



Nuclear Fusion “Breakthrough”?

Remarks of John Burroughs
Senior Analyst, Lawyers Committee on Nuclear Policy
June 8, 2023

How does international law apply to the National Ignition Facility (NIF)?

Nuclear Non-Proliferation Treaty

Based on US government statements and non-controversial assessments by outside observers, NIF at a minimum is intended to and does help maintain scientists’ skills and understanding necessary for maintaining the US nuclear arsenal and for designing new or modified nuclear weapons should that be deemed necessary. It also seems to go beyond that by validating computer codes used to model nuclear weapons and assess issues relating to their maintenance. For example, does using a different material in a replacement part affect performance?

Thus NIF as part of the US nuclear weapons program is predicated upon the long-term maintenance of the US nuclear arsenal. Such long-term maintenance is contrary to the obligation under NPT Article VI to pursue in good faith negotiations on nuclear disarmament, meaning the elimination of nuclear weapons. That obligation was reinforced and specified by a 2000 NPT Review Conference commitment, an “unequivocal undertaking to accomplish the total elimination of nuclear weapons”. Good faith, a legal principle, requires that such obligations be fulfilled – and certainly be sought to be fulfilled – on a reasonable timeline. I think that means, 50-plus years into the history of the NPT, in the foreseeable future, within say 10-20 years. However you view a reasonable period, NIT and the Stockpile Stewardship program of which it is part clearly assumes maintenance of the US arsenal for the indefinite future, many decades.

So in that respect, NIF as a weapons program is contrary to the spirit and the thrust of the NPT.

I cannot assess the extent that NIF assists or could assist in the design and development of new design nuclear warheads. Well-known weapons designer Ted Taylor, for example, said NIF could contribute to the design of nuclear weapons with tailored effects. It has also been theorized that NIF could contribute to the design of new types of nuclear weapons, like pure fusion weapons. To the extent that NIF is used to such ends, that would run contrary to the NPT Article VI obligation **to negotiate the cessation of the nuclear arms race at an early date**. Fifty plus years on, we are well past the “early date”.

Comprehensive Nuclear-Test-Ban Treaty

The CTBT has not yet entered into force; ratifications from a number of states, including the US, are needed for that to happen. The US has signed but not ratified the treaty; it does state its adherence to the basic norm of not conducting nuclear weapon test explosions. While not yet in force, the CTBT is an influential treaty, with an active international body monitoring compliance with it.

Under the CTBT, state parties are obligated not to carry out any nuclear weapon test explosion **or any other nuclear explosion**. The preamble recognizes the obligation not to conduct such explosions “constrains” the “development and qualitative improvement of nuclear weapons” and “ends” “the development of advanced new types of nuclear weapons.”

In my understanding, there is no question that “ignition” in a NIF experiment qualifies as a nuclear explosion. So on its face the CTBT prohibits such ignition experiments. Further NIF is part of a nuclear weapons program and appears to at least potentially contribute to the development and improvement of nuclear weapons, and may even contribute to the development of “advanced new types” such as pure fusion weapons.

What are the arguments against this view? Generally, NIF experiments, contained, very small, and conducted in a very large facility, are far different than a typical explosive test of an actual nuclear warhead.

Moreover, in the NPT context, in 1975 the US asserted that miniscule contained laser fusion explosions are not prohibited including when carried out by a non-nuclear weapon state. In this view, laser fusion technology is not considered a “nuclear explosive device,” since non-nuclear weapon states are prohibited from possessing such devices. The US has publicly claimed that this exemption applies in the CTBT context. However, the CTBT prohibits “nuclear testing”, not the possession of nuclear explosive devices. Moreover, and obviously, the CTBT is a separate treaty.

It could be that the confidential negotiating history shows acquiescence in the US interpretation of the CTBT as not prohibiting laser fusion explosions. But we do not know that. Or perhaps more likely, the US enlisted key allies in an understanding that such explosions would be acceptable. This would be similar to the experience with the nuclear sharing arrangements that predated the NPT.

It is now nearly thirty years since the CTBT was negotiated. No CTBT review conferences have been held, since the treaty has not entered into force. Such conferences would have been appropriate forums for consideration of issues relating to issues relating to laser fusion, magnetic fields, particle accelerators, or high explosives used to implode a target and produce a small explosion. It would also be possible for the Executive Council or CTBT Conference, per the

treaty text, to employ various means to investigate and settle disputed issues. One option is to obtain an advisory opinion from the International Court of Justice.

Given all of the above, critics of laser fusion experiments and explosions are not in a strong position to argue that there is currently an indisputable violation of a norm against nuclear testing of any kind, military or non-military. The fact remains that NIF is part of a nuclear weapons program, which inevitably makes NIF experiments at least illegitimate under the CTBT.

Treaty on the Prohibition of Nuclear Weapons

The US and other nuclear-armed states are not party to the TPNW. They thus are not bound directly by the obligations set forth in the TPNW. However, the TPNW reinforces and also helps develop relevant rules and principles as a matter of general international law, applicable to all states whether or not party to the treaty. Accordingly, it is worth briefly reviewing certain TPNW provisions.

The TPNW prohibits “testing” of nuclear weapons. No definition of testing is offered, but the preamble refers to the CTBT, so at a minimum the prohibition covers “nuclear weapon test explosions”. IALANA and other groups had proposed that in some way TPNW prohibitions extend to various experimental activities related to nuclear weapons, including inertial confinement fusion experiments. That could have been accomplished by including research as a prohibited activity, or by defining testing broadly.

The TPNW also prohibits “development” of nuclear weapons. Again, there is no definition. However, to the extent that an activity such as NIF experiments contributes directly to the modification of existing weapons or development of new ones or new types, that would be covered by the prohibition.

Finally, the TPNW prohibits possession of nuclear weapons. It does not, however, clearly prohibit the retention or acquisition of knowledge relevant to nuclear weapons. It also provides for the possibility to withdraw from the treaty under extraordinary circumstances. This was a disputed issue and could have come out differently. The actual outcome, unfortunately, tends to weigh against a prohibition on retention and acquisition of knowledge bearing on design and production of nuclear weapons.

Looking Forward

The CTBT needs to be brought into force. That requires ratifications from the US, China, and several other states. Then issues relating to laser fusion and other technologies potentially capable of producing fusion explosions can be addressed within the CTBT framework.

More broadly, if – and it is a very big if – if NIF experiments are important to advance scientific knowledge and to advance development of energy sources, then NIF and laser fusion should be segregated from nuclear weapons maintenance and development, nationally and internationally.