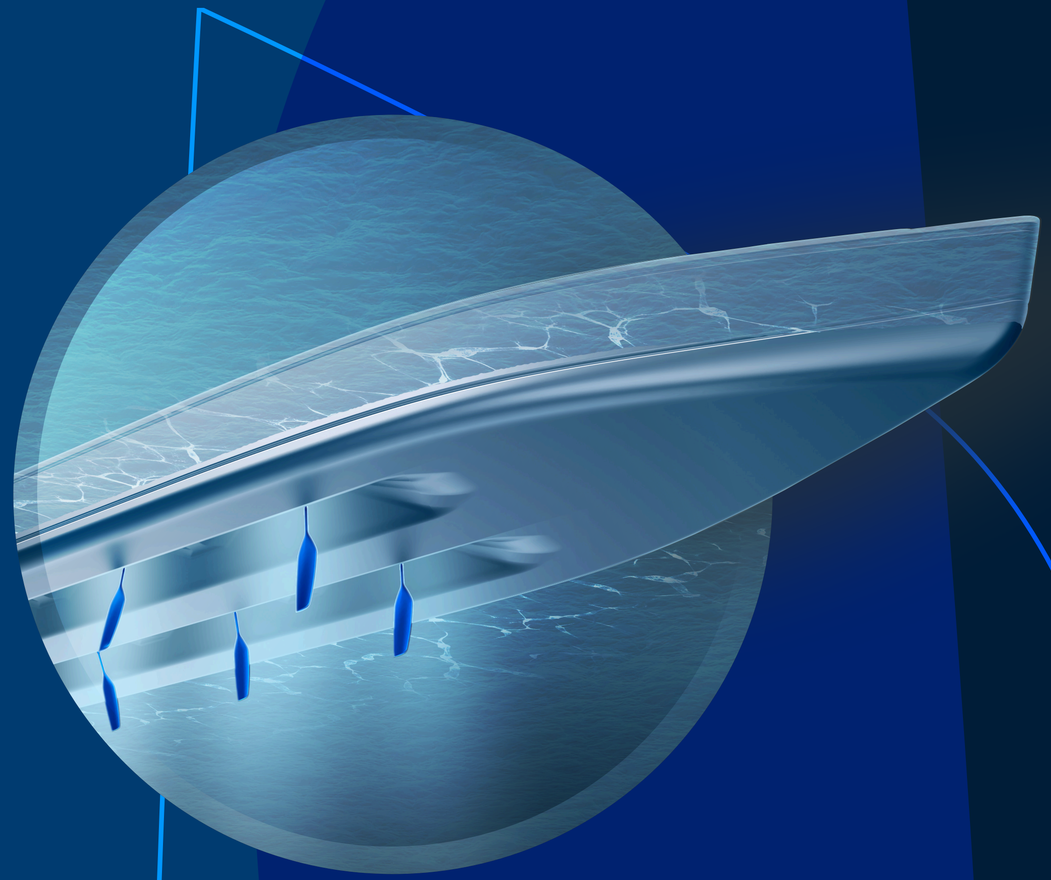
SPEAR

Unlocking the energy of rivers for everyone



Archee

A renewable energy company
spearhydro.tech

PATENTS

WIPO PCT SINCE 2017

USA GRANTED 2020

GRANTS

KET4 CLEAN PRODUCTION

EURÓPSKA ÚNIA
Európsky fond regionálneho rozvoja
OP Integrovaná infraštruktúra 2014 – 2020

MINISTERSTVO HOSPODÁRSTVA SLOVENSKEJ REPUBLIKY

SBA SLOVAK | BUSINESS | AGENCY

AWARDS

eit Climate-KIC

challenger 2020–2021 alumni

STARTUPS BOOTCAMP V4

PowerUp! by EIT InnoEnergy

Selected for Slovak Pavilion

EXPO 2020 DUBAI UAE

Technology

SPEAR is a floating hydro power plant

SPEAR technology uses internationally patented mechanical system of slow-moving, durable fins propelled by a river stream. Fins are connected to standard generators that produce electricity.

Unlike common propellers and turbines, fins don't clog, can withstand debris, and are safe for wildlife. These unique characteristics allow long-term deployment in free flow environments that was not possible until now. The technology is installed in a recycled standardized river shipping barge and can be towed in and transported to any navigable river. The anchored power plant can be plugged into a local grid network or can be used to charge batteries situated in the hull. The entire system is scalable and modular, being able to provide an output with the maximum nameplate capacity of 190kW.

PATENTED

- **WIPO PCT** SINCE 2017
- **USA** GRANTED 2020
- **EU** EXPECTED 2022

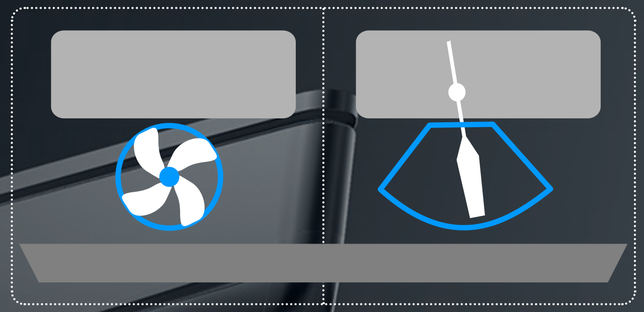
CERTIFIED

Power Output Certified by: Hahn Schickard

190 kW
~ 2 m/s water speed

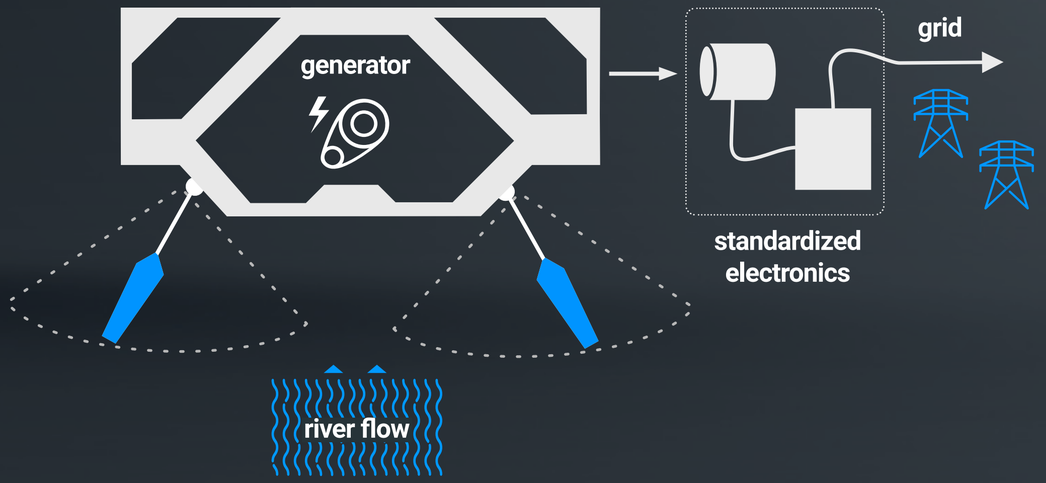
Impact Certification CIF AS01 Climate impact forecast

Ecofriendly Nanocoat: INL International Iberian Nanotechnology Laboratory



✗	Withstand debris ✓
✗	Safe for ecosystems ✓
✗	Effective area ✓
✗	No clogging ✓

SPEAR generator module



Current Challenges

Passive high-energy demand and efficient riverside buildings must comply with the Directive 2010/31/EU (EPBD).

No free flow power plants because of clogging

Centralized electricity production is often distant from energy consuming areas causing transmission losses and higher costs.

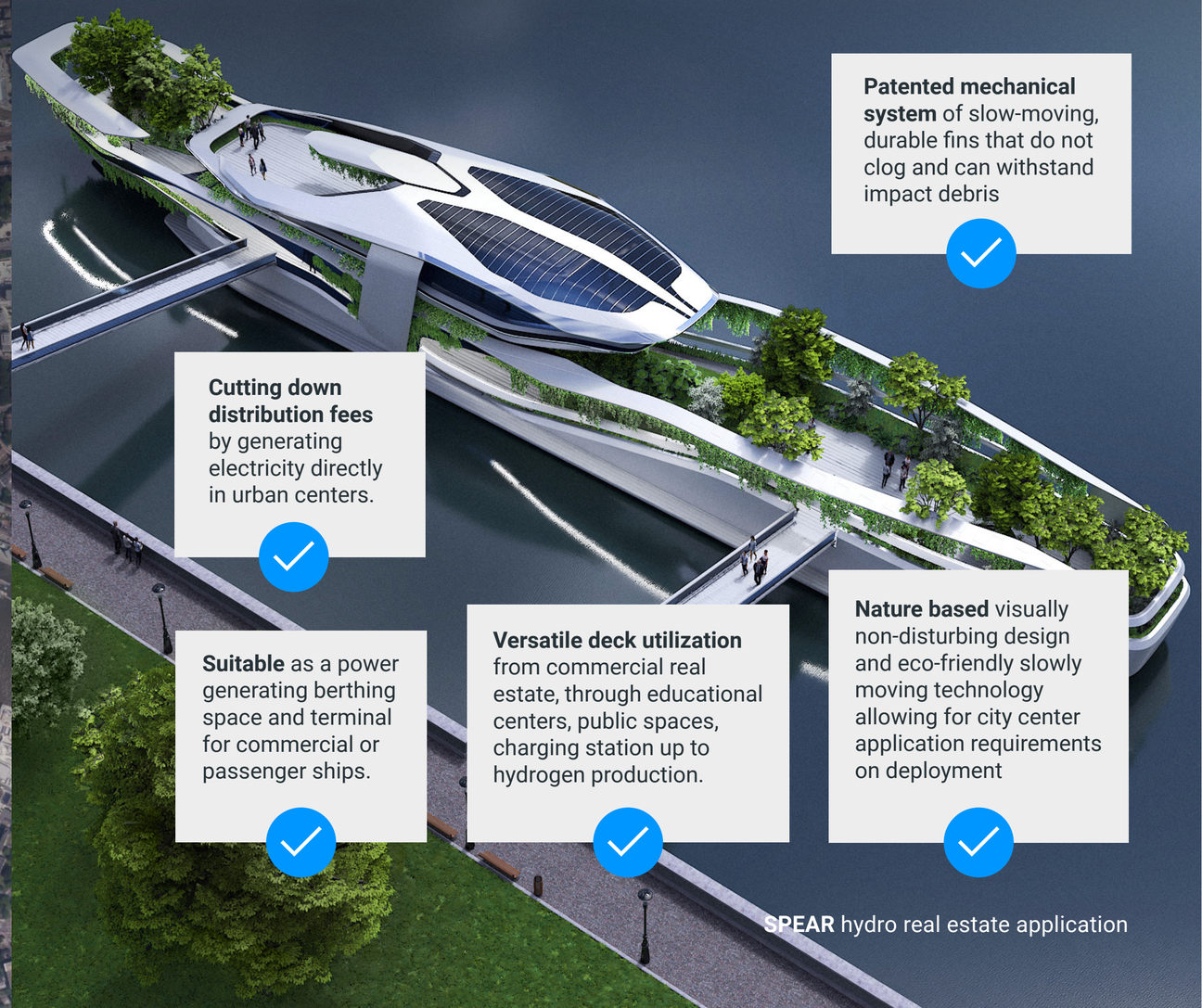
Underutilized energy potential of rivers narrowing down to turbine-based solutions that damage ecosystems, require massive infrastructure and hinder river traffic

Limited potential of current green solution in the cities due to low capacity factor and additional social and tech requirements on deployment

Port infrastructure needs to be electrified with shore-side electricity supply to comply with the Directive 2014/94/EU aiming to lower emissions and promote clean air and water.

Solution

SPEAR hydro challenging the standard in riverside real estate and port infrastructure around the globe



Patented mechanical system of slow-moving, durable fins that do not clog and can withstand impact debris

Cutting down distribution fees by generating electricity directly in urban centers.

Suitable as a power generating berthing space and terminal for commercial or passenger ships.

Versatile deck utilization from commercial real estate, through educational centers, public spaces, charging station up to hydrogen production.

Nature based visually non-disturbing design and eco-friendly slowly moving technology allowing for city center application requirements on deployment

SPEAR hydro real estate application

Business and Customers

SPEAR Hydro power plant offers a large portfolio of distinctive applications and modularity.

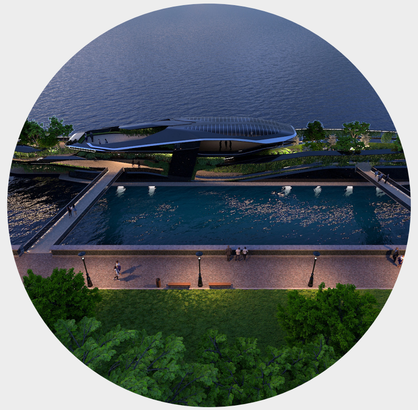
A. REAL ESTATE APPLICATION: SPEAR technology embedded real estate deck – allowing for variety of landmark projects with functions ranging from leisure and F&B through, educational centers promoting environmental consciousness, smart city hubs, tech museums, cultural centers, or charging stations for electric cars and boats.

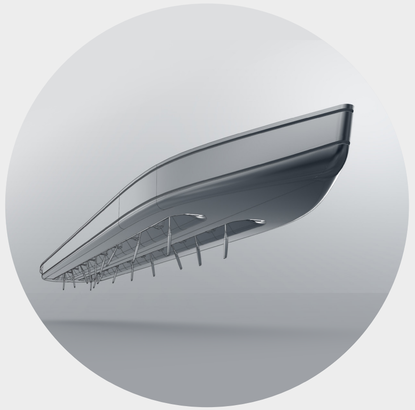
B. PORT/BERTH APPLICATION: SPEAR technology embedded PORT BERTHS – powering anchored ships and boats in compliance with the Directive 2014/94/EU requiring electrification of all berths by 2025.

Future applications include SPEA technology-based solutions for powering integrated hydrogen farms and spin-off systems designed to harvest the energy of ocean currents and wind energy.

We build and sell SPEAR Hydro in both applications to meet our customers' specific needs.

Later, we intend to offer SPEAR technology for licensing and joint-venture scale-up production.





Simplified Economics

	ONE SPEAR UNIT	SPEAR EMBEDDED RIVERSIDE REAL ESTATE	SPEAR EMBEDDED PORT / BERTHS
Operated by Customer	Yearly revenues - electricity	€ 284,785	€ 190,345
	Yearly revenues - deck rental/docking fees	€ 752,779	€ 268,747
	Yearly operation costs	€ 234,859	€ 89,582
	EBIDTA per unit operated	€ 802,706	€ 369,510
	ROI (years)	7.7	9.1 *
SPEAR Financials	Unit production and instalation cost **	€ 6,194,640	€ 3,345,120
	Unit price	€ 8,362,764	€ 4,515,912 *
	Profit pre unit (35 %)	€ 2,168,124	€ 1,170,792
Licensing	Royalties on revenue from licensing	5%	5%

* SPEAR saves berth electrification costs imposed by Directive 2014/94/EU (average capex cost € 1.4 mil / berth)
** Cost shared with the customer via advanced payments

Market & Value Proposition

- CLEAN AND STABLE HYDRO ENERGY ☑
- OPEN DECK FOR REAL ESTATE ☑
- POWER GENERATION DIRECTLY IN CITIES ☑
- ELECTRIFIED BERTH FOR SHIPS ☑
- ENVIRONMENTALLY FRIENDLY ☑
- PLUG AND PLAY, EASY INSTALLATION ☑

Deck Development
- Housing
- Offices
- F&B / Leisure
- Public venues (gallery, park)
- Electrified Berth for cruise or cargo required by 2025

Technology Plugins
- Battery storage, micro grid balancing
- E mobility charging
- Hydrogen production ~ 80 kg/day
- Hydroponics and urban farming
- Small water treatment facility

Technical Parameters of one SPEAR hydro unit (real estate application)

Power output kW at 2 m/s	Power kWh per day	Capacity factor %	Electricity supply for sq m / office*	Electricity supply No. of households	Deck area for rental sq m	Tonnage	Length m	Draft m
190	**4 560**	**~ 80**	**6 400**	**+ 40**	**1 600**	**1700**	**76**	**2.5**

Market Potential

Region	Major rivers	RIVERSIDE REAL ESTATE APPLICATION		PORT / BERTH APPLICATION	
	suitable rivers are: navigable, cut through population orindustrial centers, have enough depth of at least 2 meters at its banks, are not blocked by dams and if yes, have locks allowing for river shipping, have low sedimentation deposits along banks.	No. of SPEARs	PROJECTED PROFIT POTENTIAL (millions of €)	No. of SPEARs	PROJECTED PROFIT POTENTIAL (millions of €)
Europe	Danube, Rhine, Elbe, Thames, Loire, Garonne	230	498	240	280
North America	Mississippi (+ tributaries Ohio, Missouri, Arkansas), Columbia, Potomac and Chesapeake Bay, Hudson and East River, St. Lawrence River	200	433	280	327
Russia & Ukraine	Dnieper, Don, Volga, Ob-Irtysh, Amur, Lena, and Yenisey	30	65	70	82
China & East Asia	Huang He, Yangtze, Pearl	270	585	460	538
South & South East Asia	Mekong, Red River Delta, Ganges, Yamuna, Brahmaputra, Indus, Karnaphuli	50	108	140	163
TOTAL		**780**	**1.689 billion €**	**1190**	**1.390 billion €**

* Consumption of electricity per meter squared in office buildings with more than 20 storeys is 260 kWh per m2 per year.
Based on the research project results UCL-Energy High-Rise Buildings: Energy and Density, 13 June 2017.
** Predicted number of SPEAR units based on satellite imagery, available geographical data, and technical parameters of SPEAR Technology. Real numer of units may differ.

Current Renewable Solutions

Small Hydro

- Impact habitat and local ecosystems
- Block river traffic & natural flow costly
- Require large infrastructure distant from cities do not support any development

Capacity factor 40 - 50%

Free flow systems

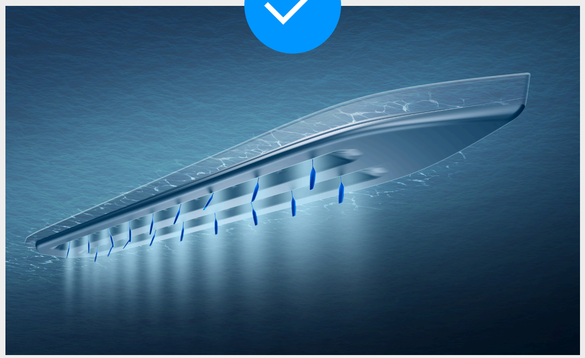
- Solutions still in development
- Small power generation <10 kW
- Do not support any real estate
- Development require waterproofing of machinery

Capacity factor 50%

Solar

- Weather dependent
- Require large effective areas for deployment
- Generate heat islands in cities

Capacity factor 25 - 35%



SPEAR Hydro

- Enables deck development
- Direct deployment in cities
- Transportable
- Easy installation
- Environmentally friendly

Capacity factor 80% +

Go-To-Market

Given the relatively high R&D costs and disruptive nature of SPEAR technology, we plan to develop the pilot unit with help of the public sources and grants. **A unique international consortium** of private and public – both business and R&D – institutions was established to advance our fundraising capacity and support the technology credibility.

Based on signed LOIs, first custom-made units are to be developed in cooperation with key ports and real estate developers for landmark projects in Slovakia. After piloting all products with local customers, SPEAR Hydro will be seeking a strong **industrial partner for joint-venture** serial production and scale-up.

CITY

BRATISLAVA

Capital of Slovakia

REAL ESTATE

CRESCO REAL ESTATE

PORT OPERATOR

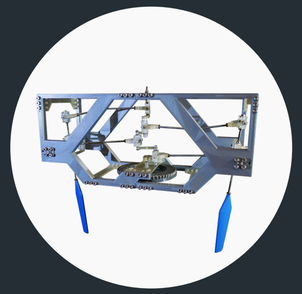
verejné prístavy

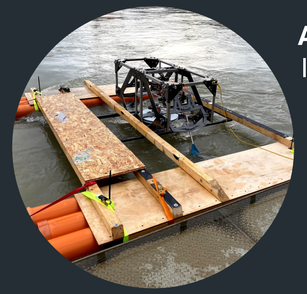
FINANCIAL PARTNERS

IPM GROUP

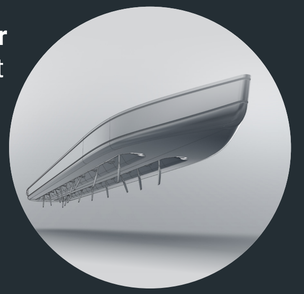
VENTURE TO FUTURE FUND

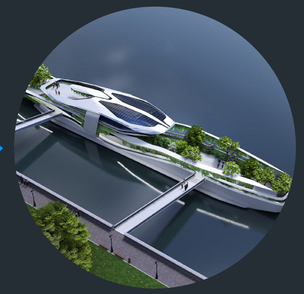
Product Development Journey





EIC Accelerator Investment Grants





Prototype 1:20 SPEAR Generator Module
TRL 4
December 2020

Prototype 1:4 SPEAR Generator Module
Tested on Danube,
TRL 6 Reached
in August 2021

Pilot Small Scale Berth
Developed
in 2023

Landmark Project for CRESCO Real Estate in Bratislava

Full Production Capacity
in 2026

Milestones

2017
WIPO PCT Patent

2018
PowerUp Startup Awards
3rd Place

2018
SBA
consultant grant

2019
KET4CP
research grant

2020
Certification:
· power output
· nanocoating
· enviro impact

2020
EIT Climate KIC startup competition
1st place

2020
US Patent

2020
LOIs
signed by first customers

2020
R&D
Consortium established

2021
TRL 6 prototype
tested on Danube

2021
Selected for **Dubai Expo**

2021
EIC Accelerator
submission

NOW

2022
R&D and Technical Blueprints

2022
EU Patent
Granted

2023
Pilot Product
(small berth)
deployment
for a customer

2024
Pilot Production
(large real estate)
deployment for
a customer

2026
Full Production
Capacity & Break Even Point

2027
Licensing
and / or
JV scale-up

Team

Martin Šichman
CEO,
Founder,
Inventor

Michal Kovács
CBO, Co-Founder,
Regulatory Affairs,
Head of Advisory Board

Marek Dorda
COO,
Project & Grant
Manager

Jan Mazur
CLO,
Co-Founder, IPR

Lubos Zalibera
Mechanical &
Electrical Engineer

Antonin Samal
Engineer

Milota Sidorova
Urban & Smart City
Specialist

Boris Melus
Designer

Julia Molcanova
Graphic Designer

For more information
about individual team
members and their
professional background
consult the EIC
Application Form

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IPM

Mario Vircik
Financial Advisor
IPM

Maria Bielikova
Machine learning, AI
KInIT

Fedor Gomory
Electrical Engineer
SAV

Business Partners

BRATISLAVA

Municipal partner interested in our Smart City solution

Bratislava is the capital city of Slovakia located on the river Danube with a rich and vibrant history being at the crossroads of important trading routes.

CRESCO REAL ESTATE

Real estate developer ready to deploy SPEAR as part of the RiverPark II landmark project

CRESCO is the largest Slovak residential developer. Established in 1992, it has completed numerous successful real estate development projects with most of them in Bratislava. The company is currently expanding its activity to other regions in Slovakia and abroad.

IPM GROUP

Advisory partner for grants and financing

IPM Group ("IPM") is an asset manager with more than one billion US dollars in assets under management. IPM focuses on investments in InfraTech sector, the intersection between real assets infrastructure and ground-breaking technologies that particularly aim to tackle climate change.

verejné prístavy

Public port operator interested utilizing SPEAR for electrified berthing space

Verejne pristavy, a.s. is the public port operator in Slovakia that ensures the collection of charges and fees and is responsible for the construction, maintenance and repairs of public port infrastructure.

R&D Partners

Hahn Schickard

CFD Simulations, Power Output Physics

Hahn-Schickard is an institute in Germany specializing in applied research, intelligent systems and technology development.

INL INTERNATIONAL IBERIAN NANOTECHNOLOGY LABORATORY

Hydrophobic and Biofouling Nanocoating development

International Iberian Nanotechnology Laboratory performs interdisciplinary research, deploys and articulates nanotechnology for the benefit of society.

MULTI ENGINEERING SERVICES

Vessel Design and Hull Optimization

MULTI is a Dutch engineering company with presence in The Netherlands, Belgium and Slovakia. MULTI focuses on 3 markets: Industry, Construction & Infrastructure and Maritime & Offshore.

SAM SHIPBUILDING AND MACHINERY

Shipbuilding, Heavy engineering and Construction

SAM is a Slovak shipbuilding company and qualified manufacturer of machinery and other engineering products with a quality management system certified by the TÜV certification. The Komárno shipyard has engaged in shipbuilding since1898 and is rated for ships up to 3,000 tonnes.

SLOVENSKÁ AKADÉMIA VIED ACADEMIA SCIENTIARUM SLOVACA

Electrical engineering and measurements

Slovak Academy of Sciences is the main scientific and research institution in Slovakia fostering basic and strategic basic research. The Institute of Electrical Engineering is covering disciplines of electronic and electrical engineering and solidstate physics supported by extensive material research.

R&D MOLD MACHINING

Engineering, Precision Mechanics

R & D MOLD MACHINING mechanical & automotive engineering focused on the production of precision parts intended for further use in the automotive, energy, manufacturing and marginally food industries.

KInIT Kempelen Institute of Intelligent Technologies

Energy Data Analytics

KInIT is a Slovak independent, nonprofit institute dedicated to intelligent technology research focusing on fields such as data analysis for green energy or information security.

MAKERS CREATIVE TECHNOLOGISTS

Energy Management, Control Systems

MAKERS is a Slovakfull stack solutions company specializing in system architecture and technology selection for complex IoT projects, development of IoT platforms, integration of HW (sensors, actuators), and PLC programming.

- Verified
- Certified
- Patented
- Recognized

See you on board!

Environmental Impact

Impact certification:
"Valid, positive and significant"

1 SPEAR Hydro

Saves
8 200 tons of CO_2 in 10 years

Equals
planting 3700 trees (3sq km)

Equals
the area of Central Park (New York)

Archee

A renewable energy company
spearhydro.tech