



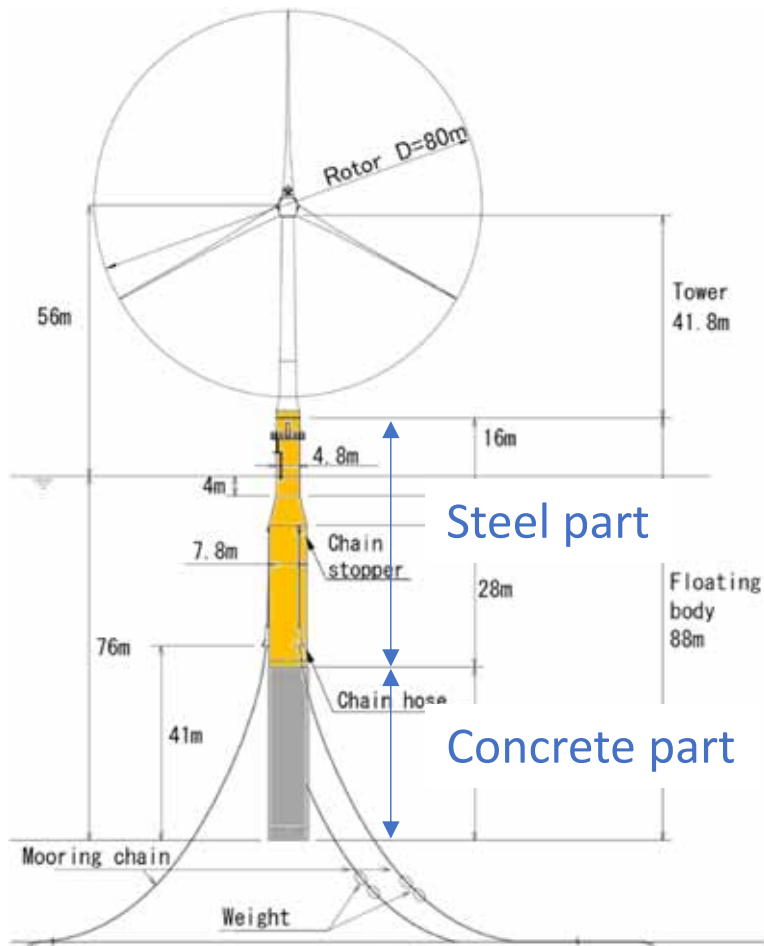
# Hybrid Spar Challenge for the future

OCEAN RENEWABLE ENERGY DIV.

TODA CORPORATION

Harada Takashi

# What is Hybrid-Spar



Hybrid:

Upper half: Steel

Sheer force dominant at shallow water

Lower half: Concrete

Pressure force dominant at deep water

Much cheaper than steel

Spar:

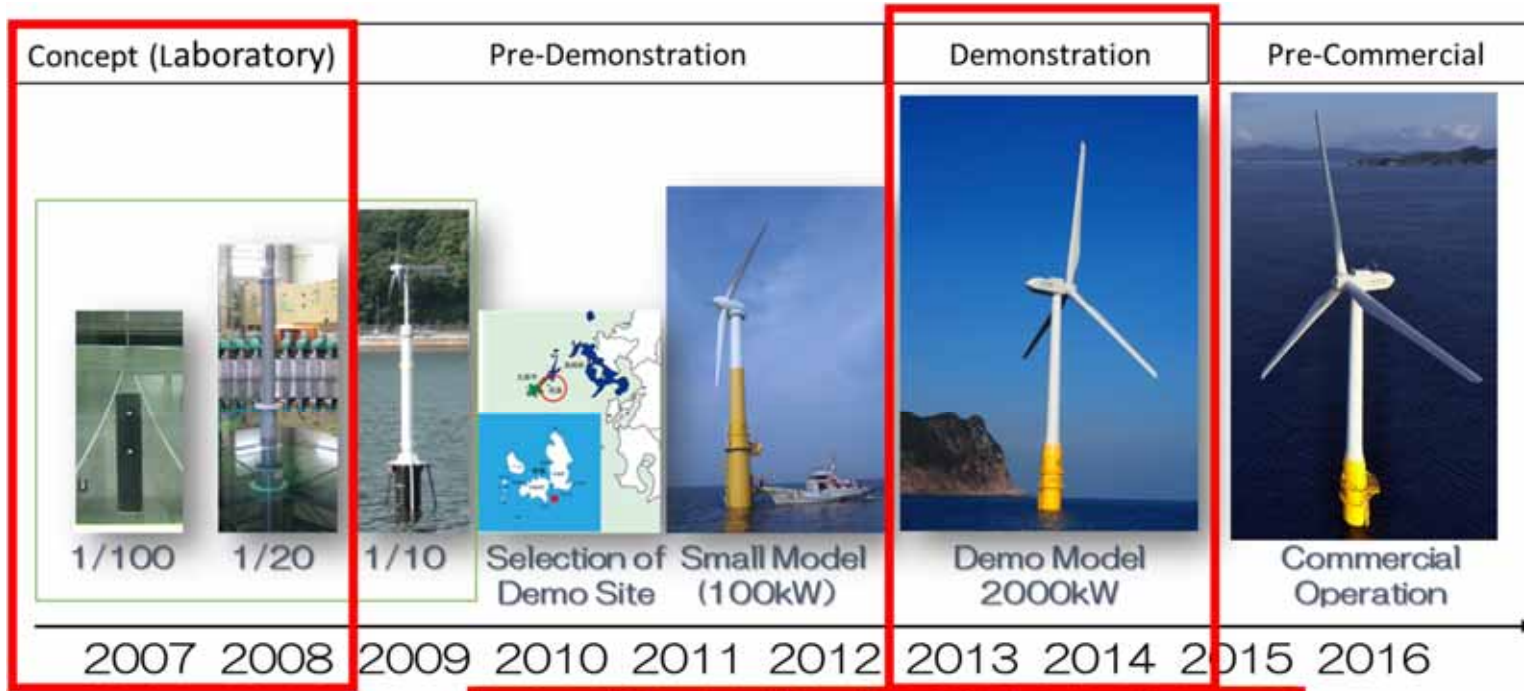
Simple shape

Mass-production friendly with same rings

Excellent stability

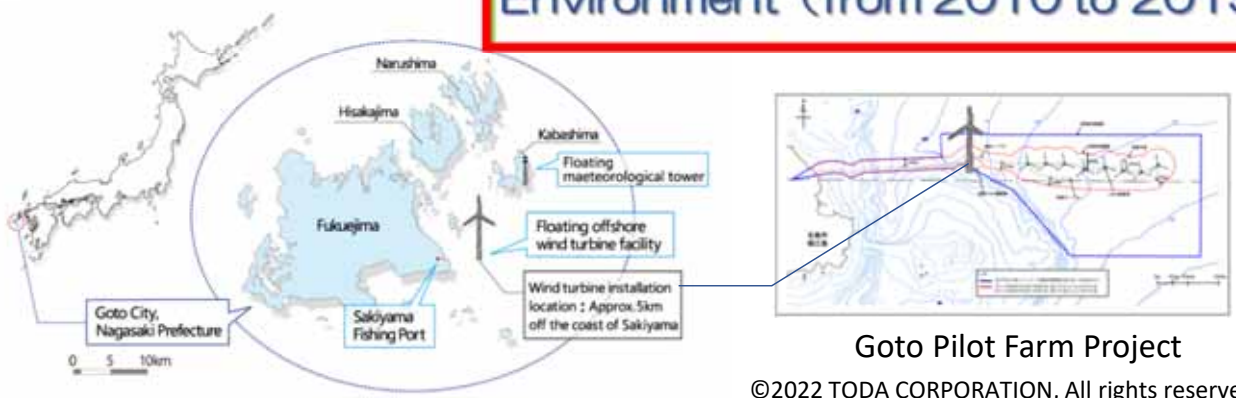
No active ballast required

# Progress in Hybrid-Spar Project



Haenkaze

**Project by the Ministry of Environment (from 2010 to 2015)**



Goto Pilot Farm Project

World First Floating Auction  
 Won by a Consortium lead by TODA Corp.  
 in 2021. COD will be 1st Jan 2024



Montage of Goto PJ, 2.1MW 8 WTGs

Goto Pilot Farm Project

# How to be a major player

## Cost down

Comparable to bottom fixed in 2020s  
Less than bottom fixed in 2030s

Expansion of applicable water area  
Utilizing Deeper water

## Upsizing

- Power per turbine 15MW by mid. 2020s  
20MW by 2030
- Project Scale and Pipeline Over 1GW / Wind farm
- Expansion of area Deeper water

Offshore wind technical potential (TWh per year)

	Shallow water		Deep water		Total potential
	Near shore	Far from shore	Near shore	Far from shore	
EU	2,266	1,077	7,841	25,844	36,728
Japan	30	13	2,233	6,808	9,074

Shallow water (10-60m)  
Deep water (60-2,000m)

Near shore (<60km)  
Far from shore (60-300km)

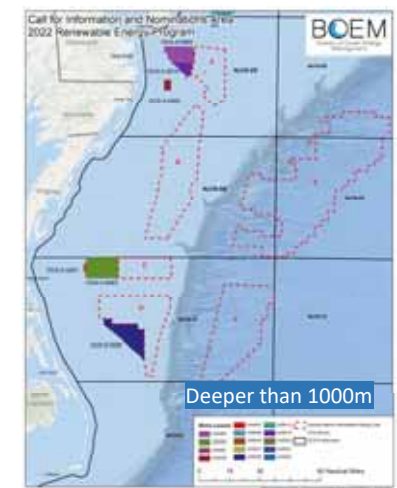
Source: Offshore Wind Outlook 2019, IEA



Historical LCOE of offshore wind and strike prices in recent auctions in Europe  
IEA: Offshore Wind Outlook 2019: World Energy Outlook Special Report



<https://www.spf.org/islandstudies/research/a00007.html>

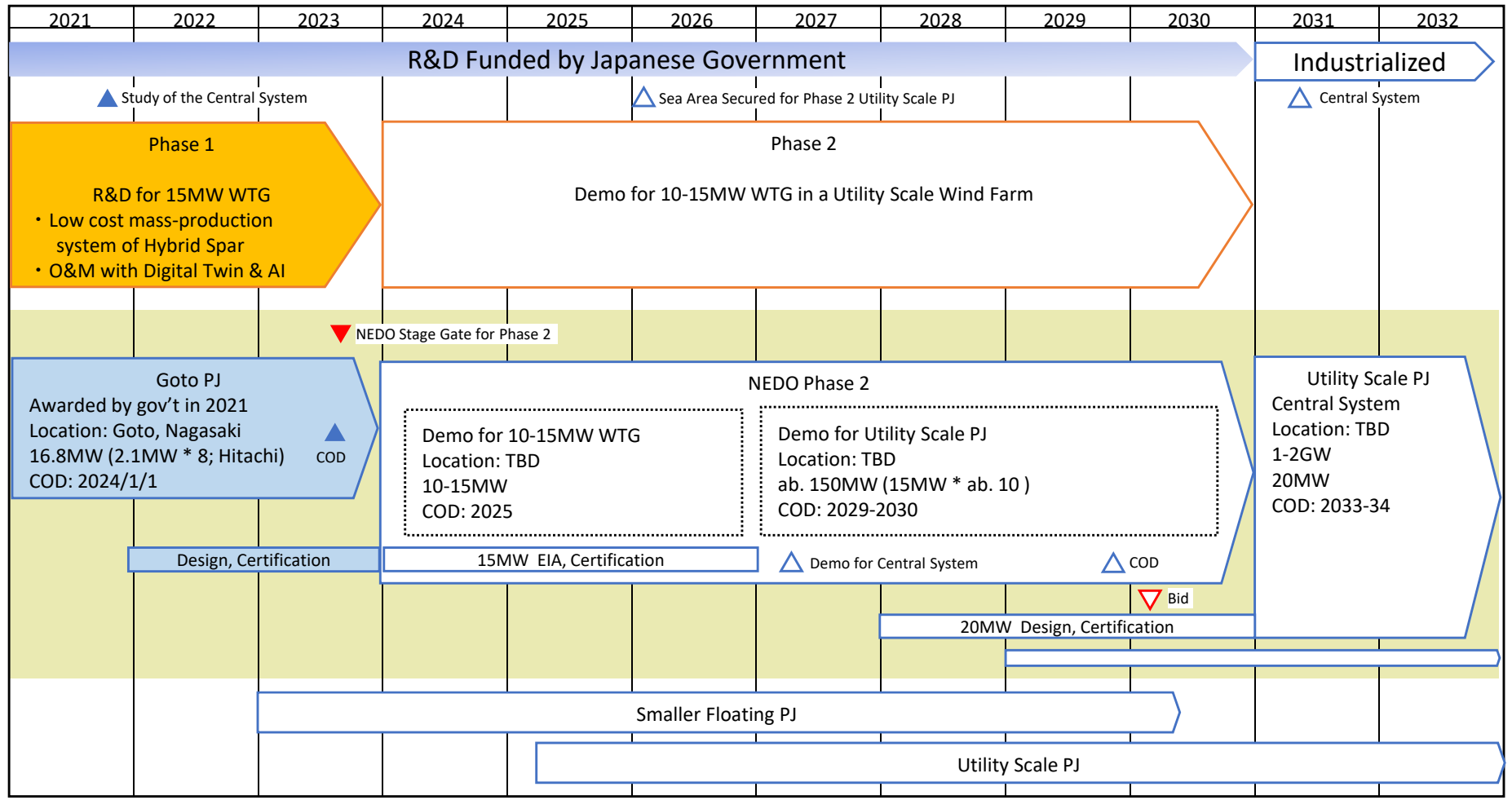




# Long Term Business Plan

▲ Plan secured  
 △ Plan prospected

Fiscal Year





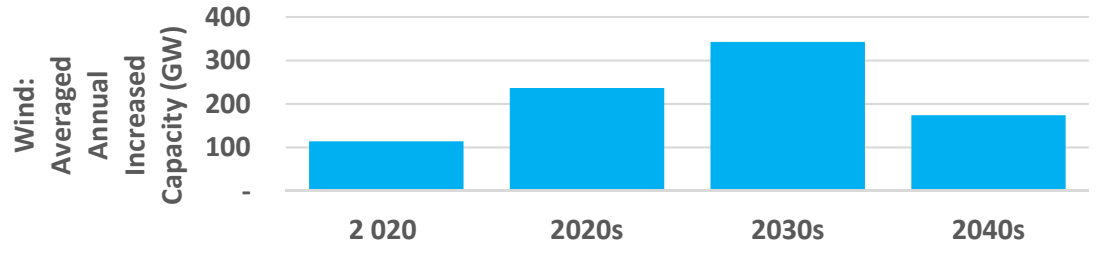
# Manufacturing Process

Anywhere

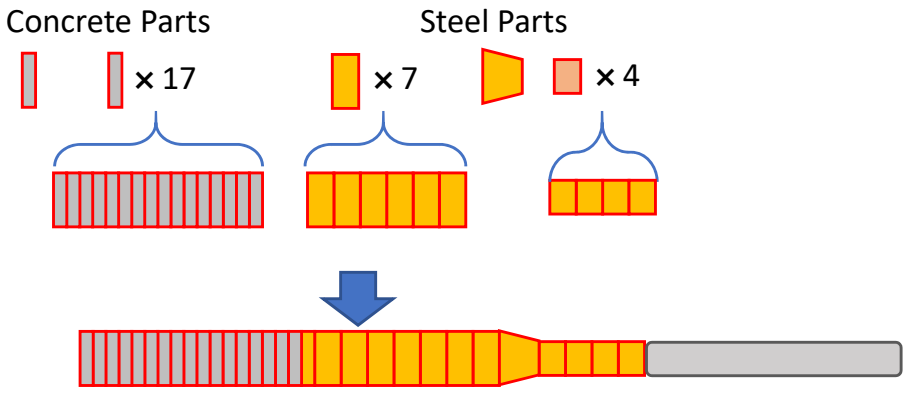
- Utilizing local ordinary port
- Production locally
- Horizontal process

Anyone

- Simple manufacturing process
- Assembly same size rings



Source: IEA: Net Zero by 2050, A Roadmap for the Global Energy Sector, Table A.3



Floating Offshore Wind Hub Goto

# Installation Process

Cost effective process  
No JUV nor Heavy crane vessel

Float Raiser  
< 5m draft  
Semi-submersible  
Sink – Drag – Raise-up



Haenkaze 2012



# Deeper water

— : Chain  
— : Synthetic Rope

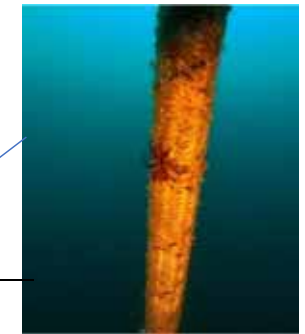
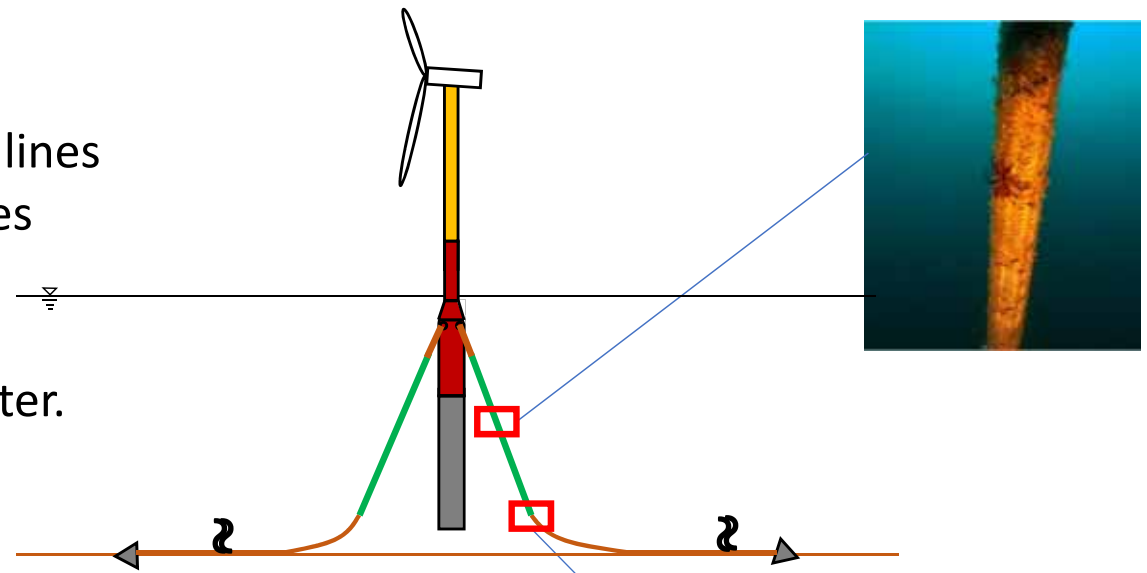
## Mooring Line

Lighter and cost effective mooring lines  
Synthetic rope is one of candidates

To gain expertise of rope,  
test ropes installed to a 2MW floater.

## Anchoring

Sand, Rock in deeper water







# “Anyone Anywhere AS required”

- Anyone
  - Simple design
  - Simple manufacturing process
- Anywhere
  - No special conditions required
  - Expand available sea
- As required
  - Any turbine
  - Adapting wide range of water conditions