Offshore Wind Turbines

Working group IMIA WGP 45 (06)

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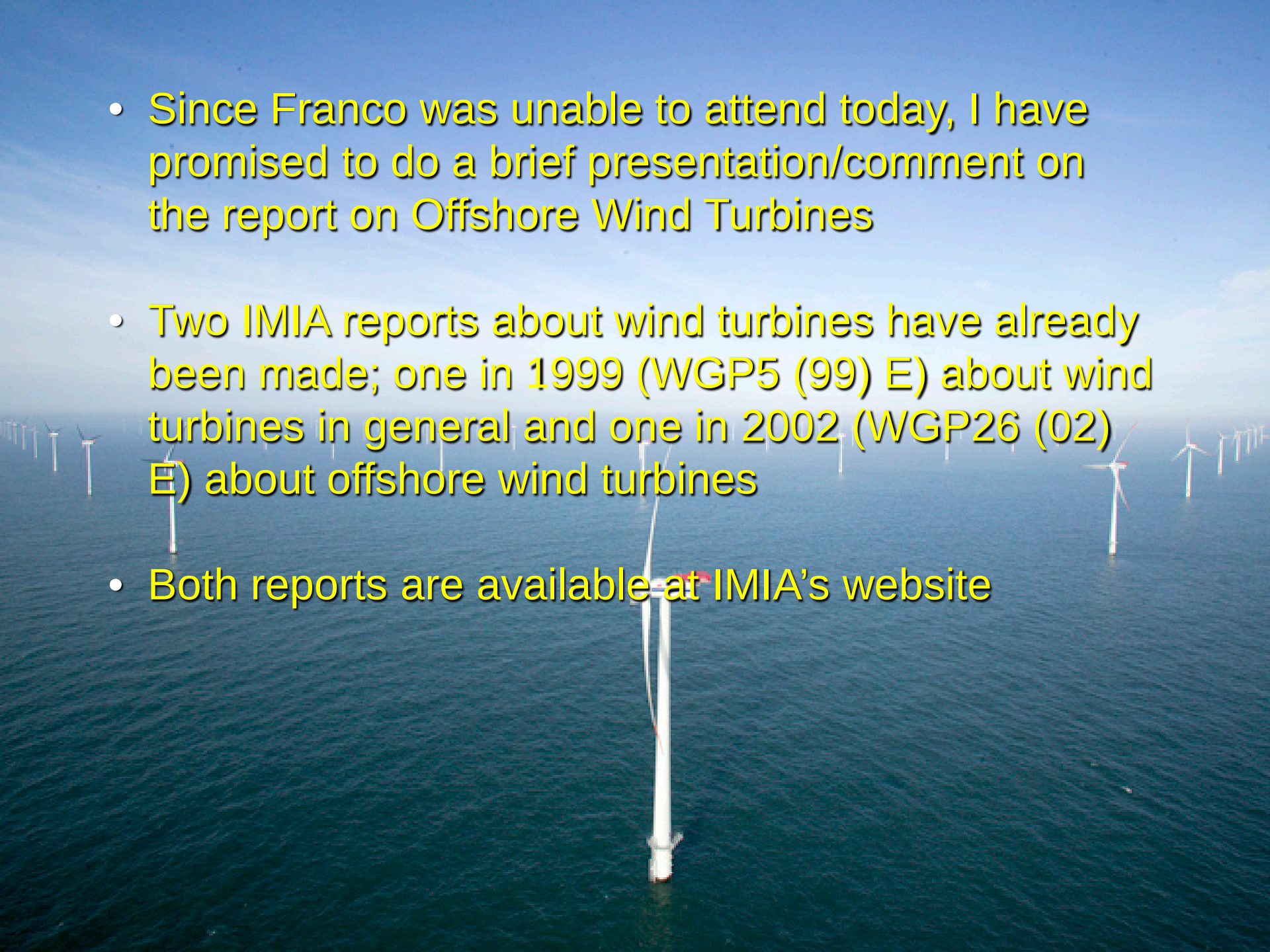
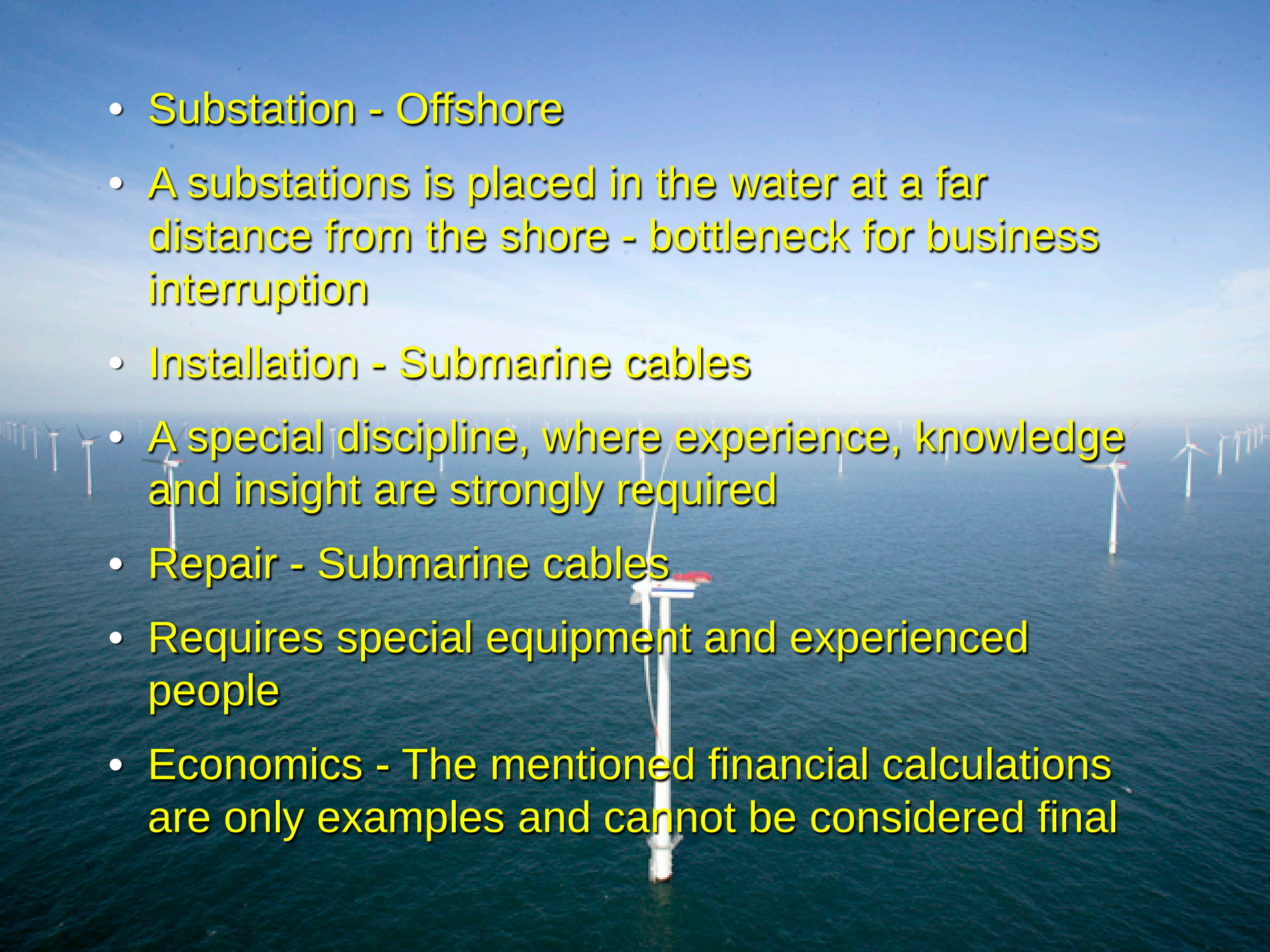


- Since Franco was unable to attend today, I have promised to do a brief presentation/comment on the report on Offshore Wind Turbines
- Two IMIA reports about wind turbines have already been made; one in 1999 (WGP5 (99) E) about wind turbines in general and one in 2002 (WGP26 (02) E) about offshore wind turbines
- Both reports are available at IMIA's website

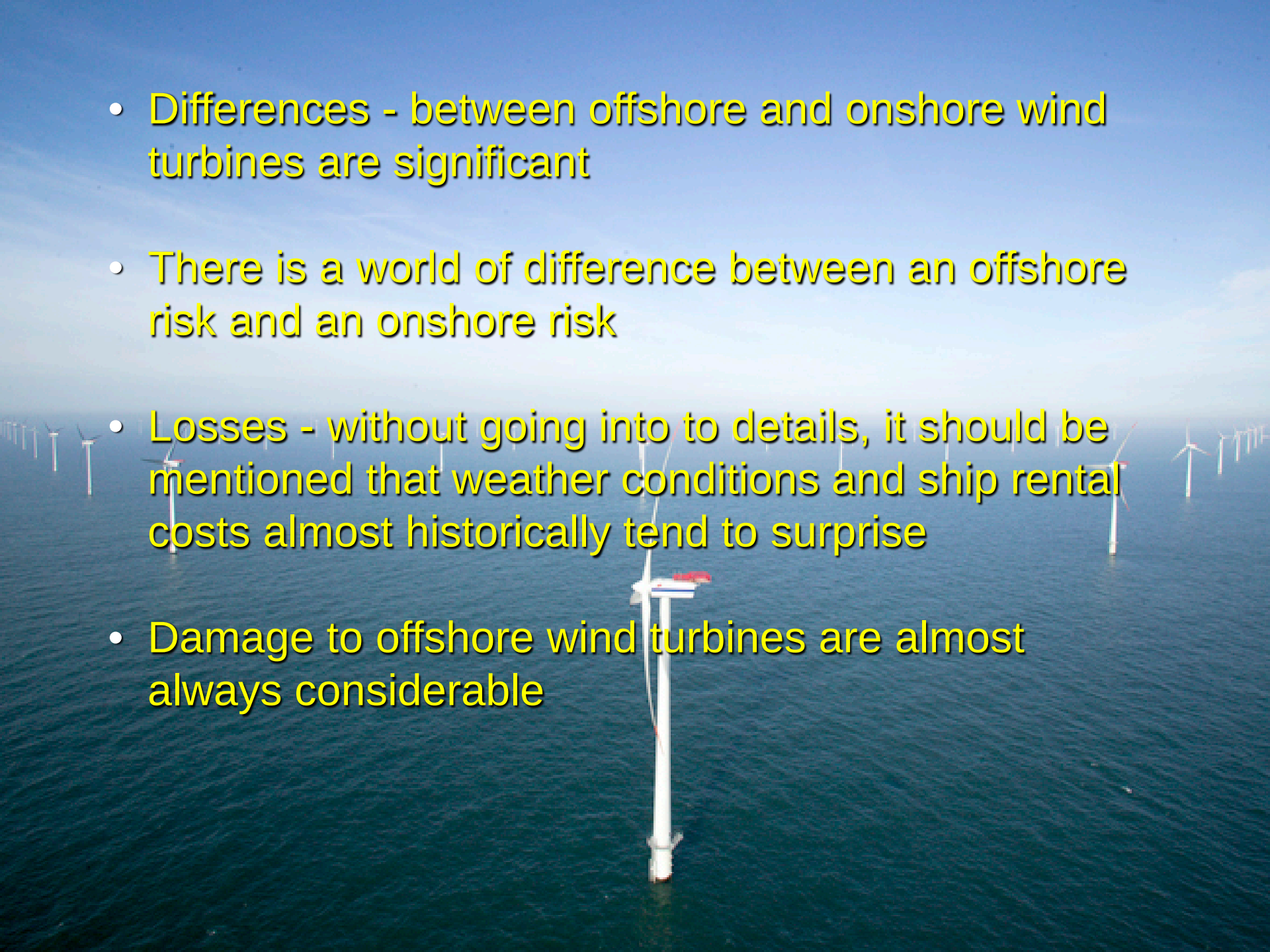
- In order to give an idea of the future expected extent of offshore wind turbines, we believe that in the year 2020 a capacity of 70,000 MW will be installed
- The investments are expected to be between EUR 110-130bn
- The annual premium for CAR/EAR is expected to amount to between EUR 40m and 80m
- The development is extremely fast and new generations of large wind turbines will soon be a reality. - This also means that this report will be out-of-date within one year
- Not more than 15 years ago no one expected to see wind turbines exceeding 250 kW!

Foundations

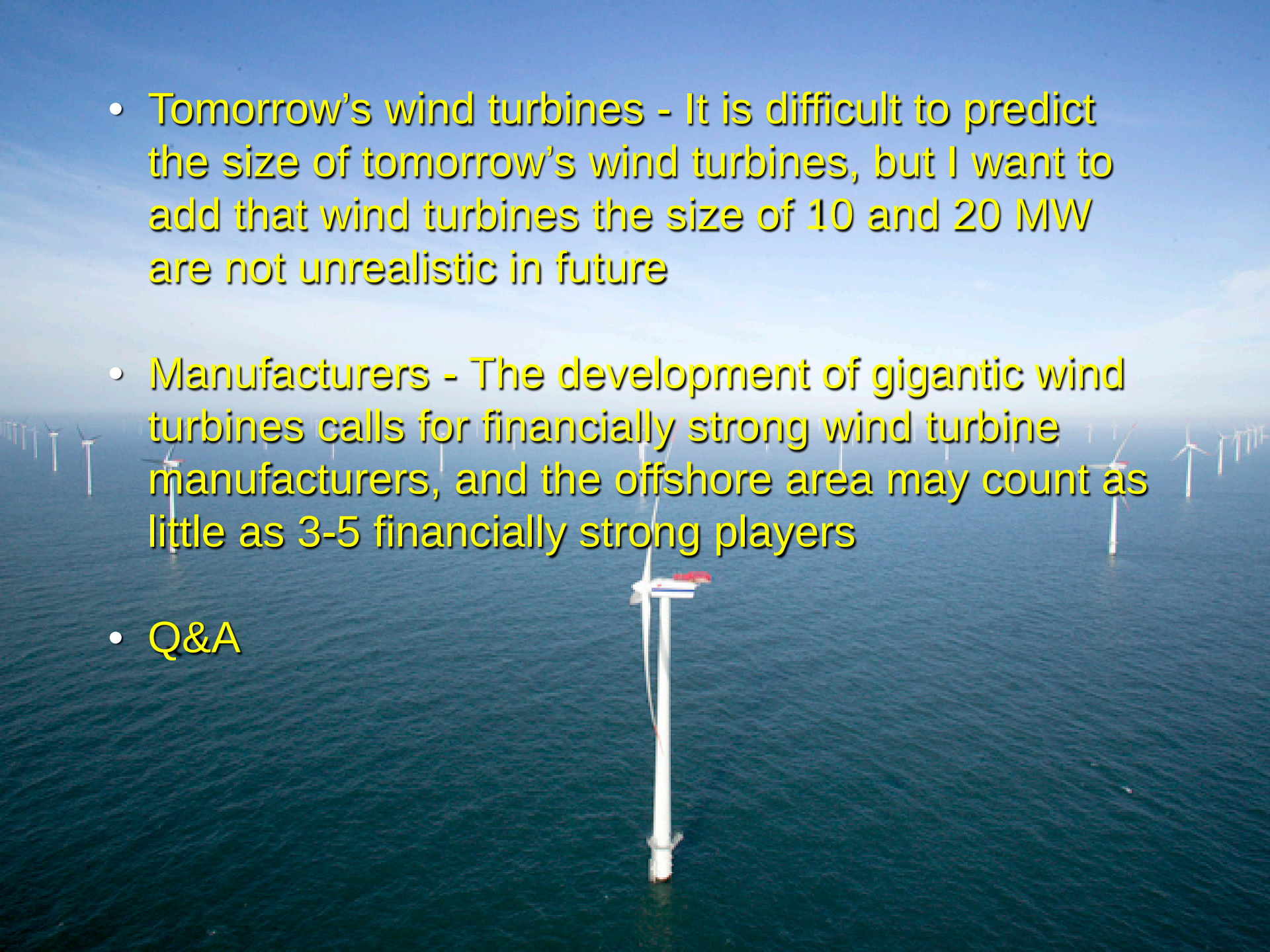
- Monopile, depth 25 meters or more
- Tripod
- Gravity Base Support Structure
- Installation - Special Ships with legs
- Cranes
- Distance to harbor 70 km up to 110 km
- 1 day to get to site
- Wave height of up to 1.5 meters
- Wind speed of up to 12 m/s



- Substation - Offshore
- A substations is placed in the water at a far distance from the shore - bottleneck for business interruption
- Installation - Submarine cables
- A special discipline, where experience, knowledge and insight are strongly required
- Repair - Submarine cables
- Requires special equipment and experienced people
- Economics - The mentioned financial calculations are only examples and cannot be considered final



- Differences - between offshore and onshore wind turbines are significant
- There is a world of difference between an offshore risk and an onshore risk
- Losses - without going into to details, it should be mentioned that weather conditions and ship rental costs almost historically tend to surprise
- Damage to offshore wind turbines are almost always considerable



- Tomorrow’s wind turbines - It is difficult to predict the size of tomorrow’s wind turbines, but I want to add that wind turbines the size of 10 and 20 MW are not unrealistic in future

- Manufacturers - The development of gigantic wind turbines calls for financially strong wind turbine manufacturers, and the offshore area may count as little as 3-5 financially strong players

- Q&A