American Superconductor®

REVOLUTIONIZING THE WAY THE WORLD USES ELECTRICITY®

基于高温超导技术的大功率风力发电机技术

10MW Class HTS Wind Turbine

6/25/2010

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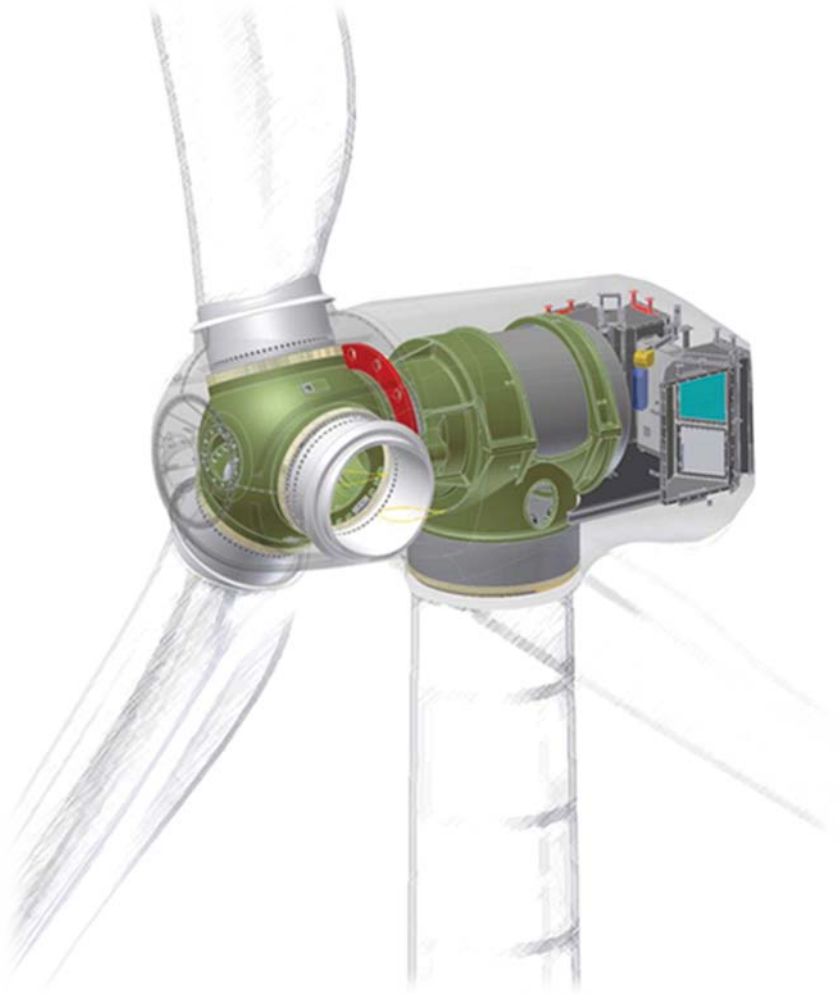
高温超导风力发电机技术概述

HTS Based Wind Turbine Overview

SeaTitan: Next Generation Wind Turbine
Seatitan 项目

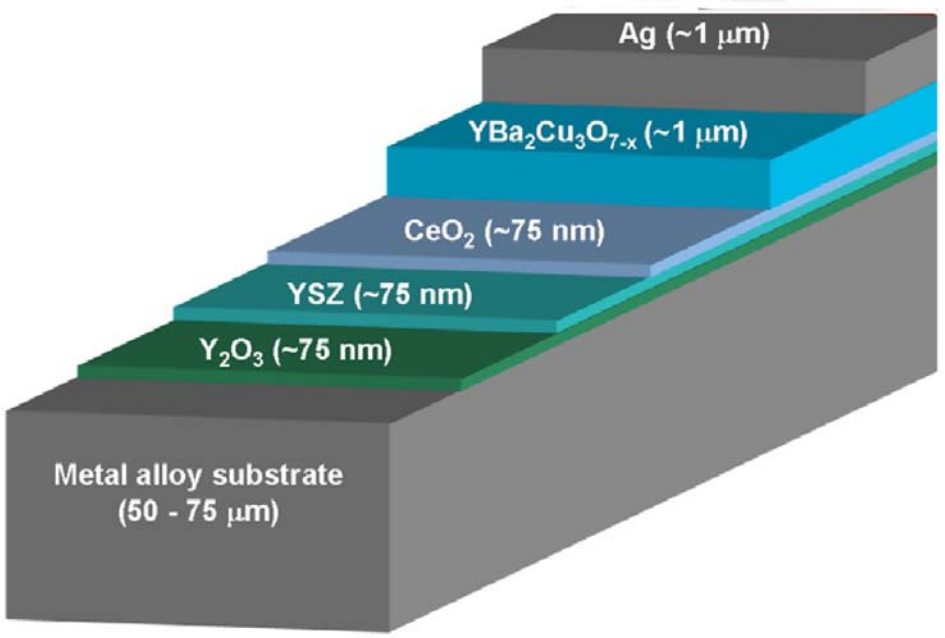


AMSC's 2G HTS Wide Strip Technology
AMSC 2G高温超导带材

RABiTS / MOD 2G Strip Architecture

- Substrate: Ni-5W alloy 基带
  - Deformation texturing
- Buffer stack: Y_2O_3/YSZ/CeO_2缓冲层
  - High rate reactive sputtering
- YBCO 超导材料
  - Metal Organic Deposition of TFA-based precursors
- Ag 银
  - DC sputtering

Width Evolution
4 cm → 10 cm

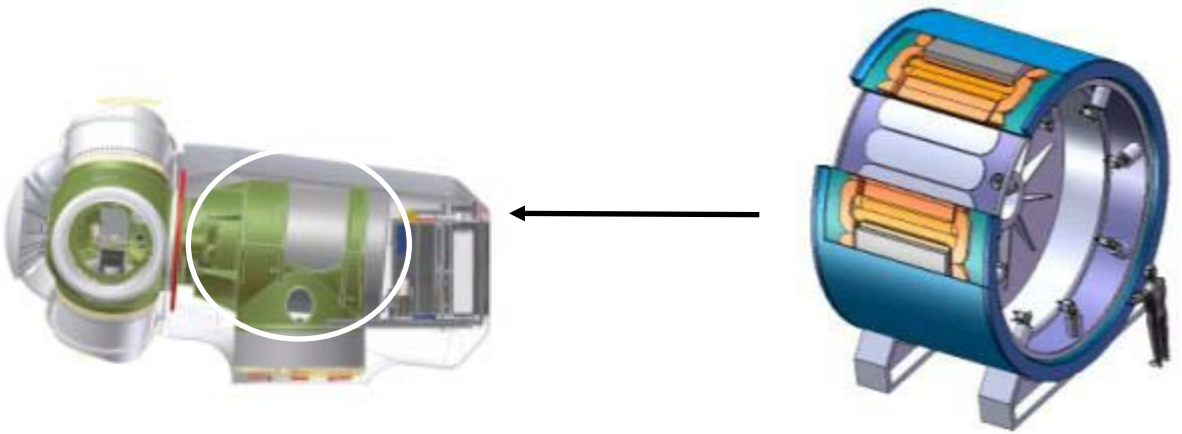


- Not to scale -

Wider strips increase manufacturing throughput and reduce cost

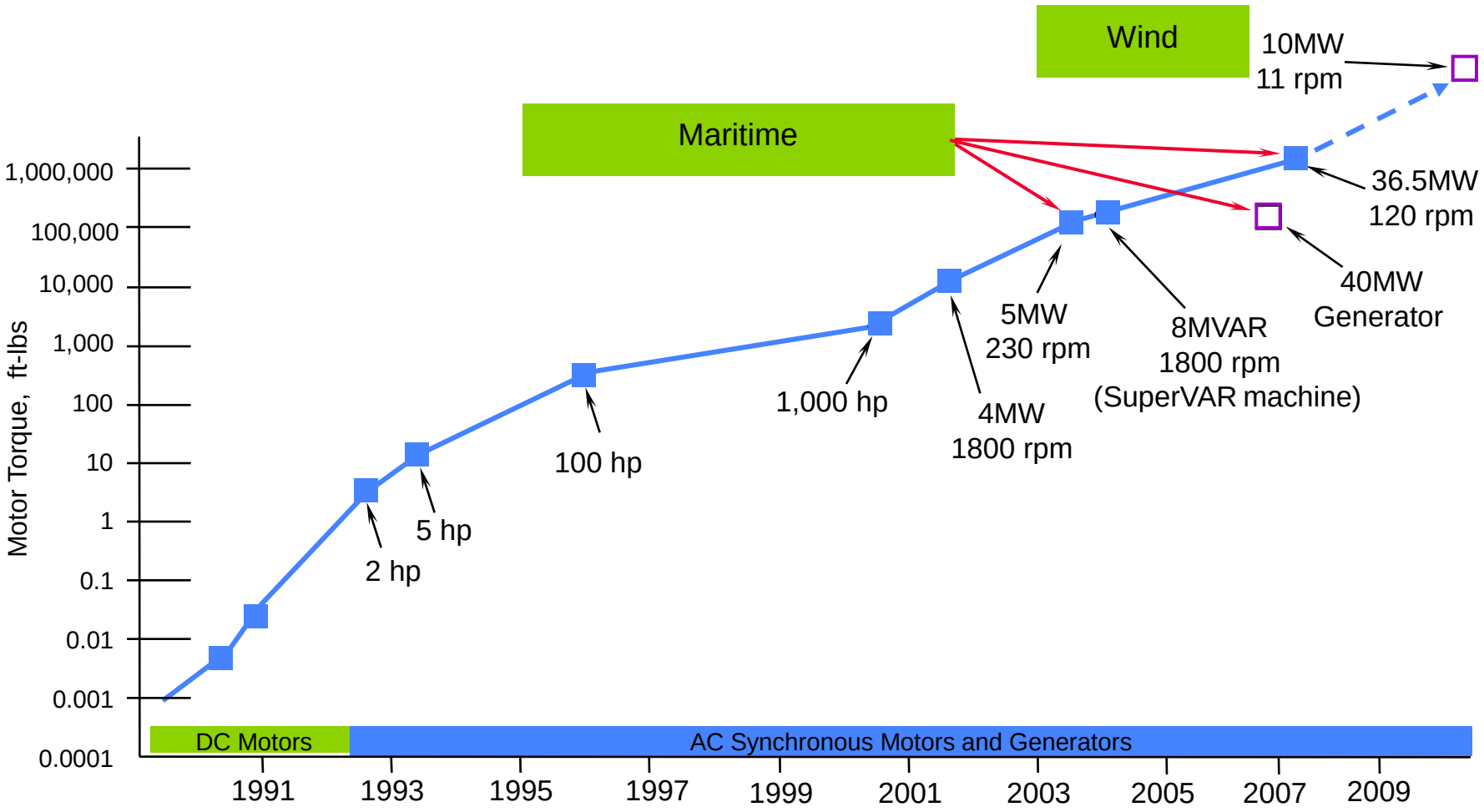
SeaTitan 10MW Wind Turbine
SeaTitan 10MW级别风力发电机

- Based on HTS motor and generator technology from AMSC
  基于AMSC超导电动机和发电机技术积累
- Focus is on utilizing superconductor technologies for wind turbine generators that can lower nacelle weight, thus reducing total cost of energy
  利用超导科技以降低风机整体重量和造价
- AMSC Windtec now designing the SeaTitan wind turbine as part ofof prototype phase
  AMSC Windtec正在开发原型机



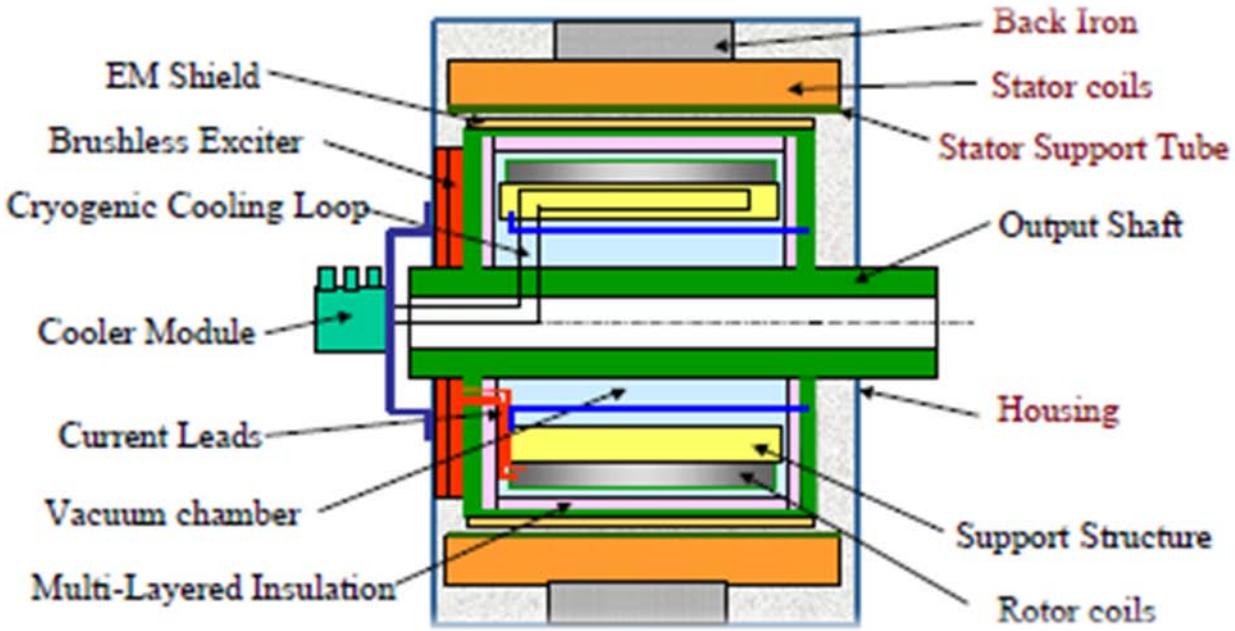
Primary focus is for the huge offshore market expected to emerge around 2015

10MW HTS Generator
10MW级别高温超导发电机



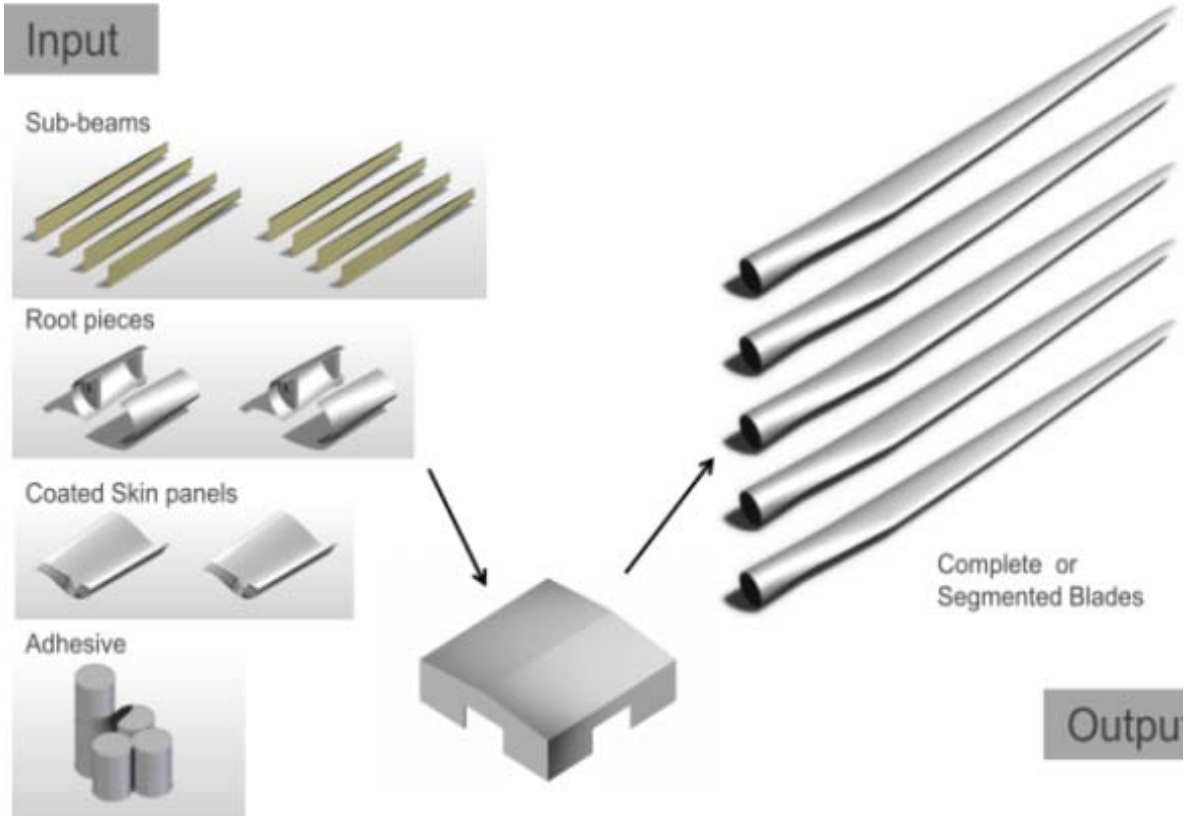
Over 17 years of HTS rotating machine development

Structure of HTS machine
高温超导电机结构



SeaTitan Optimization
SeaTitan优化设计

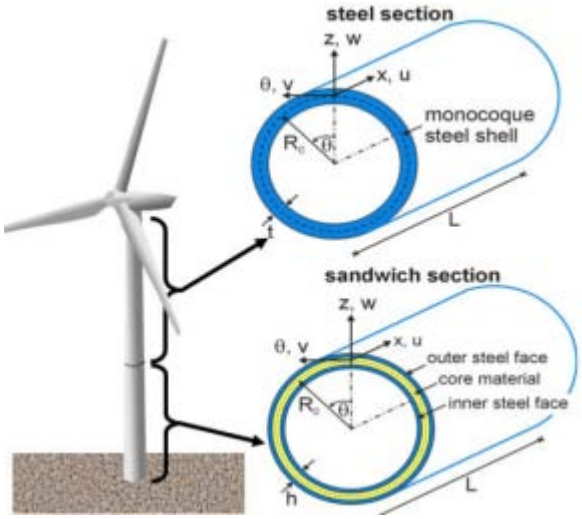
New Blade Dynamics blade design, comprising small parts that are manufactured around the world and assembled close to the wind turbine assembly area. This provides significant cost reduction and avoids transportation problems. The design furthermore reduces fatigue loads significantly.



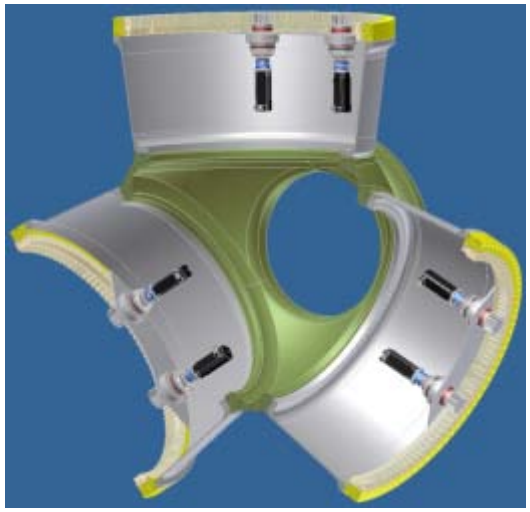
SeaTitan Optimization
SeaTitan优化设计

Many special optimized components to reduce total turbine weight, manufacturing complexity, improve assembly processes, reduce transportation and erection costs as well as to increase reliability and reduce possible component replacement time

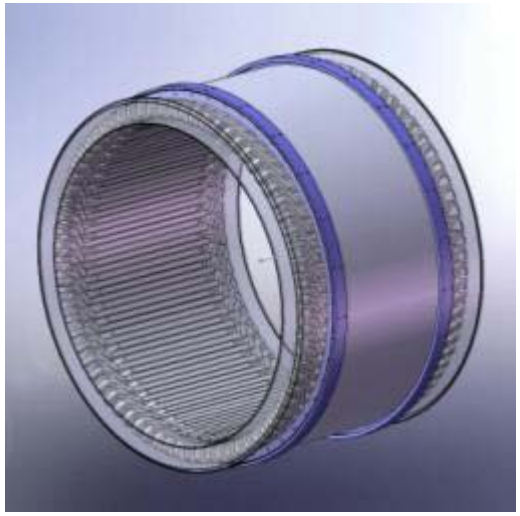
Optimized Tower



Optimized Hub



HTS Generator

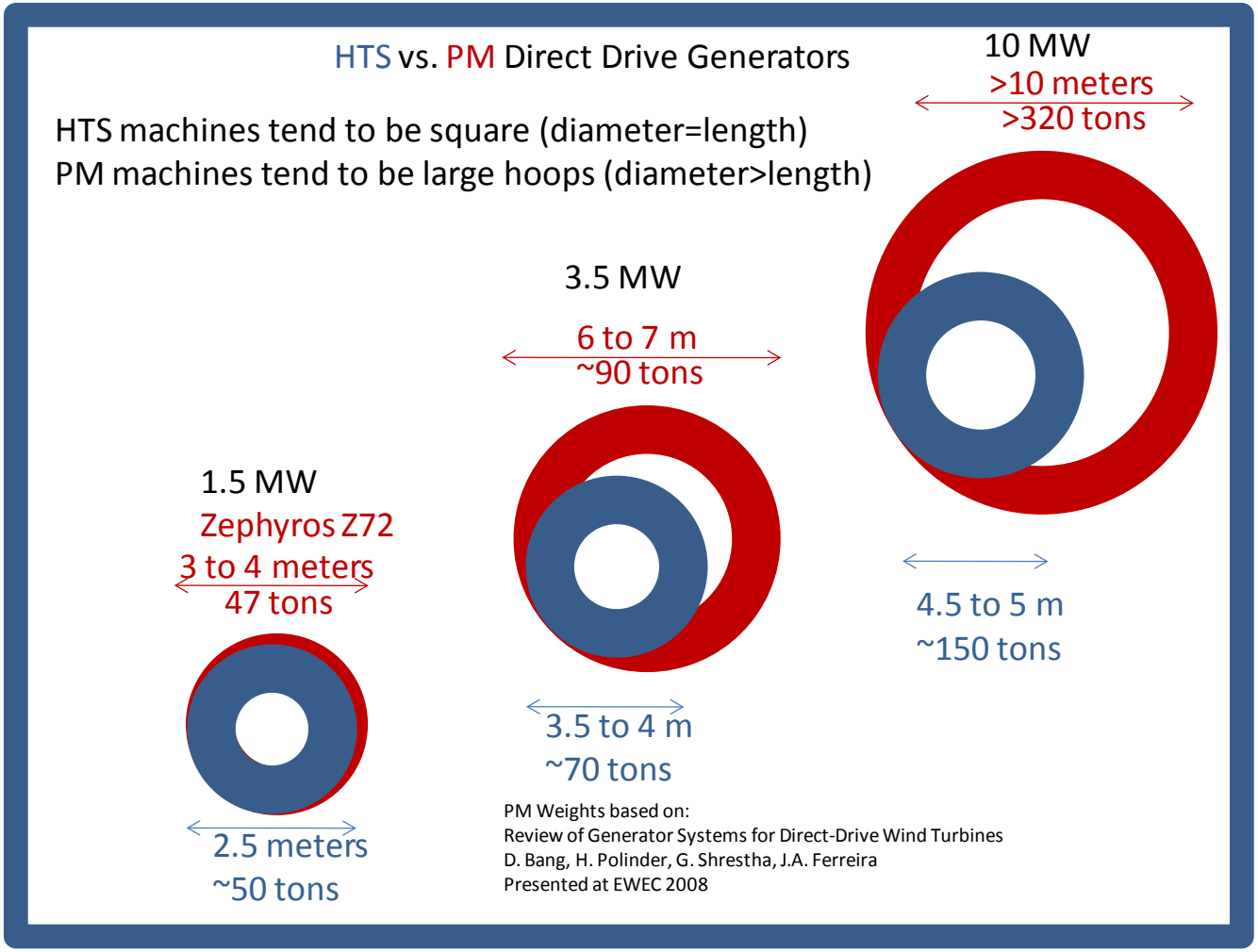


Optimized Yaw

高温超导风力发电机技术优势

HTS Based Wind Turbine Advantages

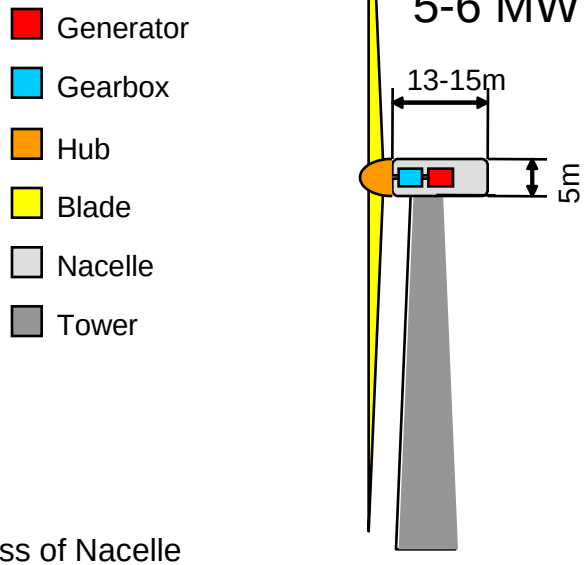
SeaTitan Superconducting Generator
SeaTitan超导发电机

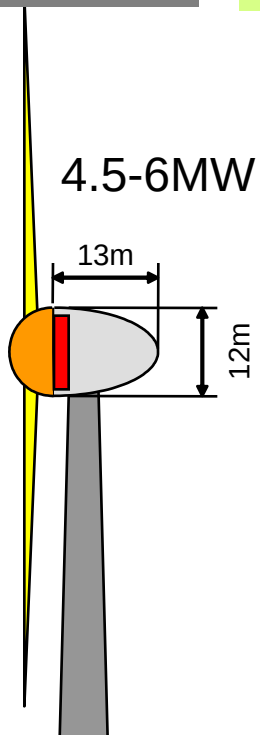


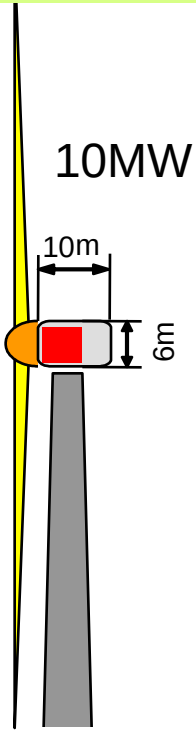
Wind Turbine Scale Up
大功率风力发电机比较

Powered by AMSC

Main Stream Geared	Conventional Direct Drive	**Optimized HTS Direct Drive (AMSC)**





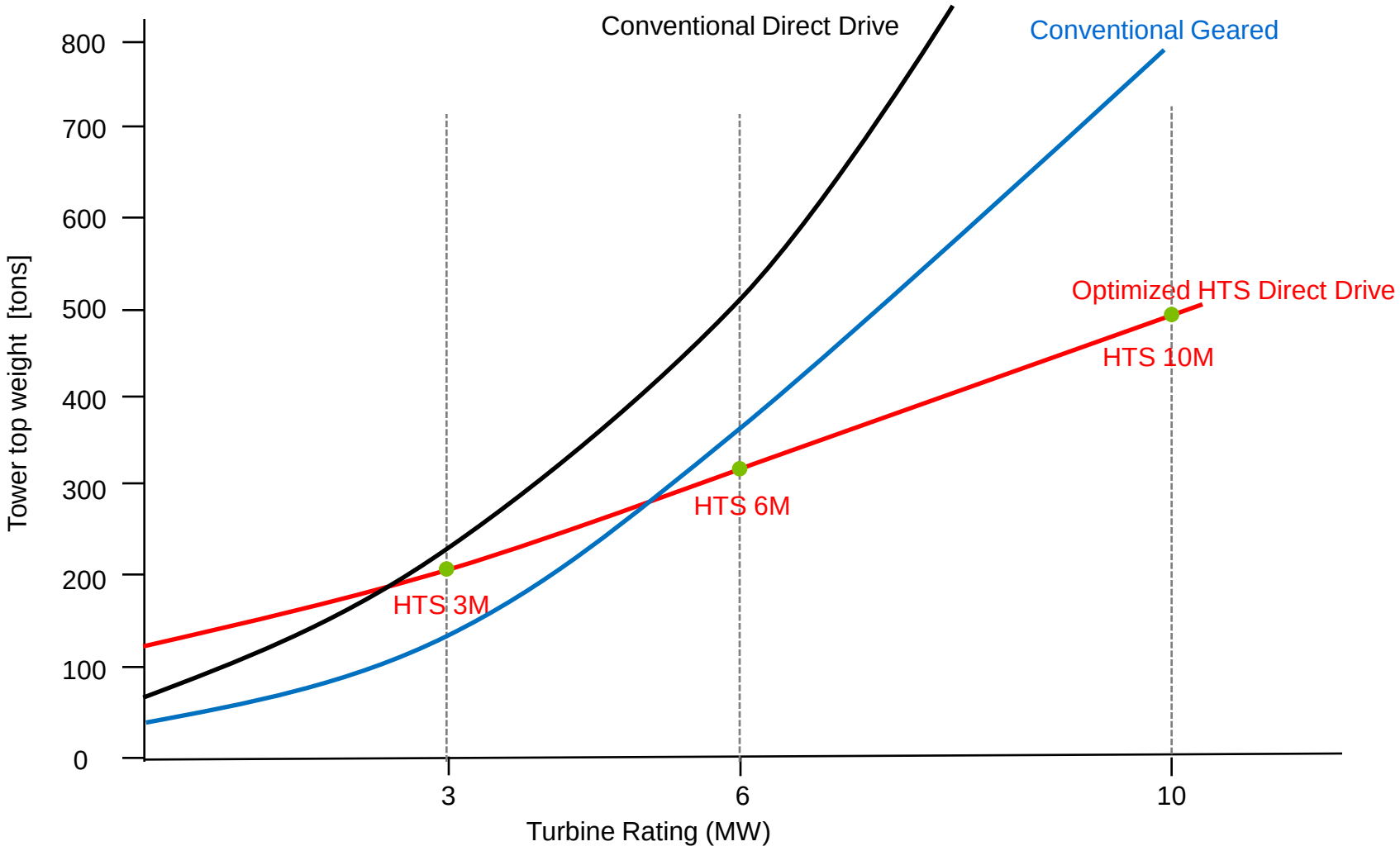


Possible to go as large as 20MW with HTS

Mass of Nacelle + Hub + Blades	m_{Top}~410t	m_{Top}~500t	
Extrapolated for 10 MW	m_{Top}~750t – 850t	m_{Top}~800t-900t	m_{Top}<500 t

Power density of HTS generators allows for 10MW in a 5MW top head weight

Top Weight/Power Rating Comparison
重量/额定功率之比较



HTS is the technology to meet the demands for large offshore turbines

Q&A and thank you for attention
感谢关注AMSC

所 旭

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