LARGE SCALE NUCLEAR HYDROGEN&POWER PLANT BASED ON MGR-T

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Hydrogen - highly effective and ecologically clean fuel. Large-scale use of hydrogen is mastered in industrial chemical processes and rocket engineering. Manufacture of hydrogen in the world has exceeded 50 MT H2 (6.4 EJ) and quickly grows.

In the report the concept of Nuclear-hydrogen power (NHP) as strategy of production and use of hydrogen on base of "clean" technologies and, first of all, modern innovative high-temperature nuclear energy source, modified under hydrogen production application is considered with steam reforming of methane (SRM). The increase of a nuclear energy share in a global energy balance is capable essentially to affect structure of on organic fuel consumption, and, hence, on resulting parameters on hydrocarbon world flows and CO2 emissions. Under the various forecasts (IIASA, IAEA, IEA, EPRI etc.) in 21 century the sharp growth of demand hydrogen is expected in connection with transition of various base technological branches to mainly intensive methods of qualitative products output with increase of processing depth of petroleum industry, greater consumptionj of ammonia and methanol, refinery processing (for example, from heavy oil or bituminous sand) or synthetic (first of all, - from coal) liquid fuel, increase of direct production of qualitative sponge iron etc.At the same time, greatest contribution to perspective growth of world demand on hydrogen is necessary to expect from a vehicle sector and systems of the dispersed power supply, in which the hydrogen acts as energy carrier, capable to collect and to be transported similarly to natural gas, but not having, as against methane, restrictions on resource base and not having effluents of greenhouse gases in an atmosphere. Research and development on process heat application of high-temperature helium reactors (HTR) for hydrocarbon conversion were initiated in the Kurchatov Institute in the beginning of 1970s. Different types of reactors (small, medium and high power) and applied conversion technologies (shaft tube reforming, heat radiation rings, multistage process, solid carrier circulation etc versions) have been developed for nuclear chemical complexes produced hydrogen, ammonia, methanol and for direct reduction of iron, chemothermic systems and for energy accumulation till the date. Hydrogen production technology – MGR-T reactor as an energy source, which provides the total energy supply for the plant produced the hydrogen - was studied and successfully applied for design of the effective high-temperature reactor systems, based on famous GT-MGR project developing by joint international team (USA, Russia, Japan, France). Multistage adiabatic catalytic reforming with multiple heating of the methane-steam mix in the first helium reactor circuit were used for hydrocarbon conversion under moderate temperatures with minimal energy and capital cost (per hydrogen molecule obtained) and with low (40-45% reduced) natural gas consumption**.**

For the prospects the work is done to combine the MGR-T power source with Solid Oxide Electrolysis of water at high temperature heat supply from helium circuit.