**Powering Smallsburg Worksheet Example**

**Instructions**

The village of Smallsburg needs power. Smallsburg has a mall, a school, a sports stadium, and a hospital. Table 1 shows how much power each one needs.

|  |  |
| --- | --- |
| **Community Facility** | **Power Required (in MW, mega watts)** |
| Mall | 20 |
| School | 1 |
| Stadium | 10 |
| Hospital | 15 |
| Offices/businesses | 4 |

**Table 1**

Now that you know about the community of Smallsburg, complete the following questions.

**Questions**

1. Based on Table 1, how much total power (MW) does the Smallsburg power plant have to supply? **50 MW**

You can pick combinations of the power plants in Table 2 to add up to the total power needed in Question 1. Each power plant costs money, and some power plants give off emissions (pollution) and some do not.

You have **a total of $250** million dollars to spend.

| **Power Plant Type** | **Power Provided (MW)** | **Cost (million $)** | **Emissions Per/Year** |
| --- | --- | --- | --- |
| Hydroelectric | 10 | 40 | None |
| 25 | 100 | None |
|  |  |  |  |
| Photovoltaic | 5 | 50 | None |
| 25 | 250 | None |
|  |  |  |  |
| Wind turbines | 10 | 60 | None |
| 25 | 150 | None |
|  |  |  |  |
| **Power Plant Type** | **Power Provided (MW)** | **Cost (million $)** | **Emissions Per/Year** |
| Nuclear | 10 | 40 | 1 ton radioactive waste |
| 25 | 100 | 2.5 ton radioactive waste |
|  |  |  |  |
| Coal | 10 | 20 | 80,000 ton CO2, 200 ton SO2, 6 pounds mercury  |
| 25 | 50 | 200,000 ton CO2, 500 ton SO2, 15 pounds mercury |
|  |  |  |  |
| Advanced Coal | 10 | 50 | 80,000 ton CO2, 20 ton SO2, 0.6 pounds mercury |
| 25 | 125 | 200,000 ton CO2, 50 ton SO2, 1.5 pounds mercury |

**Table 2**

1. Fill in the table below with your power plant choices to power the necessary services listed in Table 1. (Note: You do not have to use all of the rows below.)

|  |  |  |  |
| --- | --- | --- | --- |
| **Power Plant Type** | **Power Provided (MW)** | **Cost (million $)** | **Emissions Per/Year** |
| **Coal** | **25** | **50** | **200,000 tons CO2, 500 tons SO2, and 15 pounds mercury** |
| **Nuclear** | **25** | **100** | **2.5 tons of radioactive waste** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

1. What is the total energy (power) production of your power plants? **50 MW** (Note: add up column 2)
2. What is the total cost of your power plants? **$150** million dollars
(Note: add up column 3)
3. Do your power plants give off emissions (pollution)? \_\_\_\_\_\_\_\_\_\_\_\_

What might that pollution do to the community?

**The CO2 (carbon dioxide) contributes to global warming. We are not sure about all the negative impacts of global warming, but increased number and severity of hurricanes is one example of a negative impact. Sulfur dioxide contributes to acid rain, and mercury causes birth defects. The radioactive waste needs to be stored somewhere safe for a long time. Otherwise, it causes cancers and other illnesses in people.**

1. How much money do you have left, after buying the power plants? **$100** million dollars
2. If you did not spend all the $250 million on power plants, what will you buy with the money left over (see Table 3)? **$50 million is going to universities to research how to prevent emissions from coal power plants and the other $50 million is going to construct a safe place for the nuclear waste**.

|  |  |
| --- | --- |
| **Improvement** | **Cost (million $)** |
| Repair streets and sidewalks | 20 |
| Fund universities to research cleaner energy technologies | 30 |
| Double the number of teachers in all the schools | 20 |
| Make food free for the community | 100 |
| Nobody works on Fridays | 40 |
| Build large central park | 20 |
| Help fund a free medical clinic | 10 |
| Give money back to taxpayers | Remainder |

**Table 3**