UNIVERSITY POLITEHNICA OF BUCHAREST SMART GRID MICROGRID PILOT PROJECT FEASIBILITY STUDY

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- In the last years initiatives on Smart Grids 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 Grid and intelligent building technologies throughout its campus.
- The project is planned to be performed in two stages:
  - a feasibility study
  - full implementation at UPB
- The feasibility study performance is supported from USDTA grant. The Contractor is **E3 International**, having **ISPE** – Institute for Studies and Power Engineering as local partner.

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;

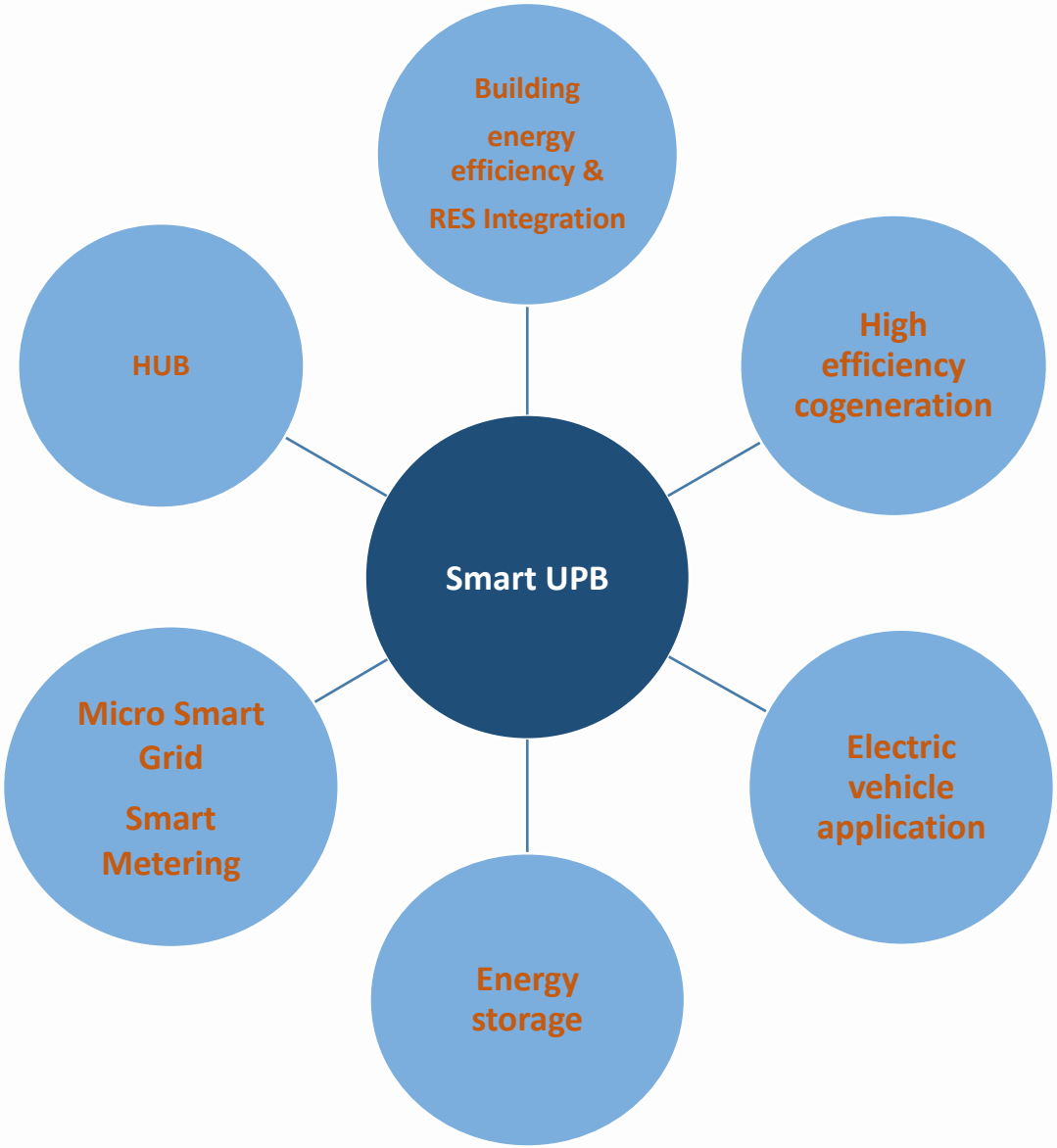
define

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

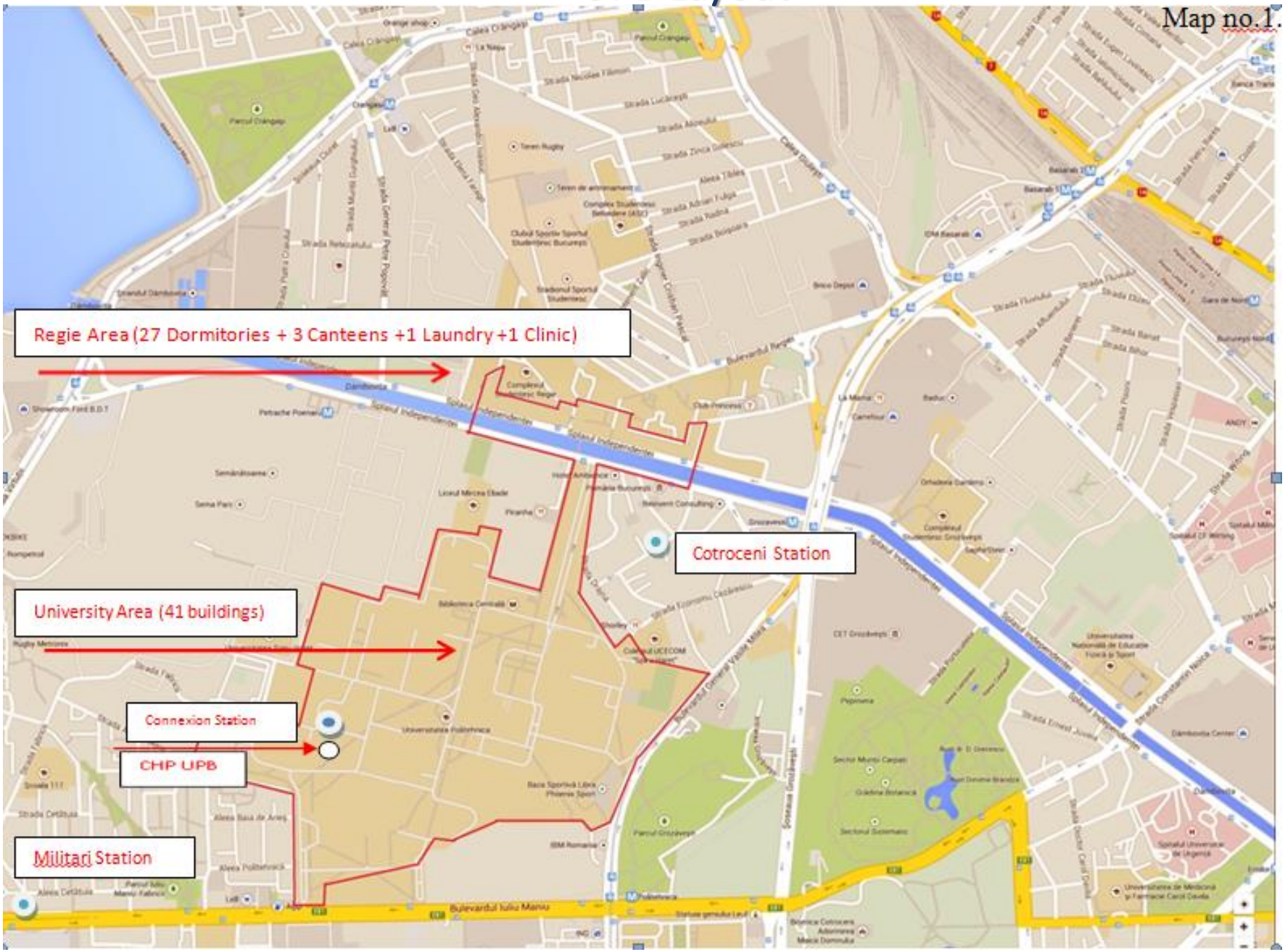
develop

the scope for an implementation phase of the project.

UPB Smart Grid PROJECT



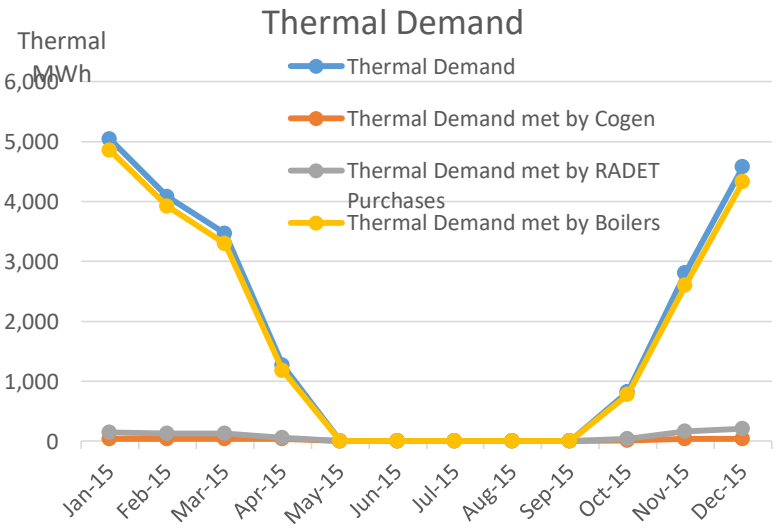
UPB Layout

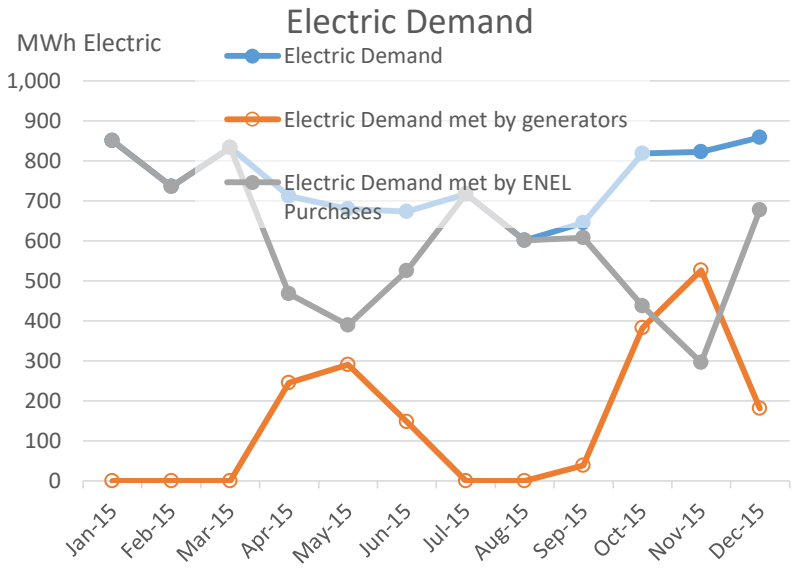

Map no.1.
Regie Area (27 Dormitories + 3 Canteens +1 Laundry +1 Clinic)
Cotroceni Station
University Area (41 buildings)
Connexion Station
CHP UPB
Militari Station

TECHNICAL ANALYSIS

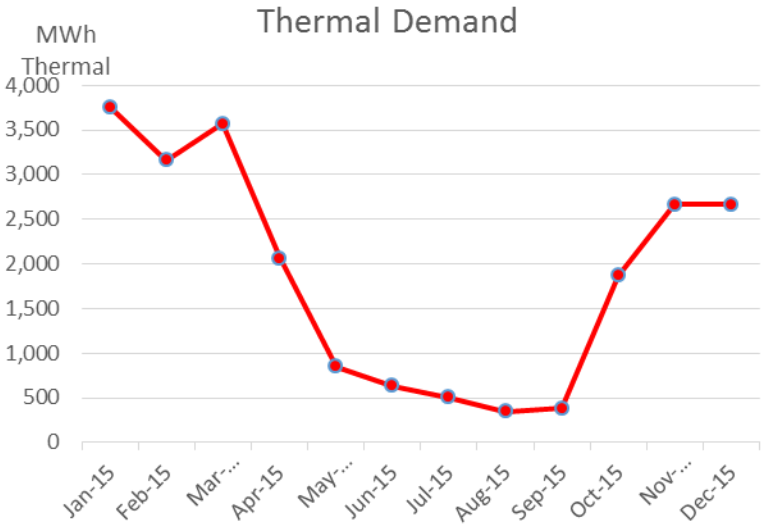
1. Baseline assessment – electric demand, heat load
2. Assessment of distributed generation opportunities
3. Assessment of load reduction opportunities
4. Determination of UPB Smart Grid system functionality
5. Determination of Security requirements
6. Determination of Smart Grid architecture

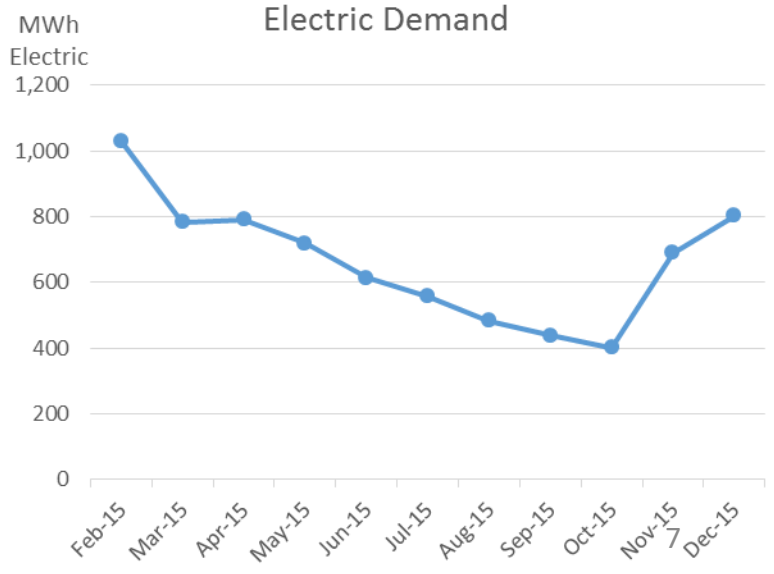
Main Campus Energy Profile



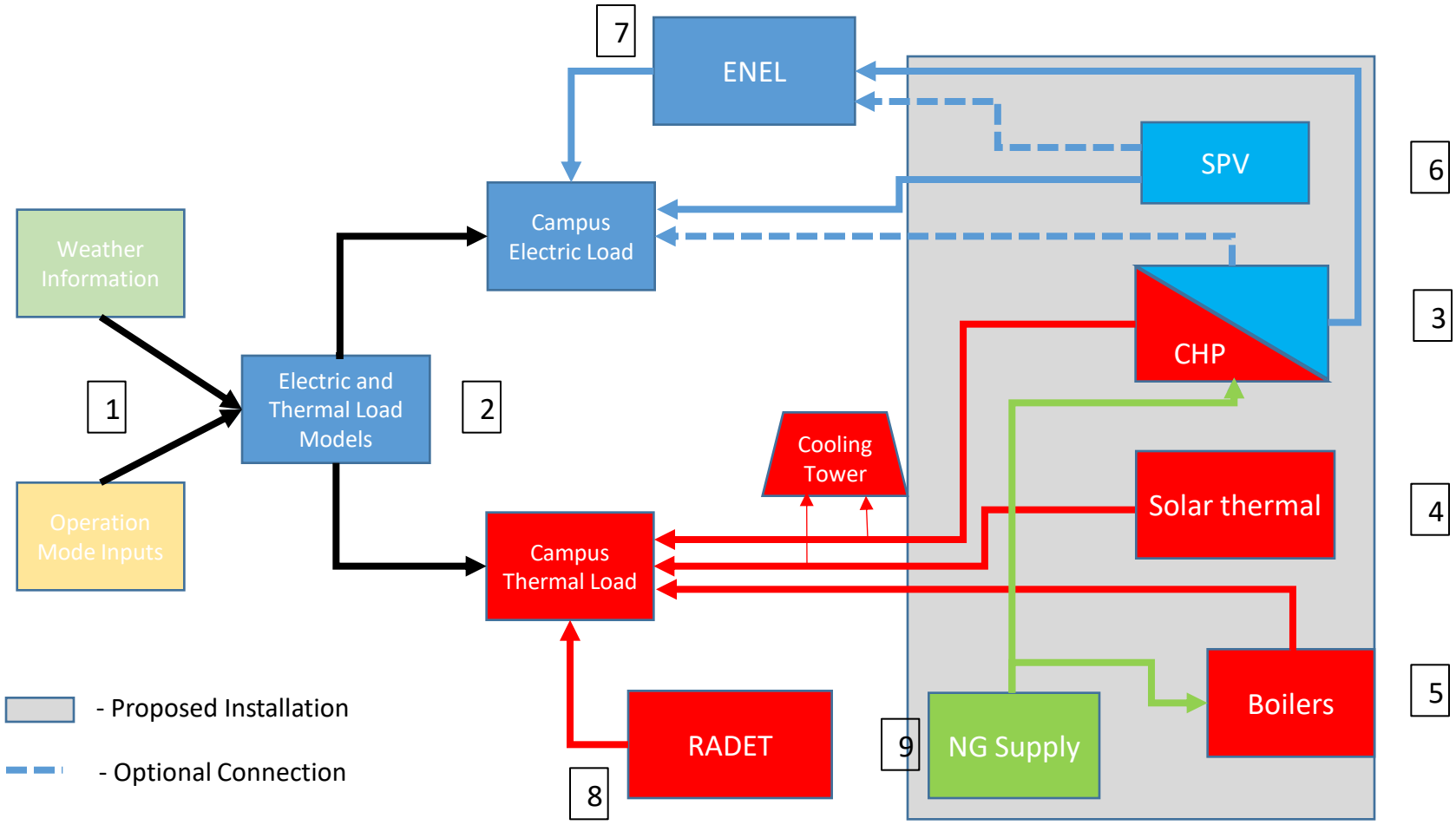


Regie Area Energy Profile





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 system;**
- **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;**
- **Estimmation of any Renewable Energy Credits or Carbon Offsets from renewable DG;**
- **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 Gird Components

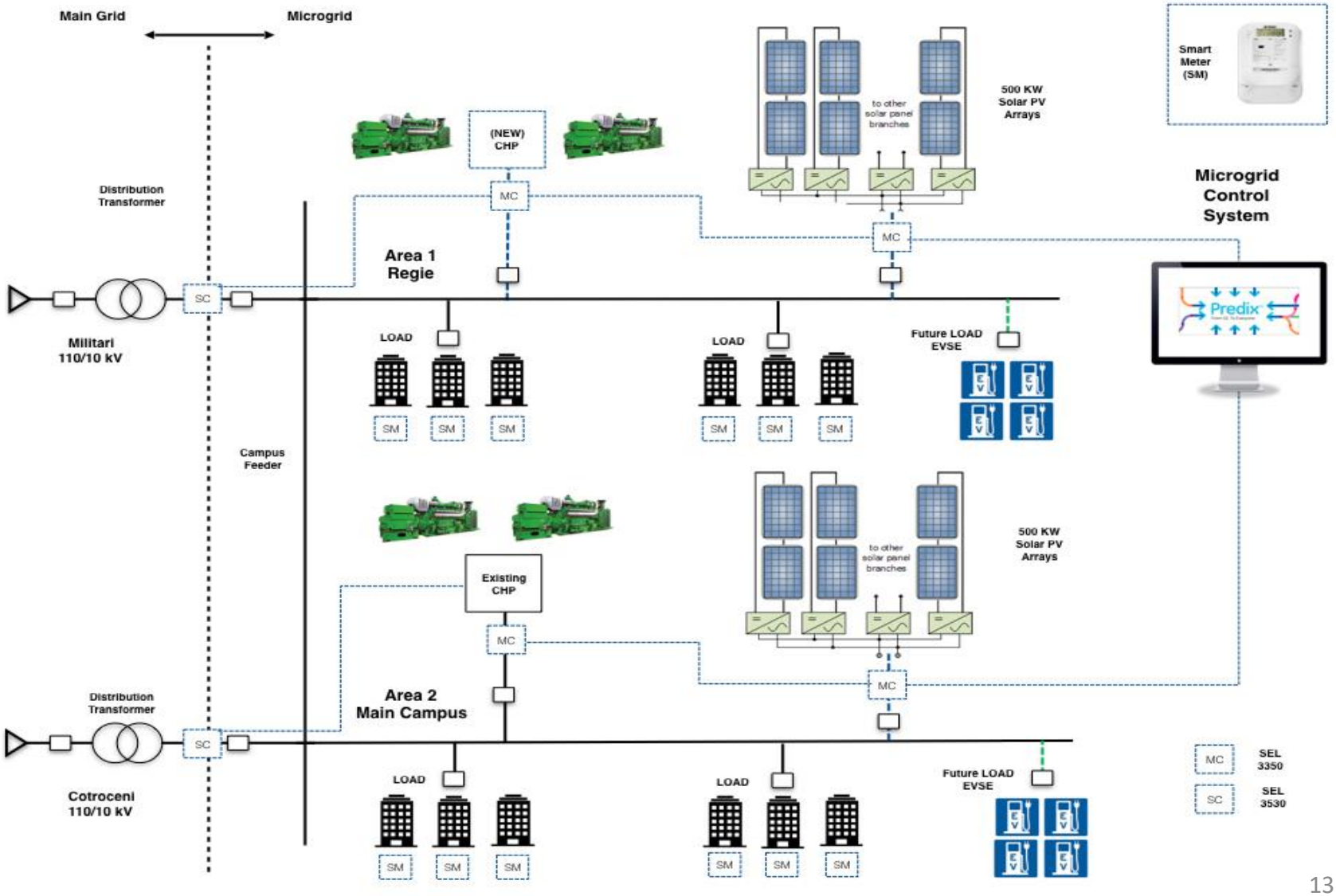
- Existing CHP plant
- Proposed additional CHP plant
- Solar PV plants
- EV Charging Stations
- Microgrid Communications System and Controller
- Optional Energy Storage System (ESS) to be integrated in the future.
- Not proposing an islanded Microgrid at this time as the need for critical backup power and or grid support to the main grid are not well established or backed up by economic incentives.

- 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 hi gh-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 (IEDs);
- **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 the correlation engine, AGMC actors and every cyber actor in the micro grid control system and (e.g. firewalls, routers and switches);
- **Cyber security configuration management (CSCM):** interactions between management systemsand 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 bassed on results of the previous tasks;
- Provided the optimal distribution network infrastructure management;
- Provided capabilities advanced technical calculation, based on static and dynamic data;
- 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.