Decarbonizing the Electric Grid

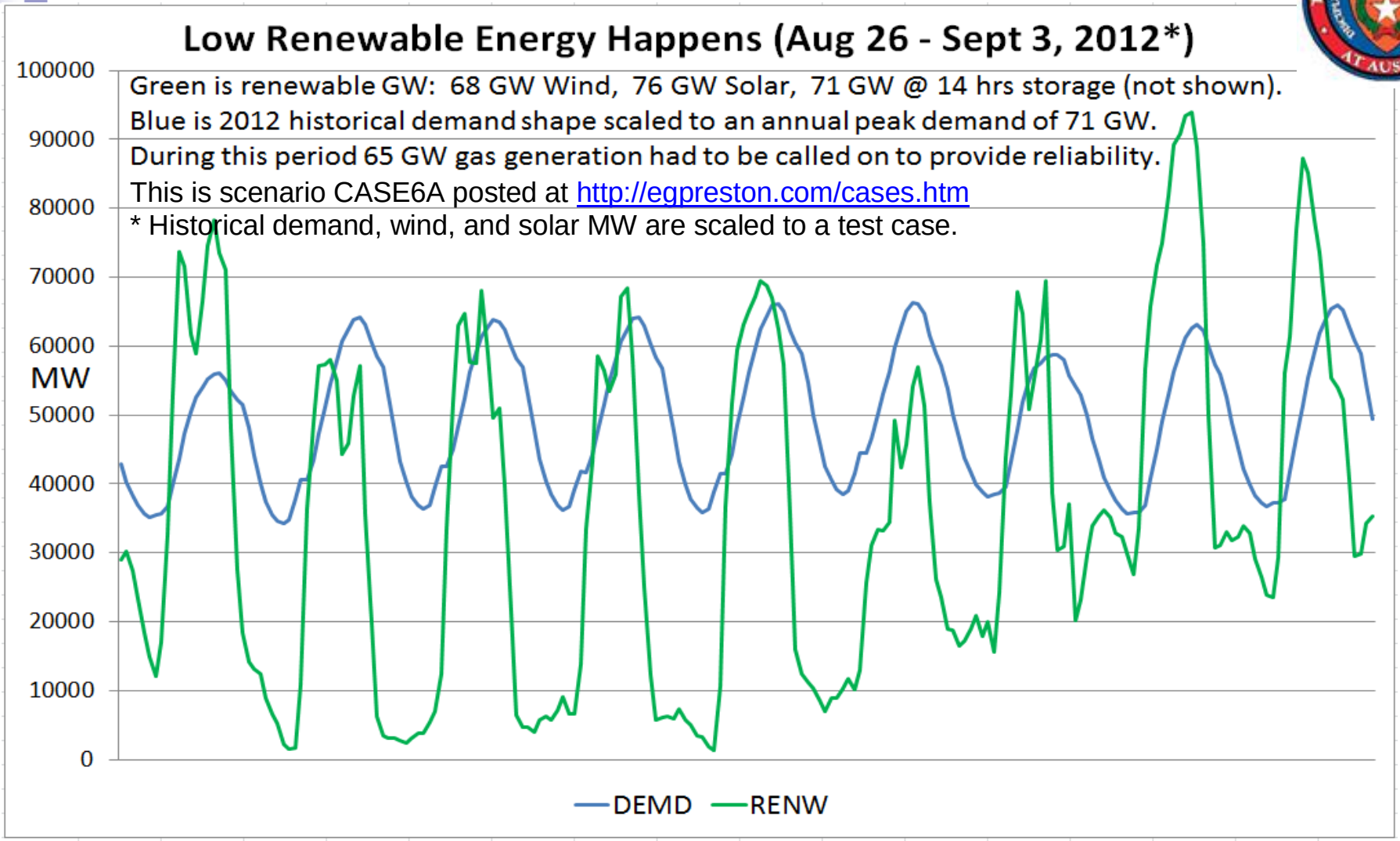
https://www.mccombs.utexas.edu/Austin-Electricity-Conference

Gene Preston's 10 minute talk

- CEO Transmission Adequacy Consulting
- Runs Solar & Wind Transmission Studies
- Runs Loss of Load Probability Studies
- Holds PhD from The University of Texas

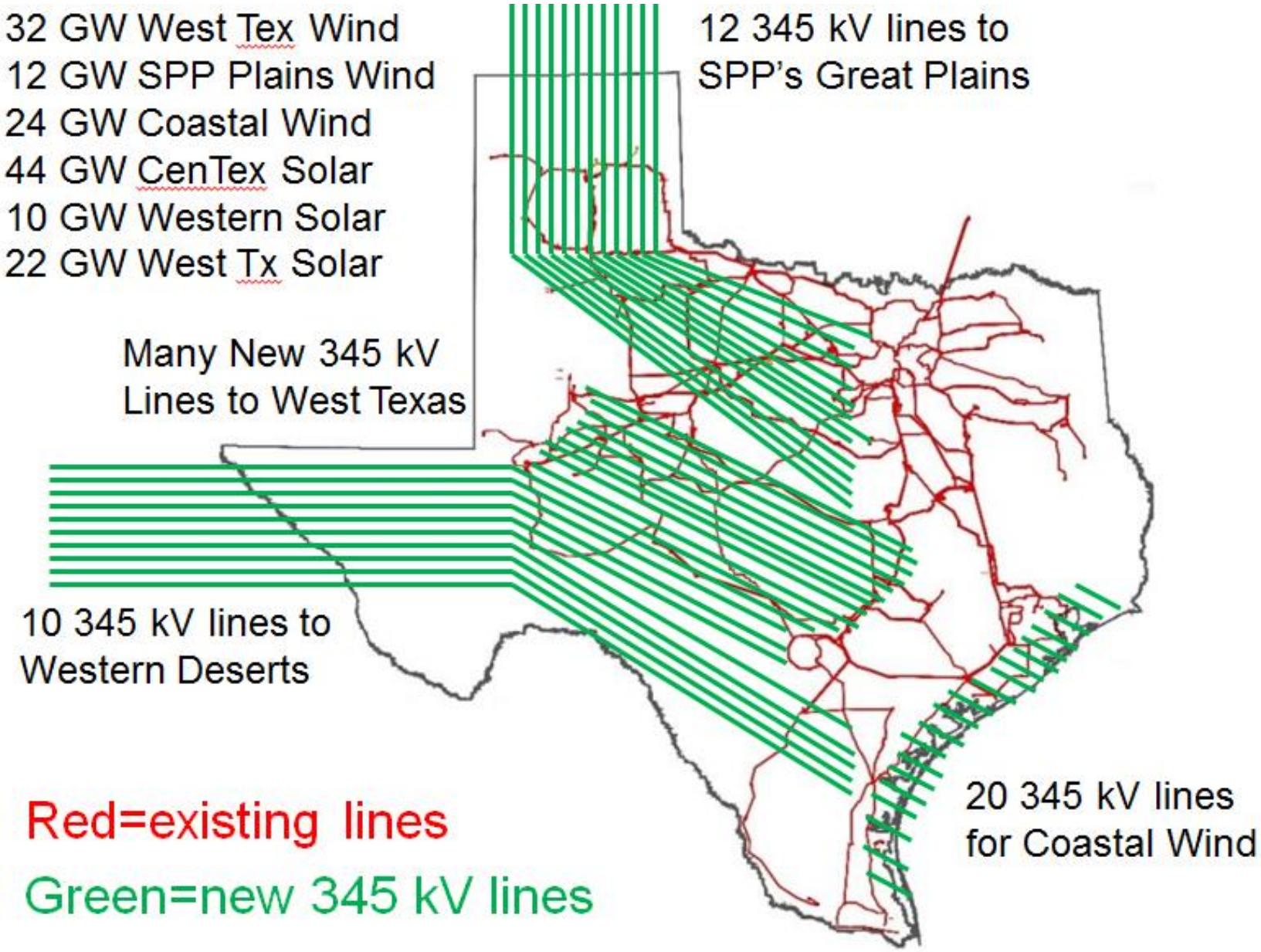
This presentation with links is posted at

http://egpreston.com/DecarbonizingTheGrid.pdf



Several days of low renewable energy is a common occurrence. These can cover areas as large as the United States. Long term storage is needed for renewable energy to bridge these times; an electrical equivalent to grain silo storage. A lack of long term storage forces us to depend on fossil fuels which infrequently run, which has a high cost per kWh.

Many New 345 kV Transmission Lines Are Needed

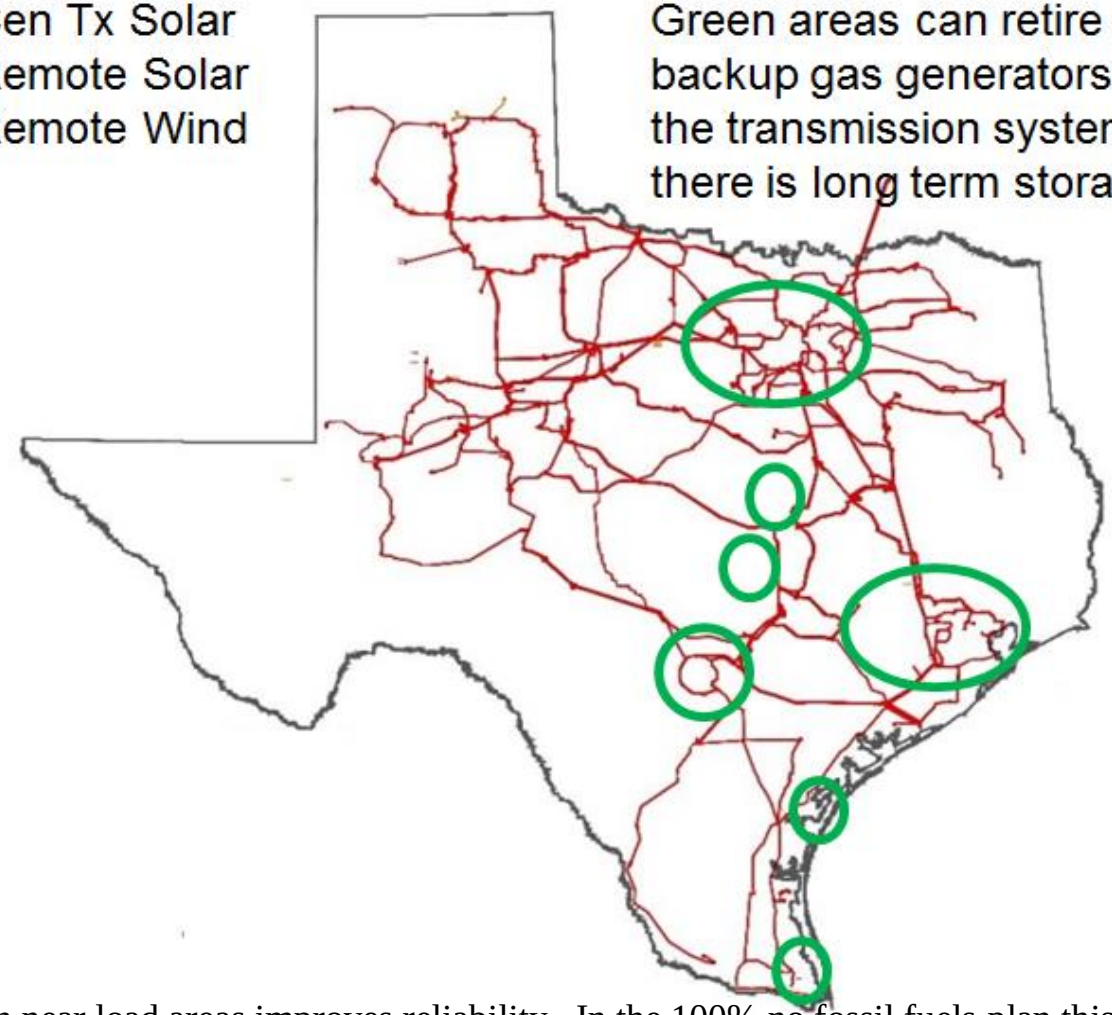


- Red=existing lines
- Green=new 345 kV lines

Without Gas Backups Load Areas Are Unreliable

44 GW Cen Tx Solar
32 GW Remote Solar
68 GW Remote Wind

Green areas can retire their internal backup gas generators only when the the transmission system is strong or there is long term storage in the area.



Local fossil generation near load areas improves reliability. In the 100% no fossil fuels plan this generation goes away creating a severe local load area reliability problem. This could be overcome with a large amount of long term storage in the load areas. Long term storage is at least a day of run time at full storage capacity and probably should be much longer.

Nuclear Is Also An Option

- Eliminates much of the transmission and storage
- Long term fuel supply using IFR waste burner
- Ultra fast load follower using off the shelf parts
- Thorium fuel designs are proliferation resistant
- New designs operate at low 1 ATM pressure
- Spent fuel we currently have is worth trillions
- Nuclear plants give jobs and local tax revenue
- Nuclear can be made both safe and low cost
- Don't let fear rule; Trust engineering solutions

IFR = integral fast reactor burns up spent fuel including actinides; uses liquid sodium at 1 ATM; this design needs more testing. Ultra fast load follower is a 1200 MW nuclear design with gas injection to rapidly raise the power to 2900 MW; needs testing. Thorium molten salt reactors designs are being proposed, such as the Thorcon design. These need to be tested. There are vast sources of nuclear fuel, but not for existing reactor designs. We must move on to testing the new designs which can extend the nuclear fuel supply to thousands of years and are safer and solve a number of problems with existing reactors.