

Importance of Peaceful Utilization of Nuclear Energy

J. Frydryšková

Following the massive destruction of Hiroshima and Nagasaki in the end of Second World War, the atom was generally taken to be the primary symbol of the new era, the so-called ‘atomic age’, a prototypical modern conjuncture forever oscillating between the agonies of mass death and standardized terror, and the euphoria of tremendous economic transformation through the permanent resolution of the ever increasing need for electrical energy at little or no cost. After Hiroshima the symbolic meaning and presence of the atom crossed and recrossed the lines between popular culture, lived experience, political protest, strategic discourse, modern design, industry, medicine, and agriculture, that it truly became ‘atomic age’ whether one was in the US, France, China or anywhere else.

Keywords: Atomic Bomb, Manhattan project, IAEA (International Atomic Energy Agency), Soviet offer, Nuclear Research Institute in Řež near Prague, VVR-S reactor.

1 Manhattan project

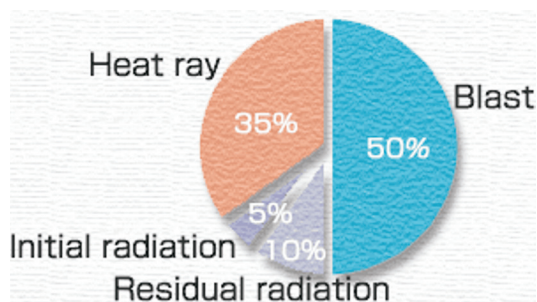
After receiving permission from President Roosevelt to develop an atomic bomb in 1942, a laboratory in Los Alamos, New Mexico, and other facilities in the U.S., began atomic bomb research in secret. Given the code name “Manhattan Project”, the development cost roughly \$2 billion, an enormous amount at that time, and required the participation



Fig. 1: The World’s First Atomic Bomb Test [14]

of more than 120,000 persons (Fig. 1).

The atomic bomb was quite different from all previous bombs. At the moment of detonation, powerful radiation and a fierce heat ray were emitted. As the rising temperature



Graph 1: Breakdown of the A-Bomb Energy Released [14]

expanded the surrounding air, it generated a tremendous blast. The complex interaction of these factors amplified the damage (Graph 1).

On July 16, 1945, the world’s first atomic bomb test was carried out in the desert near Alamogordo, New Mexico.

2 Hiroshima and Nagasaki – the days of Uranium Bomb

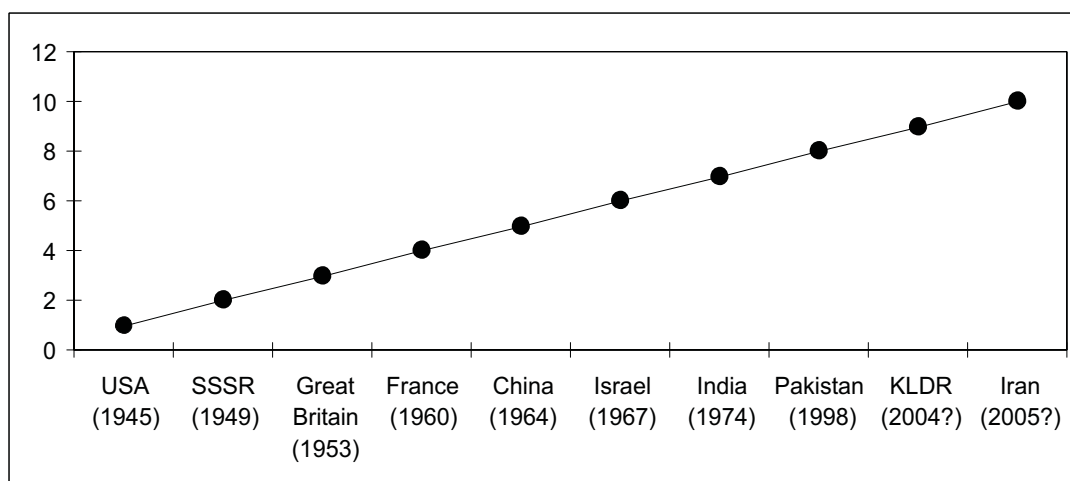
For six years, World War II had led to death and starvation of whole families, and the destruction of cities. Adolf Hitler committed suicide, Germany surrendered in May 1945.

August 6th 1945 seemed like any other day. Nothing pointed to any change to the monotonous run of daily life. The BBC Six o’Clock News consisted of only a few sentences. ... “President Truman has made known a great achievement of Allie scientists. They have created the Atom Bomb. The first has just been dropped on a Japanese army base and had as much explosive power as a ten ton bomb...”

The atomic bomb dropped on Hiroshima at 8:15 a.m., August 6th, 1945. It detonated 580 meters in the air. The dropping of the bomb called Little Boy was followed three days later on August 9th 1945 by the detonation of the ‘Fat Man’ nuclear bomb over Nagasaki [8] (see Table 1).

Table 1

| Effort and Results | Hiroshima | Nagasaki |
|--|-------------|-------------|
| Planes Bomb load | Atomic bomb | Atomic bomb |
| Population density per square mile | 35,000 | 65,000 |
| Square miles destroyed | 4.7 | 1.8 |
| Killed and missing | 70–80,000 | 35–40,000 |
| Injured | 70,000 | 40,000 |
| Mortality rate per square mile destroyed | 15,000 | 20,000 |
| Casualty rate per square mile | 32,000 | 43,000 |



Graph 2: Development of the A-Bomb in other countries [5]

3 A-bomb and the other countries

The Soviet Union's successful atomic bomb test in 1949 signaled the end of the nuclear monopoly, in which only the US possessed atomic bombs. President Truman ordered the development of the more destructive hydrogen bomb, and the US and the Soviet Union began their extended arms race. The Soviet Union constructed the Abomb earlier than the US had expected.

In some cases, particularly the United States, the Soviet Union, and China, the nuclear issue was from the outset a question of bombs. For the United States, building the bomb moved seamlessly from being a part of the war effort to defeat the Axis powers to being a central element in the Cold war against its new enemy, the USSR. The Soviet Union followed a similar path. Stalin became obsessed with building atomic weapons once he realized what they meant in a new era of power world.

4 Nuclear research in Czechoslovakia

a) International influence – IAEA

The important moment in the history of peaceful utilization of nuclear research was the speech made by American president D.D. Eisenhower United Nations General Assembly on 8th December 1953. Among others he initiated the establishment of the International Atomic Energy Agency (IAEA). The IAEA was created in response to the deep fears and great expectations resulting from the discovery of nuclear energy, fears and expectations that have changed profoundly since 1945 and continue to fluctuate. The basic aim was seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world. One year later the decision to organize the first international conference on the peaceful use of nuclear energy was adopted.

Since its establishment, IAEA has been cooperating with many international organizations, e.g., UNSCEAR (United Nation Scientific Committee on the Effects of Atomic Radiation), UNESCO, UNEP (United Nations Environ-



Fig. 2: In 1979, the Austrian Government and the City of Vienna completed construction of the Vienna International Centre (VIC), next to the Donaupark, which became the permanent home of the IAEA and other UN organizations [9]

ment Programme), WHO (World Healthy Organization) and others.

These events also influenced the establishment of research on nuclear energy in Czechoslovakia, and 1955 was the year when the USSR, motivated by political and power aims, offered to provide scientific and technical support for a scientific institute for nuclear research to design reconstruction a nuclear reactor. Similar offers were also made to Poland and to East Germany.

b) Government discussion

The limited capacity of energy reserves was well known to the Czechoslovak Government, which decided to start research in nuclear physics with the help of the Soviet offer. A preliminary statute and a later resolution established the basic aim:

- 1) to create nuclear energy centre,
- 2) to produce radioisotopes and radioactive compounds for utilization in science and in the national economy.

On the basis of this plan, the government panel for research and peaceful utilization of nuclear energy (in Czech VVAE) was established under the chairmanship of Václav Kopecký. At the beginning, its primary commitment was to take up the Soviet offer and then establish and create a nuclear research institute.

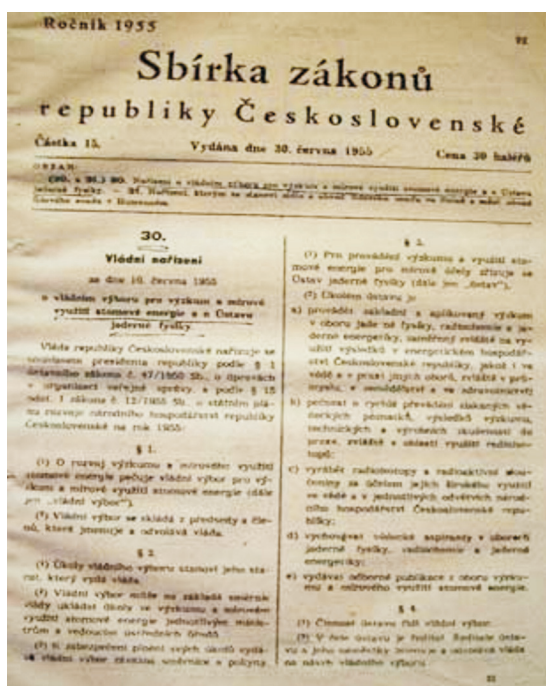


Fig. 3: The Government Decree from 30/06/1955 on the Government Panel for Research and Peaceful Utilization of Nuclear Energy Establishment [3]

c) Nuclear Research Institute

How important it was for Czechoslovak industry was to have this research institute is best manifested by the speed with which the Institute of Nuclear Physics was constructed. Its nucleus was the Nuclear Physics Laboratory of the Czechoslovak Academy of Sciences, located in the old Hostivař Mill, with approximately 50 staff.

In 1956 the institute was transferred to the authority of the Czechoslovak Academy of Sciences, and its name was changed to the Nuclear Research Institute.

The location at Řež near Prague was selected for the institute, because Hostivař Mill soon became too small.

Czechoslovakia entered the atomic age in 1957. A couple of minutes before midnight on September 24th scientists from the Nuclear Research Institute started the first controlled fission reaction. The VVR-S Experimental nuclear reactor was constructed in less than two years, with the objective of estab-

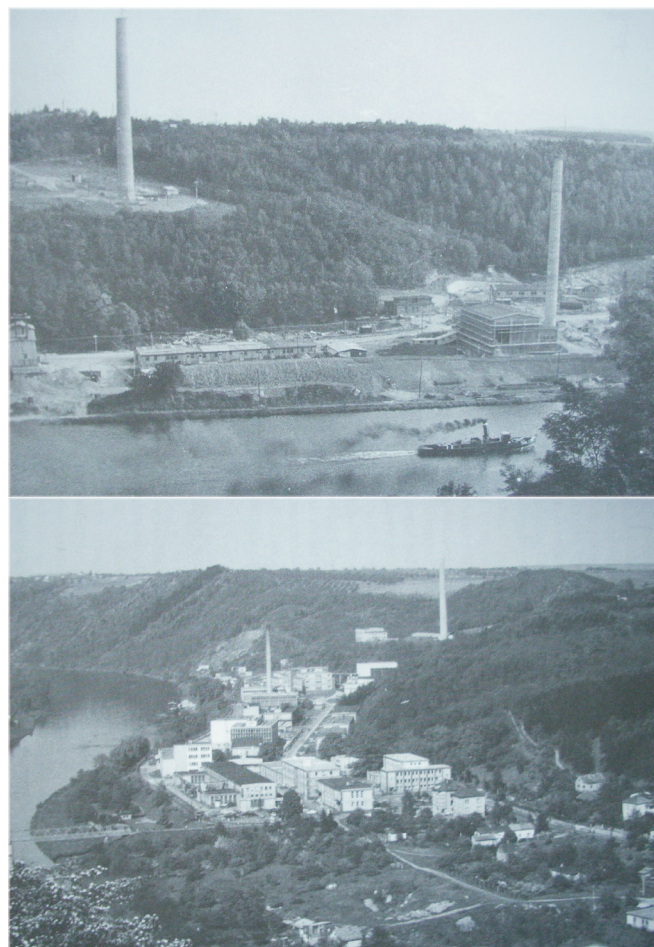


Fig. 4: The site place for the future Institut and the institute in 1975 [1]

lishing a and research base for neutron and reactor physics experiments and for producing radioisotopes. Its startup meant the birth of a new scientific discipline. In the course of its life it has been redeveloped several times and its power has been increased; occasional utilization has changed into a three-week cycle, and requirements for quality and safety of operation have increased significantly.

Czechoslovakia was one of the first countries to have this kind of establishment. Only the USA, Canada, the USSR, the UK, France, Belgium, Sweden and India had preceded

Table 2: Structure and scope of the targets of the Nuclear Research Institute [2]

| | Before | | | |
|---|--------|------|------|------|
| | 1965 | 1968 | 1971 | 1975 |
| In a planned Economy /basic aim | >90 % | 40 % | 27 % | – |
| In a Planned Economy /development of science and technology | – | 51% | 45 % | 91 % |
| Departmental targets | – | – | 21 % | 2 % |
| Institutional targets | ~10 % | 9 % | 7 % | 7 % |

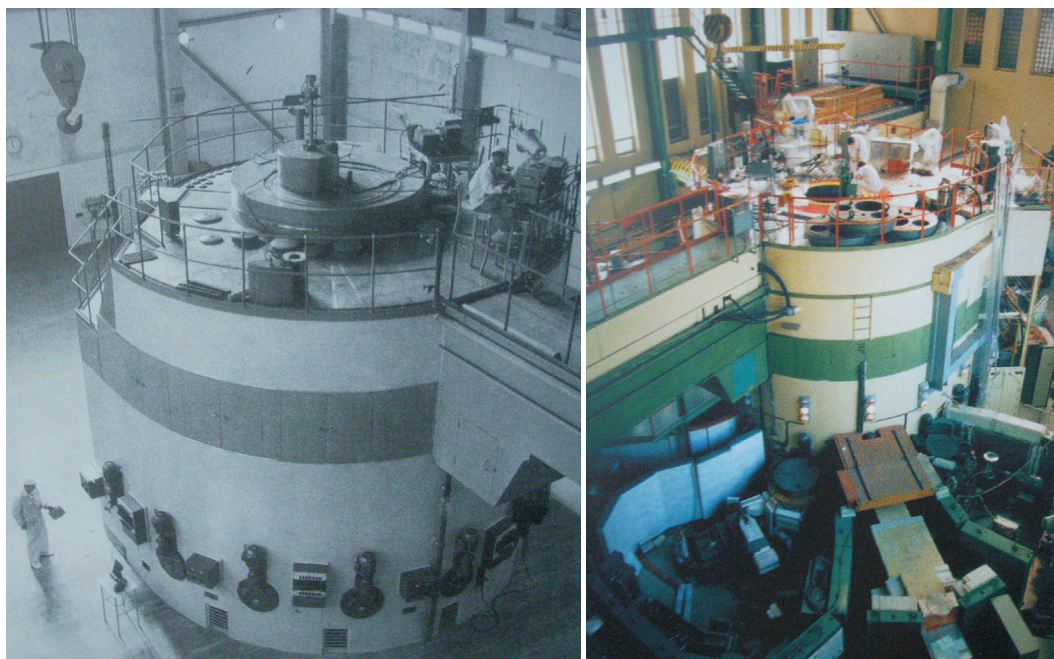


Fig. 5: Reactor Hall in 1958 and in 2004 [3]

Czechoslovakia. The startup of the nuclear reactor was an important step for Czechoslovak program for peaceful utilization of nuclear energy.

4 Conclusion

German scientist Otto Hahn, whose experiments with co-workers Lise Meitner and Fritz Strassman in Berlin in 1938 and 1939 led to the discovery that uranium nuclei can undergo explosive fission, releasing enormous energies, expressed his feelings about the dropping of the bomb on Hiroshima as follows: „ ... wanted it not to be true, but the Major assured me that it was no reporter's fanciful tale but an official announcement of the President of the United States. I almost fell to pieces at the thought of this new, great misery...” [10]. He felt responsible for the deaths of the hundreds of thousands of people, because his discovery had made the development of the atomic bomb possible. The fear that the atomic bomb might be used led the states work on a process of arms control and disarmament during the so called Cold War.

In spite of the lessons of history nuclear politics is still active, mainly in problematic countries such as Iran, North Korea, Pakistan and India.

By founding the institute, Czechoslovakia made a first step on its way to peaceful use of atomic energy, and a new branch of industry was founded.

Acknowledgments

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Jana Frydryšková
e-mail: j.frydryskova@seznam.cz

Charles University in Prague
Faculty of Arts
The Institute for Economic and Social History
Celetná 20
116 42, Prague 1, Czech Republic