



# *Seabased and Wave Power*

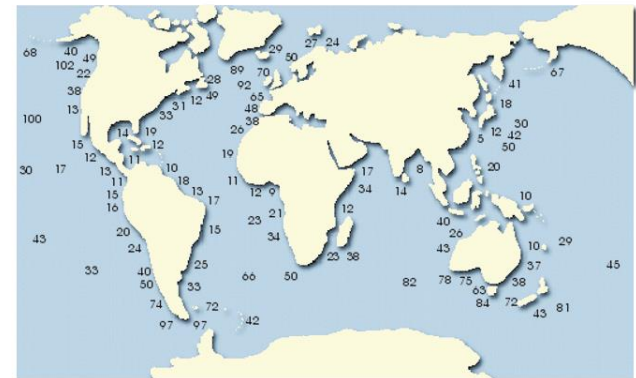
*2016-03-18*



# Wave Energy – General

- ❑ The energy stored in waves is proportional to the wind speed that generates the wave, the length of time for which the wind blows and the distance over which the wind blows.
- ❑ Waves formed by high winds continue to propagate long after the wind stops blowing. Therefore the capacity factor (the number of hours per year of useable energy) can be far higher for wave than for solar or wind power (see table below).
- ❑ Key metric is the amount of energy per unit length of wave (see chart below).

Energy Source	Usable hours per year	Capacity Factor (%)
Tidal currents	5,300 to 5,800	61 66
Wave power - Sweden	2,600 to 3,100	30 35
Wave power - Good climate	4,000 to 5,000	46 57
Offshore wind	3,500 to 4,400	40 50
Onshore wind	2,200 to 3,100	25 35
Solar	1,200 to 2,100	14 24
Hydro	1,800 to 8,300	20 95

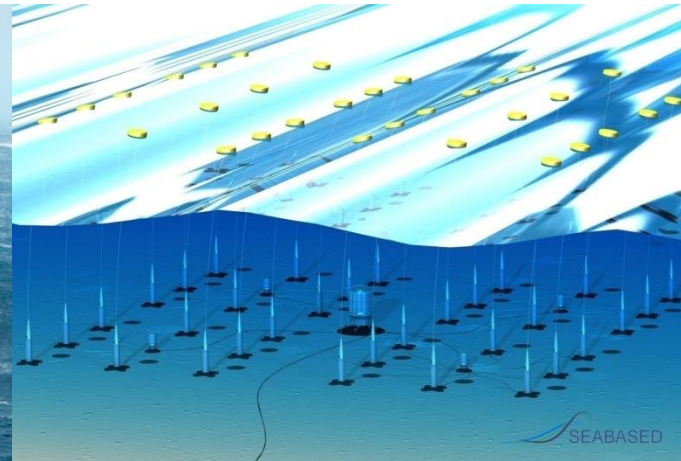


Sources: World Energy Council, 2010 Survey of Energy Resources; IRENA.org; NREL.Gov, BBC, FOE



# Wave Energy Plants - Complete

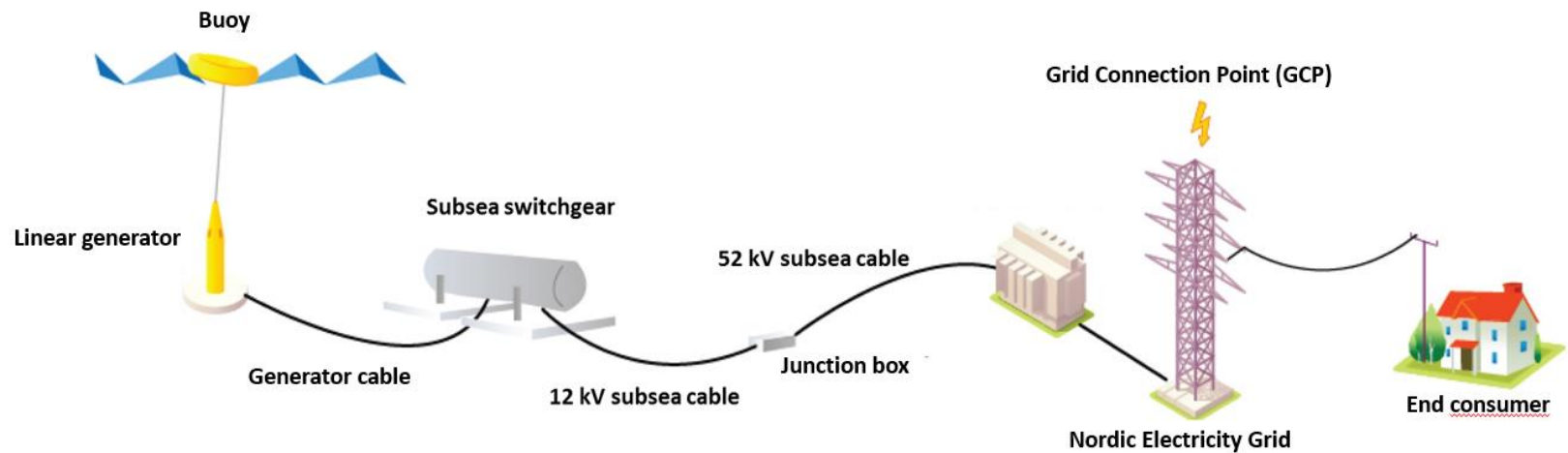
- ❑ Seabased plans, engineers and builds *complete* wave energy plants consisting of,
  - ❑ a number of Wave Energy Converters, WECs, each comprising a point absorbing buoy on the ocean surface directly connected to a linear generator on the ocean floor,
  - ❑ an electrical system which provides electrical conversion and transmission of the generated energy to the grid connection point on shore





# Wave Energy Plants – Verified

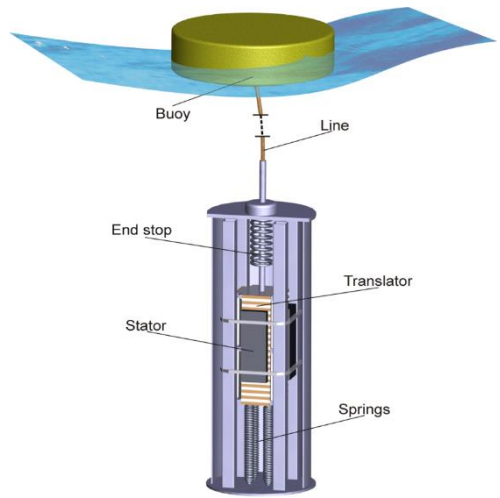
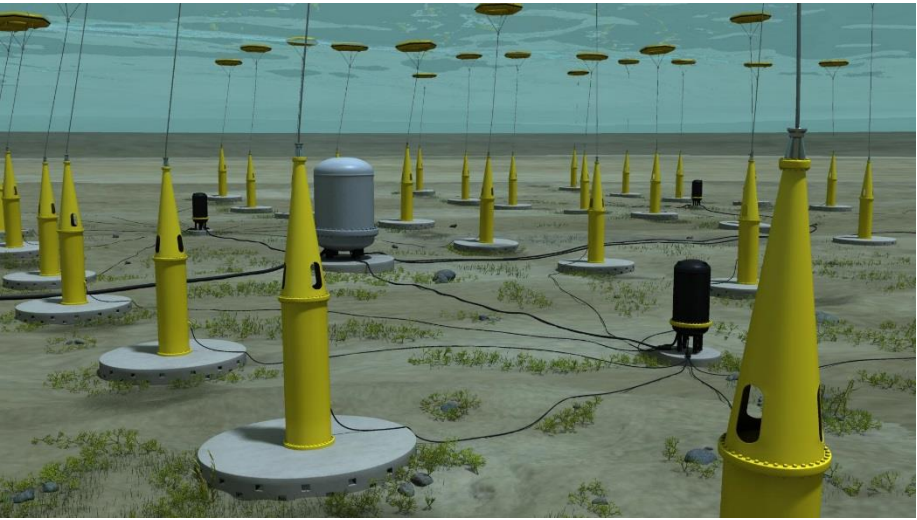
- The functionality of the total Seabased system has been verified through the *grid connection* of the Sotenäs Wave Power Plant on the Swedish west coast and subsequent *generation of power to the Nordic Electricity Grid*.





# Mechanically simple and robust solution

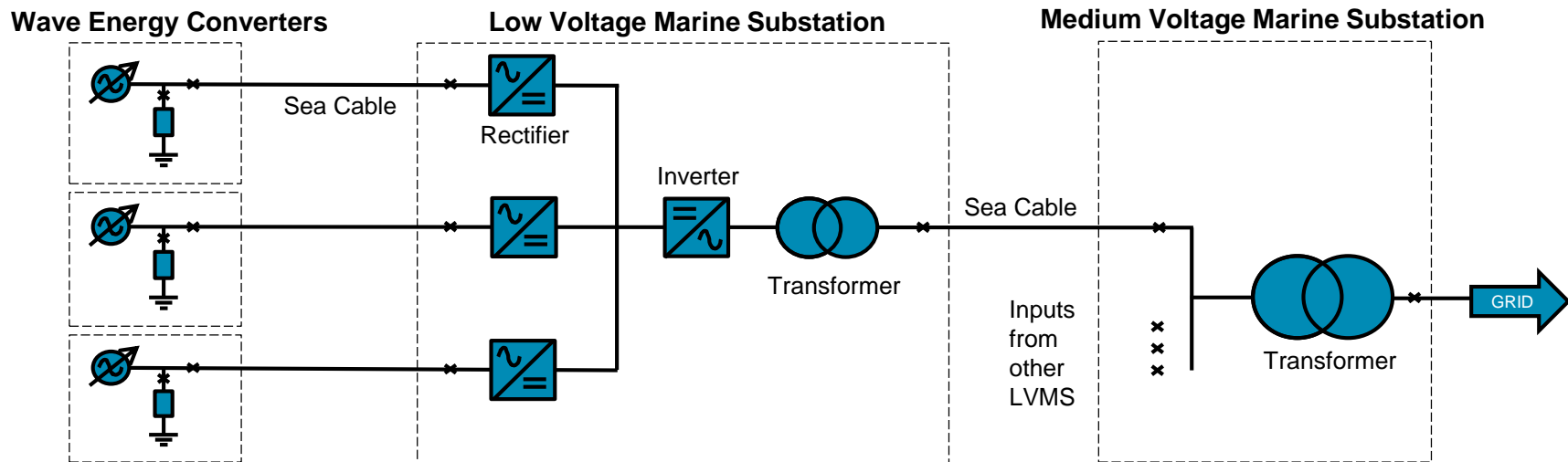
- ❑ Locating the linear generators on the seabed protects them from the extreme conditions that may occur on the sea surface and helps minimizing the maintenance required. Combined with a *mechanically simple* (very few moving parts) and robust generator technology, an *efficient and reliable* energy conversion system can be achieved.





# Modular and flexible design

- ❑ The Seabased solution is highly *modular* and smaller or larger wave power plants can easily be built up from the same standard building blocks. This design philosophy also *facilitates a stepwise build-up or expansion*, increasing flexibility and *reducing investment risk*.





## Complete resources in-house

- ❑ Manufacturing is carried out at the Seabased factory in Lysekil, Sweden, a *deep integration* facility with the capability of carrying out in-house most of what is required for the delivery of a complete wave energy plant. With complete control of all operations such as laser cutting, welding, machining, milling, sand blasting, painting, etc, as well as final assembly and testing, *quality as well as cost efficiency* are ensured.





# Installation

- ❑ Seabased can also take overall responsibility for the installation of the complete wave energy plant.



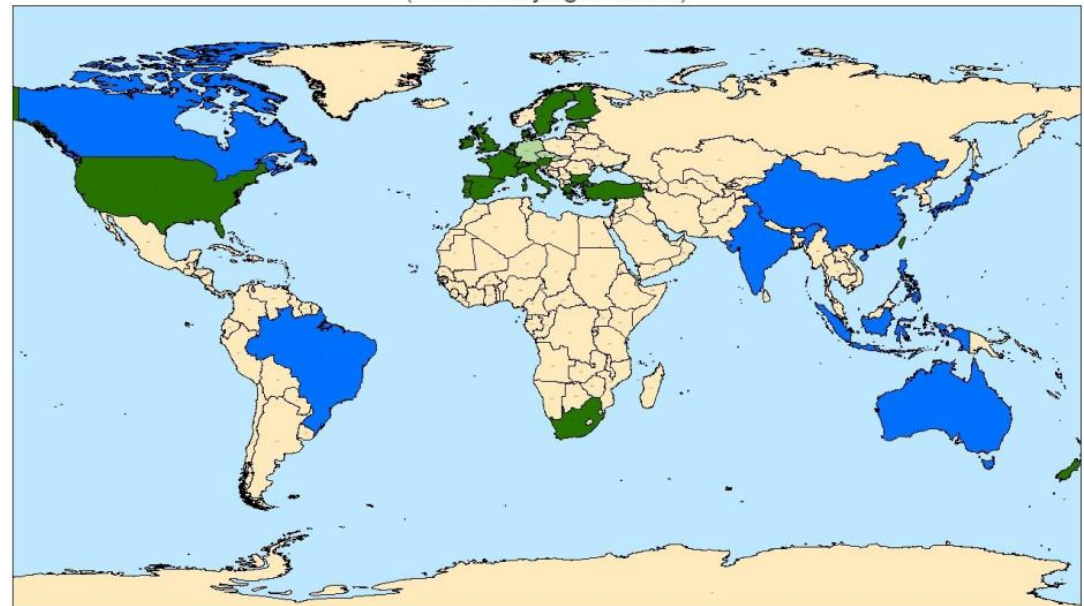




# Worldwide patent portfolio

- ❑ Seabased has a very comprehensive patent portfolio, comprising *around 20 patent families* and with each patent filed *in multiple jurisdictions* focusing on Sweden and Western Europe, USA, Canada, Brazil, China, India, Japan, Indonesia, Australia and New Zealand.

World patents 2008 WEC (Wave Energy Converter)  
(Patent Linjärgenerator)



Seabased AB, 2008-09-23

**Patent WEC**

- Non-EPO patent pending
- Registered national patent or nationally verified PCT/EPO patent
- PCT/EPO approved patent pending national verification
- No application filed





## Projects – Under execution

Projects under execution are;

- ❑ Sotenäs, 10 MW - Fortum, Swedish Energy Authority
  - ❑ Phase 1 - 34 + 2 WEC, 1 LVMS, 9.5 km sea cable, GCP land station, SCADA-system and wave measuring buoy - grid connected in 2015
  - ❑ Phase 2 - Subsequent to evaluation of Phase 1, decision will be taken regarding the continuation with the second phase
- ❑ Ghana, 5 MW - TC Energy, Ada, Ghana
  - ❑ 50 WEC, 2 LVMS, sea cables and land station - Commissioning early 2017
- ❑ Ghana, continuation
  - ❑ 14 MW contract signed, financing under discussion with banks and EKN - 375 WEC, 8 LVMS, cables
  - ❑ MoU and customer PPA for 1 000 MW
  - ❑ O&M contract under discussion



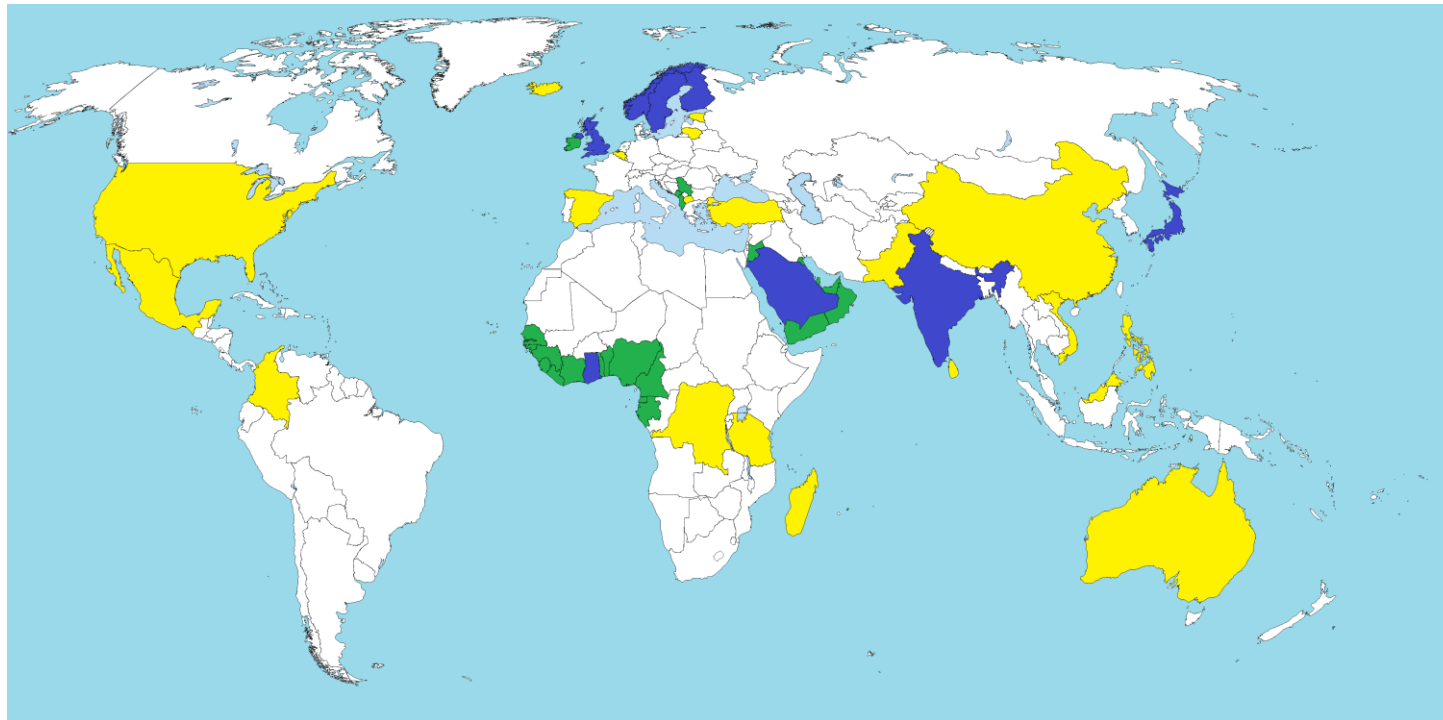
# Projects – Future

Discussions ongoing regarding opportunities in;

<i>Europe</i>	<i>Africa</i>	<i>Middle East</i>	<i>Asia and Oceania</i>	<i>Latin America</i>
Albania	Benin	Jordan	Australia	Colombia
Belgium	Camerun	Kuwait	China	Mexico
Estonia	Cape Verde	Oman	Cook Islands	
Finland	Equat.-Guinea	Qatar	India	
Iceland	Gabon	Saudi Arabia	Japan	<i>North America</i>
Ireland	Gambia	UAE	Malaysia	USA
Latvia	Ghana		Pakistan	
Lithuania	Guinea		Philippines	
Macedonia	Guinea-Bissau		Sri Lanka	
Montenegro	Ivory Coast		Tonga	
Norway	Kongo		Vietnam	
Serbia	Liberia			
Spain	Madagascar			
Sweden	Mauritius			
Turkey	Nigeria			
UK	Senegal			
	Sierra Leone			
	Tanzania			
	Togo			



# Market presence and activities



Participating in



The project has received support from the Swedish Agency for Economic and Regional Growth.



**Green** Representative appointed    **Yellow** Enquiries, activities    **Blue** Contract or MoU, L/I



## Commercially viable

- ❑ Today, a Seabased wave energy plant can be supplied at a cost which is well competitive with other renewable energy sources such as wind or solar PV as well as with diesel power generation.





Thank you!