In a number of countries, including Myanmar and Bangladesh for example, we have encountered large projects configured with large capacity power plants that are not supportable in the sites they have been designated to occupy.

Large power plants require heavy infrastructure support, and deep-water draught access.

Furthermore, deploying centralized large power plants require extensive and expensive wide-lane high power transmission facilities to distribute the power to where it is needed.

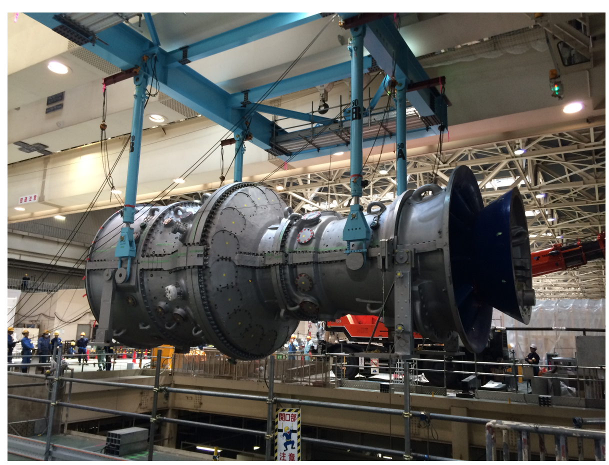
We understand that there are plans afoot to build a 1,200 MW gas turbine power plant in Payra and an 800 MW gas turbine power plant in Mongla.

Such large industrial undertakings require substantial infrastructural support –

Large shipments of casted parts must come up river into ports congested with many small boats.

Assemblage, operations, and maintenance all require jumbo cranes

Repairing these large gas turbine plants requires complex equipment, and special engineering resources:



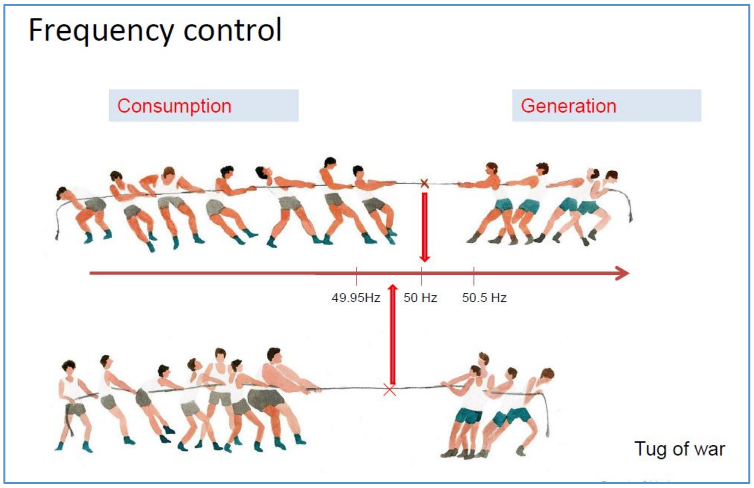
Such large plants require high-voltage transmission facilities to carry the electricity to all the local power distribution grids that deliver it to end-users.

10500 watts of the electricity transmitted is lost as heat generation every 100 km of transmission.

Power Losses in Transmission Lines

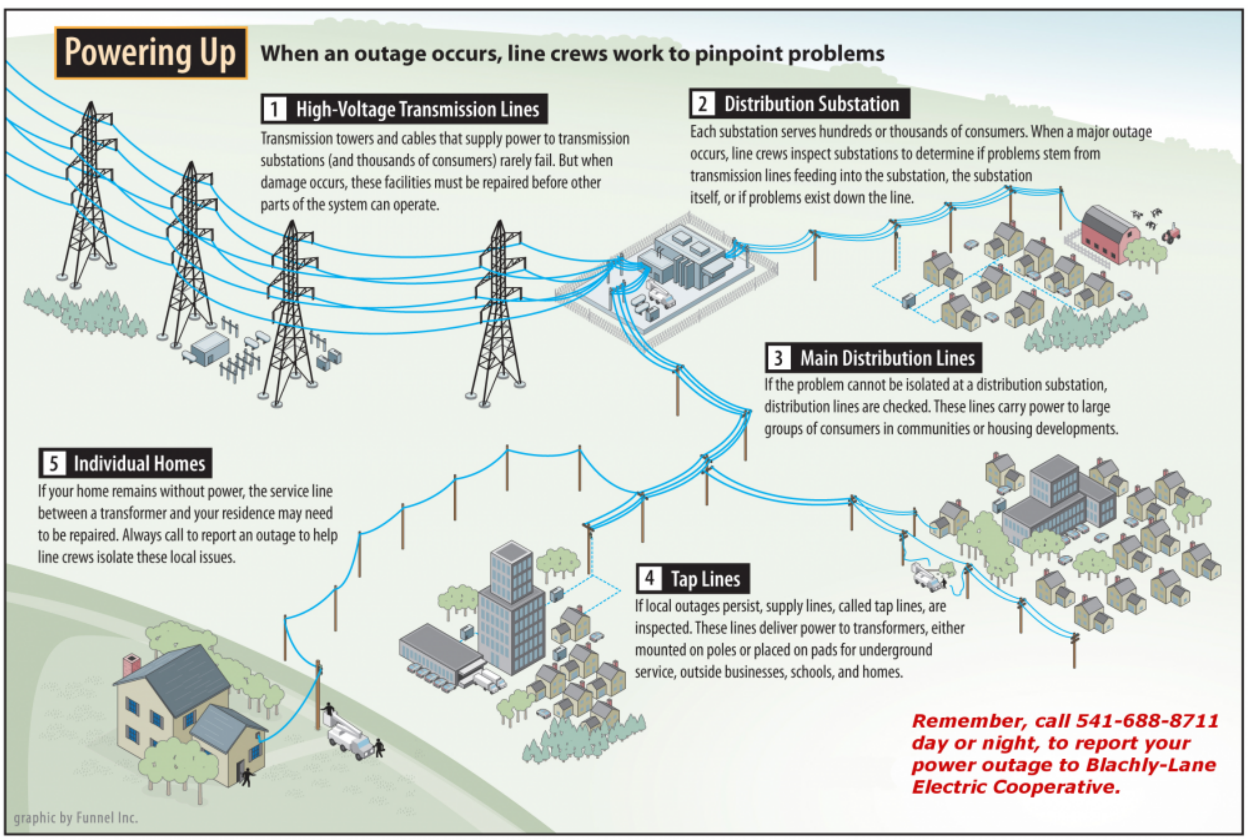
- The main heat loss is due to the **heating effect of a current**. By keeping the current as low as possible, the heating effect can be reduced.
- The **resistance in a wire** due to the flow of electrons over long distances also has a heating effect. If the thickness of the copper wire used in the core of the transmission line is increased, then the resistance can be decreased. However, there are practical considerations such as weight and the mechanical and tensional strength that have to be taken into account. The copper wire is usually braided (lots of copper wires wound together) and these individual wires are insulated.
- The insulation material has a **dielectric** value which can cause some power loss. Some of the power from the lines goes into changing the orbits of the electrons in the insulating material.
- Finally, the changing electric and magnetic fields of the electrons can encircle other electrons and retard their movement on the outer surface of the wire through **self-inductance**. This is known as the 'skin effect'. The size of the power loss depends on the magnitude of the transmission voltage, and power losses of the order of magnitude of 105 watts per kilometre are common.

Synchronizing machines throughout the transmission network are needed to balance the electricity flow at 50 Hz:



Otherwise, the grid will shut down, to protect itself.

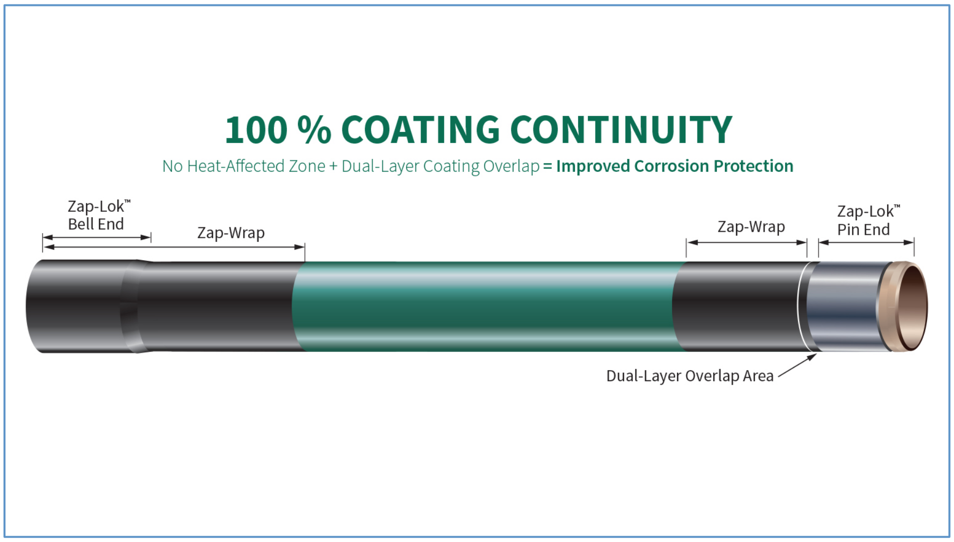
The centralization production and wide decentralization of produced electricity is complex, expensive and vulnerable – especially for a developing country:

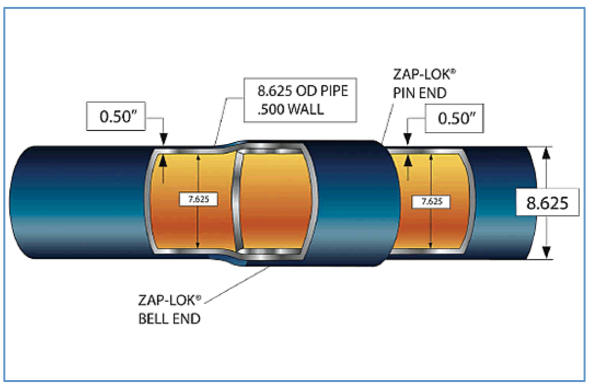


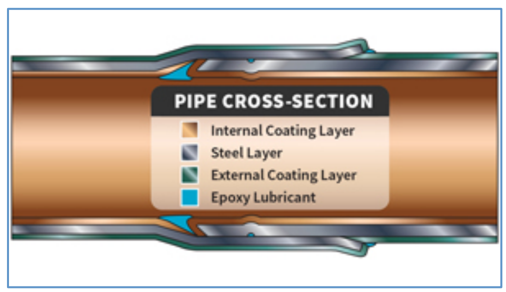
When electricity goes out, most of us expect power will be restored within a few hours. But when a major storm causes widespread damage, longer outages may result. Co-op line crews work long, hard hours to restore service safely to the greatest number of consumers in the shortest time possible. Here's what's going on if you find yourself in the dark.

We recommend a decentralized generation strategy:

[1] Build and operate an underground natural gas pipeline that delivers fuel to small power plants co-located with their retail power distribution grids for end-users.

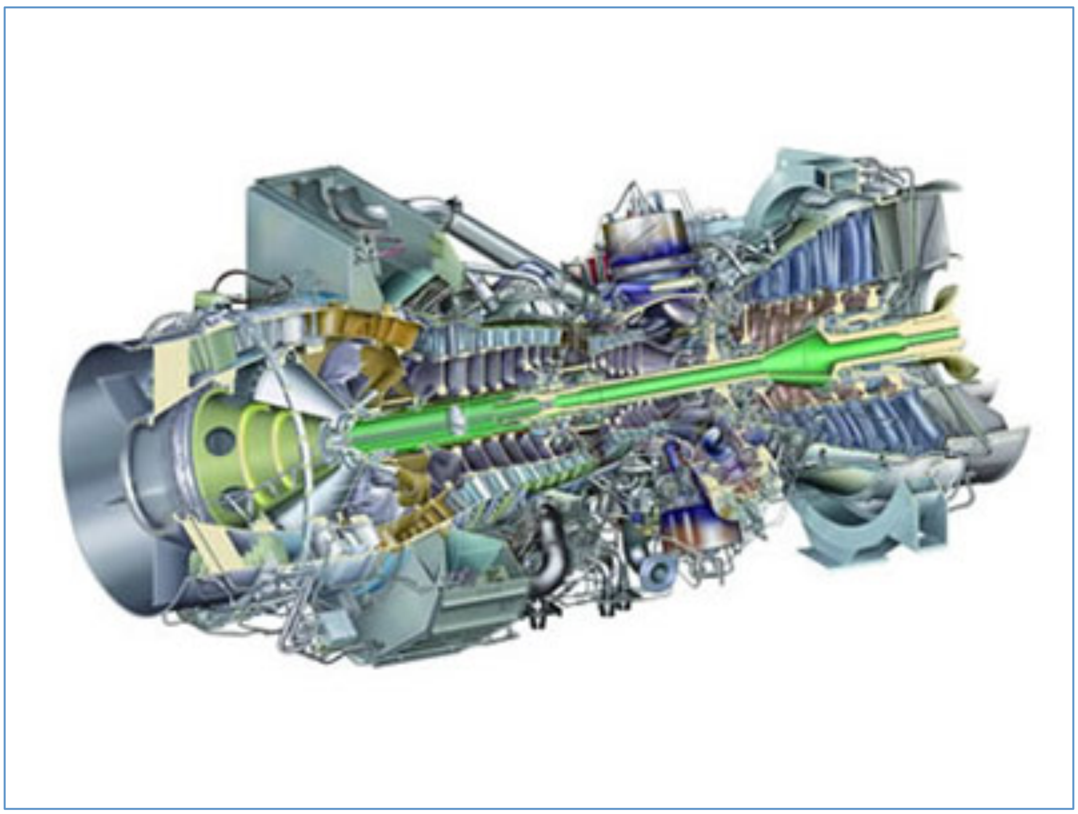






[2] Create small (60 – 120 MW) gas power plants that can be readily built out, are easy to operate, maintain, and repair without major infrastructure support.

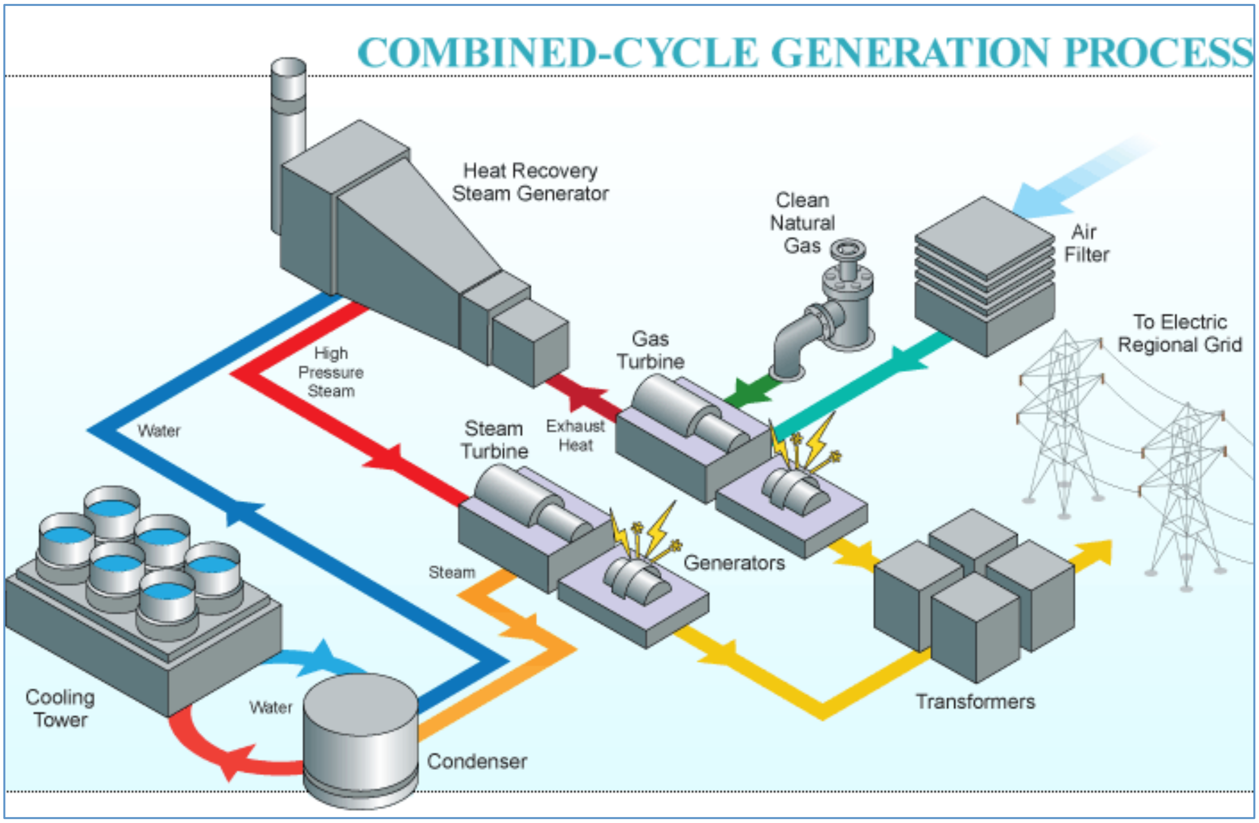
Two 60 MW combined cycle gas turbines operating in tandem.



Summary of the benefits of the Industrial Trent 60 WLE (66 MW):

- Highest power aeroderivative gas turbine
- Highest simple cycle efficiency gas turbine
- Aeroderivative flexible power – starting and restarting in less than 10 minutes with multiple start capability

Using two Trent 60 MW aeroderivatives, a combined cycle power plant can be deployed at 50+% heat rate efficiency.



We would also utilize an innovation developed in Prague, Czech Republic by Prague – Brayton:

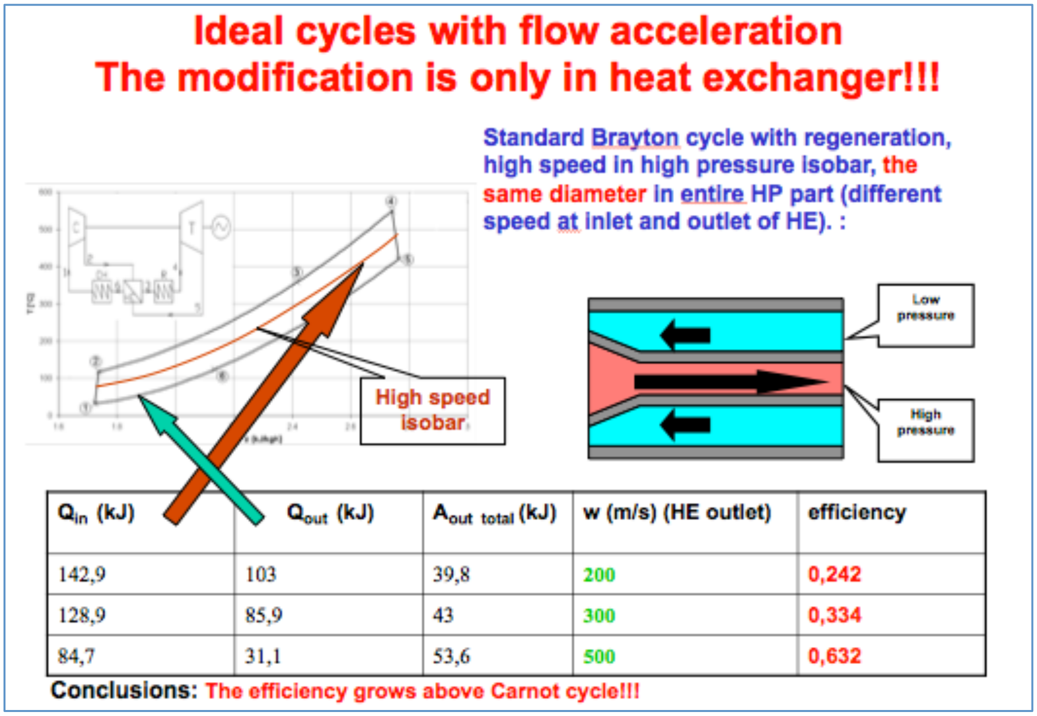
OCGT, CCGT efficiency improvement by low temperature conversion cycles with flow acceleration

SHORT DESCRIPTION, COMMENTS

Petr Hájek

Today's general approach leading to cycles with high efficiency is to go to maximum temperatures, but also other ways can be exploited.

IT IS SUPPOSED THAT THE CYCLE CAN BE DEVELOPED WITH:
•input heat temperature in the range 100 – 150°C (212 – 302 F)
•efficiency in the range 30 – 40%
•only waste heat from OCGT is used as input in the cycle, that by 30 – 40 % growth former efficiency of OCGT



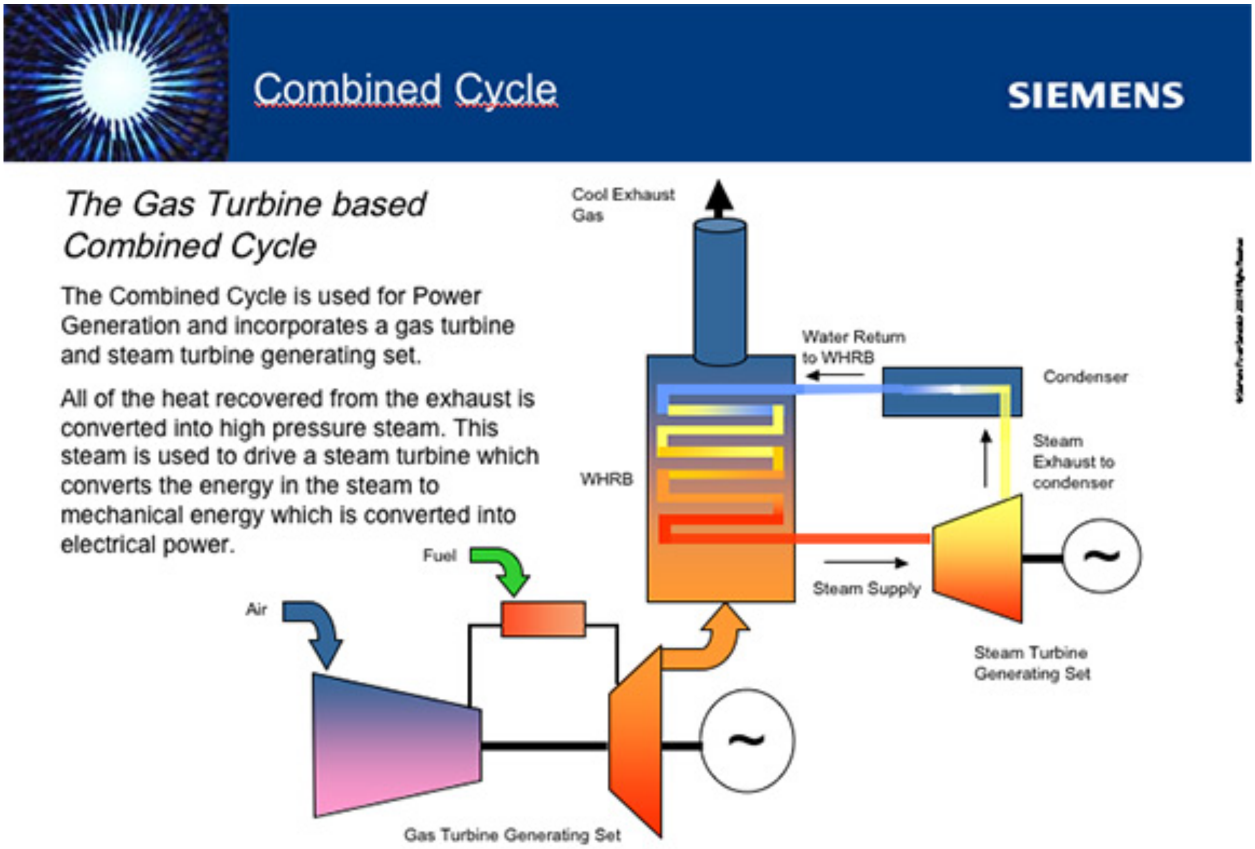
Q_{in} (kJ)	Q_{out} (kJ)	$A_{out\ total}$ (kJ)	w (m/s) (HE outlet)	efficiency
142,9	103	39,8	200	0,242
128,9	85,9	43	300	0,334
84,7	31,1	53,6	500	0,632

The Prague-Brayton heat exchanger could utilize 100˚ C. to achieve 30% higher heat ratethan the standalone CCGT power plant – from 50+% to 65+% -- resulting in more electricity generated per million BTUs of natural gas.

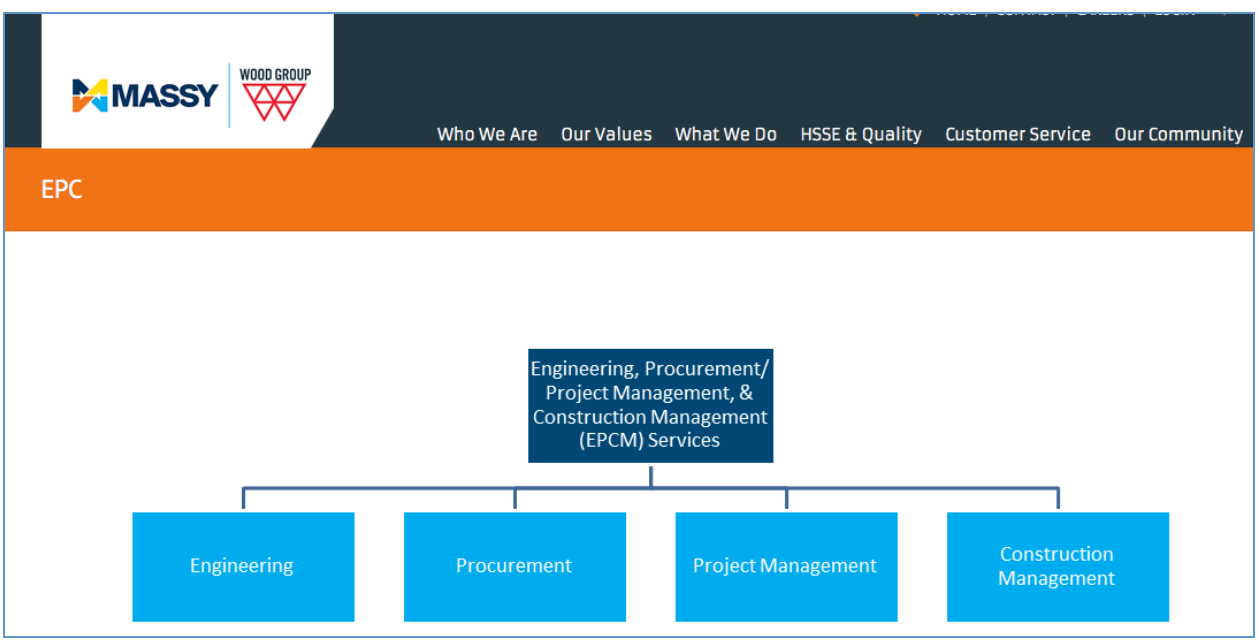
Benefits of This Strategy over centralized power generation with high-voltage power transmission.

- Faster build out
- Lower cost build out
- Easier to manage fuel supply chain versus hard-to-manage electricity distribution chain
- More local autonomy as each retail power grid has its own generation facility, with gas from the pipeline.
- Lower overall risk management issues will yield higher availability and reliability of electrical power throughout the region.
- Elimination of most inter-dependencies of a long-distance grid.

For generation, we would use Siemens combined cycle gas turbines:



For EPC we would use Wood Group



For terrestrial pipeline we would use NOV Tubescope and its Zap-Lok™ pipe interconnection technology.

ZAP-LOK AND INTERNAL COATINGS

Zap-Lok connections improve coating integrity while simultaneously simplifying pipeline construction. By eliminating the heat of welding, Zap-Lok allows for the use of internal coatings without the risk of damage to the connection area. Every length of pipe is manufactured to allow a 100% continuous coating layer by creating an overlapping, dual-layered coating section.

This process ensures a high margin-of-safety and can still be completed at rates over 1,000 ft. per hour in the field.

To learn more about Zap-Lok's Coating Advantages click here to navigate to our coatings page.

Installation Footprint – Case History

8 inch Welded Construction	
Welding Crew	20 people
Field Joint Coating Crew	5 people
X-Ray Crew	2 people
Total Pieces of Equipment On-site	15 pieces

8 inch Zap-Lok Construction	
Zap-Lok Installation Crew	12 people
Total Pieces of Equipment On-site	5 pieces

Zoom