

2020Q6**(DIVISION, TABLES)**

One Energy's *Wind for Industry*[®] projects are sized such that the customer's facility is a net consumer from the grid, which means the wind project does not produce more energy than the facility pulls from the electricity utility. This results in the facility using energy from the grid in addition to the energy produced by the wind project. One turbine can produce approximately 4,000,000 kWh in a year after losses (wake loss, maintenance downtime, icing downtime, etc.). One Energy is evaluating a project for a facility that consumes 25,000,000 kWh in a year.

L1: How many turbines could One Energy site at this facility?

L2: Due to land constraints, One Energy was able to safely site 3 turbines at the facility. The turbines' monthly production and the facility's energy consumption are shown in the table below. How much energy did the plant draw from the grid each month? For the year? What percentage of the facility's energy was produced by wind?

MONTH	FACILITY CONSUMPTION (KWH)	TURBINE PRODUCTION (KWH)
Jan	2,191,000	1,504,000
Feb	1,042,000	1,040,000
Mar	1,721,000	1,297,000
Apr	1,451,000	1,348,000
May	2,173,000	719,000
Jun	2,484,000	728,000
Jul	2,505,000	500,000
Aug	2,488,000	563,000
Sep	2,343,000	626,000
Oct	2,210,000	1,103,000
Nov	2,280,000	938,000
Dec	2,112,000	1,493,000

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L1: The total number of turbines the facility could potentially use is the site's consumption divided by one turbine's estimated annual production.

$$\# \text{ of turbines} = \frac{\text{Facility Consumption}}{\text{Estimated Turbine Production}}$$

$$\# \text{ of turbines} = \frac{25,000,000 \text{ kWh}}{4,000,000 \text{ kWh}}$$

$$\# \text{ of turbines} = 6.25 = 6 \text{ turbines}$$

L2:

$$\text{Facility Consumption} = \text{Turbine Production} + \text{Grid Production}$$

$$\text{Facility Consumption} - \text{Turbine Production} = \text{Grid Production}$$

MONTH	FACILITY CONSUMPTION (KWH)	TURBINE PRODUCTION (KWH)	GRID PRODUCTION (KWH)
Jan	2,191,000	1,504,000	687,000
Feb	1,042,000	1,040,000	2,000
Mar	1,721,000	1,297,000	424,000
Apr	1,451,000	1,348,000	103,000
May	2,173,000	719,000	1,454,000
Jun	2,484,000	728,000	1,756,000
Jul	2,505,000	500,000	2,005,000
Aug	2,488,000	563,000	1,925,000
Sep	2,343,000	626,000	1,717,000
Oct	2,210,000	1,103,000	1,107,000
Nov	2,280,000	938,000	1,342,000
Dec	2,112,000	1,493,000	619,000

The facility used 13,146,000 kWh from the grid over the year.

$$\text{Wind Energy \%} = \frac{\text{Turbine Production (kWh)}}{\text{Facility Consumption (kWh)}}$$

$$\text{Wind Energy \%} = \frac{11,859,000 \text{ (kWh)}}{25,000,000 \text{ (kWh)}}$$

$$\text{Wind Energy \%} = 47.4\%$$