Renewable energy and the potential of energy storage in aquaculture.

futurology

or activities necessary for the survival of the industry in times of energy crisis?

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Ziemowit Pirtań, Olsztyn, november 2022

Do we need renewable energy?

- Rapid change in the realities of the energy market
- Risk of failure / sabotage of critical infrastructure
- „Energy blackmail”
- Rising costs of conventional energy
- Climate change / intensity of farming energy intake
- Adjusting the PV production curve to the needs of farming
- Falling PV installation prices / increasing efficiency and quality
- Legal solutions
- Rising potential of innovation - new technologies

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IDEOLOGY / PRAGMATOLOGY

- Acceptable development is sustainable development…
- Sustainability means high efficiency with minimal environmental impact and consumption ...
- Intensive aquaculture = technological professionalization in which reducing the impact on the environment becomes a side effect of farming processes ...
- The more technology, the greater the demand for energy ...
- The greater demand for energy increases the pressure on the environment - if the energy comes from "dirty" sources.

The greater demand for energy reduces the positive effect of new technologies in reducing environmental pressure.

The use of renewable energy sources in aquaculture production is an opportunity to offset the effects of increasing energy demand

Currently, all realities are turned upside down - the lack of decisive action to ensure renewable energy sources for aquaculture may destroy the effects of technological progress and sustainability ...

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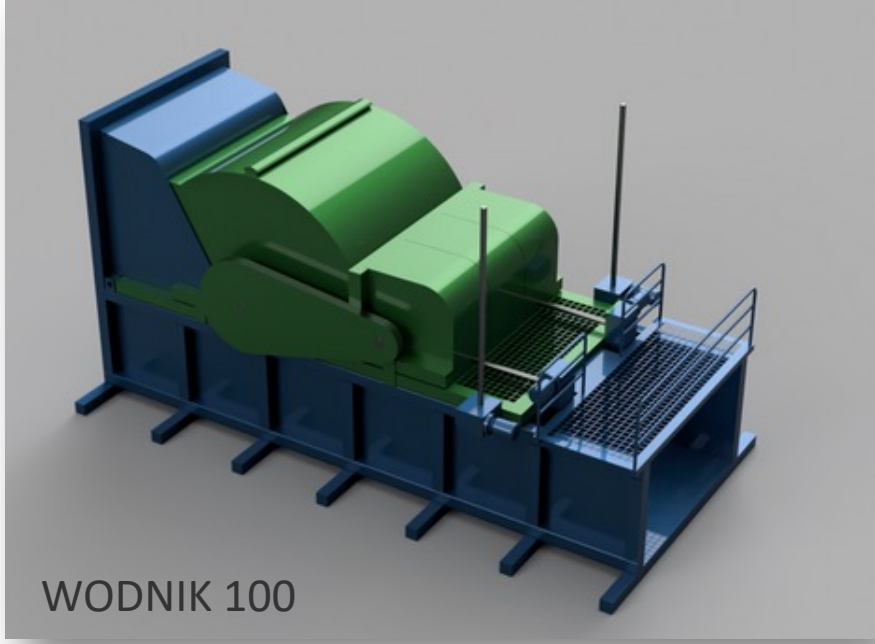
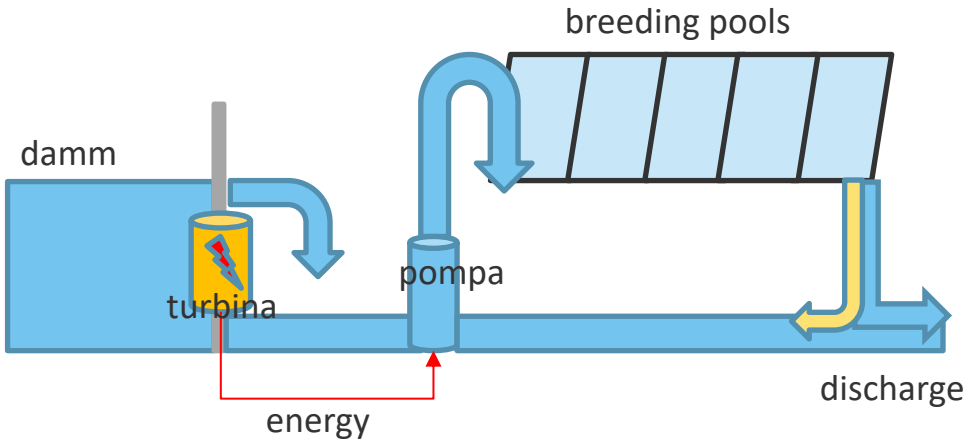
Technologies

Hydropower plants

- Existing weirs, water inlet and outlet,
- Modern water turbines – lowering prices (easy installation),
- Stable electricity production day and night
  - Sensitivity to drought and severe frost,
  - Relatively expensive technology (especially new dams),
  - Water balance conflict ???





Hydroelektrownie mogą być dobrym uzupełnieniem technologicznym dla istniejących obiektów bazujących na dużych piętrzeniach wody

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Technologies

Innovative hydropower plants

- Kinetic hydropower plants
  - installation on channels, low damming level,
  - in locks, culverts,
  - compact design and relatively reasonable price,
  - availability !!!

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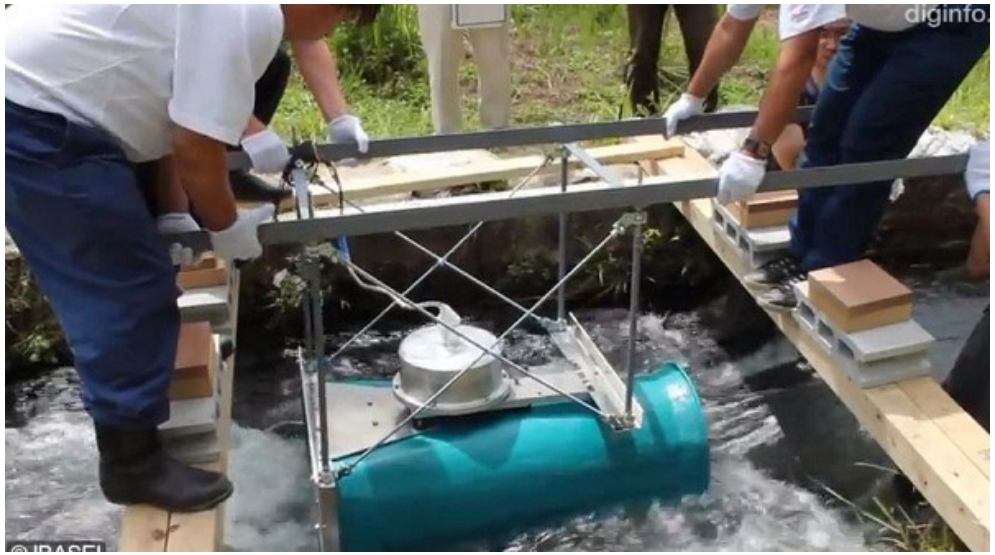
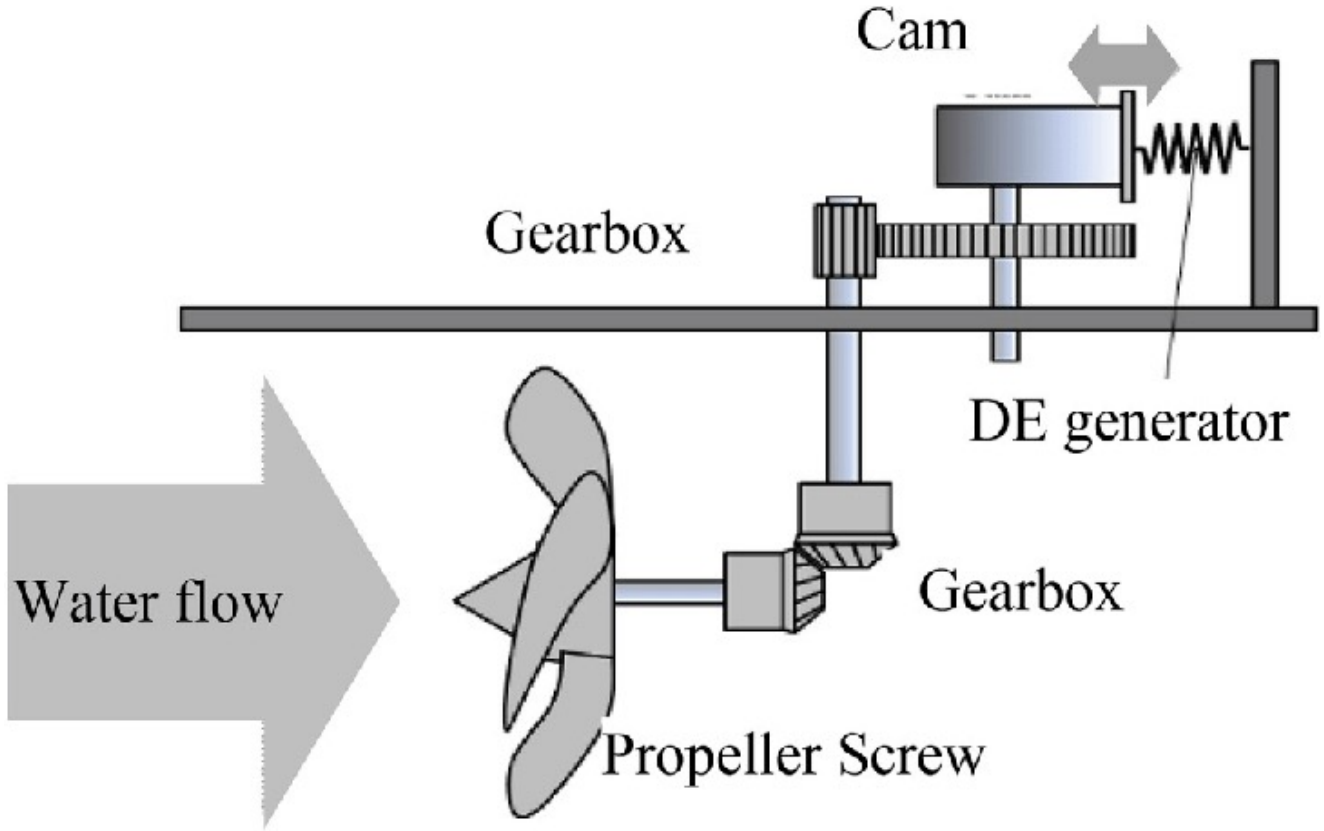
Technologies

Innovative hydropower plants

Propeller power plants
- experimental phase





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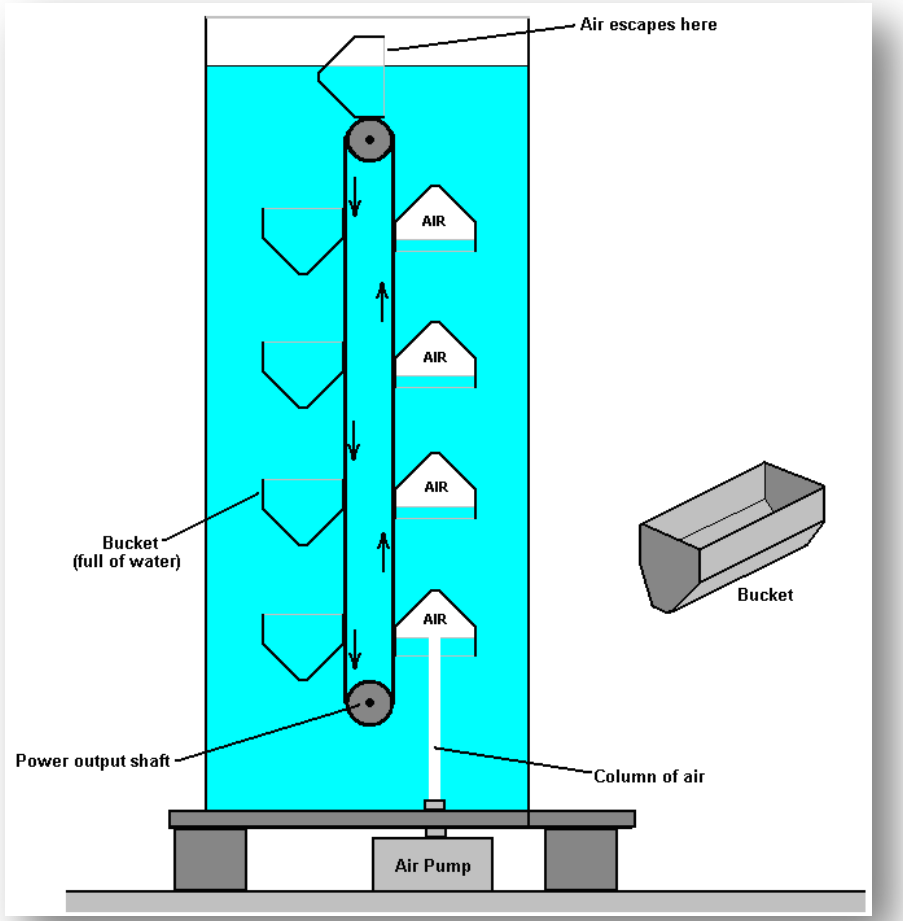
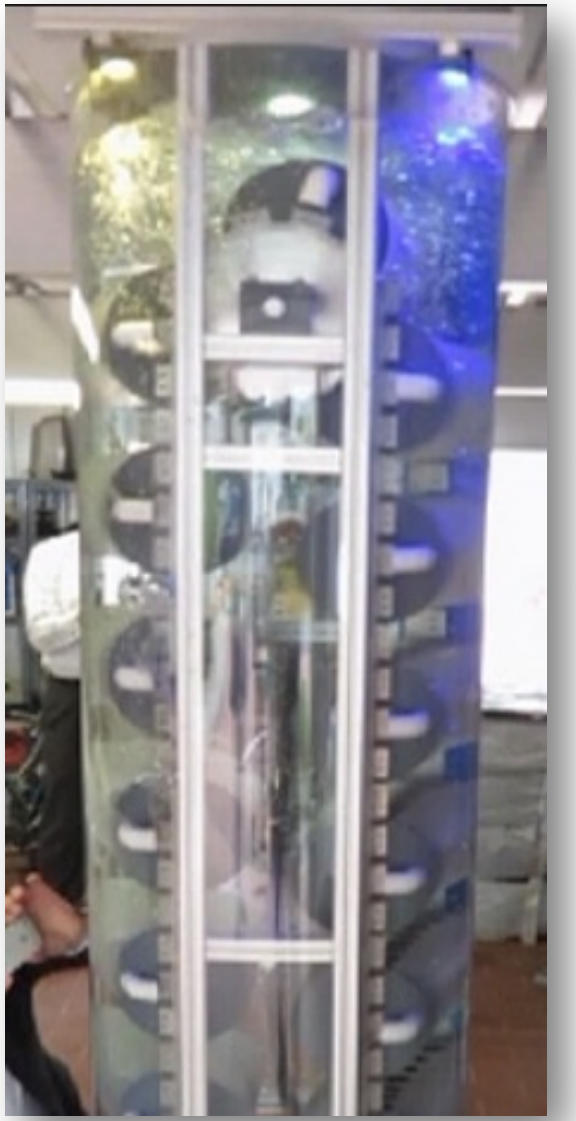
Technologies

Innovative kinetic power plants??





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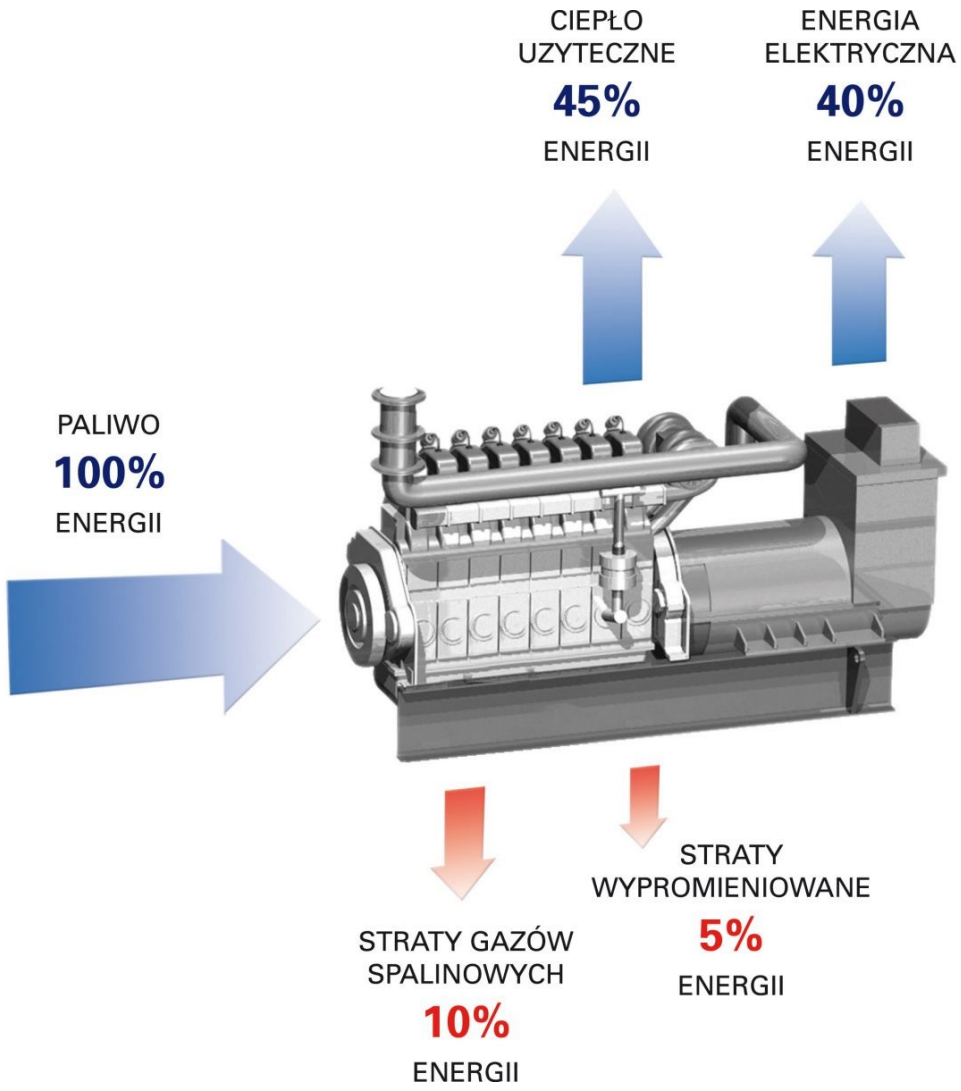
Technologies

Cogeneration

The use of devices dedicated to other purposes to obtain energy:

- power generator,
- oxygen generators,
- air turbines and compressors,
- heat recovery and transfer.

Cogeneration is an essential element in reducing the operating costs of devices used in intensive breeding.

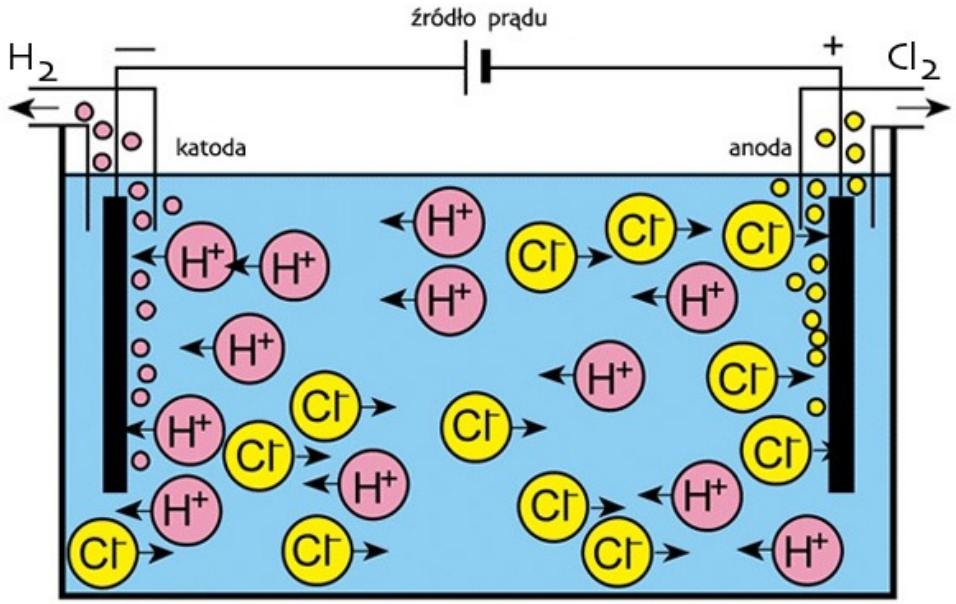


Technologies

HYDROGEN

Hydrogen generation using the phenomenon of electrolysis
- reversible process
- waste oxygen
- thermal energy
- possibility of use również jako paliwa

Hydrogen is a medium with great potential and the use of this technology can be beneficial for aquaculture facilities for several reasons



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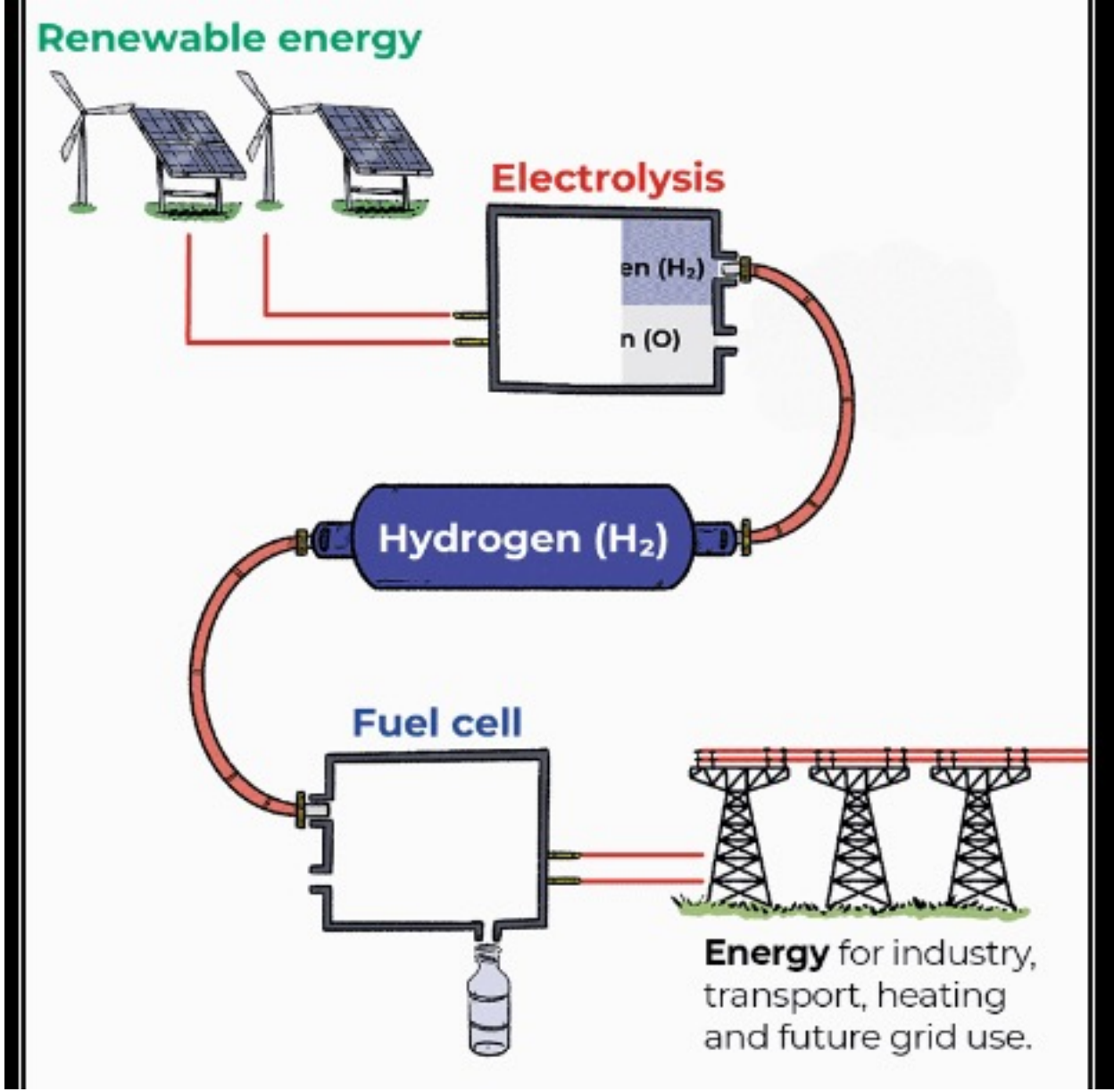
Technologies

Hydrogen - as an energy store

The use of hydrogen in aquaculture?

- **Utilization of waste oxygen**
- **Use of waste heat (in both transformations)**
- **Use of both gas and fuel cells**



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Technologies

PHOTOVOLTAICS

- + the best ratio of installed capacity to investment price,
- + a huge qualitative leap in panels and other system components,
- + full controllability, ease of use, safety,
- + very predictable and stable energy production,
- + marginal operating costs,
- + the lowest cost of system replacement / modernization,
- + use of the area used for fishing activities,
- - electricity produced only during the day, power drop in winter periods

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Technologies

Biogas plants

Biogas plants as a supplement to PV

- **Biogas plants as a supplement to PV**
- **Use of fish waste**
- **Utilization of RAS substrate**
- **The use of plant biomass (lagoons, wastelands, public areas)**
- **Cooperation with farmers and food plants**
- **Possibility of seasonal operation, complementary to PV panels**

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What does the future holds ?

interdependent systems

- Heat exchange fish farming;
- Fish farming using waste heat, oxygen, etc .;
- Diversified renewable energy sources with elements of energy storage and seasonal use of various utilities;
- Breeding focused on the recovery of biomass;
- Treatment of electricity and heat production as an additional source of income (public grid, local communities);

Panie Dyrektorze – ale tu jest jezioro !
I bardzo dobrze – zrobimy w nim elektrownię wodną zasilaną wodorem z biomasy uzyskanej z procesu denitryfikacji biogenów. A w dni parzyste będzie tutaj lodowisko zasilane wiatrakami!

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What does the future holds ?

Revision of the approach to state aid!

- Broad access to capital on preferential terms;
- Feedback mechanisms;
- Strong emphasis on the development of diffuse sources;
- Stabilization of the energy market, resistance to the mechanisms of market monopolization and speculation;

The development of distributed renewable energy sources is now the raison d'être of all EU countries

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What does the future holds ?

A new role for aquaculture

- Sustainable production;
- Zero Carbon Footprint;
- Zero waste;
- Farm to fork;
- Water source of energy;
- The source of energy from the sun;
- Biomass energy source;
- Local energy storage;
- Local supplier of good energy and great food.

Aquaculture - good energy!

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Improving food together

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