Opening

I was looking at my friend's calcs on WALL-E. Specifically the one where he got struck by lightning and I realized lightning is surprisingly powerful. Credit to him on the calcs.

According to this document, the main method of calculating lightning has more than a few errors and there is a method to calculate the energy of lightning without as many errors. This would be fossilized lightning.

TLDR A lot of times this lightning strikes the sand that covers the state. When it does so, it creates a new type of rock, called a fulgurite – a hollow tube formed as the lightning travels through the sand, vaporizing it and melting its outer edges.

When the sand cools down, which happens quickly, the hollow tube is frozen in glass, recording the path the lightning traveled. By definition, a fulgurite is a metamorphic rock, changed by heat and pressure, from sand to something new.

They calculated the energy needed for lightning to make the fulgurite rock and got some surprisingly high numbers.

By their numbers lightning can reach temperatures of over 20,000 degrees Celsius and contain, on average tens of gigawatts, to potentially even terawatts of power.

That is 20,000,000,000 joules to 1,000,000,000,000 joules per second or 4.78011 tons of TNT to 239.00573 tons of TNT per second. High 8-C to 8-A, Large Building level to Multi-City Block level

So yeah, lightning is very strong.

New End

Here is a new end I found.

A single bolt of lightning can release 5 gigajoules of energy in 30 microseconds or 0.00003 seconds to 1 millisecond or 0.0001 seconds.

- Energy: 5e9 joules
- Time: 0.001 seconds
- Power: 5 terawatts

- Energy: 5e9 joules
- Time: 0.00003 seconds
- Power: 167 terawatts

That is… surprisingly consistent with the document with it saying it could reach terawatts of power.

So for the energy of them lasting a full second.

- Energy 1: 5e12 joules, 1.195 kilotons
- Energy 2: 1.67e14 joules, 39.31 kilotons

So for the low end lightning has at least 20 gigawatts. For the mid end lightning has 5 terawatts and for the high lightning has 167 terawatts.

Then we just calculate how long a character is struck by or creates lightning. I am slightly leaning more towards the low and mid ends but it's still a big upgrade!