

*NATIONAL AEROSPACE UNIVERSITY*  
*Kharkiv Aviation Institute*

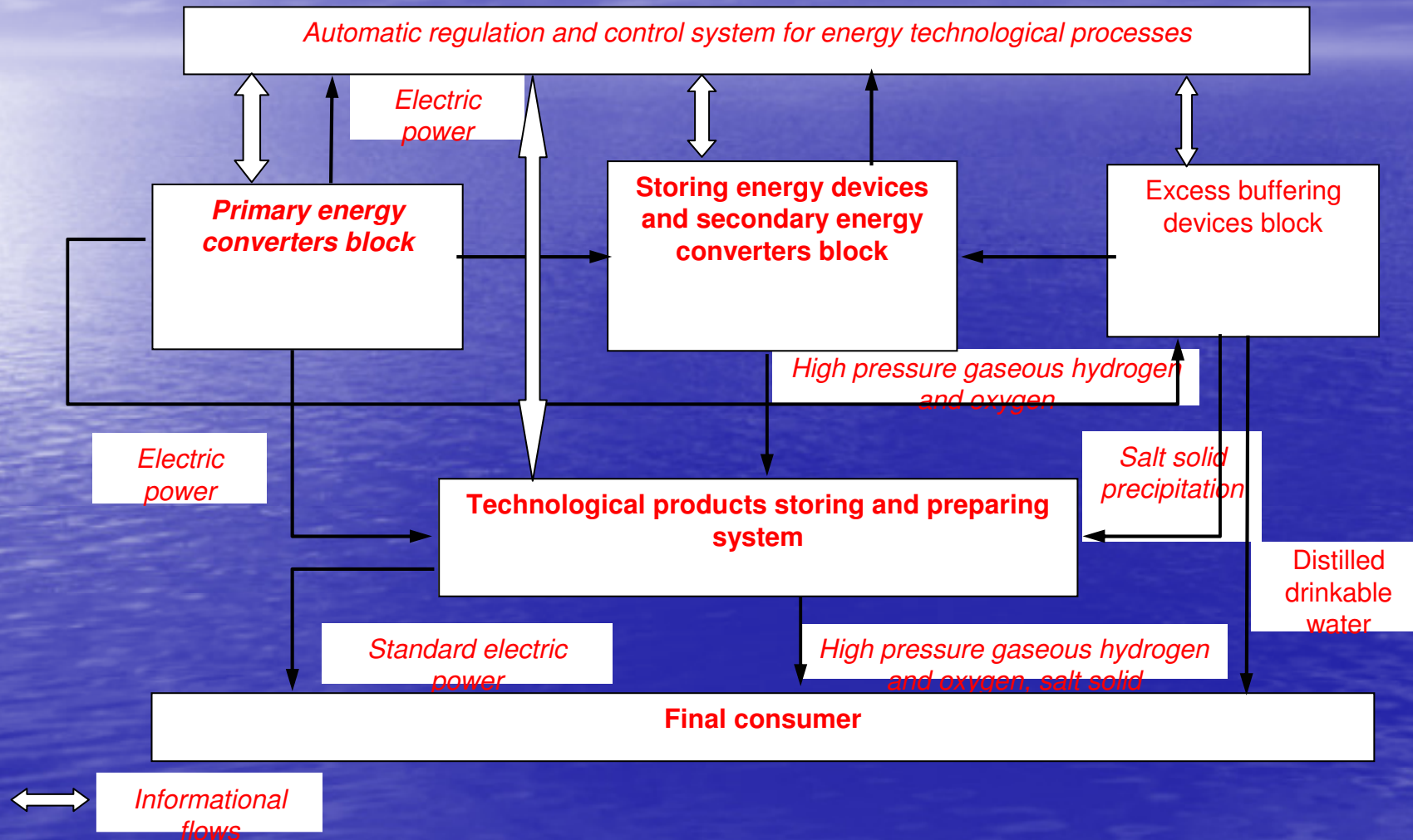
**Energy-Technological  
Complex (ETC)  
for Producing Ecologically  
Pure Energy Carriers  
and Sub-products**

- **The technical area of the project relates to energy, ecology and environment safety.**

**The work has been supported by STCU  
Project # UZB-23j**

- **The idea of the project is to develop the autonomous energy-technology complex (ETC), which uses primary solar and wind energy and produces continuously both consumable electricity and hot water, and also fresh water for drinking.**

# ENERGY CARRIERS AND SUBPRODUCTS SCHEMATIC DIAGRAM



# **The ETC**

**main constituent**

**elements:**

*-WPS 3 kW-*



*-SPVT 0.5 kW-*



*-Distiller and Solar collector 3 kW-*





*-Electrolyser 0.5 kW-*



*-Fuel cell 0.4 kW-*



- **Novelty of the project idea realization is to combine a solar collector, a solar photovoltaic element/battery, a wind power station, a distiller/desalt, an electrolyzer, hydrogen and oxygen storage/supply system, a hydrogen fuel cell into a whole autonomous energy-technology complex (ETC) for producing consumable electricity and pure water, which is controlled automatically. Moreover the operation of such complex requires adaptation to the regional geo-climate conditions of the use, which is provided by the special control system and the elaborated software containing geo-climate database.**

**The results of development and natural testing (April 2004 in the Crimea, Ukraine) of the Energy-Technological Complex were generalized over the input/output characteristics:**

- wind-energy station – two aggregates, each providing 2-2.8 kW (70 V, 31 A) (estimated cost \$3k per unit);
- stationary silicon solar battery – 500 W (100 V, 5 A), efficiency of energy transformation is 15 % (estimated cost \$2.7k per 0.5 kW);
- water distiller with 200 W electric driver/engine – 1.5 - 2 kW total power (211 V, 9.5 A), distilled water output 1 liter/kWhour, efficiency 0.9 kWh/l (one stage process) and 0.6 – 0.7 kWh/l two stages process, (estimated cost \$1.1k per unit);

- **high-pressure electrolyzer – 450 W (200 V, 2.2 A) up to 0.5 kW, output of Hydrogen – 0.52 m<sup>3</sup>, Oxygen – 0.26 m<sup>3</sup>, the specific energy consumption to 4.9 kW/m<sup>3</sup> , efficiency 0.9 (estimated cost \$2k per unit);**
- **storage/supply system for hydrogen (with 0.04-0.06 vol.% of oxygen) and oxygen (with 0.08-0.1 vol.% of hydrogen) in cylinders at high pressure (150 atm);**
- **fuel cell – consumes H<sub>2</sub> - 270 liter/h, air- 1500 liter/h at 0-80 C, produces electricity 150-400 W (15-20 V, 10-20 A), efficiency ~ 0.5, (estimated cost \$5k per 0.5 kW);**
- **the automatic control system was done and the control parameters were controlled.**
- **Elaboration of ETC technical documentation (technical project) with use of licensed SOFTWARE SOLIDWORK.**

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