§11. Consideration on History of Nuclear Fusion Research on the Basis of Historical Documents

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The purpose of this collaboration research is to draw lessons useful in making future plans through studying history of nuclear fusion research on the basis of historical documents. This fiscal year, the target of collaboration was the R-project (Reacting Plasma Project) that was planned in Institute of Plasma Physics (IPP), Nagoya University. The brief summary was described on how and why the project was planned and prepared in "History of Inter-university Research Institutes and Archives" of which activity was carried out under the Sokendai project.

Period background: In 1975 the Council for Science and Technology (hereafter abbreviated to CST) of Ministry of Education issued the document "On the Development of Fusion Research" responding the consultation by Minister of Education, Mr. OKUNO Seisuke. At that time enthusiasm about realization of fusion reactor arose after the first oil shock in 1973-74. The contents of the document were composed of 1) establishment of plasma physics and related fields of academic study, 2) contribution to interdisciplinary research field on the basis of knowledge of plasma physics accumulated in universities, 3) cultivation of human resources to tackle the long-term development of fusion. In May 1976 CST established the task force on fusion headed by Dr. HUSIMI Kodi, under which task force several subcommittees were organized. A group of research centers were established in universities. Organizations of fusion research on the bureaucracy side were improved during this period.

Status of R-project in CST and in IPP: In March 1975 the subcommittee of Science Council of Japan (SCJ) issued the report on "Prospect and Plan on Development of Nuclear Fusion Research". Being stimulated by the report, the steering committee and the expert committee of IPP began in earnest to discuss the future plan. The R-project was regarded as the main project of the third-term research program of IPP. In July 1978 the subcommittee of the steering committee announced the basic principle of the third-term research program. On the other hand the subcommittee of the task force of CST organized the group, headed by Prof. UCHIDA Taijiro, to make a plan on the next fusion program. There was an opinion in CST such that the program should be strongly oriented toward realization of fusion reactor provided big money, i.e. 200MY, would be envisaged. This means physics-oriented program was not enough and development of the reactor was requested in the interuniversity research institute, IPP. In June 1979 CST issued the interim report on "Promotion of Fusion Research" where the following points were described to promote: 1) basic research of burning plasma physics, 2) multi-pass strategy, 3) further development of IPP as an interuniversity institute. In November 1980 CST presented the proposal to the minister of Education, Mr. TANAKA Tatsuo, where the following points were stressed: 1) to promote the research oriented toward the D-T burning, 2) to develop alternative confinement systems, 3) to promote interdisciplinary research, especially to do so globally and systematically by utilizing the Grant in Aids "Special Research: Energy", 4) to enhance the research system, 5) to promote the research by international collaborations. In December 1980 the expert committee of IPP issued "Reacting Plasma Project" in pace with the line of subcommittee of CST. The R-project was to make the tokamak with a non-circular cross-section that had machine parameters: the major radius of 2.1m and the magnetic field strength of 5 Tesla, to investigate effects of D-T burning on confinement characteristics of the tokamak plasma. Referring to minutes of the expert committee we can find some opinions that it should be careful to carry out the D-T burning project because of the small manpower of IPP. However, the majority of the community was favorable for the project. Dr. KAKIHANA Hidetake was invited from IAEA as the third director of IPP in the fiscal year of 1980, and proposed about 40 billion Yen asking for the budget of the fiscal year of 1981. Prof. MATSUURA Kiyokata was nominated as the leader of the project. The author (M.K.) was a member of tokamak-design team that consisted of 6 researchers who covered the tokamak itself including an igloo, power supply and water-cooling system, torus hall including radiation shielding, tritium handling including a recovery system, and remote handling system, which seems too many tasks for 6 people in every respect. The project included the heating team, the diagnostics team and so on along with the tokamak-design team. Especially a lot of researchers nationwide were involved in the diagnostics team as collaborators, which reflected a lack of manpower in IPP like the tokamak-design team. The confinement study of burning plasma was important from an academic viewpoint of α-particle behaviors, however the construction of the tokamak where tritium was to be introduced would not be the task of IPP. It is apparent that to cover tritium handling, remote handling, radiation damage to diagnostics and so on by the limited manpower of IPP was beyond the ability. Profile diagnostics, essential to elucidate confinement physics, were limited at that time. Some of the citizens around the new site were against the introduction of tritium from the radiation safety viewpoint. The project was finally broken down by the external factor. However, even if it were approved, we would encounter considerable difficulties in carrying out the project. It would also be difficult for us to get fruitful scientific achievements because of limited number of profile diagnostics.

Summary: The research in inter-university institutes should be based on an academic aspect within a reasonable budget corresponding to the manpower.

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