TABLE I: Parameter values

Parameter	Value
V_{min}, V_{max}	0.95, 1.05
$p_{D_{R_j}}$	$0.33p_{L_{R_j}}$
$S_{D_{R_j}}$	$1.2p_{D_{R_j}}$
$P_{B_{R_j}}$	$0.33p_{L_{R_j}}$
$S_{B_{R_j}}$	$1.2P_{B_{R_j}}$
B_{R_j}	$T_{fullCharge} \times P_{B_{R_j}}$
$T_{fullCharge}$	4 h
Δt	1 h
η_c, η_d	0.95, 0.95
soc_{min}, soc_{max}	0.30, 0.95
α	0.001

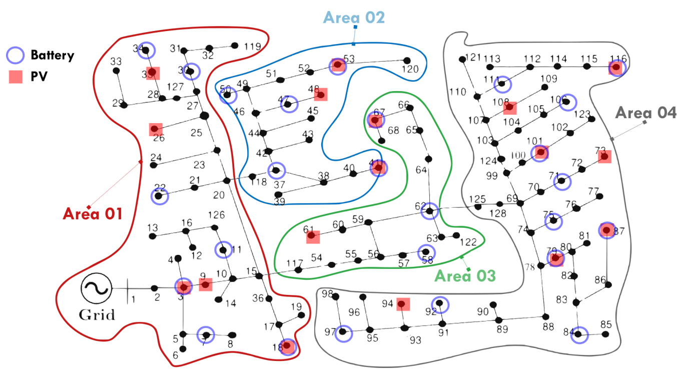

Fig. 1: IEEE 123 node system divided into four areas

I. Case Study Demonstration

A. Simulation Data: IEEE 123 Bus Test System

The case studies are conducted on the balanced three-phase version of the IEEE 123 bus test system, which has 85 Load Nodes. Additionally, 20% (17) and 30% (26) of these load nodes also contain reactive power controllable PVs and BESS, respectively. Their ratings are as per Table I. To demonstrate the effectiveness of the proposed algorithm, the test system is divided into four areas as shown in Figure 1. It is assumed that a horizon-wide forecast for loads p_L^t, solar power output p_D^t and cost of substation power C^t is available to the distribution system operator. Initially, the study is carried out for 5 hours with input data shown in Figure 2. The five-hour workflow is described below.

B. Simulation Workflow

All simulations were set up in MATLAB 2023a including both the high level algorithms as well as calls to the optimization solver. MATLAB's `fmincon` function was used to parse the nonlinear nonconvex optimization problem described by **??**–**??** in tandem with the SQP optimization algorithm to solve it. From the completed simulations, the resultant optimal control variables were obtained, and were passed through an OpenDSS engine (already configured with system data and forecast values) in order to check for the ACOPF feasibility of the results. The associated code may be found in [**?**]. As the IEEE 123 bus system is decomposed into 4 areas, so the total number of variables exchanged at each iteration for the 5-hour simulation of the MPDOPF is $2 * 3 * 5 = 30$.

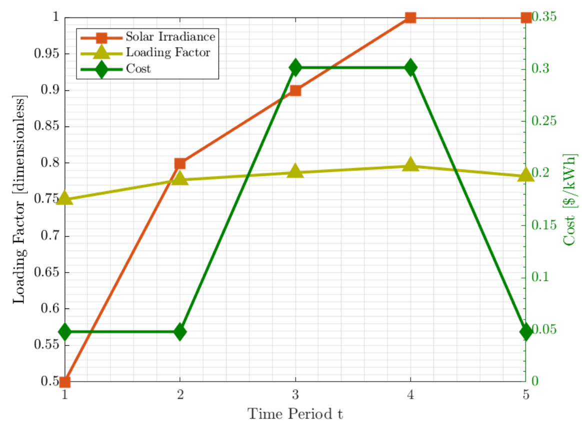

Fig. 2: Forecasts for demand power, irradiance and cost of substation power over a 5 hour horizon