How to Go Green Using the Blue



www.excipioenergy.com

#### SIMPLE, SCALABLE, REPEATABLE, RELIABLE

For questions or comments contact Roy Robinson, Excipio Energy, Inc. Phone: +1(832)720-4190 Email: roy.robinson@excipioenergy.com

## **Multiply the Energy Capture Potential**

#### What if you could double or triple the power

#### of each floating platform you install using only proven technology?

The Excibuoy<sup>™</sup> developed by Excipio Energy, Inc of Houston, Texas can do just that with a Patent Pending platform design that is:

**Technology agnostic** – without changing the design or its modular construction,

Excibuoy can host wind and wave energy, with capabilities to carry up to 12,000 In port

7 m draft

tons of additional equipment. The platform is designed to act only as a host, meaning the owner can competitively tender (bid) for the individual systems choosing the best value. **Modular** – the Excibuoy<sup>™</sup> can have 3, 4 (shown), or 6 legs depending on required

payload capacity. The legs and struts that hold them are identical, only the center hub of the superstructure changes, enabling mass production.

Adaptable – by adding or removing systems the platform is tailored to the local renewable resource. In warm deep waters, OTEC could be included or that space can be used for hydrogen production. The extra payload capability allows easy addition of aquaculture, ocean mining, biofuel, or e-fuels systems.

Easy to Construct – The Excibuoy<sup>™</sup> is designed to be fully assembled in port from pre-fabricated components, at only a 7m draft with legs raised. Offshore installation only requires ROV equipped MSV's and anchor handling tugs.

#### The largest reservoir of renewable energy is the world's oceans.



**Installed on Moorings** 



# **How We Got Here**

Observations that led to the Exicbuoy™:

- Floating Wind's focus on "hull cost" is self limiting and has low impact on Levelized Cost of Energy (LCOE).
- Technically marine hydrokinetic technologies (wave, currents, OTEC) work, financially none do on their own.
- Excipio's approach is "maximize the power and value output per platform", which has no upper limit and a significant impact on LCOE.
- The traditional marine renewables industry suffers from silo-mentality
- Conventional offshore wind breaks the Golden Rule.....

..... "Never do anything in port you can do onshore, and never do anything offshore you can do in port"





### Excibuoy is a Platform, not a device

Excibuoy is a system, it is designed to incorporate any offshore renewable technology ...... Oscillating Wave Energy is built into the legs....

...but other technologies can be deployed in novel ways in the 90m wide moonpool

Wave riding energy devices work on the surface, but ride waves without attenuating them



Bombora<sup>™</sup> or similar pressure differential wave energy devices are mounted 10m to 25m below sea level.

#### There is energy throughout to water column





### Designed for mass production, yet customization

Excibuoy can be configured to fit the best available technology or location without changing the hull design or the serial production capability.



This Presentation is the property of Excipio Energy, Inc, any use or reproduction requires express written permission.

Large wind turbine Small high speed wind turbines In Hull: OTEC; Aquaculture; Ocean Mining; Hydrogen Production; Power-to-Fuel; Marine Research; Search & Rescue; Ocean Surveillance etc.... Surface riding wave energy capture Subsea wave energy capture

Based on the local resources and needs the payload changes

**Ocean Currents** 



#### **Assembly and Installation**



Components are assembled in port, ideally in an enclosed factory; and then towed to sea and tied-in to pre-installed moorings and risers.

In port configuration 7m draft

This Presentation is the property of Excipio Energy, Inc, any use or reproduction requires express written permission.

Installed configuration 75m draft

# **How Are Costs Reduced?**

The following **cost items are either the same or only** *slightly higher* for a multi-source platform like Excipio's design when compared to a wind-only, floating platform:

#### CAPEX

- 1. Permitting & Legal fees
- 2. Project Management
- 3. Engineering
- 4. Insurance
- 5. Finance Charges
- 6. Surveys
- 7. Assembly/Construction (Slightly higher)
- 8. Installation and hook-up per platform
- 9. Transmission to market
- 10. Substation
- 11. Hull and deck (only slightly more)

- 12. Logistics
- 13. Certification
- 14. Stakeholder and Community Management
- 15. Owners Costs
- 16. Block Auction Costs
- 17. Resource Evaluation
- 19. Energy Storage (if any)

#### OPEX

20. Planned Maintenance (more total cost, less per MW)

- 21. Inspections (Hull, Moorings, Cables, Equipment)
- 22. Decommissioning (if any)
- 23. Block Royalties (if any)



# **Combined Energy Systems Beat Wind Alone**



 Excibuoy<sup>™</sup> captures the energy other platforms fight.

- Waves
- Currents
- o Thermal Gradients

**OTEC Resource Potential\*** 

- Brazil EEZ (Exclusive Economic Zone) Resource Capacity Potential\*
  - **7.2 TW wind alone**
  - 20.0 TW combined systems
  - 1,400 x Itaipu Dam (≈ 14 GW)







### **Excibuoy™ Comparison: Brazilian Waters**

#### **Excibuoy**<sup>™</sup>

#### Wind, Wave, Ocean Currents and OTEC

Wind Only





\* 30 Platforms per grid, grids average 60 km x 100 km. assumes Excibuoy™ with OTEC and 10MW

Turbine on Wind Only platforms. Numbers shown are representative, and not based on a rigorous resource assessment. The relative increase in power is correct, the absolute values are not.





# The Plan

www.excipioenergy.com

Excipio Energy has a highly qualified and experienced offshore development team. The team is diverse and has practical experienced spanning the globe.

### **Use of Funds - Design and Test Plan**

#### **Excipio Energy - Oversight & Engineering**



\*Possible Supplier – subject to change



### **Execution Road Map**

,	Phase I				Phase II		Phase III	
STAC	Concept FE		ED	Detailed	Construction Start Up		Commercialization	
TIME	2016 - 2019	2020-2021	2022-2023	2024	2025	-2027	2028-F	orward
CORPORAIE	<ul> <li>Excipio founded</li> <li>First investors</li> <li>Business plan developed</li> </ul>	•Marketing and PR Drive	<ul> <li>Expanded staffing</li> <li>Appoint External Board</li> <li>Series A Funding Round</li> </ul>	<ul> <li>Sign PPA for prototype</li> <li>Series B Prototype funding round.</li> </ul>	<ul> <li>Stakeholder management</li> <li>Series A Exit Option</li> </ul>	<ul> <li>Marketing for Phase III</li> <li>Utility scale PPA's</li> </ul>	<ul> <li>Secure Finance</li> <li>Identification of opportunities</li> <li>Factory construction</li> </ul>	<ul> <li>Stakeholder management</li> <li>Market Expansion</li> </ul>
TECHNICAL	<ul> <li>Desktop study of offshore renewable technology.</li> <li>Excibuoy™ hull type identified and Patent filed</li> <li>Suppliers identified Consortium Letters of Intent signed.</li> </ul>	<ul> <li>Database reaches 500+ companies;</li> <li>6000 patents reviewed</li> <li>Develop engineering and test plan</li> </ul>	<ul> <li>Award Testing Contract</li> <li>CFD Modeling</li> <li>Issue RFP for Prototype</li> <li>File developed patents</li> <li>Award of FEED Contracts</li> </ul>	<ul> <li>Build and deploy 1/7 Demo.</li> <li>Site surveys and permitting</li> <li>Full Scale Design locked</li> </ul>	<ul> <li>Construction</li> <li>Project and site management</li> <li>Quality Control</li> <li>Phase II R&amp;D</li> <li>B ISSUE</li> </ul>	<ul> <li>Installation and Commissioning.</li> <li>Start up and Operations Support</li> <li>Find the second se</li></ul>	<ul> <li>Site Identification</li> <li>Serial Construction</li> <li>Design Optimization</li> <li>Supply chain maturation</li> <li>ID</li> <li>ID</li> <li>Sales</li> </ul>	<ul> <li>Surveys and environmental assessments</li> <li>Installation and Commissioning.</li> <li>Operations &amp; Maintenance</li> </ul>



# **The Team**

www.excipioenergy.com

Excipio Energy has a highly qualified and experienced offshore development team. The team is diverse and has practical experienced spanning the globe.

# **Experienced** Team

#### The management team of Excipio Energy



Roy is an inventor and always looking for the "better way". He is applying 25+ years of offshore project development experience to develop innovative ways to speed the energy transition.

Roy Robinson CEO and Co-founder



Georg's organizational abilities and attention to detail are second to none. He is a sought-after technical authority, as well a CEO of his own development company.

Georg Engelmann Board Member and Co-founder



Mike is an experienced Executive and has established several new Corporate offices. He is creating the corporate HSEQ and Regulatory Compliance systems.

#### Mike Byrne (Houston/Philippines) HSEQ & Compliance

#### **Excipio Energy do Brasil**



Senior executive with strong experience in the Power Generation, with focus on renewables and Oil & Gas industries, having held Managing Director and Business Development Director positions in major companies as well as Board Director of a US based company.

Ivan Furtado Director of a US based of Head of Operations and Co-founder



Long experience in both oil and gas and hydropower engineering and management. Airton is a sought-after executive coach and business consultant.

Airton Alves Consultant

Dr. Chin's business and entrepreneurial experience includes co-founding 3 companies. She has set up a venture forum for start-up's, qualifying and bringing new products into the conventional and renewable energy industries.

Doreen Chin PhD Chief Business Development Officer (China)



# **Subject Matter Experts**

Excipio Energy has developed a sterling reputation as impartial experts in the Blue Economy, covering all forms of offshore energy harvesting, aquaculture, algae and plankton cultivation, ocean mining, and marine monitoring and security.

#### **Over the last two years Excipio:**

- Were chosen for a US Department of Energy grant to study the repurposing of legacy oil and gas platforms and pipelines.
- Have consulted to oil companies on how to transition.
- Provided advice to oil and gas service companies on how to leverage their skills to be better positioned for the Blue Economy
- Have been invited as speakers at energy conferences on topics as diverse as offshore wind and geothermal systems to aquaculture.





# The Technology

www.excipioenergy.com

## **Excipio Intellectual Property**

## Patents

➤ Excibuoy<sup>™</sup> (Granted 2021)

# **Patents Prepared**

Novel OTEC System

- Oscillating Water Column Amplifier
- Low Temperature Geothermal
- Wireless Export of Electrical Power
- High Voltage Subsea Connector



The Excibuoy<sup>™</sup> is a system, not a technology.

The platform is designed so it can host any combination of viable offshore renewable energy devices



### **Components & Technical Readiness Level (TRL)**



Component Description	No. of Suppliers	TRL
Large Wind Turbine <sup>(1)</sup>	10+	9
Small Wind Turbines	8+	8
Oscillating Water Column <sup>(2)</sup>	9	7
Point Absorber Wave Converter	9	7
Vertical Axis Turbine	12	8
Ocean Thermal Energy Conversion <sup>(1)</sup>	10	7
Surface Flow Turbine	35	9
Mooring Energy Converter	1	3
Articulated Leg Platforms	2	4

#### Notes:

1) Imposed Loads only will be modeled, not performance

2) The number of internal chamber configurations tested will be dependent on Case

3) Includes multiphase simulation to verify E-OTEC patent

4) TRL Per ISO 9-point scale definitions





### **Large Wind Turbines**



Seawind, 2 Bladed Downwind

**GE Halide X** 



20

### **Small Wind Turbines**

Excipio Energy has an agreement for the supply of the small wind turbine. Part of the development study is to improve the generator performance of this design.



These turbine can survive wind speeds up to 150 mph



#### **Ocean Current Receptor Development**



Excipio were so impressed with the performance of the small wind turbine we decided to include a marinized version to capture currents. We tank tested the design in 2016.

And the owners of the test facility and the developer of the small wind turbine were so impressed with Excipio they became our first investors



### **Wave Energy Devices**

#### **Oscillating Water Column (OWC)**

Chamber will be designed by Excipio as part of the development.

#### **18 Device Developers**





Where there is wind there are <u>ALWAYS</u> waves...





#### **Ocean Thermal Energy Conversion**





# The Opportunity

www.excipioenergy.com

## **LCOE Comparison**

#### Estimated Levelized Cost of New Electric Generating Technologies in 2018 (2011 \$/megawatthour)





### **How Sharing a Platform Reduces Costs**

#### **Overnight Capital Cost Breakdown (\$/kW)**

	MW Per Device	Owners Cost, Incl. Finance	EPCM	Prime Mover	Balance of Plant	Total		
Floating Wind	10	\$844	\$685	\$1,740	\$2,004	\$5,272		
Wave Energy	7	\$320	\$448	\$3,200	\$2,432	\$6 <i>,</i> 400		
Flow Energy	2	\$706	\$706	\$2,058	\$1,235	\$4,705		
OTEC	10	\$121	\$764	\$3,927	\$2,852	\$7 <i>,</i> 664		
		Resulting Overnight Capital Cost						
Floating Wind	10	\$844	\$685	\$1,740	\$2,004	\$5,272		
Wave Energy	7	\$64	\$45	\$1,600	\$243	\$1 <i>,</i> 952		
Flow Energy	2	\$141	\$71	\$1,441	\$124	\$1,776		
OTEC	10	\$24	\$76	\$2,749	\$1,426	\$4,275		
Integrated Platform Total	29	\$324	\$278	\$2,033	\$1,250	\$3,886		
W/out OTEC	19	\$482	\$385	\$1,657	\$1,157	\$3,681		
Reduction in Overnight Capital Cost over wind alone: 26% to 30%								

#### LCOE<sup>1</sup> Calculation

	FCR*CAPEX	Fixed OPEX	Net Capacity Factor	<b>AEP<sub>net</sub></b> (MWhr per	LCOE
	(\$/kW/yr)	(\$/kW/yr)	(%)	MW/yr)	(\$/MWh)
oating Wind	\$498	\$106	56.7%	49,669	\$122
ave Energy	\$605	\$200	45.0%	27,594	\$204
ow Energy	\$445	\$38	32.4%	5,672	\$170
TEC	\$724	\$383	90.0%	78,840	\$140
oating Wind	\$498	\$106	56.7%		122
ave Energy	\$184	\$60	45.0%		62
ow Energy	\$168	\$11	32.4%		63
TEC	\$404	\$249	90.0%		83
tegrated atform Total	\$367	\$138	63.5%	161,775	\$91
//out OTEC	\$348	\$79	49.7%	82,935	\$98
Design Li	fe = 25yr	Reduction in LCOE over wind alone:			19% to 25%

1) LCOE Definitions and calculation per USA National Renewable Energy Center definitions

Fixed Charge Rate (FCR)<sup>1</sup> = 9.45%

O



The first company to build offshore renewable energy platforms like Boeing builds planes will dominate the market.

Suppliers 500k employed 6 million parts 787 Prototype \$7 billion, and 5 years Estimated build cost \$90 MM each, 80 units per year **Excibuoy** Integrated Platform

Projected 250k employees

Suppliers 1MM+ employed

40 major components Required Build Rate 300 per year (1GW)



#### **Potential for Power to Fuel**



The Excibuoy™ can hold 12,000 tonnes of payload. This means carbon capture and hydrogen separation technology can be carried.

#### **Offshore Renewables + O&G Facilities + Power to Fuel = Opportunity**

Moving H2 production to the energy platform distributes the brine, avoiding negative marine impacts. Distributing CO2 capture allows plants to reasonably sized for an offshore system.



# **Blue Industry Web**





# **The Competition**

www.excipioenergy.com

### **Floating Wind Systems**

There are many competing hull designs, but none that have **Excibuoy's™** stability, versatility, and payload capacity.





#### **Competition? - Floating Wind**

All of the below have financial backing of their local Government or a major company. None of them have the potential of an Excibuoy. Excipio would be pleased to provide head-tohead comparisons to any wind or hybrid (see next slide) system.

Туре	Companies	Туре	Companies
Spar	Hywind	Barge	<u>Ideol</u>
	Windcrete		<u>Saitec</u>
	Fukushima Spar		Float Inc PSP Technology
	Sway Spar	TLP	<u>PelaStar</u>
Semi Sub	Windfloat		Avangrid TLPWIND
	SCD Nezzy	Multi-Turbine	<u>Nenuphar Wind</u>
	Nautilus		Floating Power Plant (FPP)
	Olav Olsen Semi Sub		HEXICON Offshore Wind
	Sea flower	Gravity Anchor Plate	GICON-SOF
	Fukushima Semi-Sub		BlueH TLP
	TetraSpar		Esteyco Floating Design
	Aquaventus		



### **Competition? – Hybrid Systems**





# In Closing

www.excipioenergy.com

## **Excipio are in for the Long Haul**



Every member of Excipio Energy have devoted the better part of their lives to the safe and responsible development of our oceans.

We see a future where ocean-based power, minerals, food, and recreation are developed in a sustainable, environmentally positive way.

Subsea Habitat designed by the CEO, Age 10

To share in this vision contact us for more information: <u>roy.robinson@excipioenergy.com</u> +1(832)720-4190

