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Case 22A is the 2022 peak of 80 GW, 5 GW nuclear, 35.6 GW wind, and 12.4 GW solar. Nuclear is run all the time and wind and solar are historical 2022 hourly values. Fossil picks up the remaining hourly load. Gas (represents all fossil) is 59% of the total energy. The ERCOT system needs more EHV transmission to improve reliability and reduce congestion so that new generation projects of all kinds can be sited. Long range ERCOT planning for non CO2 generation with forward transmission planning is urgently needed.

Case 22A1 is a 1% CO2 emissions case with no nuclear, 150 GW wind, 200 GW solar, 200 GWh Li battery, and 55 GW fossil fuel standby capacity (calculated). Average energy cost is 16.4 c/kWh omitting transmission costs. The reason this case is not feasible is because there is far too much transmission needed and the battery costs are excessive, making the plan impractical (impossible) to implement.

Case 22A2 is a 1% CO2 emissions case with 40 GW base loaded nuclear, 36 GW wind, 58 GW solar, a modest 20 GWh Li battery, and 25.3 GW gas peaking (calculated). Average energy cost is 10.7 c/kWh. The new lines needed are minimized. Institutional rules prevent this plan from being implemented.

Case 22A3 is a 1% CO2 emissions case with 40 GW base loaded geothermal, 36 GW wind, 58 GW solar, modest 20 GWh Li battery and 25.3 GW gas peaking (calculated). Average energy cost is 12.1 c/kWh. The difference between this plan and the above nuclear plan is the higher estimated cost of geothermal. The transmission plans depend on where the geothermal projects are sited. Texas should fund a 500 MW 5 billion dollar geothermal demonstration project.

Case 22B is 0% CO2 emissions case with 40 GW base loaded nuclear, 36 GW wind, 58 GW solar, 250 GWh Li battery, and 28 GW standby gas generation that never runs until there is a storm Uri. 2021 hourly data captures the storm Uri hourly loads that would be expected to be present with about 10% demand side management. The average energy cost of this plan is 13 c/kWh. The battery cost is what drives up the cost of this plan with a battery ten times larger than the 1% case 22A2. That the gas peakers never run except during a Uri event is problematic. These gas peakers need to be tested and run frequently as they are in case 22A2, but not in this case. We can consider this 0% plan impractical.

Case 22C is 0% CO2 plan with 30 GWe nuclear reactor feeding only thermal energy to a 200 GWh thermal battery. 63 GW of conventional turbines run directly off the thermal energy. The case has the 2021 Uri event modeled. No gas capacity at all is needed to serve another Uri event. What is nice about the thermal battery is it allows a full dispatch of 36 GW wind and 58 GW of solar. This non CO2 plan has the lowest energy cost at 10.1 cents per kWh. The problem is that the thermal battery needs to be demonstrated as workable. Imagine there are 12 of these plants with each having about 5 GW of transmission capacity needed. Transmission costs would be minimal if the generators are spread throughout the state instead of being relegated to remote locations.

The one thing all these cases show is the importance of developing about 40 GW of base load non CO2 generation capacity and energy for the ERCOT system to reduce our dependency on natural gas and to reduce CO2 emissions.

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