

Eco fuels of future

Belarusian scientists may master laser thermonuclear synthesis

By Dmitry Patolichev

Mankind continues to seek alternatives to fossil fuels, which may only last another five decades. Developed countries have allocated huge funds in this direction, including investigation of the synthesis of deuterium and tritium: hydrogen isotopes. Reserves are almost inexhaustible, being found in seawater. They can also be easily synthesised from natural raw materials. The most important thing is that this environmentally friendly energy's only 'waste product' is pure water, in addition to gamma radiation (which remains within the facility).

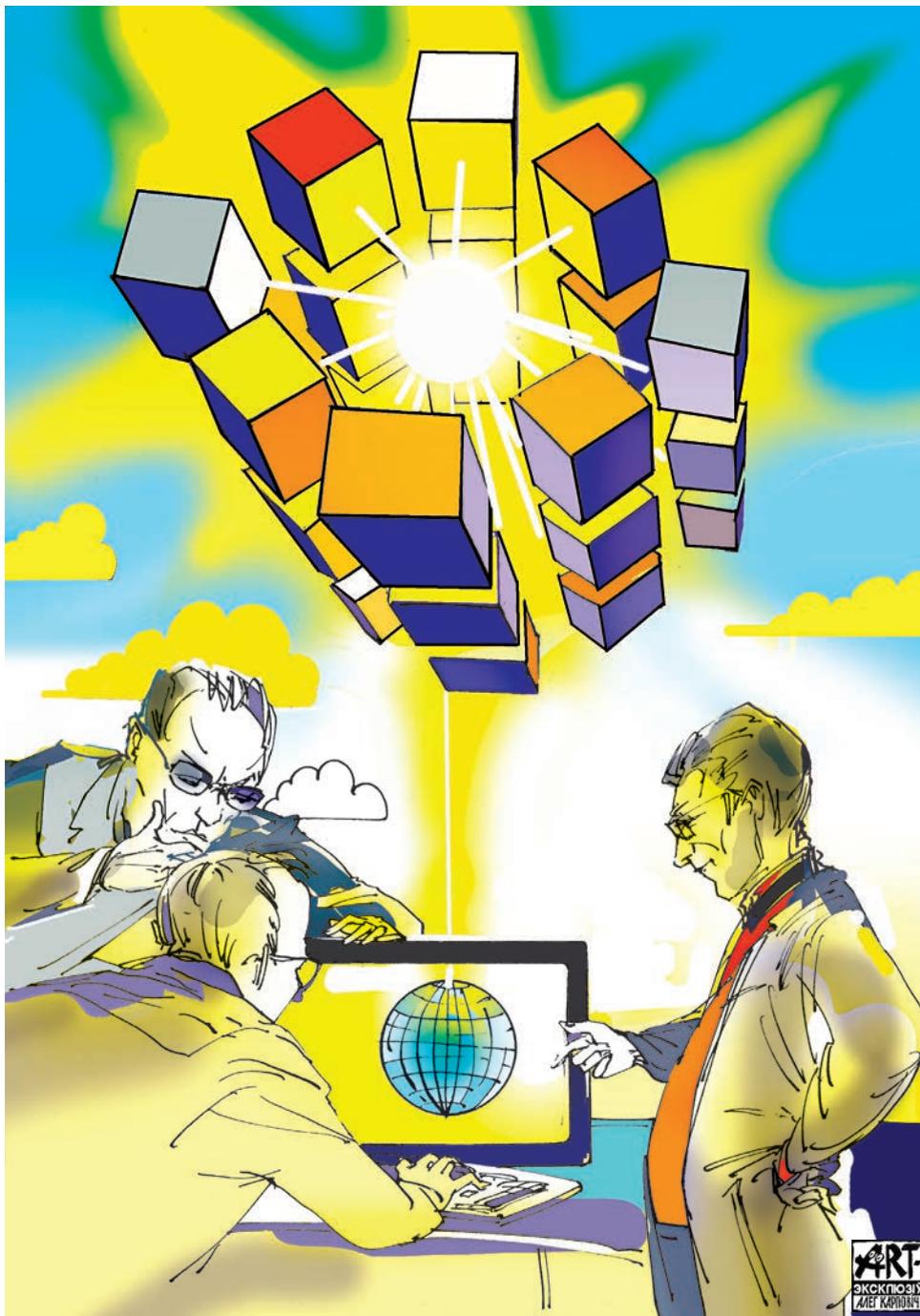
Extracting energy from isotopes is a straightforward process: electric-magnetic repulsion is overcome, making lighter nuclei blend with heavier ones. This thermonuclear synthesis generates more energy than is used. Two methods exist. The first involves thermo-isolation of high-temperature low-density plasma, using a magnetic field over long time periods, as researched at Russia's 'Tokamak' (toroidal chamber with magnetic coils) facility since the 1950s. Foreign analogues also exist. However, the technique is yet to be efficiently perfected and trials continue. The impulse method is winning more supporters, using lasers to heat small volumes of deuterium and tritium to about 100 million degrees (hotter than inside stars) and to compress them to a high density. This inspires a thermonuclear reaction. About two hundred lasers are used simultaneously from all sides to compress the

tiny two-millimetric spherical targets, which fall into the operating chamber every half-second.

The technique of laser thermonuclear synthesis was first discovered in the USSR in the late 1960s, by Russian Nikolay Basov and Oleg Krokhin; several research facilities — including 'Kamar' and 'Delphin' — were constructed at the Physical Institute of the Russian Academy of Sciences. Meanwhile, 'Iskra-4' and 'Iskra-5' were set up in Arzamas-16 (present day Sarov) which boasts the world's largest laser facility for thermonuclear synthesis; still under construction, it will be as tall as a ten-storey house and about 360m in length. The new facility will be operating at full capacity by 2020.

The Americans were the first to inch towards realisation of a similar megaproject, thanks to huge investments; the National Ignition Complex, at the Lawrence Livermore National Laboratory, took 12 years to build, at a cost of about \$4bn. Sadly, even by its target date of September 30th, 2012, after more than a thousand trials, a thermonuclear reaction was yet to be achieved. The United States Congress became sceptical but experts in Russia, Europe and Japan remain convinced that this is a sphere worthy of attention, continuing their own projects.

Despite the highly secretive nature of such research, especially considering the use of nuclear materials, the Americans have opted to collaborate, in search of fresh ideas. With this in mind, the American Society of Me-



Belarusian scientists solving global issues with laser technologies

chanical Engineers recently organised an international scientific conference on creating energy via laser thermonuclear synthesis. Nuclear physicists and optical engineers gathered in Prague, this spring, including those from the B.I. Stepanov Institute of Physics, of the National Academy of Sciences of Belarus. Well-known since Soviet days as a leading centre in the field of nonlinear optics and laser physics, its director, Vladimir Kabanov (a doctor of physical and mathematical sciences) explains, "We've seen the true level of laser systems used in various countries in laser

thermonuclear synthesis installations and are convinced that we can make improvements, as our developments can rival their foreign analogues and actually even surpass them in some aspects. The capacities of foreign facilities are to be envied but some of our innovations prevail if we speak about the quality of the outgoing laser beam, optimisation of resonator parameters, as well as those of a closing device and an active element: our diode-pumped solid-state impulse lasers for spectrometric analysis of substances, lidar equipment and gas testing, and our systems

of infrared vision, ranging and targeting. The quality of our laser beams is optimal for resonance and transformation of energy, while being compact, reliable and durable. Belarusian developments in larger laser systems are at the cutting edge. Taking into account that Russians don't have an impulse laser with required characteristics for their Sarov facility yet, we've made a proposal to them to collaborate and hope to make our own contribution into this project. We are in no sense a 'poor relation', having proven ourselves in practice, at Belarusian enterprises."

Mighty winds share their power

Total capacity of wind turbines in Belarus could increase 100 times by 2015

"We currently have 18 wind turbines, with a total capacity of 4 megawatts across Belarus. By 2015, there should be 13 wind parks operational, producing about 400 megawatts," notes Igor Rogozin, who heads Hydro-meteorological Department at the Ministry of Natural Resources and Environmental Protection.

Many regions of Belarus enjoy the appropriate climatic conditions for wind power; research shows that 1,840 platforms could be set up for wind turbines, with energy potential of over 1,600 megawatts. "Taking this into account, we're planning to develop wind energy over the coming seven years," Mr. Rogozin emphasises.

Volumes of precious metal rise

Gold reserves of National Bank of Belarus increased by half a tonne over first six months

As of July 1st, this year, the gold reserves of the National Bank of Belarus have increased by 500kg, to reach almost 34 tonnes. Last year, National Bank reserves of gold, silver, platinum and palladium increased by 1.6 tonnes, reaching a total of 33.3 tonnes.

Third plant building

European Bank for Reconstruction and Development giving credit to private company to build enterprise

A day or two ago, agreements were signed on two long-term loans of up to 200 million Euros, to be used by Kronospan to build two new enterprises in Russia and Belarus.

The Belarus plant will be located at Mogilev Buildings Management Service, producing slabs widely used in building. The plant's productivity should reach 500,000 cubic metres of slabs annually. It will be the third Kronospan plant in Belarus, built with funding from the European Bank for Reconstruction and Development.

Customer with an individual approach

Belarusian Cement Corporation to be created in Belarus by year's end

"The organisation will merge not only Belarusian cement plants, but house-building factories and cement-dependent enterprises — such as those who make blocks from concrete, as well as lime and concrete products," noted Belarus' Minister of Architecture and Construction, Anatoly Nichkasov, speaking at a press conference in Minsk.

Concerning the creation of construction holding companies, the Minister noted that there's no need for concern. "If the merger of enterprises into a holding company doesn't pro-

duce the best result, it's better not to be engaged in their creation. There are other structures — consortiums and concerns — in which enterprises can support each other. We'll take an individual and balanced approach to every enterprise merger," Mr. Nichkasov emphasised.

The Deputy Prime Minister of Belarus, Anatoly Kalinin, also spoke at the press conference, noting plans to create associations of construction organisations, to facilitate the entry of Belarusian builders into foreign markets.



Krichev plant producing cement using 'dry' method

"We should revive engineering companies to provide a link between customers and general contractors. An engineering company should be engaged in collecting initial data,

working with design organisations and with banks, selecting equipment with customers and choosing the general contracting organisation, while supporting the whole cycle until

completion. Today, in Belarus, only a few such organisations exist but we are working to create a competent mediator between customers and builders," noted Mr. Kalinin.