Cell tower power consumption

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Cell towers only transmit around 10 watts usually. Sometimes up to 50 or so in urban areas. Your phone can transmit up to 2 watts. antenna gain depends on losses and diversity gain (Sphere/beam coverage)

We present the energy consumption of DSL, HFC networks, passive optical networks, fiber to the node, point-to-point optical systems, UMTS (W-CDMA), and WiMAX. Optical access networks are the most energy efficient of the available access technologies.

A typical 5G base station consumes up to twice or more the power of a 4G base station, writes MTN Consulting Chief Analyst Matt Walker in a new report entitled "Operators facing power cost crunch." And energy costs can grow even more at higher frequencies, due to a need for more antennas and a denser layer of small cells.

But with more than 400,000 cell tower sites in the US alone, they outnumber data centers and their power footprint totals a not-insubstantial 21 million megawatt hours (MWh) of power per year. As energy prices soar, ESG continues to grow in importance, and 5G"s increased power demands loom, a number of cell tower owners and telco operators ...

I want links to references if possible.

First of all, you have a misconception about GSM, 3G, 4G:

The frequency bands you list are some of the frequency allocations for these networks. These are different between different operators and in different countries.

Then: Cellular networks are not broadcast transmitters. They don"t work with constant output powers.

The power they transmit depends on what they need to achieve. As noted in the comments above, a cell tower that covers a huge rural area will blast out more power per user on average than a small-cell tower in a city centre.

Since power consumption is one of the biggest costs in operating a mobile network, carriers are extremely interested in keeping transmit power as low as possible.

Also, lower maximum transmit power allows for smaller coverage area - this sounds like an anti-feature, but it means that the next base station using the exact same frequencies can be closer, which becomes necessary as operators strive to serve very many users in densely populated areas, and thus need to divide these users among as many base stations as possible, to even be theoretically able to serve the cumulative data rate of

these.

Then, as mentioned, the transmissions will be exactly as strong as necessary to offer optimal (under some economic definition of "optimal") service to the subscribers. Which means: when there are only a few devices basically idling in the cell, the power output will be orders of magnitude less than when the network is crowded and under heavy load.

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