8 Lamps	25-28%
Implementation of Daylight Harvesting Technology with T5 Lamps	35- 39%
Implementation of Daylight Harvesting Technology with LED Lamps	45-50%
Thermal Energy Saving Technology	**Potential Load Reduction of Thermal Load**
Thermal Energy Controllers at Substations and in Buildings	15%

Overview of Smart Energy system Components

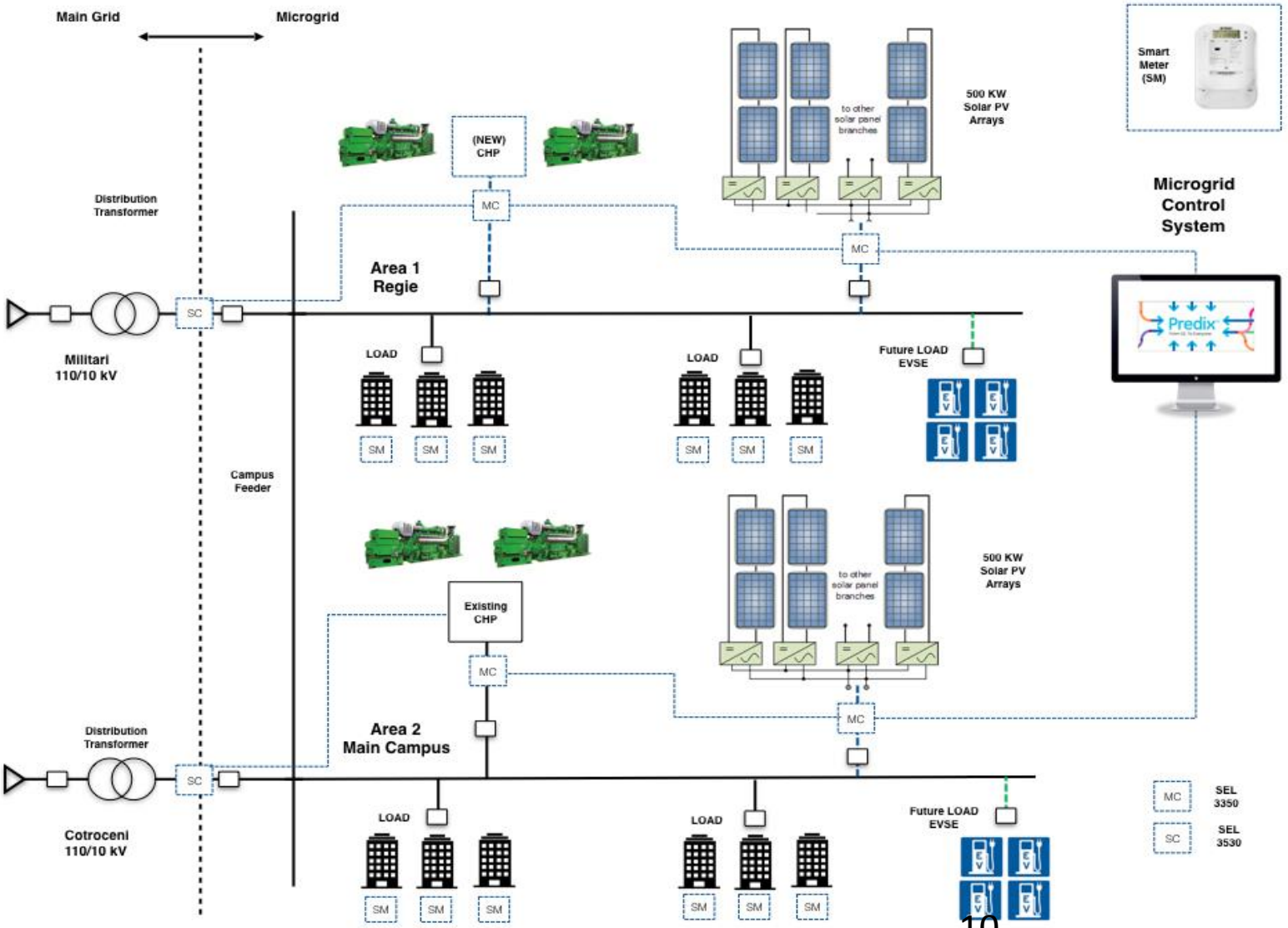
- Existing CHP plant
- Proposed additional CHP plant
- Solar PV plants
- EV Charging Stations
- Microgrid Communications System and Controller
- Optional Energy Storage System (ESS) to be integrated in the future.

- **The proposed Microgrid System is a grid-connected system consisting of the existing CHP plant, a proposed additional CHP plant, Solar PV plants, EV Charging Stations, a Microgrid Communications System and Controller, and an optional Energy Storage System (ESS) to be integrated in the future.**

It will be assessed the following requirements for a multilayered security system for the Project including the following high-level system functions for the Project (Micro Grid Control System and Network):

- **Automated grid management and control (AGMC) operation:** interactions between the energy management system (EMS), aggregators, inverters, relays, and every other power actor in the micro grid control system and network (e.g., remote terminal units (RTUs) and intelligent electronic devices (lEDs);
- **AGMC maintenance**: interactions between the engineering consoles and power actors in the micro grid control system and network;
- **Cyber security situational awareness (CSSA):** interactions between engines, AGMC actors and every cyber actor in the micro grid control system (e.g. firewalls, routers and switches);
- **Cyber security configuration management (CSCM):** interactions between management systems and the cyber actors in the micro grid system and network.

Microgrid Architecture



It will be:

- **Developed a smart grid architecture and functional design for the Project's Smart Grid;**
- **Provided the optimal distribution network infrastructure management;**
- **Provided capabilities to optimize and use to the fullest extent all kinds of scattered generation sources, including the production of energy from renewable sources;**
- **Provided the ability to control and regulate voltage levels and reactive power, as well as mechanism to actively optimize demand shape.**

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