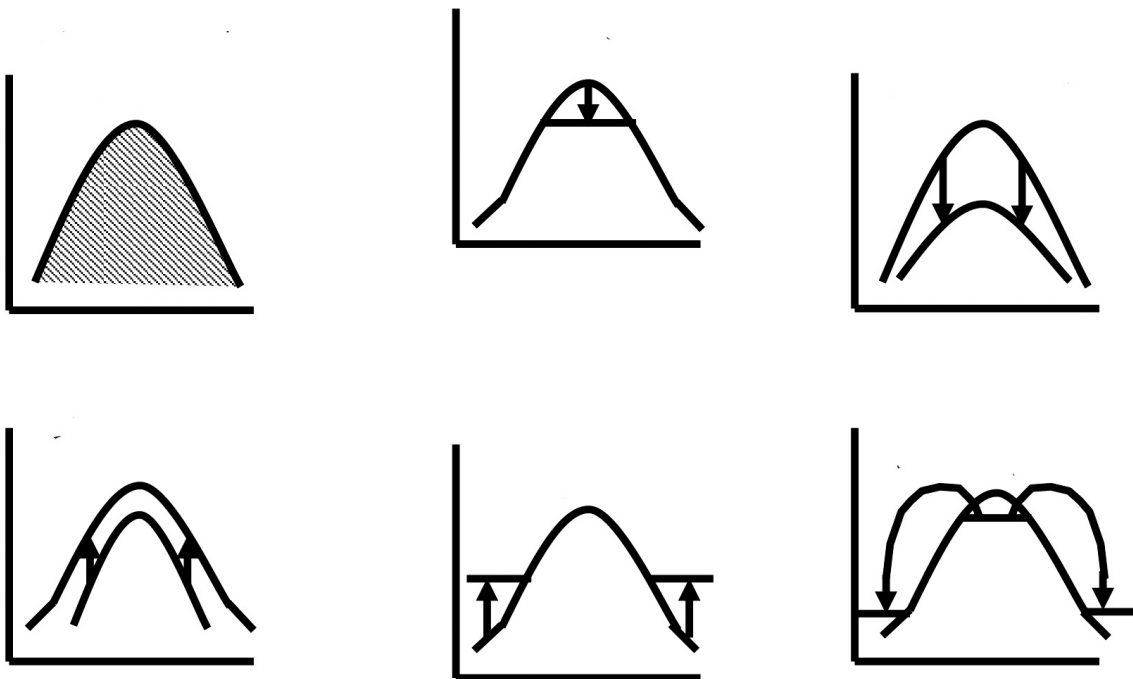


Homework 8

Quiz Date: Tuesday, December 12, 2017 during class

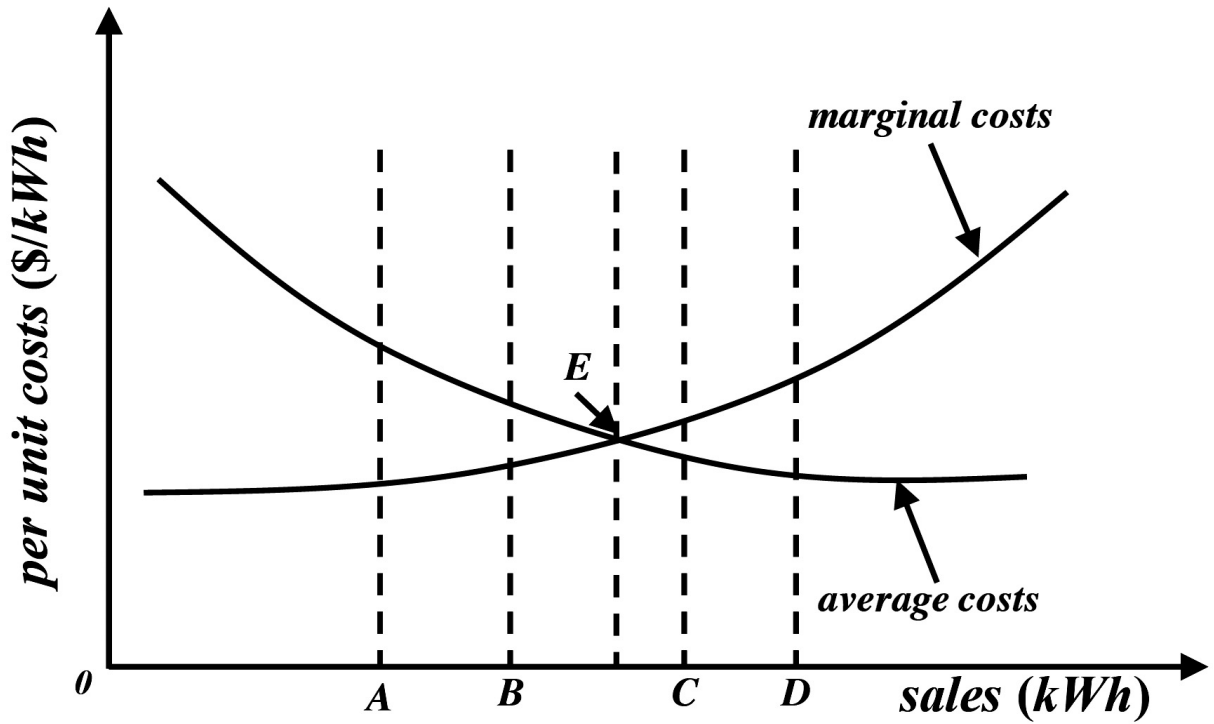
The quiz is based on the following material: Lecture 18, Lecture 19, and the problems in Homework 8.

Problem 1: Provide the names of the demand-side management programs illustrated below.



Problem 2: List the appropriate *DSM* applications for intermediate load segments.

Problem 3: Consider the graph below.



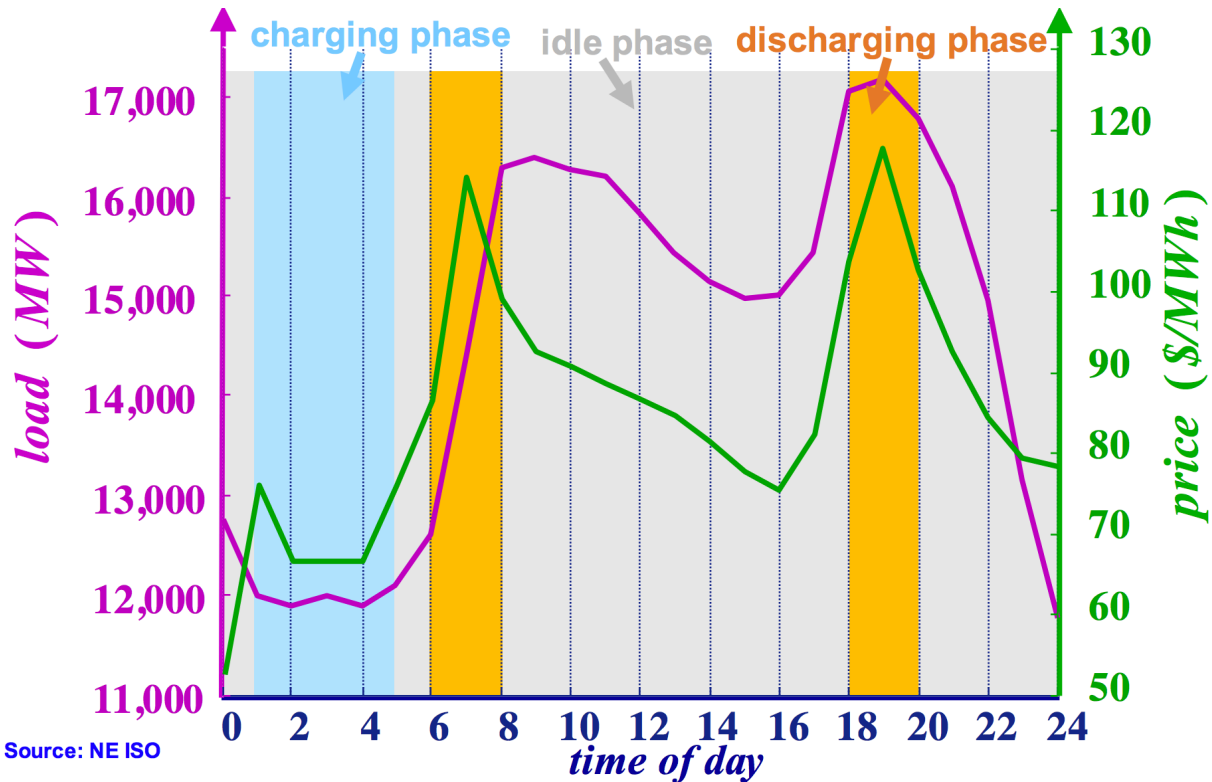
- a. For sales of A kWh , **state** whether marketing programs or consumption reduction programs must be implemented. **Justify** your answer.
- b. For sales of C kWh , **state** whether marketing programs or consumption reduction programs must be implemented. **Justify** your answer.

Problem 4: Suppose you are the lead engineer on a project to install an energy storage resource (ESR) in a microgrid. The following table provides the renewable generation and the load data of the microgrid throughout the day.

<i>hour</i>	<i>load (kW)</i>	<i>renewable generation (kW)</i>
1	50	50
2	60	40
3	50	50
4	60	60
5	50	40
6	90	30
7	110	70
8	150	80
9	170	110
10	140	120
11	100	160
12	80	170
13	50	180
14	50	160
15	50	160
16	60	140
17	90	130
18	140	100
19	170	40
20	150	30
21	140	20
22	90	20
23	70	20
24	50	30

Determine the minimum required capacity and capability of the ESR so that no renewable generation in the microgrid gets spilled. **Assume** that the renewable generation and the load stays constant at the level specified for each hour. Moreover, **assume** that no energy is stored in the ESR at the beginning of the day. **State** all your other assumptions.

Problem 5: State the three phases of *ESRs*. Consider the following graph.



Explain how the ability of *ESRs* to be in three phases is instrumental to take advantage of price differences throughout a day.

Problem 6: State 2 *ESR* integrations with the grid. Provide the *ESR* owner’s interest and the grid impacts for each integration.

Problem 7: State 2 challenges of the integration of variable energy resources to the grid. Explain how the integration of *ESRs* can address each challenge.