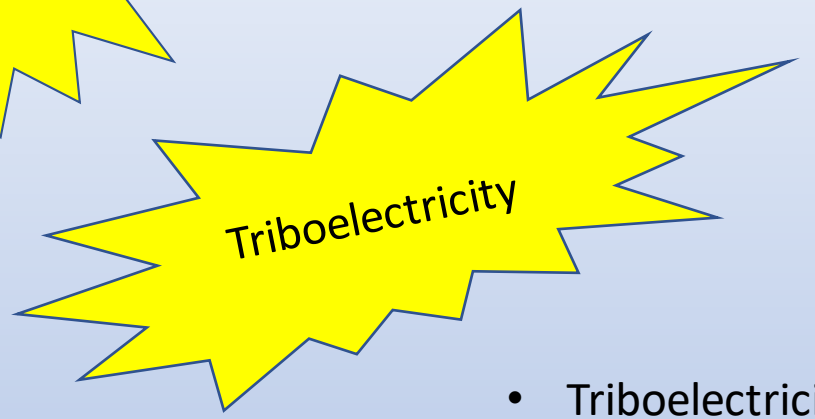
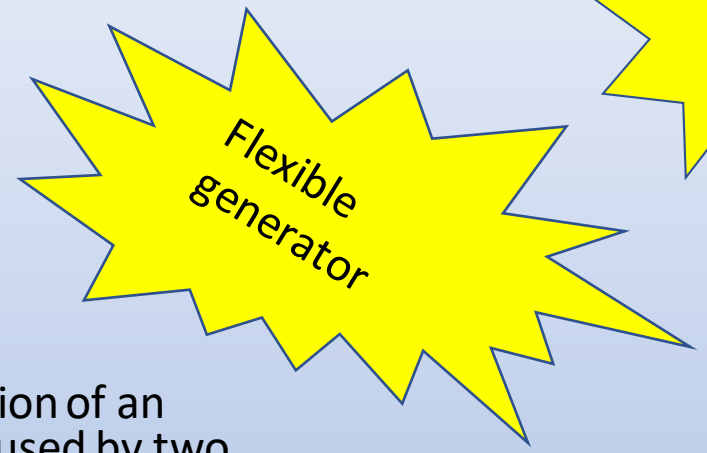
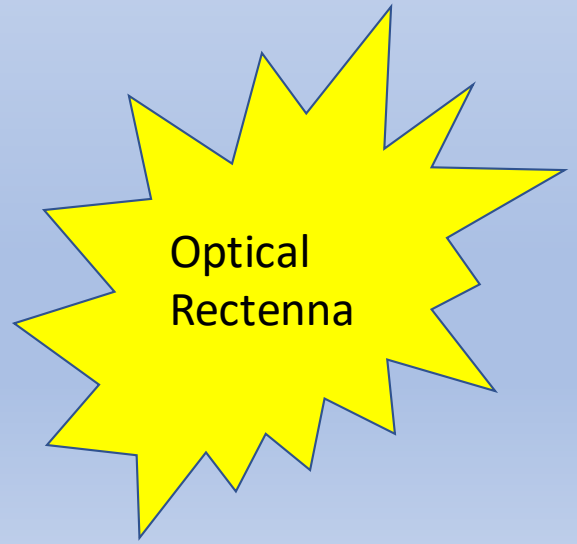
A look into the future of Energy Efficiencies

We won't let history define our future. Our actions will speak for us. Our determination will turn doubters into believers.

Future Power Considerations

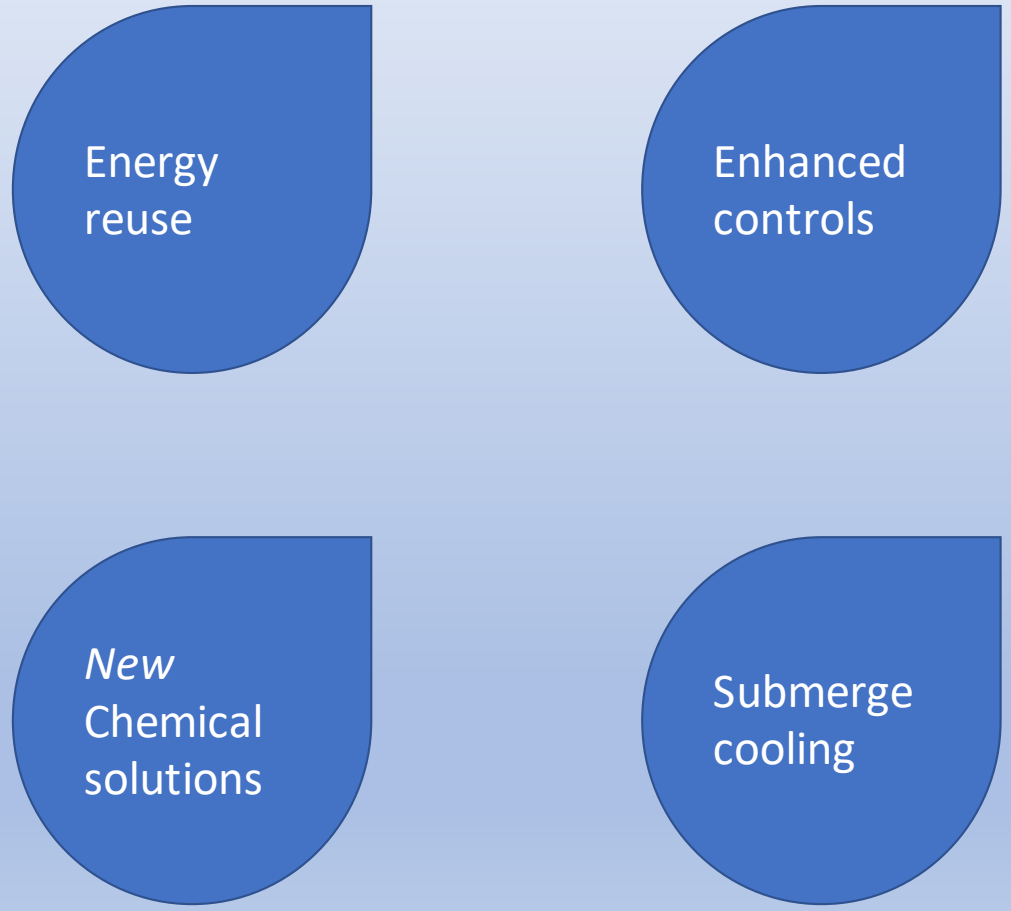






- Triboelectricity- Enables production of an electrical charge from friction caused by two different materials coming into contact
- Optical rectenna- Electromagnetic waves into direct current electricity
- Flexible generator- Solid-state devices that directly convert heat to electricity without moving parts
- Enhanced controls- Plant control systems and compute controls all inclusive
- Sodium Ion batteries- Could be a replacement for Lithium
- U Beam batteries- Uses ultrasound to transmit electricity

Future Cooling Considerations

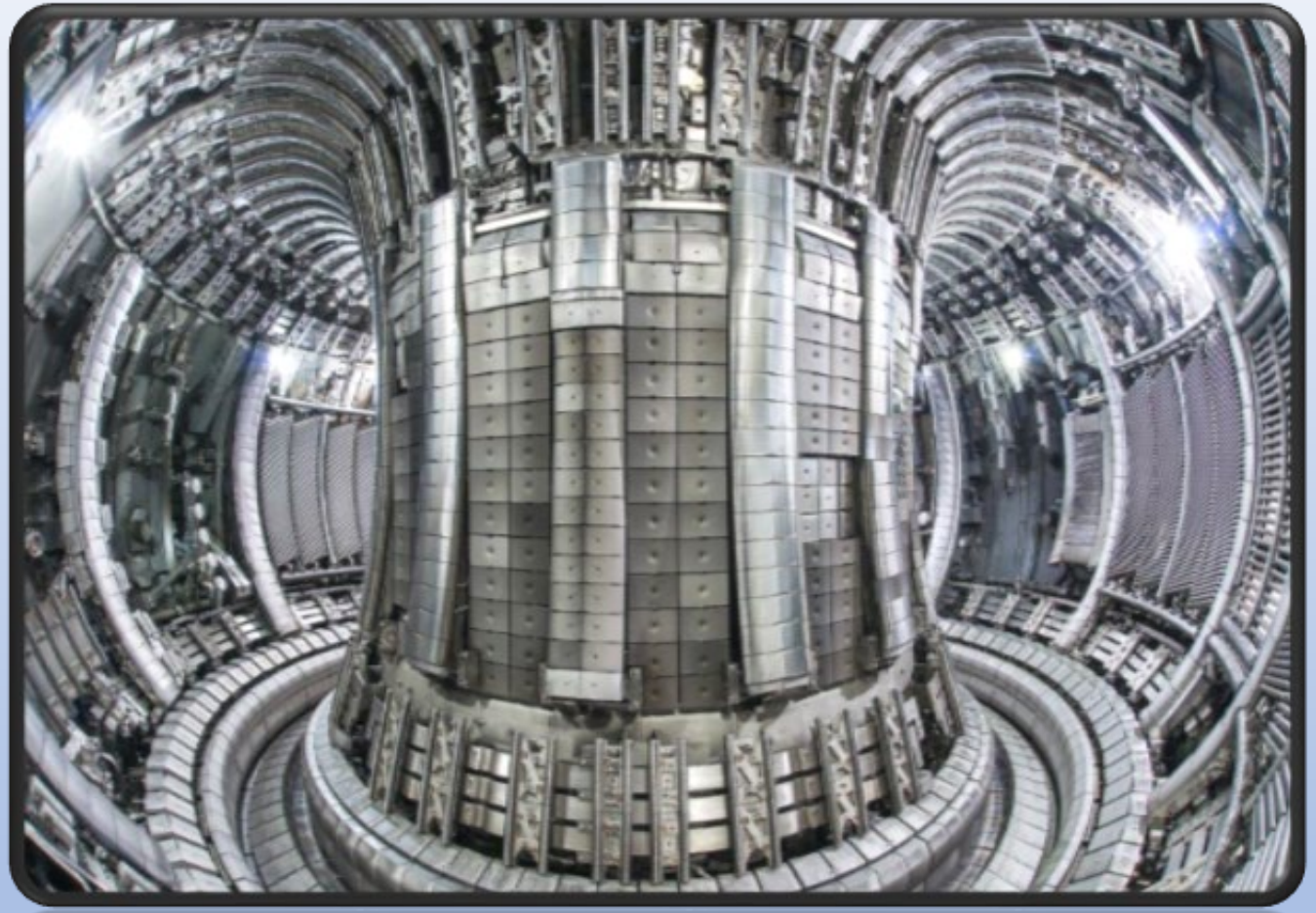


- Energy reuse – Capture waste heat and repurpose
- *New* Chemical solution – Emerging chemical solution that will enhance heat transfer
- Submerge cooling – Utilizing an immersive solution for infrastructure and at compute level
- Enhanced controls – Plant control systems and compute controls all inclusive

What could this mean to existing infrastructure

- Resiliency – Right condition and right controls - know your environment
- Energy efficiencies – Need to be more energy efficient will be the driver
- More efficient designs – Thinking outside of the box
- Long range planning/flexibility – Must be a visionary to develop a sustainable over arching plan that includes strategies for both power/ cooling & connectivity to the site
- Closely coupled/integrated control systems are a must – Algorithms based on compute demand/power availability/environmental all meeting the most optimum curve in the respective design
- New team members (e.g., chemical engineers, high voltage engineers)
- Collaboration of efforts – Can't do it alone

Alternative sources of power

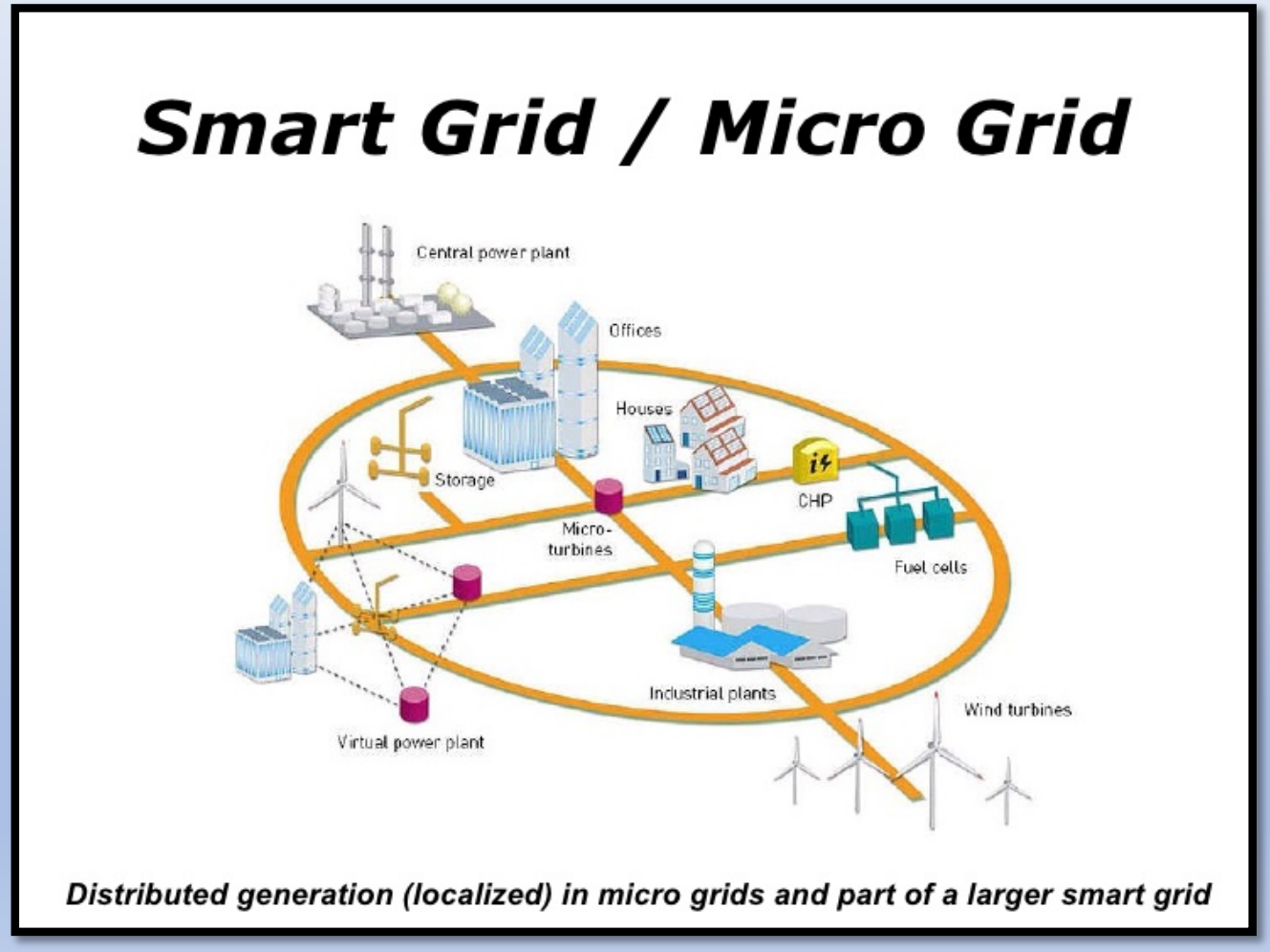


- Fuel cells
- Wind/solar
- Geo thermal
- Nuclear fusion

Future Cooling Considerations

- Thermosyphon
- Hyperbolic Cooling Tower
- Plate Frame Heat Exchangers
- Absorption Machines

Completing the Puzzle



- All inclusive in one arena
- Self sustaining system
- Utilization of the grid as back up power
- Low impact to the community
- No impact to the aging outside infrastructure (e.g., transmission lines and piping)

Life is all about choices…