

Interconnection Process vs Project Development Timeline: Offshore Wind

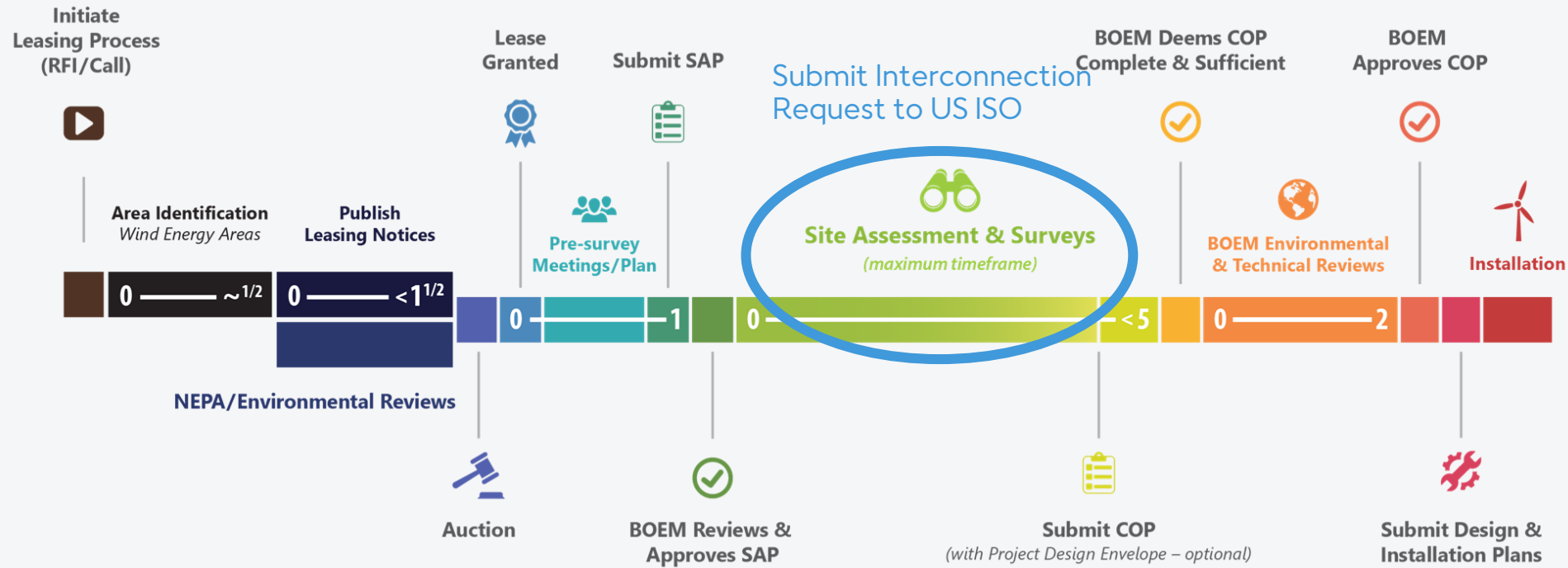
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When does offshore wind farm design start?

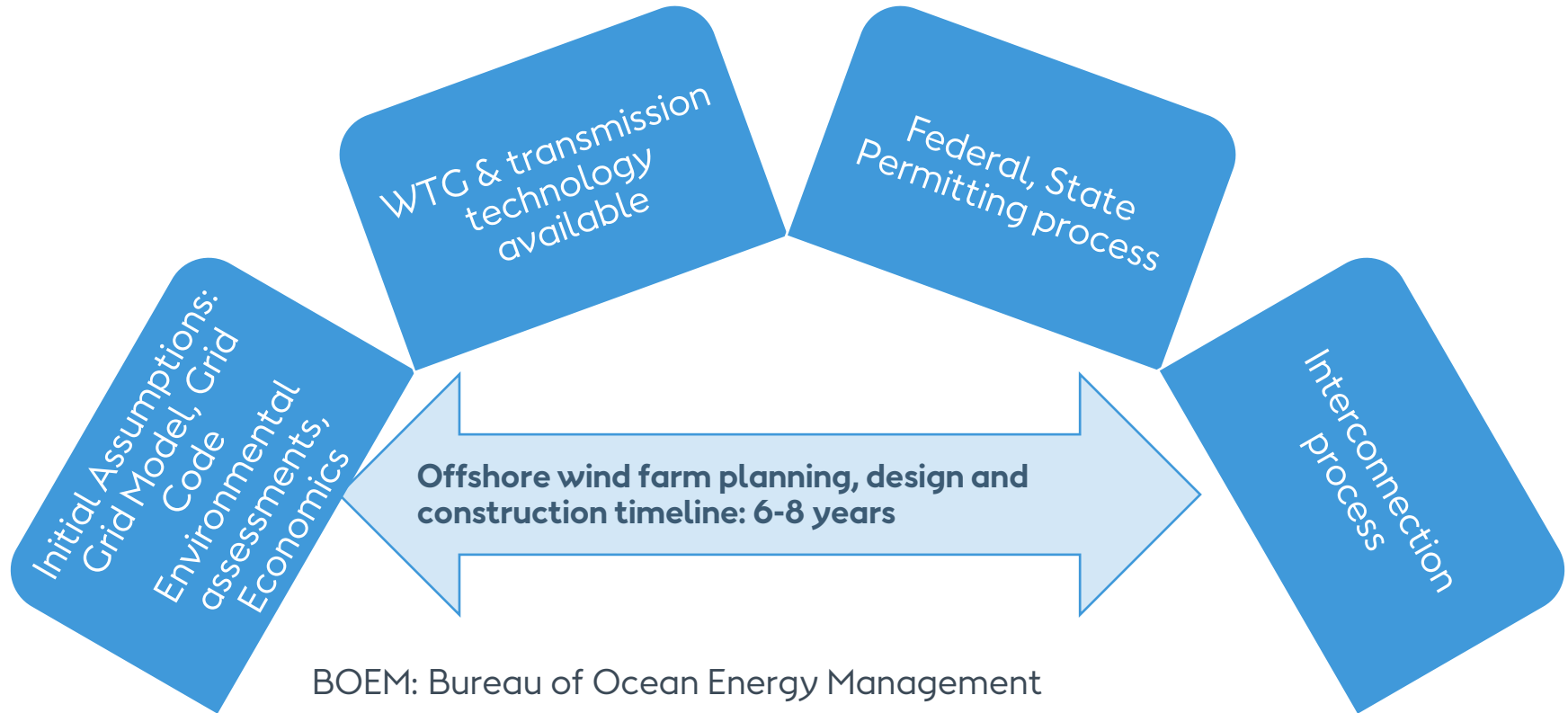
US region specific process

US Federal Offshore Wind Process



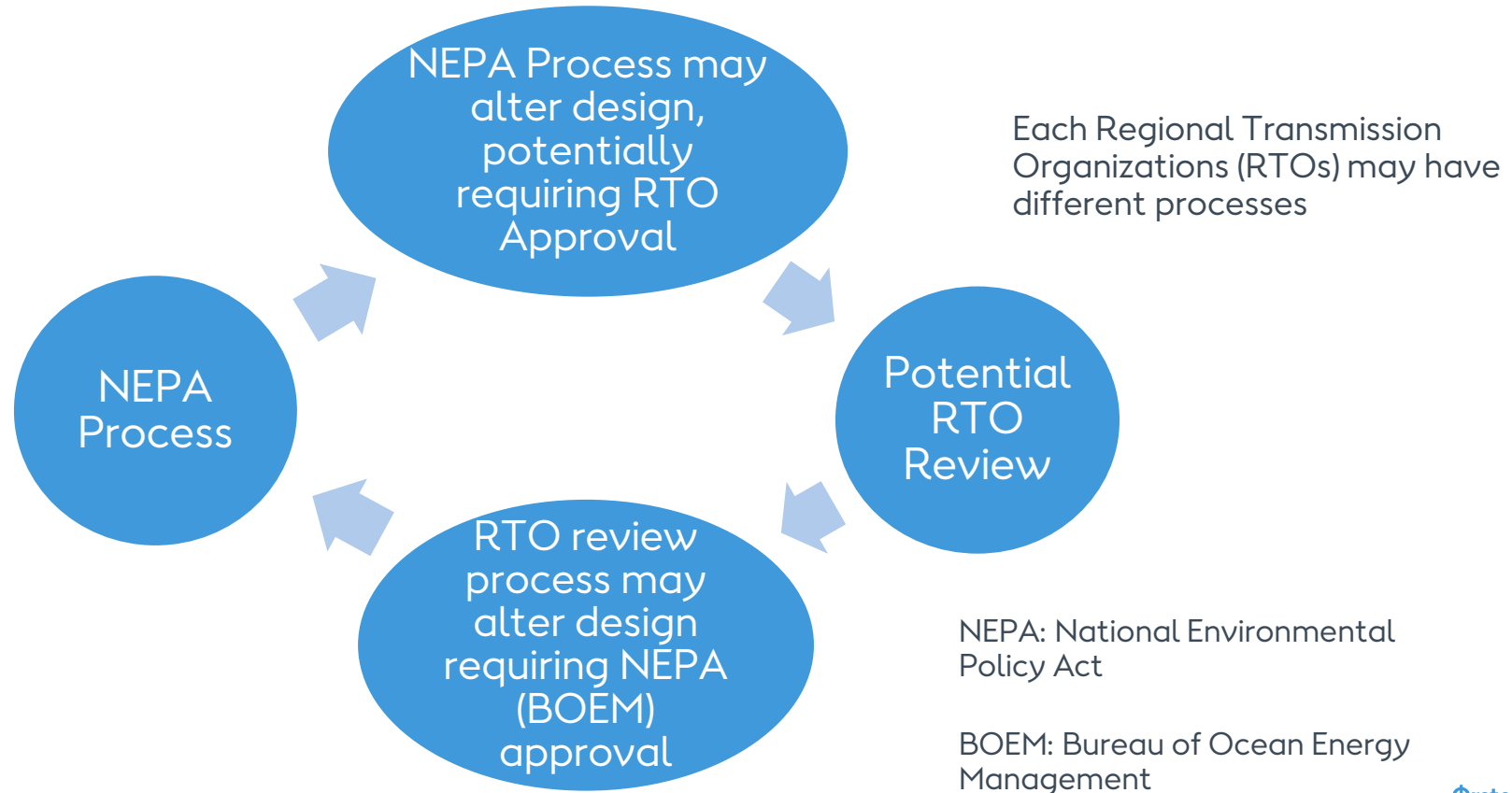
Courtesy: Bureau of Ocean Energy Management

US Offshore wind farm planning and design: An Overview

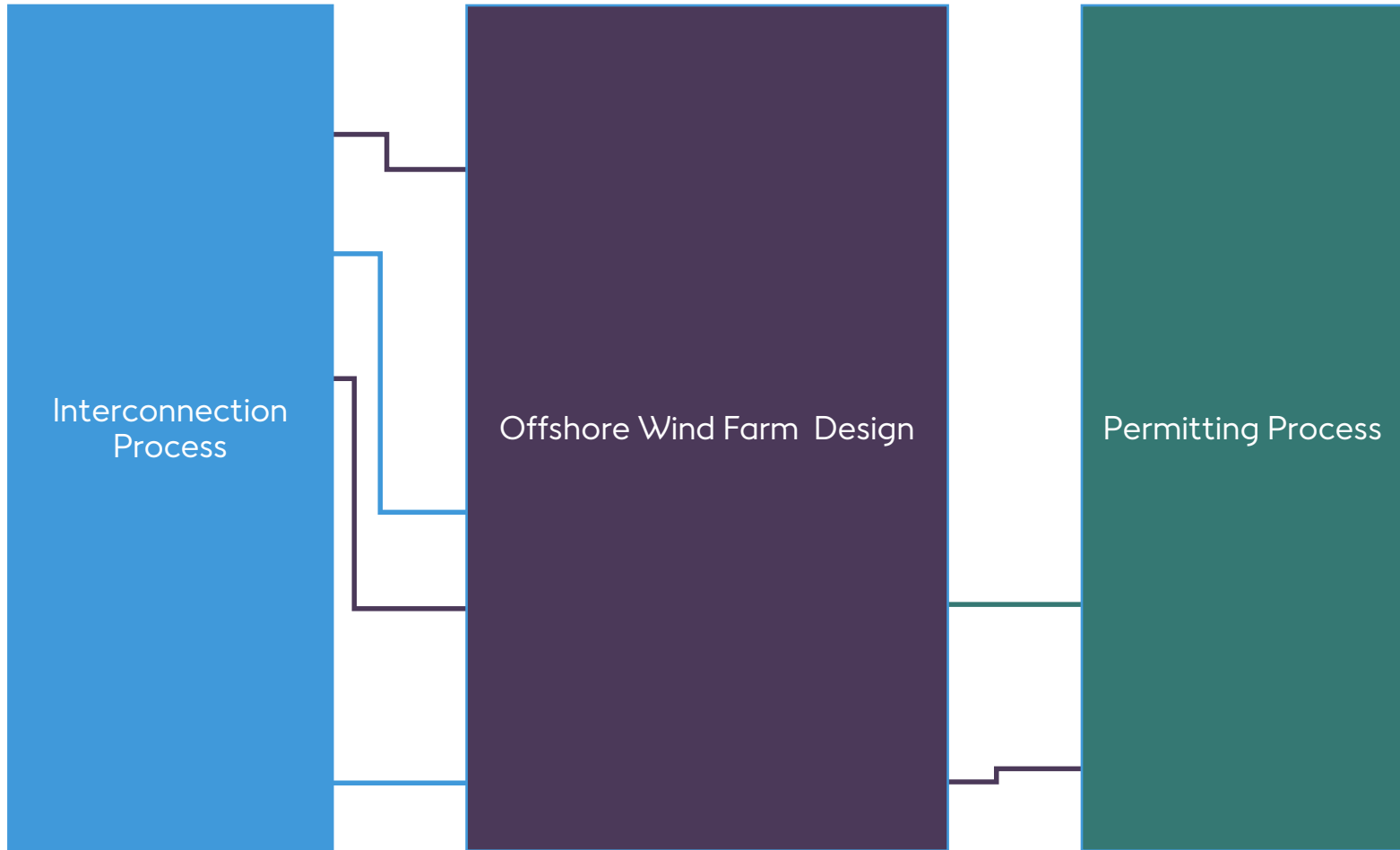


BOEM: Bureau of Ocean Energy Management
WTG: Wind Turbine Generator

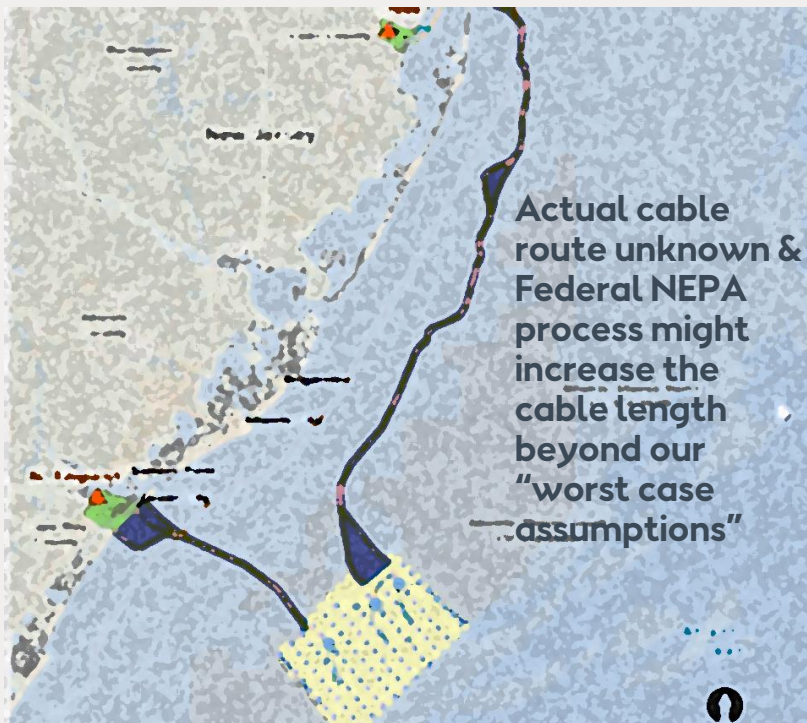
Relationship between federal permitting and Interconnection process



Interplay : Interconnection Process and Federal Process



An example case: Offshore wind farm design & US permitting



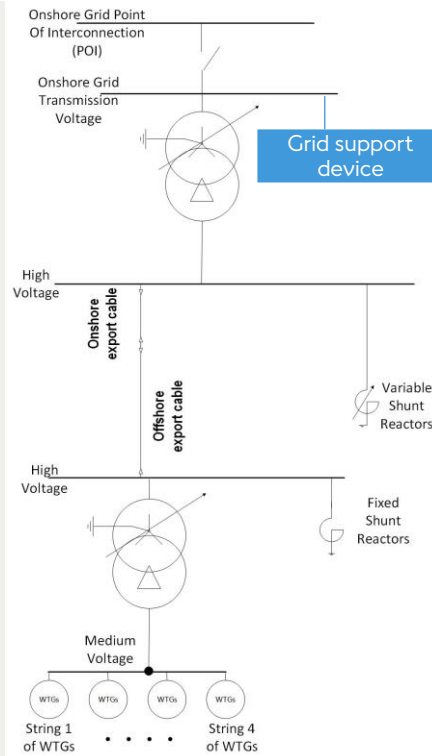
Why does cable length matter?

- Additional reactive power compensation: Will trigger new federal permitting process
- Might decrease the short circuit strength at the WTC terminal, necessitating additional equipment onshore like synchronous condenser. This will require start of new federal permitting process

Federal NEPA process can change WTC rating, number, layout, cable routes, location of reactive power compensation, filter location, etc

An example case: Offshore wind farm design & US interconnection

- Late stage understanding of grid requirements and stability concerns
- Most often mitigation requires additional onshore equipment
- Trigger new federal permits
- Revised design triggering re-study for the US ISO
- Challenges in obtaining project specific models from the equipment vendor



Conclusion

- Accurate transmission grid model/data early reduces offshore wind farm design iterations and minimizes the risk of sub-optimal designs
- Early knowledge of grid code helps mitigate late stage design changes and eliminates the risk of restarting federal permitting process or interconnection process
- Offshore wind farm transmission system plays a vital role in providing grid stability and significantly impacts the plant interaction with the grid.
 - Dynamic device like STATCOM, HVDC converters (if present must be modelled in the planning studies.
 - All other passive balance of plant equipment must be modelled adequately depending on the study type (stability, power quality)
- Coordination between Federal regulatory and interconnection process would reduce the project development cycle time to 5-6years instead of 6-8years.