



Floating Production, Storage and Transfer of offshore energy

- perspectives on Oil, Gas and Renewables in the energy transition

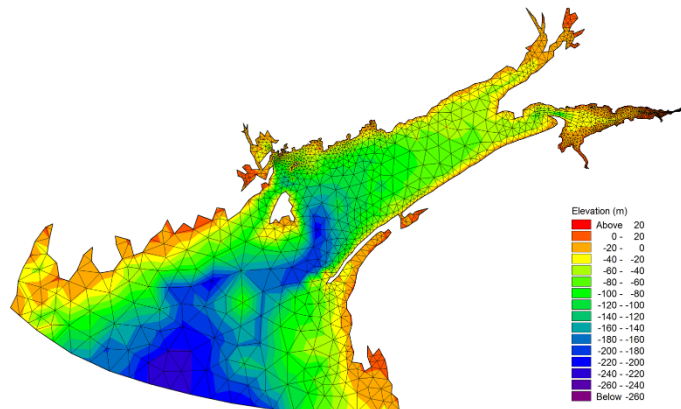
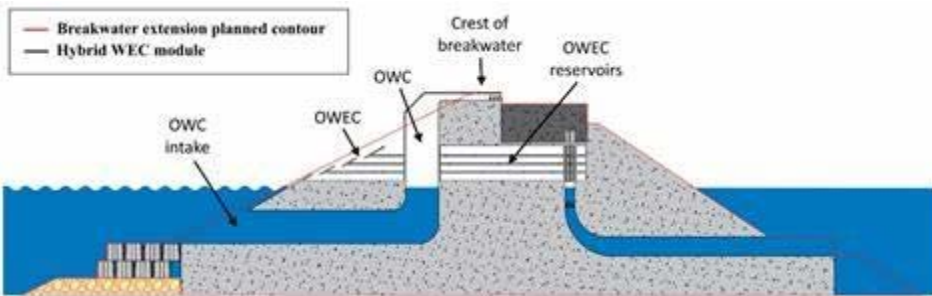
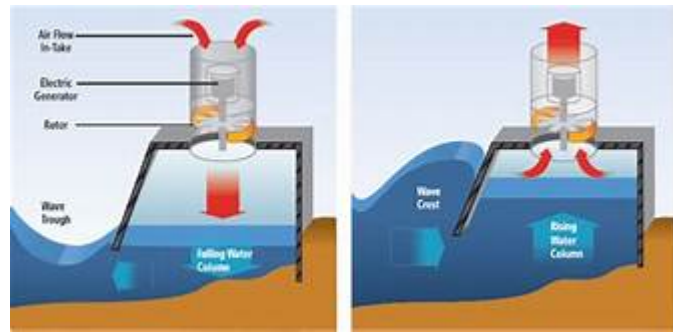
Arun Duggal

SOFEC, Inc.

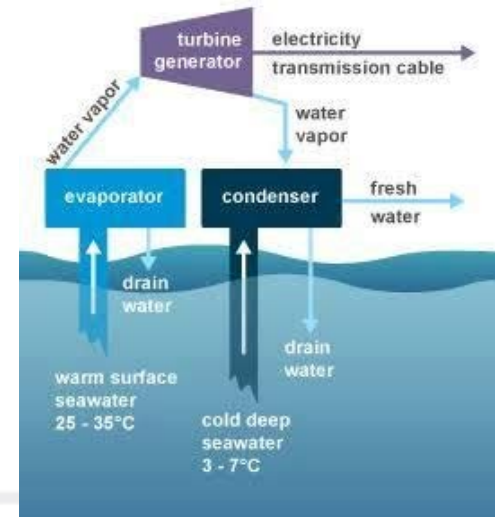
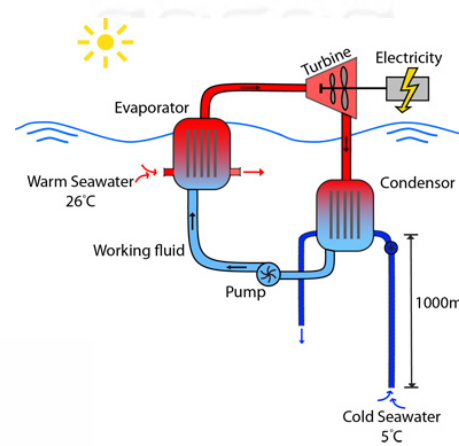
FPSO Research Forum

WWW, 27 May 2020

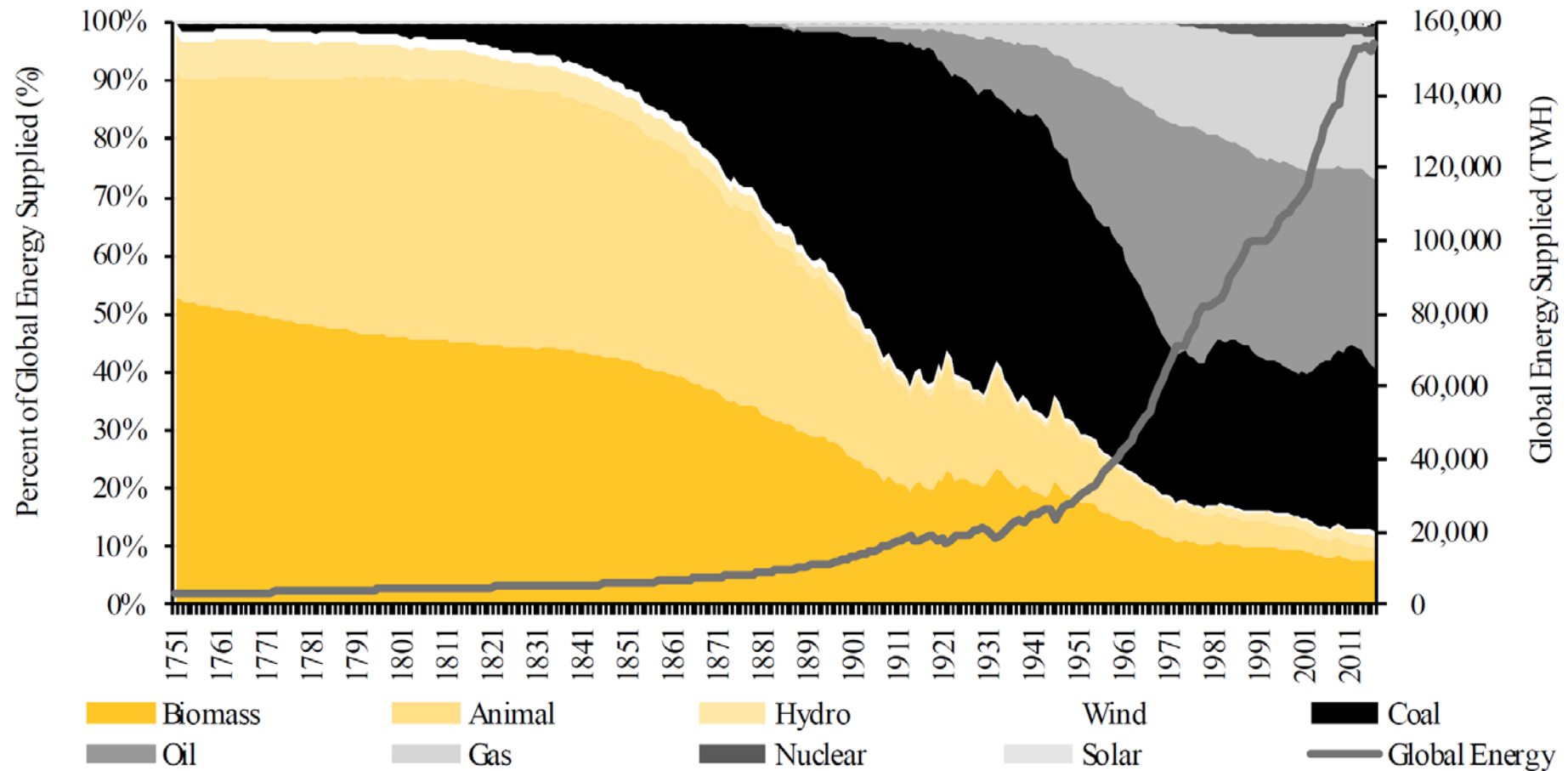
My Inspiration..... and Career Path!



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Energy Disruption: Over Decades not Years

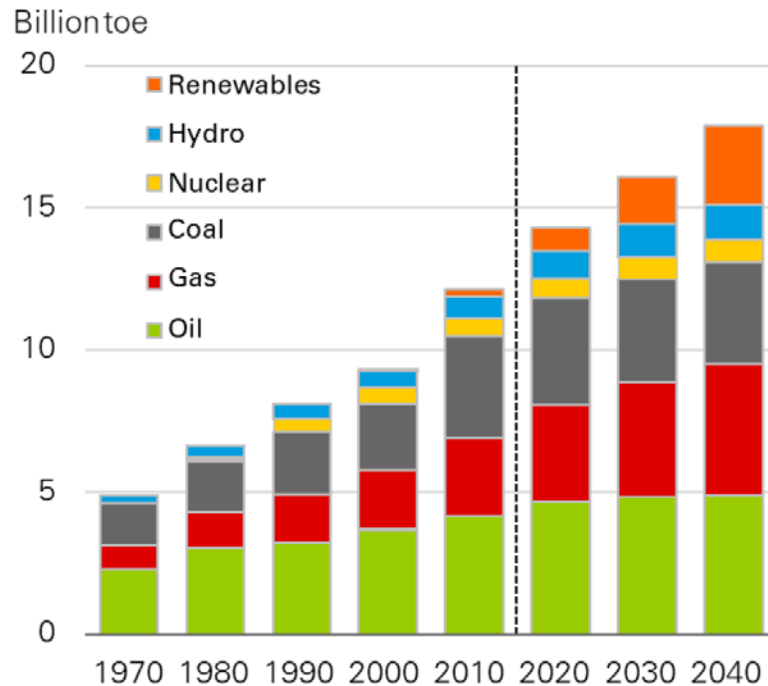


Source: BP Statistical Review, Carbon Dioxide Information Analysis Center, Smil, V. (2017). *Energy Transitions: Global and National Perspectives*, Redburn estimates, Rob West, Thundersaidenergy.com (2019)

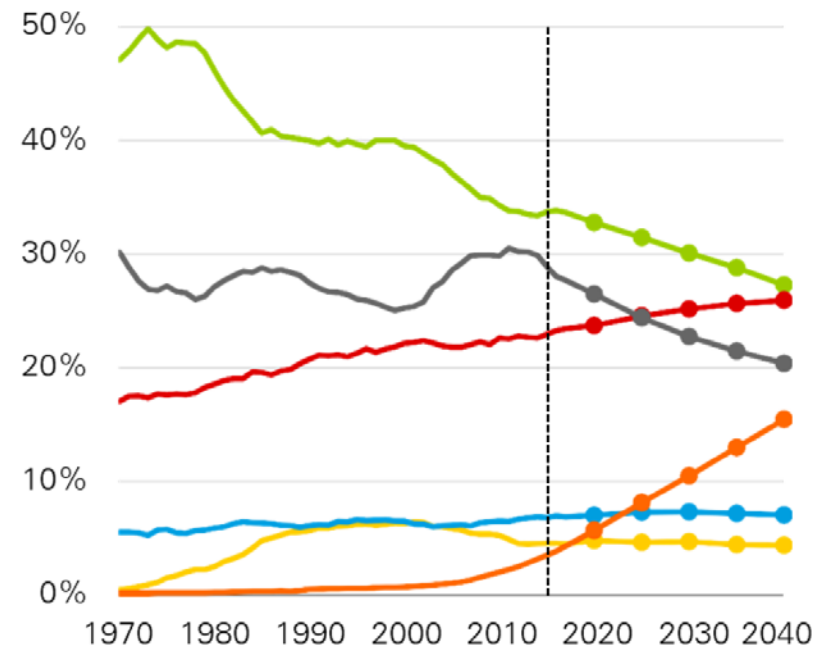
Global Energy by Fuel Type (One View!)

SOPEC

Primary energy consumption by fuel



Shares of primary energy



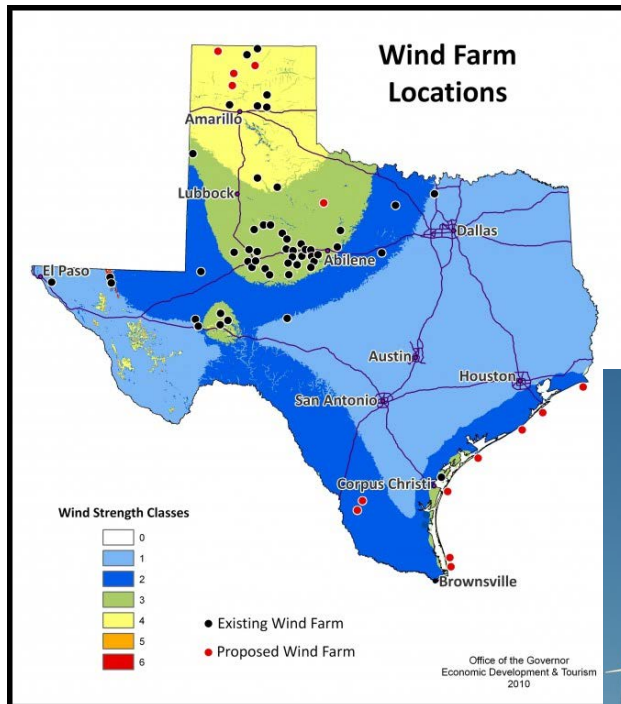
2019 BP Energy Outlook

© BP p.l.c. 2019

David O'Connor, BP (2019)

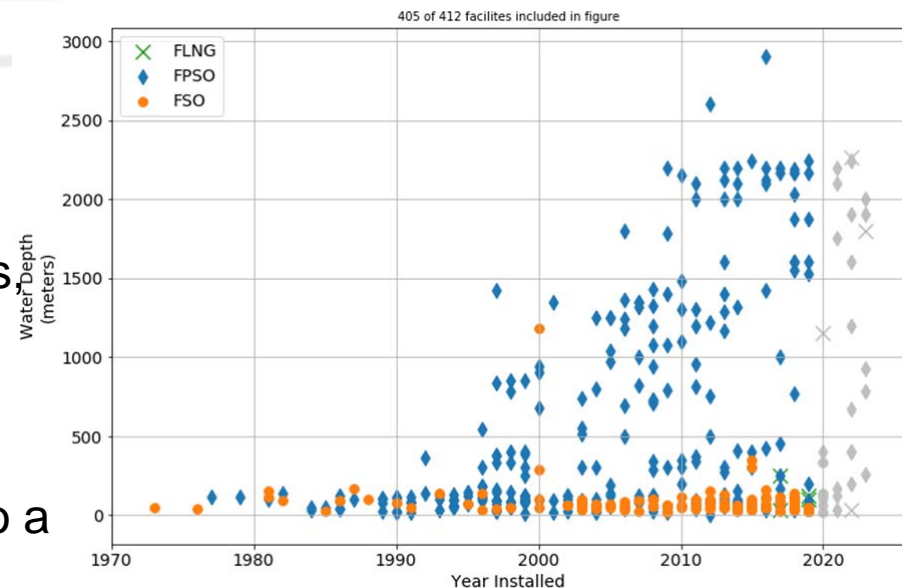
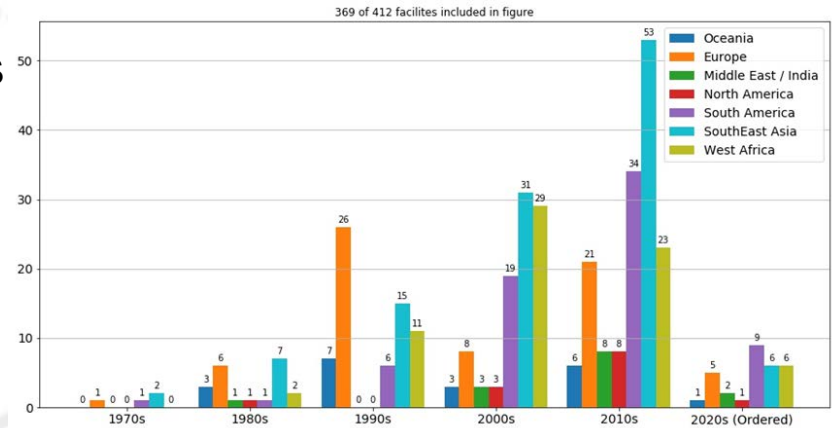
Wind Energy in Texas

- Some facts:
 - 28 GW [2019] installed capacity, peak 19.7 GW (Jan 2019)
 - If Texas was a country it would rank #5 in the world after China, USA, India and Germany!

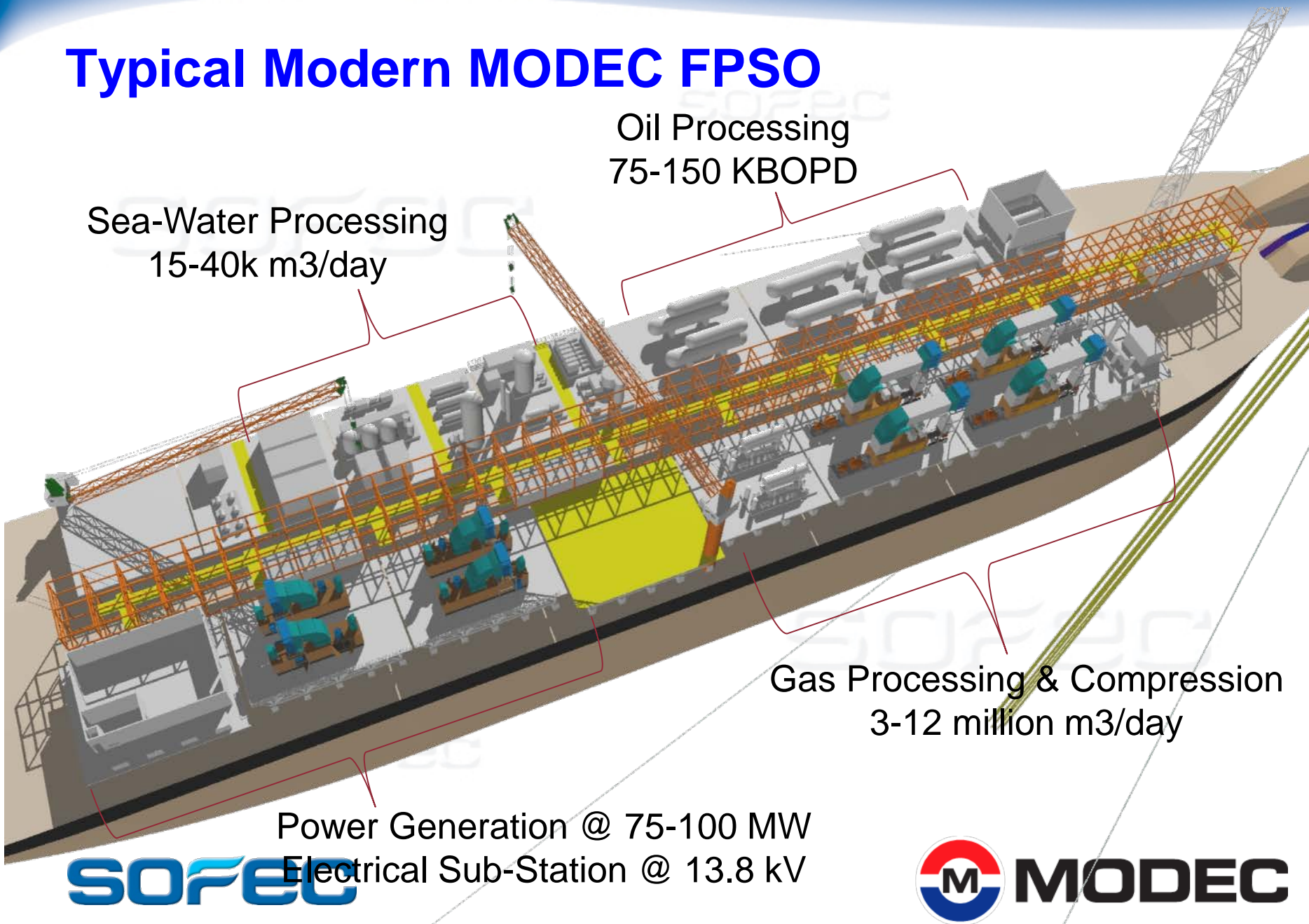


FPSOs – ~5 Decades of Innovation

- Over 400 Floating Facilities
- Variety of Mooring Systems and Hull Forms
 - Focus on Safety, Reliability, and the Environment
- Innovation in all aspects of the development:
 - FPSO Hulls
 - Mooring Systems
 - Topsides
 - Risers
 - Subsea Technologies
- Current focus on ensuring low emissions, efficiencies across the system, CO2 Separation and Injection, Digitalization, Remote manning, etc.
- Technology developed can be applied to a number of alternative energy systems



Typical Modern MODEC FPSO



Oil Processing
75-150 KBOPD

Sea-Water Processing
15-40k m3/day

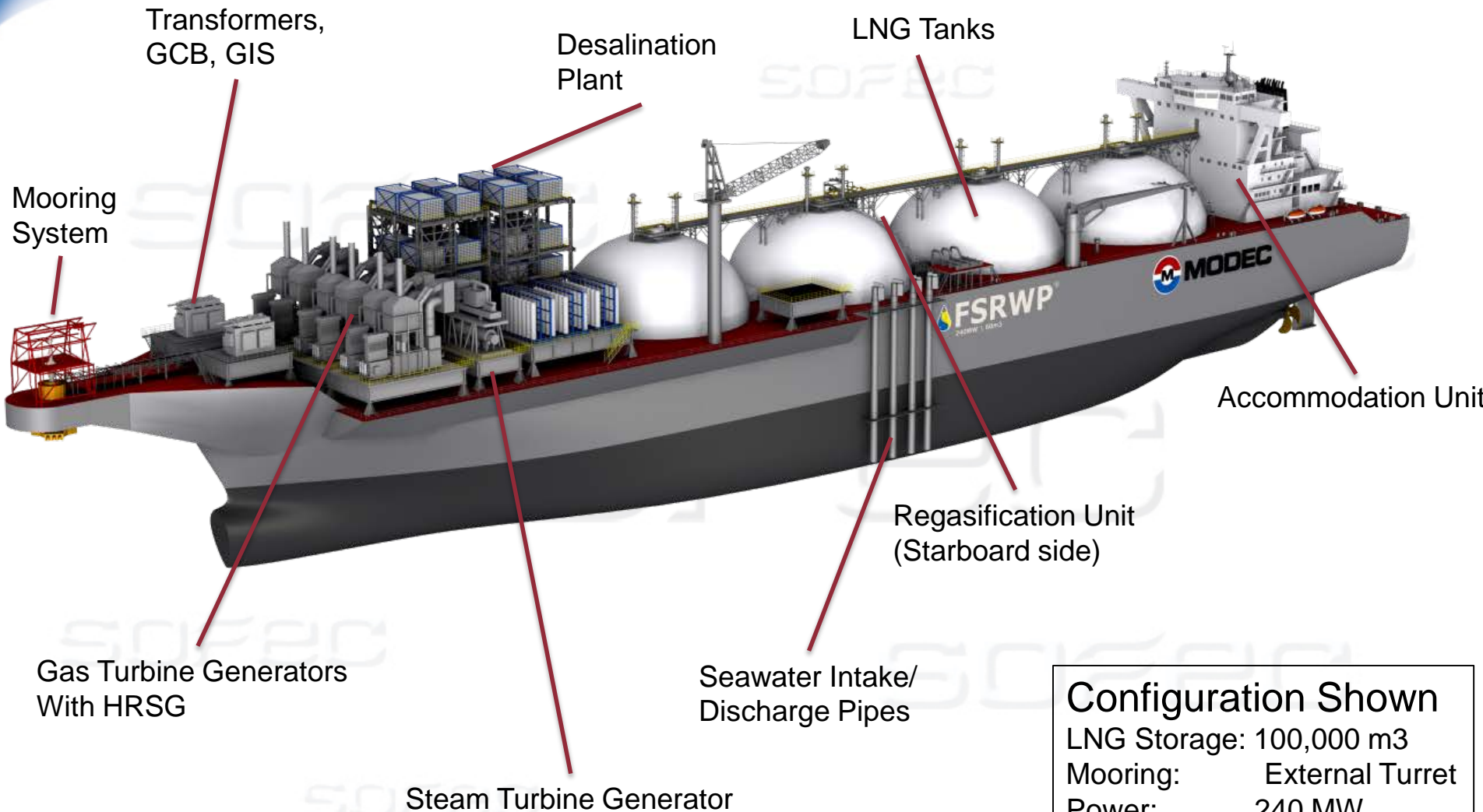
Gas Processing & Compression
3-12 million m3/day

Power Generation @ 75-100 MW
Electrical Sub-Station @ 13.8 kV

SOFEC

MODEC

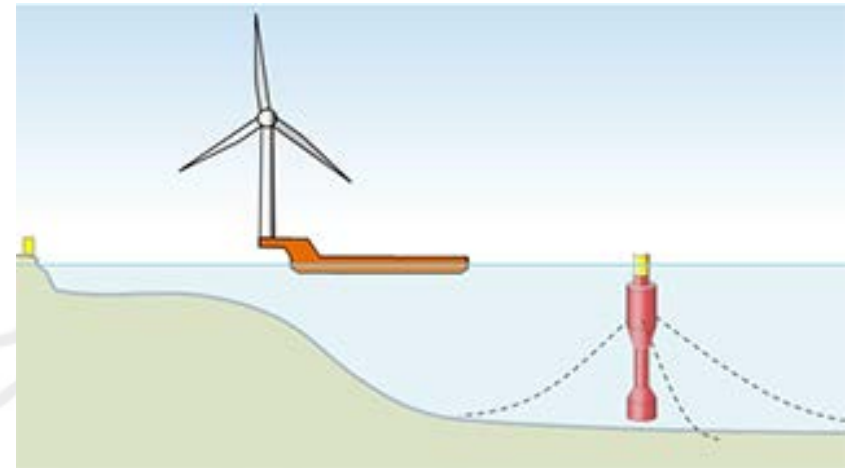
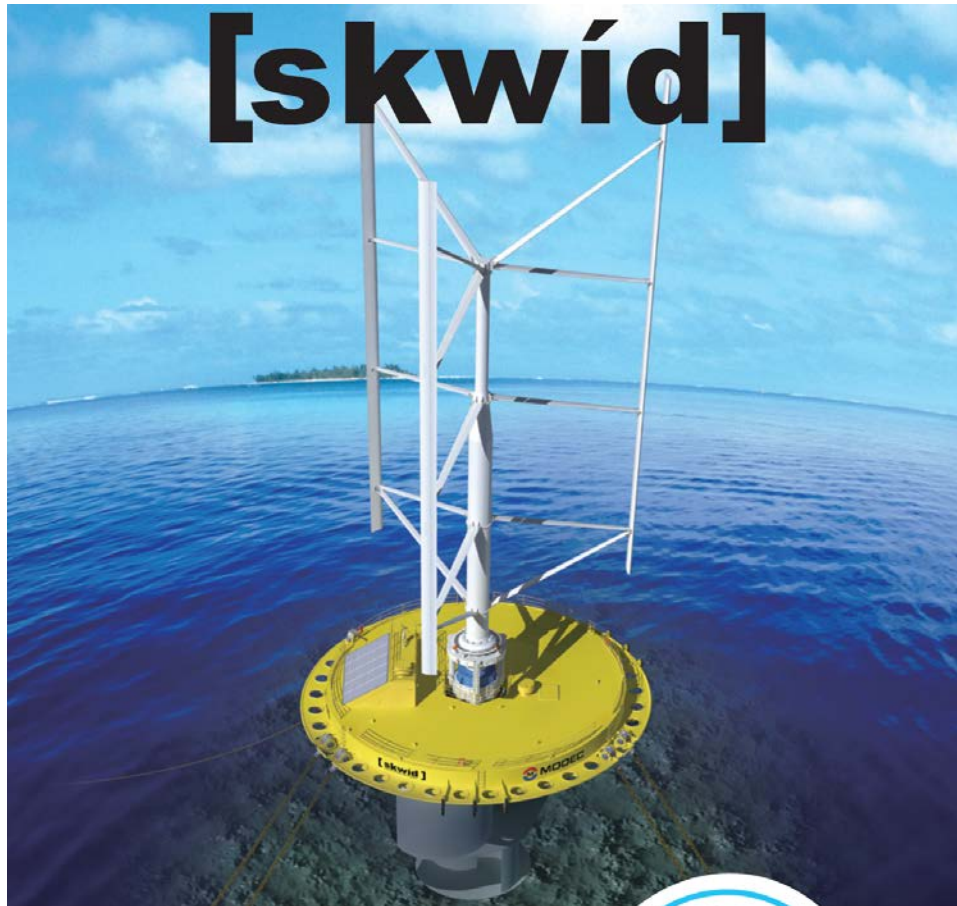
FSRWP Main Systems / Technology



Configuration Shown

LNG Storage:	100,000 m3
Mooring:	External Turret
Power:	240 MW
Desalination:	60,000 m3
Vessel:	MOSS Tanker

Dabbling with Wind Energy Concepts



What does the future hold...

- Challenges:
 - Climate Change
 - Increasing Demand for Energy
 - Trade-offs between Efficiency/Cost/CO2 Emissions, etc.
 - 1st World – versus 3rd World Issues
 - Politicization
 - Energy Balance: Demand, Supply, Storage, Delivery..
 - ...

What does the future hold...

- Path Forward:
 - Strong Drivers for Transition Worldwide; however...
 - ...pace of Change will vary around the World
 - Requires Cultural Transformation coupled with Innovation
 - as with everything this is in transition around the World
 - Developments in Europe will help define the path for the RoW
- Contractor Solutions:
 - Wide range of experience related to floating systems, Operations Offshore, Inspection and Maintenance, Technology, Finance...
 - Strong Project Management, Construction and Installation Experience coupled with Technical Expertise that can be applied
 - Focus on Collaboration with Current Innovators to provide Robust Solutions