Renewables and Research in Kazakhstan: Uneasy Choices?

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The Svevind Energy GmbH Hydrogen project in KZ

- The German-Swedish company Svevind, specialising in renewables (**wind power**) is expected to cover 8% of Sweden's energy market by 2026
- **KZ:** 40 GW_e = wind (70%) + solar (30%)
- **Technology:** water intake and desalination, followed by the splitting of water (H2O) by electrolysis into hydrogen (H2) and oxygen (O)
- **Production capacity:** 2 million tons of hydrogen, converted into 11 million tons of ammonia used as an energy vehicle in 2030-32
- **Investments:** USD40Bn - 50Bn
- **KZ buyout**: up to 25% share.

Project Features:

- **An autonomous system of energy production and transportation.**

Major Concerns:

Water consumption:

- 2 million tonnes of H2 would require 18 million tonnes of water, given the molar weights of hydrogen (2g) and water (18g).
- The Caspian sea (area of 78,000 km^3) contains 78 trillion tonnes of water. The project will therefore use 0,0002% of sea volume annually.
- Continued use of water may have a cumulative environmental impact considering the already decreasing sea volume.
  - ➢ Sea levels have decreased by 28.1 meters since 2005 (Bukharizin, 2022)

Major Concerns:

- **Heavy infrastructure**
- **High cost** (The project area is equal to half of Belgium)
- **Efficiency** (3-stage process: desalination, electrolysis and reverse conversion of ammonia)

Wider Questions:

- Does the project reflect a **dependency** on singular technology?
  - (e.g.: oil and gas in the 20th century?)

- Does the current project posses the capacity to **evolve** and **adapt** to the global development of Science and Technology?

Policy

Policy for Critical Minerals and Energy

- Kazakhstan requires a holistic approach through comprehensive and multi-angled policy aimed at **Education, Science and Technology.**
  - ➢ Inclusion of Hydrogen energy can **combine the three fields**, while promoting further research.

- The project is to be closely supervised and regulated by Kazakhstan's authorities with the support of appropriate, **high-level, domestic expertise**.

The Algebra of Development

***(a conventionally linear one)**

Ecosystem (social and educational development) --->

Science (the grasping of nature's principles) and **Culture** (a distinct form of human intellectual activity) --->

Engineering (the application of science) --->

Technology and Innovation (Integration of engineering for public good and/or commercial gain) --->

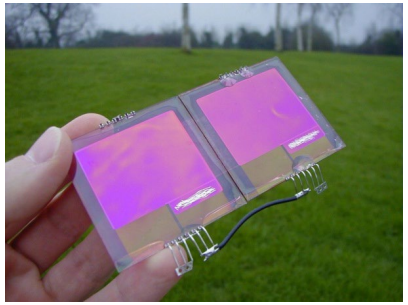
Industry, Economy and Finance (contribution to development).

Natural options

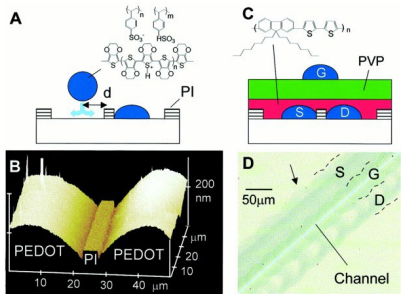
Polymer and oxide semiconductor devices

Light-emitting diodes

Solar cells



Transistors

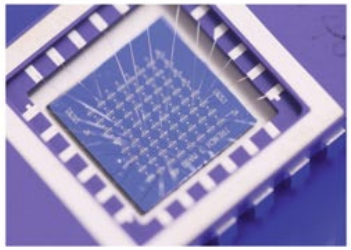


- **Cheap deposition of polymers by printing**
- **Improve devices by understanding physics**
- **Successful spin-out of technologies**

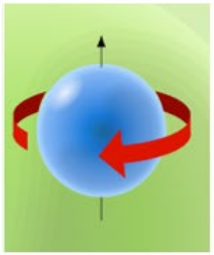
We do have the sun! and also the plastic!

From silicon electronics:

To:



non-silicon electronics



spintronics

Almaty Centre of Advanced Science and Technology (ACAST)

Objectives of the ACAST:

- **To establish a linked fundamental science laboratory**
- **To establish a commercialisation platform via certification**
- **To nucleate an innovation ecosystem focused on the mining, metallurgy and agriculture industry sectors of Kazakhstan**

Almaty Centre of Advanced Science and Technology (ACAST)

- Natural wealth of vast materials and metals is a driving factor in the **new era** of electronics, refrigeration and energy-storage
  - ➢ All of which underpin all the other areas of technology and thus global sustainable development.

- Hydrocarbons and Silicon-based technologies in particular

- The Centre will also provide research and services relevant to most technically reliant industrial and manufacturing sectors, particularly those which rely on materials, R&D and analysis.

References

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