From *The Economist*, September 5, 2015

Monitoring nuclear weapons

Lasering the fuel

Another way to enrich uranium may impair efforts to detect secret nuclear programmes

Sep 5th 2015 | From the print edition

TRYING to find facilities that conceal uranium enrichment is hindered by the vast number of buildings worldwide. It has at least been possible to narrow the search down to big structures. Using spinning gas centrifuges to enrich fuel for nuclear bombs requires a structure the size of a department store, and enough electricity for some 10,000 homes. An alternative method being developed would make the search far more difficult.

Enrichment extracts ^{235}U, the main fissile isotope which makes up 0.7% of natural uranium. A 4% concentration of ^{235}U will fuel a power plant; 90% is bombmaking grade. In a centrifuge uranium is heated into a gas and passed through thousands of rapidly spinning tubes. The alternative is to zap the uranium vapour with a powerful infra-red beam from a laser. The beam is tuned to "excite" only ^{235}U atoms and thereby separate them from other atoms. At least 27 countries, by one tally, have worked on laser enrichment since the 1970s. Most gave up, largely because production batches were tiny. Now, however, two firms say that they have learned how to scale up the process.

Jeffrey Eerkens of Neutrek, a Californian research firm, says its laser process requires around half the space and electricity that centrifuges need. A competing laser method is offered by Global Laser Enrichment (GLE), a consortium of General Electric, Hitachi and Cameco, a Canadian uranium producer. It, too, requires less space. In 2012 GLE was awarded a licence to build a facility in North Carolina for the commercial production of reactor fuel.

America has classified the technology, but that may not stop it spreading. The most important bit of laser-enrichment know-how has already leaked, says Charles Ferguson, head of the Federation of American Scientists—namely, that companies now consider it to be practical. This will reinvigorate efforts by other countries to develop the technology for themselves.

Laser enrichment is fiendishly difficult, says Ryan Snyder, a nuclear physicist at Princeton University, who is working on an assessment of its impact on proliferation. Nevertheless, far more engineers work with lasers than with centrifuges, he adds, so advances are constantly being made.

Non-proliferation optimists think laser-enrichment might not work as well as advertised, because GLE has still not begun commercial production. But this may be only temporary, because the company says the price of enriched uranium is too low to justify completing the project. A regime keen for a more discreet path to the bomb would not bother with such considerations.

From the print edition: Technology Quarterly