In 2015, the City of Talent used approximately 37 GW of energy. Currently, 76% of the housing in Talent is single family detached, 19% multifamily, and 5% is single family attached. According to the Talent Clean Energy Action Plan, 71% of the energy needed is for residential use.

Based on your population growth projections, the City of Talent will need 5 GW of energy for residential use by the year 2030. The plan moving forward is to build 65% single family detached, 10% single family attached, and 25% multi-family.

In 2018, the City of Talent used 491,075 kWh of energy to power all of the City buildings, approximately 1.33% of the total energy used.

Table 1. City of Talent Energy Consumption Breakdowns

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Current** | **Projected** | **Totals** |
| **Residential** | 31,985,924.68 kWh | 5,086,743.044 kWh | **37,072,667.72 kWh** |
| Single Family Detached | 24,309,302.76 kWh | 3,306,382.99 kWh | 27,615,685.75 kWh |
| Single Family Attached | 1,599,296.23 kWh | 508,674.3 kWh | 2,107,970.53 kWh |
| Multi-family | 6,077,325.69 kWh | 1,519,331.42 kWh | 7,596,657.11 kWh |
| **Commercial**  | 4,523,000.32 kWh |  | **4,523,000.32 kWh** |
| **Municipal** | 491,075 kWh |  | **20,773 kWh** |
|  **Grand Total 41,616,441.04 kWh** |

Table 2. Single Family Detached Residential Annual Averages (Based on Class Solar Data)

|  |  |  |  |
| --- | --- | --- | --- |
| **Current Consumption** | 16,978.74 kWh | **Solar Capacity (kWh)** | 10,696.81 kWh |
| **Post Reduction Consumption** | 12,393.17 kWh | **% of Energy Generated by Solar** | 93.5% |

The average installation cost per single family resident would be $20,237.

***To generate the kWh deficit, we can use a combination of wind and solar energy. Show your work on a seperate piece of paper but neatly write your answer in the space provided.***

Table 3. Annual Wind Power Potential

|  |  |  |  |
| --- | --- | --- | --- |
| **Blade Length (m)** | **Power (kWh/yr)** | **Blade Length (m)** | **Power (kWh/yr)** |
| 0.5 | 8.96 | 1 | 71.75 |
| 1.5 | 242.2 | 2 | 574.09 |
| 2.5 | 1,121.26 | 3 | 1,937.55 |
| 3.5 | 3,076.71 | 4 | 4,592.72 |
| 4.5 | 6,639.25 | 5 | 8,970.17 |
| 5.5 | 11,939.28 | 6 | 15,500.45 |
| 6.5 | 19,707.42 | 7 | 24,614.14 |
| 7.5 | 30,274.29 | 8 | 36,741.80 |

1) How much additional energy needs to be produced for:

Residential:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_kWh

Commercial: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_kWh

Municipal:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_kWh

**Grand Total:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_kWh**

2) a) How many, and what size(s), wind turbines can the City use to generate the deficit?

b) What would the cost be to install wind turbines (assume $6/watt)?

c) What would be the return on investment? (Use $0.056/ kWh)

3) a) What size DC kW system would be needed to generate the kWh deficit using solar? (Use PVwatts to help you figure this out.) Do you have suggestions as to where solar farms can be constructed?

b) What would the cost be to install solar arrays (assume $3/watt)?

c) What would be the return on investment? (Use $0.056/ kWh)

4) How would you suggest that the energy that is used by commercial and municipal

 facilities be generated?

5) What combination of wind and solar would you suggest that the City install to generate the kWh deficit needed in 2030?