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[00:00:44] **Speaker 1** With 43 and counting, data processing centers are popping up all over Wisconsin, like the Microsoft data center in Mount Pleasant, where the tech giant is developing a 1,900-acre site after buying it from Foxconn. Data centers contain servers and drives to store, process, and disseminate data. Companies like Microsoft, Amazon, Google, and Meta operate large-scale data centers. The Great Lakes region is a popular site for them because of the large amounts of water data centers need to cool the equipment. But what about the electricity needed to run them? What are the implications of that usage? We turn to Lena Rowald, professor in the UW-Madison Department of Electrical and Computer Engineering. And thanks for being here. Thank you for having me. So. We know that everybody talks about the millions of gallons of water that are needed to cool these data centers. But how much electricity do they need to do all that processing, like this Microsoft one in Mount Pleasant?

[00:01:51] **Speaker 2** So it varies quite a bit by data center and the type of data center. But the Mount Pleasant data center, I think, is supposed to use about 450 megawatts of power. And that is a lot. That's about the same amount as all the households in Milwaukee.

[00:02:08] **Speaker 1** And so if you talk about 43 data centers, obviously not all as large as that, but across the state of Wisconsin, that's sucking a lot of power. Yes, it is.

[00:02:17] **Speaker 2** Yeah, and the projection is moving forward with even more, particularly of these very large data centers coming, is that it will consume really a lot of power that is going to change, really, the scope of use of electricity in Wisconsin.

[00:02:32] **Speaker 1** This growth of these centers seems explosive, right? And all of a sudden, have you been surprised by it?

[00:02:38] **Speaker 2** So I have been working on data centers and their energy use since about 2018. And back then, it was already clear that we are likely going to see an increase in energy use from data centers, just because it was getting harder to keep up the efficiency gains that have allowed us to do ever more computing with essentially the same amount of electricity. So for a long time, electricity use was fairly flat. But then now, so we were expecting that there will be an increase. But of course, with AI and these large language models and these very, very large models that need really, really large data centers for training and inference, it's really been quite explosive, I would say. So it's a bit unprecedented for the grid to see this amount of growth in this short time period. In Wisconsin, do we have the capacity to provide the electricity? So it's not like there are hundreds and hundreds of megawatts of power that is just kind of laying around, waiting to be used. And so we don't necessarily have the capacity to meet all that demand as it is today. And so, we are going to need new infrastructure, new transmission lines, new power plants in order to meet that demand, because it's also not like the regions around us necessarily have that energy.

[00:03:57] **Speaker 1** So what about the cost of this energy demand and then that infrastructure of which you speak? Does that get passed along to the consumer? Like, am I gonna see it in my electric bill?

[00:04:08] **Speaker 2** That's a good question, how much of it and how that cost will be spread. So you can imagine that when more people want something, the price sometimes tend to go up because there's maybe a limit to the supply of that, of electricity. But also the way utilities do things is that they build infrastructure to meet the demand of their customers. And they have to file what is called a rate case with the Public Service Commission in order to determine how that cost is being covered. So they have ask for permission to spend that money to build that new infrastructure and they have talk about how they are going to spread that across consumers. And there is a lot of open questions in exactly how that is going to happen. And so I think both in Wisconsin but also elsewhere in the country, there's a lot of questions of how this might impact consumer bills. And frankly, to be honest with you, I am not entirely sure where the Public Service Commission, for example, will land with that, how the utilities will do things and also what kind of contracts these companies are able to get with the utilities. A lot of that will determine how energy bills will or might change.

[00:05:17] **Speaker 1** What would happen in peak times like summer? Can the grid in Wisconsin manage that load and are there concerns about blackouts or that kind of thing?

[00:05:27] **Speaker 2** Yeah, so already now, during peak times in summer, it can be challenging to meet the demand as it is today. So we have seen in past years that there has been warnings by NORC, who is the regulatory body, that has been saying that, okay, there could be challenges meeting peak demand in the Midwest during summer peak hours. And so what we might be seeing is that there is a need for more demand response. I mean, you might be familiar with, for example, energy rush hours, where the utility says, okay, I'm going to control the thermostat in your home and make it a little bit warmer during those peak hours to reduce the amount of electricity that we need in order to cool the house during summer when it's very warm. And so, of course, this happens, if it happens at the household level, there are very small changes in energy demand. The effect comes from many, many people adjusting their temperatures at the same time. So we could see more of that, but we could also see that data centers actively participate in this and that they are able to reduce their energy demand during those peak hours. And if they are to do so, we are going to need less infrastructure, there would be less stress on the grid, and there would a lower chance that there would large impacts. Like blackouts. Blackouts, typically, hopefully we will not see that because utilities are quite good at predicting energy demand, and particularly large data centers, it might be possible to know a little bit in advance how much they will use. So hopefully we would not get there, but there's definitely an increased stress on the grid that could be challenging to manage.

[00:07:05] **Speaker 1** All right, well thank you very much, Professor Lena Rowell. Yeah, you made it understandable. Like, you know, electrical grid.