John Slater's Prelude

my house uses just over 10 MWh of electrical energy per year. And from the very limited data from Tina, her 6 panels generates 1.42 MWh per year. Thus, if I had similar system on my house, I would need 10/1.42 x 6 panels = 42 panels to generate 10 MWh per year, based on the assumption that I would have same orientation and tilt of the panels facing south as does Tina. To accomplish the necessary exposure to the sun, I would have to cut down all the trees on the east, south and west sides of my property (as well as the neighbours), which is a total of 8 trees. These trees are all conifers, each of which accounts for about 35 lbs of Carbon Offset, or total of 280 lbs per year.

If I extrapolate my house requirements to City of Medicine Hat, then for 20,000 residential homes x 10 MWh per year = 200,000 MWh x 6 panels = 1,200,000 panels. Now there is some guesting that each panel area is 20 square feet. Thus 24,000,000 sq ft total/43,560 sq ft per acre = 550 acres or 0.86 section of land.

However, if I use instead the information and Website I received from David Gue (given below), then the consumption requirement is = 144,000 MWh x 6 panels = 864,000 panels. Thus the area of land needed to be covered by solar panels is 550 acres x 7.2/10 = 396 acres or 0.62 section of land.

"In 2014, the **average Canadian household** used 11,135 kWh of **electricity** per year. The **average household** in Alberta **uses** 7,200 kWh per year. (This lower figure is offset by a higher usage of natural gas.)"

Source: https://energyrates.ca/residential-electricity-natural-gas/

Now, if the average demand for the city includes business/commercial/light industry and heavy industry is 200% more than residential, the total consumption requirement would be 432,000 MWh; thus 2,600,000 panels on 1.86 sections of land. This is about the area of land near Methanex and Cdn Fertilizer Plant which was the old Westco fertilizer tailing pond land.

Using another approach, of data on the internet, it is interesting that Rob Gardner came up with an estimate of land area for solar panels of 2 sq miles (or 2 sections), which is very close to my value of 1.86 sections.

In addition to that information, Rob also mentioned that HatSmart has a website with data on the 3-turbine Box Spring Wind Farm.

https://www.medicinehat.ca/government/departments/utility-sustainability/hat-smart/city-initiatives/box-springs

The 3 turbines generate 16,000 MWh of energy to power 2,000 homes. This represents about 3% of the city's total electrical need. Thus, 16,000 / .03 = 530,000 MWh. Note, this is same order of magnitude as 432,000 MWh determined above for solar panels, so this gives some confidence for the above calculations.

Also, it is interesting to note, that since 3 turbines give 3% of city's energy needs, then 1 turbine gives 1%; thus 100 turbines would be required to supply the total city's needs.

Well, that is all I can give now with the calculations on the basis of data from Tina and information from David Gue and Rob Gardner.

PS. David & Martha lent me a copy of the Spring 2019 UofA Alumni Magazine "New Trail". There are various interesting articles. In one article on Energy Storage, Miles Skinner (a Graduate Student) says "Energy generation and energy storage will be multi-faceted. We have to ask how can we maximize the benefits to get the most of various sources (of energy). No single one is the best, but all of them will have their place". "The winning formula will come from interactions among multiple energy sources and the ways we integrate the new ones into our energy infrastructure. The magic of how we power ourselves in the future is at this point of interplay".