Table 1. Smart grid maturity levels [17]

Levels	**Description**
5: Pioneering	Breaking new ground; industry-leading innovation
4: Optimizing	Optimizing smart grid to benefit entire organization; may reach beyond organization; increased automation
3: Integrating	Integrating smart grid deployments across the organization, realizing measurably improved performance
2: Enabling	Investing based on clear strategy, implementing first projects to enable smart grid (may be compartmentalized)
1: Initiating	Taking the first steps, exploring options, conducting experiments, developing smart grid vision
0: Default	Default level (status quo)

Table 2. Smart grind maturity models domains [17]

Domains	**Description**
Domain 1: Strategy, Management & Regulatory	Vision, planning, governance, stakeholder collaboration
Domain 2: Organization and Structure	Culture, structure, training, communications, knowledge management
Domain 3: Grid Operations	Reliability, efficiency, security, safety, observability, control
Domain 4: Work& Asset Management	Asset monitoring, tracking & maintenance, mobile workforce
Domain 5: Technology	IT architecture, standards, infrastructure, integration, tools
Domain 6: Customer	Pricing, customer participation & experience, advanced services
Domain 7: Value Chain Integration	Demand & supply management, leveraging market opportunities
Domain 8: Societal & Environmental	Responsibility, sustainability, critical infrastructure, efficiency

Table 3. Emission factors of gas-fired and combined-cycle plants [2]

Type	CO_2 (kg/MWh)	SO_2 (kg/MWh)	NO_x (kg/MWh)	Particulates (kg/MWh)
Gas-fired	550	0.0998	1.343	0.0635
Combined Cycle	367	0.0665	0.895	0.0423

Table 4. Externality costs of different pollutants [2]

Pollutants	Externality Costs in $/kg (Using lower Values)
CO_2	0.025
SO_2	7
NO_x	5.5
Particulates	33

Table 5. Summary of capacity additions, total generation expansion costs, average LOLPs and environmental costs of the three cases of Scenario 2.

Cases	**Capacity Addition (MW)**	**Generation Plan Cost (M$)**	**Average LOLPs**	**Environmental cost (M$)**
Case 0.8 (EE&C)	14,610	27,269	0.1432%	8,054
Case 1.0 (EE&C)	14,300	26,961	0.1439%	8,048
Case 1.2 (EE&C)	13,899	26,796	0.1394%	7,999

Table 6. Summary of Results

Scenario Cases	**Capacity Addition (MW)**	**Generation Plan Cost (M$)**	**T&D Cost (M$)**	**Investment cost in Grid upgrade (M$)**	**Environmental cost (M$)**	**Total Costs (M$)**	**Net Benefit of avoided costs (M$)**	**Benefit-cost ratio**
Scenario 1 Base Case	15,571	27,838	27,838	—	8,243	63,919	—	—
Scenario 2 Case 0.8 (EE&C)	14,610	27,269	27,269	659	8,054	63,251	668	1.01
Scenario 2 Case 1.0 (EE&C)	14,300	26,961	26,961	659	8,048	62,629	1,290	1.96
Scenario 2 Case 1.2 (EE&C)	13,899	26,796	26,796	659	7,999	62,250	1,669	2.53
Scenario 3 Recommended DSM	14,792	26,070	26,070	10	7,612	59,762	4,157	415.7
Scenario 4 Distributed Generation	14,320	26,395	26,395	3,056	7,843	62,744	1,175	0.38
Scenario 5 Hybrid (PV+DSM)	13,393	24,601	24,601	3,066	7,475	58,798	5,121	1.67