Baseline: No Battery

Consider an electricity system with the following capacities and (private) marginal costs:

Type	Capacity Period 1	Capacity Period 2	MC
Solar	100	0	0
Wind	0	100	0
Coal	100	100	50
Gas	100	100	100

Every plant is small, and there is no market power. But solar plants can only produce during period 1, and wind plants can only produce during period 2.

There are two equally likely, perfectly inelastic, demand scenarios: period 1 demand of 275 MW and period 2 demand of 75 MW.

1. What is the price in each period? How much does each type of plant produce in each period?
2. How much total operating profit does solar earn in this market?
3. How much total operating profit does wind earn in this market?

Battery Enters the Market

An independently owned 75 MW battery enters the market. It charges the battery (buys 75 MW of power) in period 2, and then discharges the battery (supplies 75 MW of power) in period 1.

4. What is the price in each period now? How much does each type of plant produce in each period?
5. How much total operating profit does the solar earn in this market now? How much does wind earn?
6. Consider the impact on consumers. Compared to the world with no batteries, are consumers better off?