

Why the RED-Blue Energy is now ready for upscaling into MW-demonstration scale

by REDstack BV

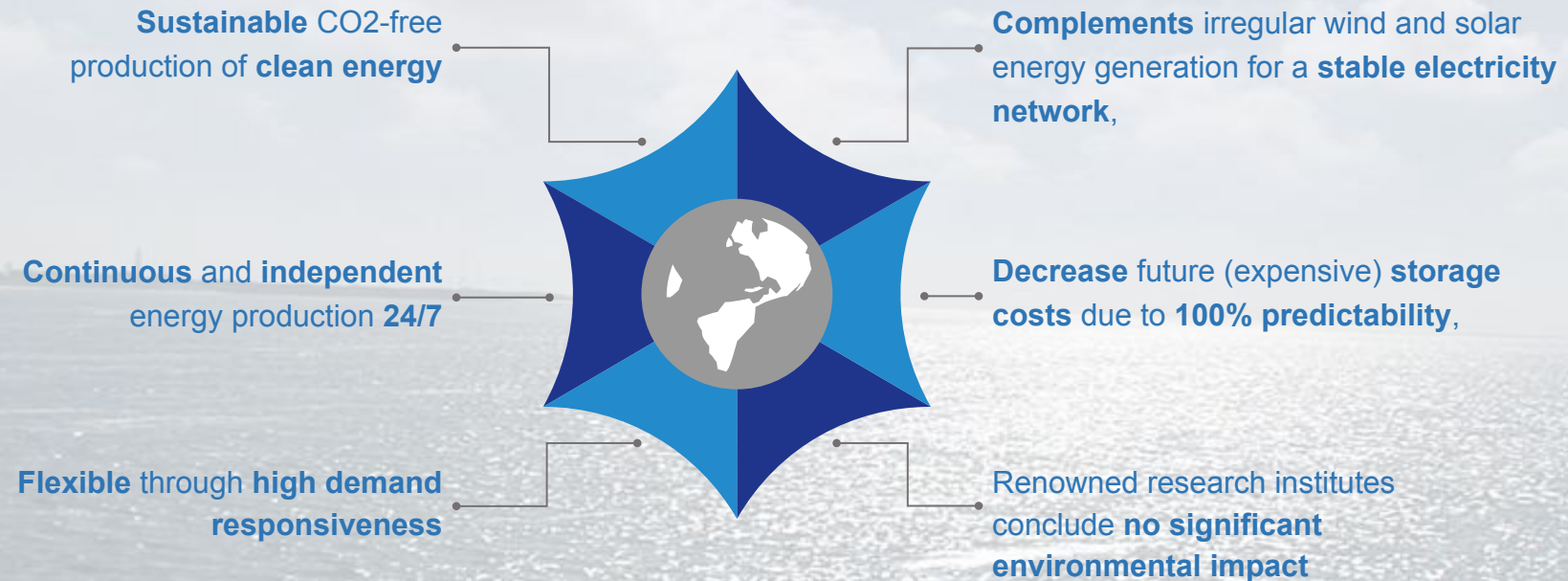
Presentation
October 27th 2023

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Blue Energy

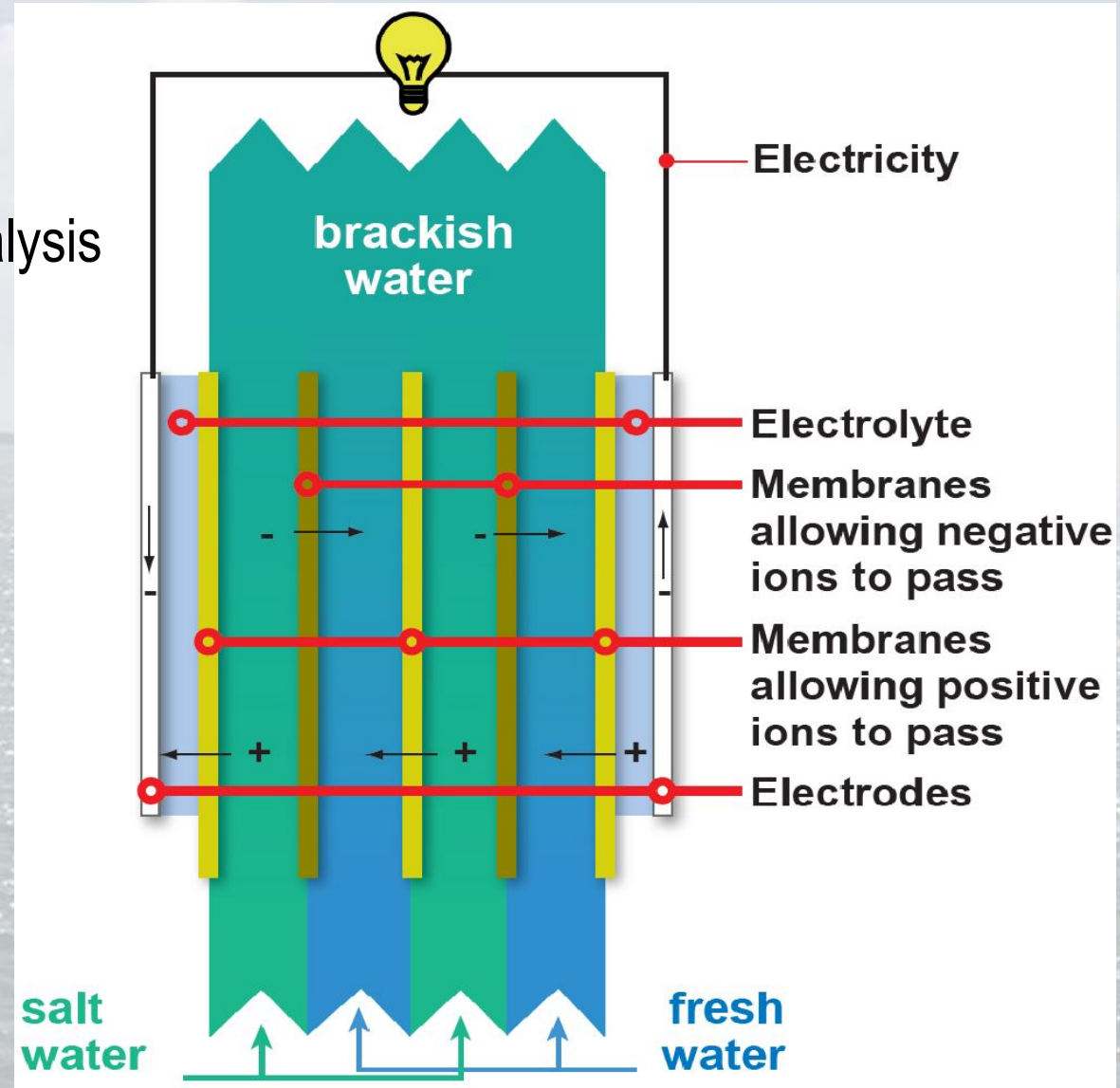
Energy harvested from the difference in salt concentration of 2 waterflows,
based on the Reverse Electro Dialysis Technology

Blue Energy impact in the Energy Transition

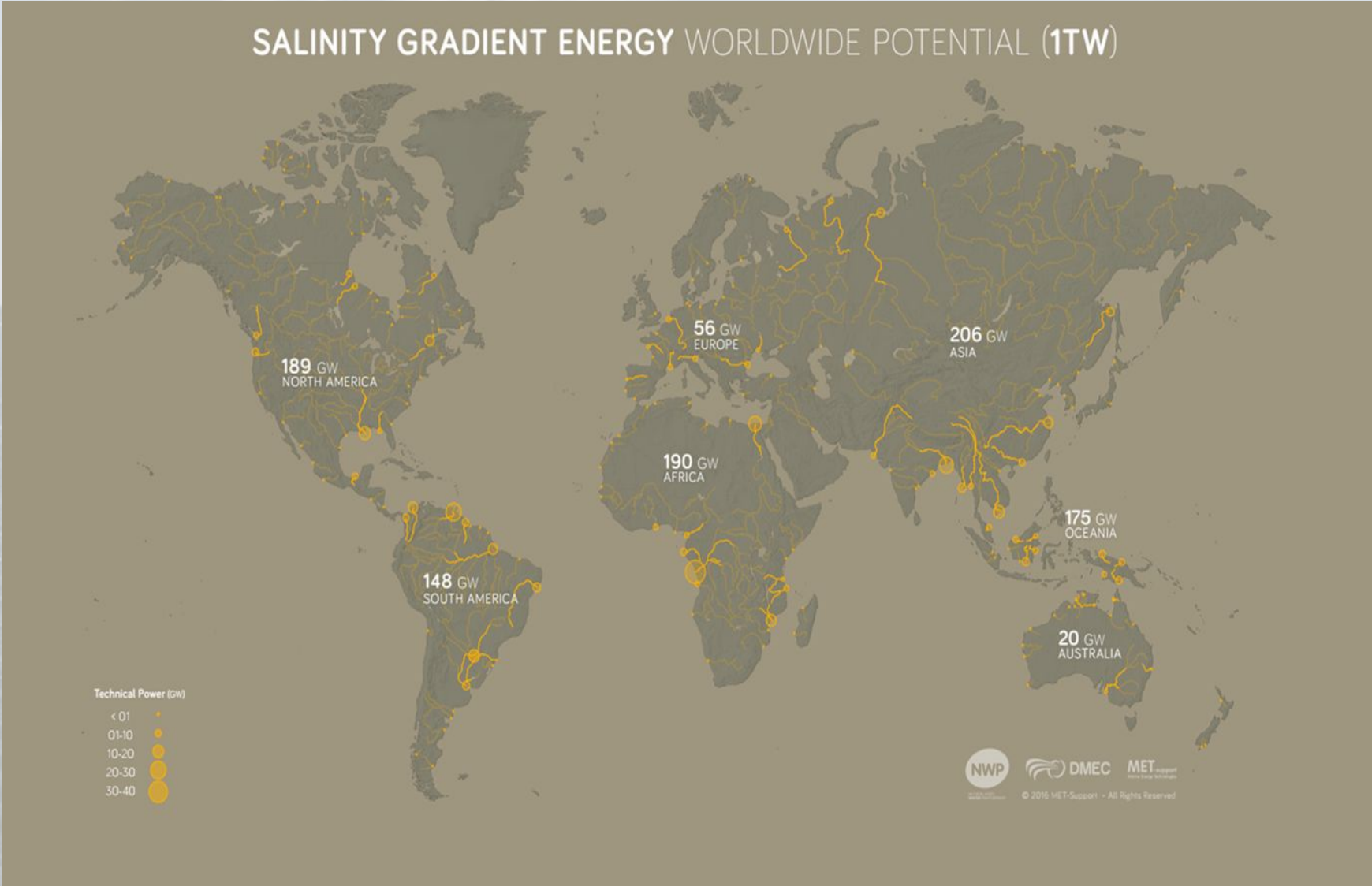


Technology, how it works

RED =
Reverse Electro Dialysis



Worldwide potential of Blue Energy represents of up to 12% of the global power consumption



Position within energy mix

- Blue Energy is a source of sustainable energy that is available full continuous
- No buffer / storage needed / no conversion losses
- Generating DC; great for H₂-elektrolysers
- Very small ecological impact
- Potential up to 12% of world power demand

REDstack, who we are

- REDstack BV is spin-off company of Wetsus, European Centre of Excellence in Sustainable Water Technology
- Back-up and support by WETSUS with 18 PhDs
- WETSUS researchers use the REDstack pilot facilities for their work
- Team 12 fte; in close cooperation with institutes and companies
- Founded in 2005; but really started in 2014, when the pilot plant was commissioned
- Several EU-funded projects supported the development

REDstack, who we are

A Dutch impact-scale-up company

- Office and Stack assembly facility in Sneek
- Pilot Plant at Afsluitdijk; the Netherlands
- Awarded the title of *Dutch National Icon* by the full Board of Ministers

IMPACT SCALE-UP

Pilot Plant at the Afsluitdijk the Netherlands



How did we meet our targets

in 2004, model-calculations stated that:

At a flow of 1 m³/s of freshwater and 1 m³/s of seawater,
1 MW could be harvested.

Power density of 2 W/m² of membrane, should be achievable when
using seawater and riverwater as powersource

Test in WETSUS laboratories (in 2011) and the pilotplant (in 2019)
have confirmed this.

However, salt concentrations and temperature are of importance

How did we meet our targets

Clogging and fouling was mentioned as a major risk for continuous operation.

Because of optimizing
the stack design
the suitable profiles on the membranes,
using the right pretreatment
suitable stack-operations-procedures,

Fouling and clogging is not an issue;
In the pilotplant, stack operating, without signs of deterioration of the performance.

How did we meet our targets

Upscaling the stacks....

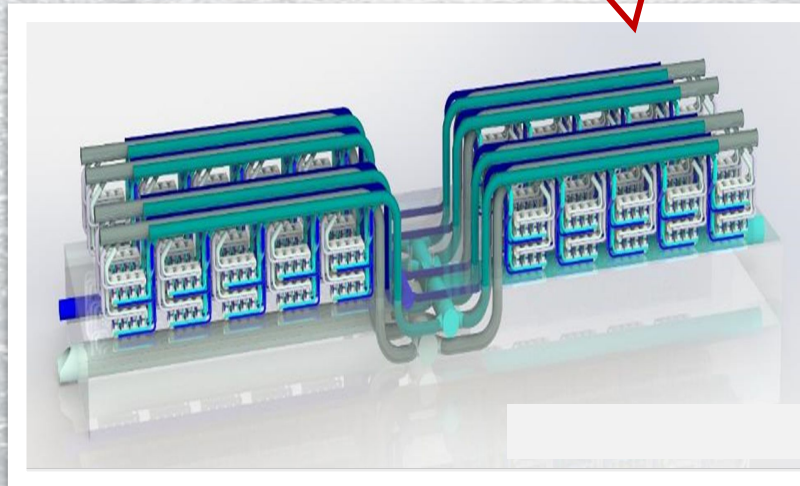
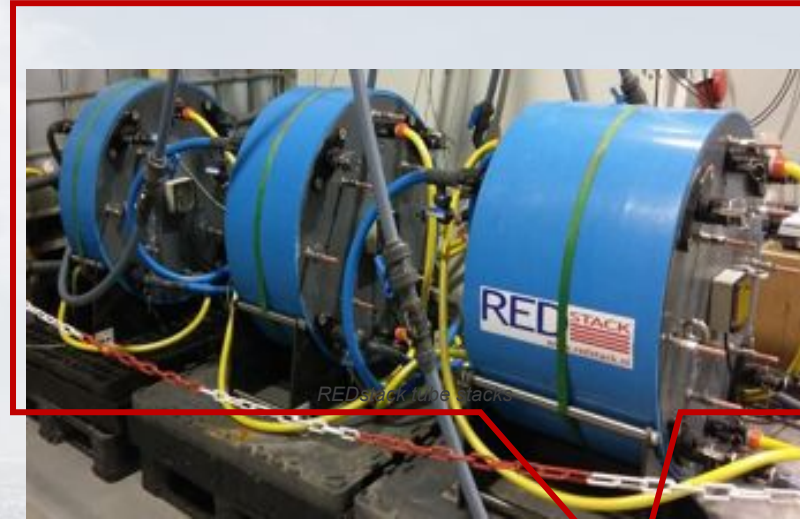
We started with stacks with 0,25 m² of membrane

Now we have stacks with more than 250 m² of membrane

The performance and efficiency of the stacks, due to upscaling the size, is not decreasing.

Next step is a stack with 2000 m² of membrane.

Upscaling the stacks



Impression of the pilot plant facility



How did we meet our targets

Water inlet-systems and filtration systems can have a negative impact on marine life.

During the pilot plant operations at the Afsluitdijk, independent professional third parties (Deltares, NIOZ...) analysed the impact on marine life.

The conclusion is that no significant environmental nor ecological impact is to be expected even at large scale implementation in an ecological sensitive and protected location.

Potential in Netherlands

in the Netherlands, the potential is up to 1750 MW
Based on 365/24/7 continuous production

- 3 MW at Den Haag (sewage effluent)
- 100 MW at Afsluitdijk
- 25 MW in IJmuiden
- 100 MW in Zeeland
- 25 MW various locations
- 1500 MW in Rotterdam area

What are the opportunities

The LCoE is calculated to be euro 0,11 per kWh for the first 100 MW plant, and going down to 0,05 after 2040.

Lower than power from Nuclear and storage systems.

Full continuous and eco-friendly power generation

World wide potential of 1000 GW

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