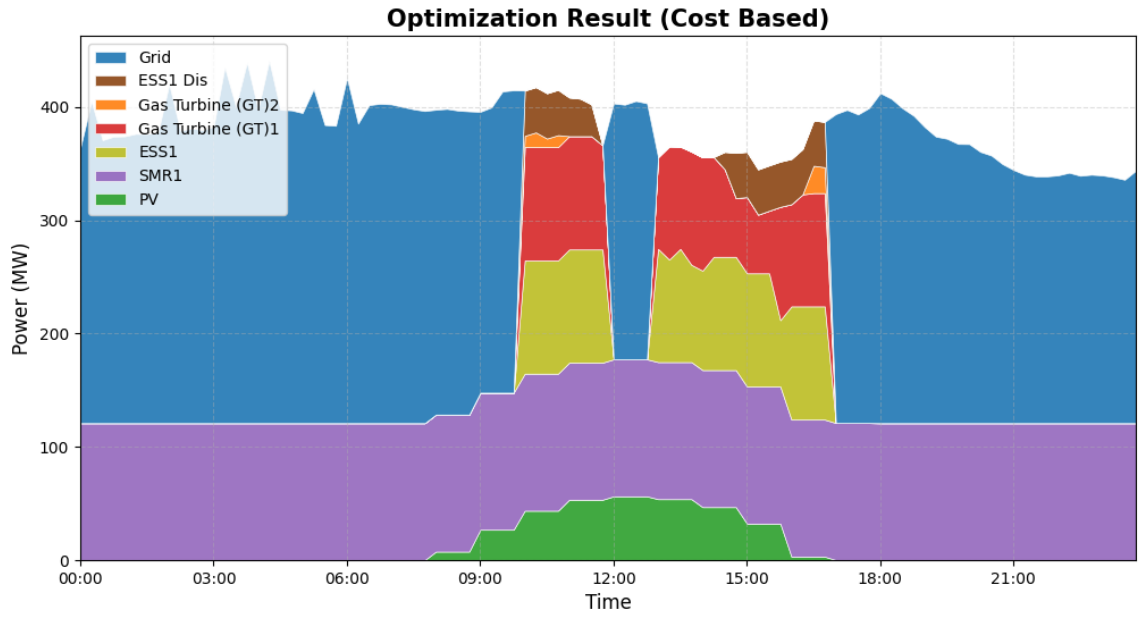
Data Center Energy Optimization Report



실행 요약서

1. 총 비용 및 효율성

이번 최적화 결과에 따르면, 데이터 센터의 에너지 관리 시스템은 총 비용 857,927,150 KRW로 운영되었습니다. 총 에너지 공급량은 36,716.0 MW로, 비용 대비 높은 효율성을 달성하였습니다. 이러한 결과는 에너지 자원의 최적 활용과 비용 절감 전략이 효과적으로 구현되었음을 나타냅니다.

2. 에너지 믹스 (전력망 대 자가 발전 대 ESS)

에너지 공급은 다양한 소스를 통해 이루어졌습니다. 전력망으로부터의 수입은 18,619.3 MW로 전체 공급의 약 50.7%를 차지하였습니다. 자가 발전 부문에서는 태양광(PV) 발전이 1,295.1 MW를 공급하였으며, 가스터빈(GT1, GT2) 및 소형 모듈형 원자로(SMR1)와 에너지 저장 시스템(ESS1)을 포함한 발전기가 16,170.8 MW를 생산하였습니다. ESS 시스템은 630.8 MW를 방전하여 피크 시간대에 추가적인 전력을 공급하였습니다. 이러한 에너지 믹스는 전력망 의존도를 줄이고, 자가 발전과 ESS의 활용을 극대화하는 데 기여하였습니다.

3. 계절/시간에 따른 시스템 적응 (피크 셰이빙)

시스템은 계절적 및 시간대별 수요 변동에 효과적으로 적응하였습니다. 특히, 피크 셰이빙 전략을 통해 고비용의 피크 시간대 전력 사용을 최소화하였습니다. ESS의 방전 기능은 피크 시간대 전력 수요를 완화하는 데 중요한 역할을 하였으며, 이는 에너지 비용 절감과 시스템 안정성 향상에 기여하였습니다. 이번 결과에서 계절적 요인은 30,000.0의 영향을 미쳤으며, 이는 시스템이 계절 변화에 따라 유연하게 대응했음을 보여줍니다.

이러한 최적화 결과는 데이터 센터의 에너지 관리 효율성을 높이고, 운영 비용을 절감하며, 지속 가능한 에너지 사용을 촉진하는 데 중요한 역할을 하였습니다.

Detailed Simulation Data (24h)

Time	Grid	PV	Gas Turbine (G	Gas Turbine (G	SMR1	ESS1	ESS1	Tot	Dif
00:00	242.7	0.0	0.0	0.0	121.0	0.0	0.0	363.7	0.0
00:15	283.9	0.0	0.0	0.0	121.0	0.0	0.0	404.9	40.0
00:30	249.7	0.0	0.0	0.0	121.0	0.0	0.0	370.7	0.0
00:45	252.9	0.0	0.0	0.0	121.0	0.0	0.0	373.9	0.0
01:00	253.2	0.0	0.0	0.0	121.0	0.0	0.0	374.2	0.0
01:15	255.4	0.0	0.0	0.0	121.0	0.0	0.0	376.4	0.0
01:30	255.2	0.0	0.0	0.0	121.0	0.0	0.0	376.2	0.0
01:45	256.7	0.0	0.0	0.0	121.0	0.0	0.0	377.7	0.0
02:00	299.1	0.0	0.0	0.0	121.0	0.0	0.0	420.1	40.0
02:15	258.0	0.0	0.0	0.0	121.0	0.0	0.0	379.0	0.0
02:30	260.3	0.0	0.0	0.0	121.0	0.0	0.0	381.3	0.0
02:45	258.7	0.0	0.0	0.0	121.0	0.0	0.0	379.7	0.0
03:00	261.7	0.0	0.0	0.0	121.0	0.0	0.0	382.7	0.0
03:15	314.2	0.0	0.0	0.0	121.0	0.0	0.0	435.2	40.0
03:30	279.3	0.0	0.0	0.0	121.0	0.0	0.0	400.3	0.0
03:45	318.3	0.0	0.0	0.0	121.0	0.0	0.0	439.3	40.0
04:00	276.7	0.0	0.0	0.0	121.0	0.0	0.0	397.7	0.0
04:15	319.9	0.0	0.0	0.0	121.0	0.0	0.0	440.9	40.0
04:30	276.6	0.0	0.0	0.0	121.0	0.0	0.0	397.6	0.0
04:45	276.2	0.0	0.0	0.0	121.0	0.0	0.0	397.2	0.0
05:00	273.8	0.0	0.0	0.0	121.0	0.0	0.0	394.8	0.0
05:15	294.8	0.0	0.0	0.0	121.0	0.0	0.0	415.8	29.5
05:30	263.2	0.0	0.0	0.0	121.0	0.0	0.0	384.2	0.0
05:45	262.5	0.0	0.0	0.0	121.0	0.0	0.0	383.5	0.0
06:00	304.6	0.0	0.0	0.0	121.0	0.0	0.0	425.6	40.0
06:15	264.4	0.0	0.0	0.0	121.0	0.0	0.0	385.4	0.0
06:30	280.7	0.0	0.0	0.0	121.0	0.0	0.0	401.7	0.0
06:45	281.9	0.0	0.0	0.0	121.0	0.0	0.0	402.9	0.0
07:00	281.4	0.0	0.0	0.0	121.0	0.0	0.0	402.4	0.0
07:15	279.2	0.0	0.0	0.0	121.0	0.0	0.0	400.2	0.0
07:30	277.1	0.0	0.0	0.0	121.0	0.0	0.0	398.1	0.0
07:45	275.5	0.0	0.0	0.0	121.0	0.0	0.0	396.5	0.0
08:00	269.1	7.5	0.0	0.0	121.0	0.0	0.0	390.1	0.0
08:15	269.9	7.5	0.0	0.0	121.0	0.0	0.0	390.9	0.0
08:30	268.4	7.5	0.0	0.0	121.0	0.0	0.0	389.4	0.0
08:45	267.7	7.5	0.0	0.0	121.0	0.0	0.0	388.7	0.0
09:00	248.0	26.9	0.0	0.0	121.0	0.0	0.0	369.0	0.0
09:15	251.8	26.9	0.0	0.0	121.0	0.0	0.0	372.8	0.0
09:30	266.0	26.9	0.0	0.0	121.0	0.0	0.0	387.0	0.0
09:45	267.0	26.9	0.0	0.0	121.0	0.0	0.0	388.0	0.0
10:00	0.0	43.6	100.0	10.0	121.0	100.0	40.0	371.0	0.0
10:15	0.0	43.6	100.0	13.0	121.0	100.0	40.0	374.0	0.0
10:30	0.0	43.6	100.0	7.6	121.0	100.0	40.0	368.6	0.0
10:45	0.0	43.6	100.0	10.6	121.0	100.0	40.0	371.6	0.0
11:00	0.0	53.3	100.0	0.0	121.0	100.0	34.2	355.2	0.0
11:15	0.0	53.3	100.0	0.0	121.0	100.0	33.1	354.1	0.0
11:30	0.0	53.3	100.0	0.0	121.0	100.0	28.1	349.1	0.0
11:45	0.0	53.3	91.9	0.0	121.0	100.0	0.0	312.9	0.0

Time	Grid	PV	Gas Turbine (G	Gas Turbine (G	SMR1	ESS1	ESS1	Tot	Dif
12:00	225.9	56.3	0.0	0.0	121.0	0.0	0.0	346.9	40.0
12:15	224.8	56.3	0.0	0.0	121.0	0.0	0.0	345.8	40.0
12:30	228.1	56.3	0.0	0.0	121.0	0.0	0.0	349.1	40.0
12:45	226.1	56.3	0.0	0.0	121.0	0.0	0.0	347.1	40.0
13:00	0.0	53.9	81.0	0.0	121.0	100.0	0.0	302.0	0.0
13:15	0.0	53.9	100.0	0.0	121.0	90.5	0.0	311.5	0.0
13:30	0.0	53.9	90.3	0.0	121.0	100.0	0.0	311.3	0.0
13:45	0.0	53.9	100.0	0.0	121.0	85.9	0.0	306.9	0.0
14:00	0.0	46.8	100.0	0.0	121.0	87.8	0.0	308.8	0.0
14:15	0.0	46.8	88.1	0.0	121.0	100.0	0.0	309.1	0.0
14:30	0.0	46.8	77.2	0.0	121.0	100.0	15.4	313.6	0.0
14:45	0.0	46.8	51.9	0.0	121.0	100.0	40.0	312.9	0.0
15:00	0.0	32.3	67.3	0.0	121.0	100.0	40.0	328.3	0.0
15:15	0.0	32.3	51.8	0.0	121.0	100.0	40.0	312.8	0.0
15:30	0.0	32.3	55.3	0.0	121.0	100.0	40.0	316.3	0.0
15:45	0.0	32.3	100.0	0.0	121.0	58.7	40.0	319.7	0.0
16:00	0.0	3.1	90.2	0.0	121.0	100.0	40.0	351.2	0.0
16:15	0.0	3.1	98.8	0.0	121.0	100.0	40.0	359.8	0.0
16:30	0.0	3.1	100.0	24.2	121.0	100.0	40.0	385.2	0.0
16:45	0.0	3.1	100.0	22.9	121.0	100.0	40.0	383.9	0.0
17:00	272.7	0.1	0.0	0.0	121.0	0.0	0.0	393.7	0.0
17:15	276.4	0.1	0.0	0.0	121.0	0.0	0.0	397.4	0.0
17:30	272.4	0.1	0.0	0.0	121.0	0.0	0.0	393.4	0.0
17:45	278.1	0.1	0.0	0.0	121.0	0.0	0.0	399.1	0.0
18:00	291.3	0.0	0.0	0.0	121.0	0.0	0.0	412.3	0.0
18:15	286.4	0.0	0.0	0.0	121.0	0.0	0.0	407.4	0.0
18:30	277.9	0.0	0.0	0.0	121.0	0.0	0.0	398.9	0.0
18:45	271.4	0.0	0.0	0.0	121.0	0.0	0.0	392.4	0.0
19:00	261.3	0.0	0.0	0.0	121.0	0.0	0.0	382.3	0.0
19:15	252.9	0.0	0.0	0.0	121.0	0.0	0.0	373.9	0.0
19:30	251.1	0.0	0.0	0.0	121.0	0.0	0.0	372.1	0.0
19:45	246.5	0.0	0.0	0.0	121.0	0.0	0.0	367.5	0.0
20:00	246.3	0.0	0.0	0.0	121.0	0.0	0.0	367.3	0.0
20:15	239.5	0.0	0.0	0.0	121.0	0.0	0.0	360.5	0.0
20:30	236.2	0.0	0.0	0.0	121.0	0.0	0.0	357.2	0.0
20:45	228.7	0.0	0.0	0.0	121.0	0.0	0.0	349.7	0.0
21:00	223.5	0.0	0.0	0.0	121.0	0.0	0.0	344.5	0.0
21:15	219.3	0.0	0.0	0.0	121.0	0.0	0.0	340.3	0.0
21:30	217.8	0.0	0.0	0.0	121.0	0.0	0.0	338.8	0.0
21:45	217.8	0.0	0.0	0.0	121.0	0.0	0.0	338.8	0.0
22:00	218.7	0.0	0.0	0.0	121.0	0.0	0.0	339.7	0.0
22:15	221.0	0.0	0.0	0.0	121.0	0.0	0.0	342.0	0.0
22:30	218.4	0.0	0.0	0.0	121.0	0.0	0.0	339.4	0.0
22:45	219.3	0.0	0.0	0.0	121.0	0.0	0.0	340.3	0.0
23:00	218.7	0.0	0.0	0.0	121.0	0.0	0.0	339.7	0.0
23:15	217.1	0.0	0.0	0.0	121.0	0.0	0.0	338.1	0.0
23:30	214.9	0.0	0.0	0.0	121.0	0.0	0.0	335.9	0.0
23:45	222.8	0.0	0.0	0.0	121.0	0.0	0.0	343.8	0.0