Nuclear Science and Technology in Myanmar

A case study report for
Interregional Seminar on Strategies and Approaches
Toward Self-reliance and Sustainability of
National Nuclear Institutions
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Introduction

Progress in education in Myanmar, particularly with respect to science and technology had slowed down in the nineteenth century as well as the early decades of the twentieth. Perhaps, this has been the general trend in all countries in the region.

In Myanmar, before independence, there was only one University - the University of Rangoon (now Yangon). Before 1920, Yangon College was under Calcutta University and it mainly taught arts subjects aimed to fulfill the requirements of a colonial administration. In Yangon University, science and engineering subjects were taught, but the number of students who studied them were very few. Teachers of Myanmar nationality who taught science or engineering were even fewer. There simply was no focus on science and technology and there were no incentives or prospects to inspire students.

Only very few graduated from Yangon University with science or engineering degrees before 1941-42. But these few formed the indigenous seeds from which has grown the present science and technology manpower. Soon after independence, teaching and promotion of science started to gather momentum. Student numbers increased and public awareness of science also improved among the educated.

1950 to1960

This is a remarkable decade. Apart from improvements and new initiatives for science and technology education, research and development programmes were also started.

In the early fifties, the research and development organization "Union of Burma Applied Research Institute (UBARI)" was established. In later years it went through changes and reorganizations and took up new names - Central Research Organization (CRO) in the seventies and later, the present name Myanma Scientific and Technological Research Department (MSTRD).

During these years many state scholars were sent abroad for science and technology training, most of them for the Universities and the research organization.

Atomic Energy

In 1955, the Union of Burma Atomic Energy Centre (UBAEC) was established. Its first director was Mr. (U) Hla Nyunt, a war-time states scholar in Japan who studied in Professor Yukawa's department. Initially, UBAEC was attached to UBARI under Ministry of Industry with plans for its separation as an independent institution.

Under U Hla Nyunt's leadership, the UBAEC's programmes were very ambitious. In international cooperation, Myanmar participated in the United Nations Conference on Atoms for Peace (Geneva, 1955). Also, Myanmar was an early member of the IAEA having joined it in 1957.

The organizational chart of UBAEC shows that its planning covers most areas of nuclear science and technology applications that we can find today.

Between 1956 and 1962, UBAEC's human resources development programme appeared to match its established goal. There were national (internal) training courses. Newly recruited students, both graduates and undergraduates were sent abroad for nuclear science and technology training. For example, we find 6 scientists trained at Argonne National Laboratory during 1956 and 1958. In 1957, 11 state scholars were studying abroad, and 10 more (brilliant students) were financially supported in Yangon University to join UBAEC upon graduation. The interaction between Yangon University and UBAEC was also very strongly bonded - the Heads of Physics and Chemistry Departments and engineering professors were Consultants to UBAEC. The laboratory and field equipment of UBAEC were appropriate at the time for a new institution.

A very serious planning was made for applications of isotopes and nuclear techniques and concurrently also for establishing a research reactor center.

Decline of UBAEC

For reasons, which the author cannot trace, these activities virtually came to a stop after 1962-63. Those who were trained abroad, on coming back, cannot join or do not wish to join UBAEC. They took up jobs elsewhere. Those already in UBAEC employ felt they have no prospects and found exits in a few years.

And, at the same time, there was also the very strong gradient driving a brain-drain. Many scientists and engineers destined for atomic energy applications (in Myanmar) changed their destiny by leaving the country. To day, we have no trace but a very few of them.

1962-1988

During these years, the national policy was based on socialist economy. As regards atomic energy, it seemed there were no national goals set.

The Atomic Energy Centre (later UB was dropped) did not grow during these years, but it still clung to life attached to Central Research Organization. All along, the Atomic Energy Centre formed a section under Central Research Organization (CRO) and later Myanma Scientific and Technological Research Department (MSTRD), although in later years C became D to change AEC to AED.

During 1962-88, nuclear applications in medicine and agriculture were introduced. Activities of the AEC during this time included monitoring of environmental radioactivity, national radiation protection and occasional advisory jobs. In Yangon University a modest nuclear laboratory for research and training was set up. However, cooperative relation between AEC and university did not reach an impressive stage.

It is noteworthy that despite AED's unimpressive record, the country made some headway in nuclear application. Nuclear medicine was introduced quite early and so was radiotherapy. The initiative for these applications seem to have come from U Hla Nyunt. Trial experiments for seed mutation also started around 1965-66. This culminated in a very widely used paddy-mutant named Shwewartun (Golden-yellow-mutant). Today, this species accounts for around 30 percent of total rice production. Apart from this success, however other remarkable breakthroughs have not been known to the author.

1989-1995

This period may be considered as a new phase which follows the political change that took place in 1988. The national policy changed from socialist economy to market economy.

This actually leads to an awakening. During these years the Director of AEC was Mr Thein Oo Po Saw, a US-trained nuclear metallurgist and reactor operator. On his initiative, new efforts were made for promotion of nuclear science and technology. The Ministry of Education, which at the time was in charge of MSTRD set up an Atomic Energy Committee. Later in 1994, the Government

reformed the Myanmar Atomic Energy Committee (MAEC) chaired by the Deputy Minister of Industry II and representatives, mostly Director-Generals of relevant departments sitting on the committee.

The work of MAEC enables new initiatives. Myanmar quickly resumed its links to the IAEA. Also, in 1993 Myanmar joined the RCA.

During 1993 to 1995 a number of IAEA TC projects were implemented. Most worthy of note are the health related TC projects which may be judged to be highly successful. For the AED, Agency assisted projects provided training fellowships and laboratory equipment with which to continue or rather to start again its activities. It was during this phase that the author joined AED, leaving his academic career in the University.

1996- to Present

In October, 1996 the new Ministry of Science and Technology was formed by the Government, its broad mandate being to work for the promotion of science and technology and to facilitate its contribution to national development.

HE U Thaung, the first Minister of Science and Technology took up very urgent steps to organize the Department of Atomic Energy at a Directorate level under the Ministry. The new set-up of DAE was approved by the Government in August 1997 and the DAE started functioning in September as an independent department under the Ministry of Science and Technology.

Since 1995, MAEC had started to work for an Atomic Energy Law. As the activities of MAEC were taken up by DAE and MOST, the business of getting the Atomic Energy Law was also persued by DAE and MOST. Myanmar got an Atomic Energy Law in August 1998. This law covers all areas of Atomic Energy and radiation application. Moreover, it also gives DAE a legal status.

Again, very helpful assistance regarding law and regulations came from the IAEA. Through the Agency's Model Project on Radiation and Waste Safety Infrastructure, DAE benefited by obtaining assistance in training, expert services and equipment needed to implement the provisions of Atomic Energy Law.

1. Facilities available in DAE

The following are currently available facilities.

1. Radiation Measuring Laboratory
   This facility is equipped with radiation detectors, spectrometers for high resolution spectrometry; X ray-fluorescence analysis (using both isotope source and tube excitation), air- samplers for environmental monitoring.

2. Instrumentation Laboratory
This laboratory was established as part of an Agency assisted TC project for Nuclear Instrument Repairs and Maintainance. It is provided with accessory equipment and tools required for a repair work. It is also capable of fabricating some nuclear related electronic modules.

3. Radiation Dosimetry Laboratory
The equipments used are TLD card readers and monitoring devices also provided by the Agency. It is providing dosimetry service for more than 300 radiation workers from government departments, but only very and only occasionally for the public sector.

4. Gamma Irradiation Facility
A 12 000 curie Cobalt-60 gamma chamber (Gamma 5000 from BRIT, India) has been recently installed. It is providing irradiation for sterilization of tissues from Tissue Bank (also an IAEA undertaking). Irradiation for research including agriculture is just beginning.

5. Non-destructive Testing Laboratory
An Agency assisted project to establish an NDT laboratory started in 1995-96 in MSTRD. For administrative reasons, the NDT lab was left in the care of MSTRD, but the facilities are available for DAE.
The facilities include Cs-137 Gamma radiography, X-ray radiography, ultrasonic, magnetic and dye-penetrant testing.

2. Sources of Funding

The DAE is funded mainly by the government. Income generation from licensing and inspection work has been expected, but recently, instead of growing it has in fact declined. For example, in 1997 there were over 100 license applications for import of isotopes for industry only. But in 1998 and 99 it has dropped to less than ten each year. This is simply a reflection of the fall in industrial projects, due to the Asian economic crisis during these years. Income from other sources, international, multinational companies or bilateral cooperation is not in sight presently, although the DAE certainly looks forward to, and would strive for them.

3. Activities for Self-reliance

The DAE has just begun its human resources development and training programmes. Collarboration with BHABHA, India and MINT, Malaysia has been going on, and to a certain extent OAEP, Thailand is accepting Myanmar trainees. The Ministry of Science and Technology has an Agreement of Mutual Cooperation with Indian Ministry of Science and Technology. Out of this

agreement, the DAE might be able to secure training and expert assistance and it is expected the cooperation would expand and strengthen. Internationally, Myanmar is linked to IAEA, and with it RCA as well, for assistance in nuclear science and technology.

It seems really logical for Myanmar to look forward to cooperating with developed RCA member states Australia, China, India, Japan, Korea.

4. Activities for Self-sustaining

Presently the DAE is fully supported by the government, the revenue it can generate being less than one percent. Prospects for earning more lies in its capacity to provide services. But then, this is constrained by the demand from industry. Some prospective areas are:

(a)NDT Services

There is no national company or foreign business in this field. But big companies look for NDT providers from abroad. The NDT facilities in DAE is not adequate to take up the challenge of competing with foreign firms. One possibility may be DAE to get a partnership with a reputable foreign NDT business and act as its representative in Myanmar and contribute manpower, logistic and administrative inputs. To accomplish this would depend on our marketing and administrative skills.

(b)Isotope techniques

Consultancy and provision of isotope application for industry and medicine is also an entirely unfilled area. Isotope applications is available only in a few big government hospitals. Industrial applications showed signs of emerging, but then suffered a setback in 998-99.

The DAE is trying and also just starting to draw the attention of conventional engineers and technologists to the benefits and prospects of nuclear applications. Before they become convinced, the DAE has to prepare itself to be in readiness and be able to respond when the need arises. This then places DAE on square-one, where it has to start recruiting and training young scientists and engineers.

(c)Nuclear Science and Technology Training Centre

Capacity building has to come first. The requirement of specially trained scientists, engineers and technicians is most important factor for ensuring success in any venture involving nuclear science and technology.

The DAE pays special attention to this need. Also it is aware that existing curricula in universities, which tends to be too theoretical or academic and also lacks practical components is entirely unsuited for its needs.

Recruiting university graduates and training them is possible; but this is a longer route in terms of human life-span. Thus the DAE has proposed the set-up of a Nuclear Science and Technology Training Center, and the Ministry has approved it in April 2000.

Also a proposal for IAEA TC assistance for this training center has been made and the Agency's favorable response is expected. If Agency's assistance comes along, the training center will see a spurt of achievement, although without it achievement will come but more slowly. In this connection, the DAE welcomes contributions or cooperation of developed RCA-partners to assist Myanmar in setting up the training center. This nuclear-dedicated establishment will in the long run provide the main requirement of self-reliance - the technologically competent manpower that can feed-back on itself and keep going.

5. Current IAEA TC projects

A. DAE currently has the following IAEA TC projects :

(i) MYA/0/005 Human Resources Development and Nuclear Technology Support.
This project covers all national needs for trained human potential and DAE only acts as the coordinating Agency for training programmers.

(ii)MYA/8/005 Multipurpose Irradiation Facility.
This is to build up a national irradiation facility to provide training, semi-commercial irradiation services and demonstration of industrial radiation applications. This project has fallen behind schedule and the Agency is rescheduling the plans for 2000-01.

(iii)MYA/4/007 Network for Repair and Maintainance of Nuclear Instrument.
This project aims to build up the national capacity to maintain and repair nuclear instruments and to a certain extent to fabricate simple electronic modules and use computer interfacing.

(iv)RAS/9/021 International Model Project Radiation and Waste Safety.
By participation in this project DAE promotes its capacity as a regulatory organization. Also it will grow as a provider of training in radiation and waste safety and regulatory compliance as well as related services.

(v)RCA Projects (participation)

B. Other Departments

1.MSTRD	(i)MYA/8/004	NDT Project
2.MAS	(i)MYA/5/008	Mutation Breeding in Grain
3.LBVD	(i)MYA/5/009	Monitoring and control of Animal Diseases.
4.DMR	(i)MYA/6/020	Production of In-House Reagents for Radio immunoassay.
	(ii)MYA/6/022	Production of Monoclonal Antibodies and Reagents for RIA.
5.YGH	(i)MYA/6/021	Improvement Radiation Theraphy
6.MTB	(i)MYA/7/005	Reactivation and Upgrading of Tissue Bank.

6. Expectations from TC programs

High expectations are placed on above agency assisted projects. Their success will give national confidence – an important ingredients of self – reliance.
Self-reliance is greatly department on self-sufficiency. Apart from producing trained specialists, production of applicable radioisotopes in the country is also a vital need. A research reactor for training as well as for isotope production is needed. It will have to be planned very soon and the Agency will be to looked to for assistance, probably in the 2002-03 cycle.

7. The Long-term View

While in the short term, Myanmar DAE would have to occupy itself with capacity building and self-promotion, it has also to look ahead and plan for at least a few decades ahead. In doing so, two main streams of activity should be considered.

(a) Application of Nuclear Techniques

In the years ahead, simple forecast based on GDP growth would show a rising demand for application of proven nuclear techniques by the industry. The institution should do well to be the leading provider of services in the country. Among the many areas are radiation (gamma and electron beam) application in manufacturing, NDT services, tracer applications, radiophamaceuticals, nucleonic gauges and control systems. There would be a rising need for these services especially during a period of rapid economic growth. It should be noted that economic growth of countries certainly oscillate in perhaps irregular cycles and that the next rising phase is bound to come, or may be not very far off. This is one hopeful opportunity for self-promotion and with it feed-back for growth.

NUCLEAR SCIENCE AND TECHNOLOGY IN MYANMAR

a case study report

by

Dr. Tin Hlaing

Department of Atomic Energy

Past Histor

- In colonial days almost no Science & Technology

- Up to 1920, Yangon College was Under Calcutta University – only very few Science Students; and almost all teachers are foreigners.

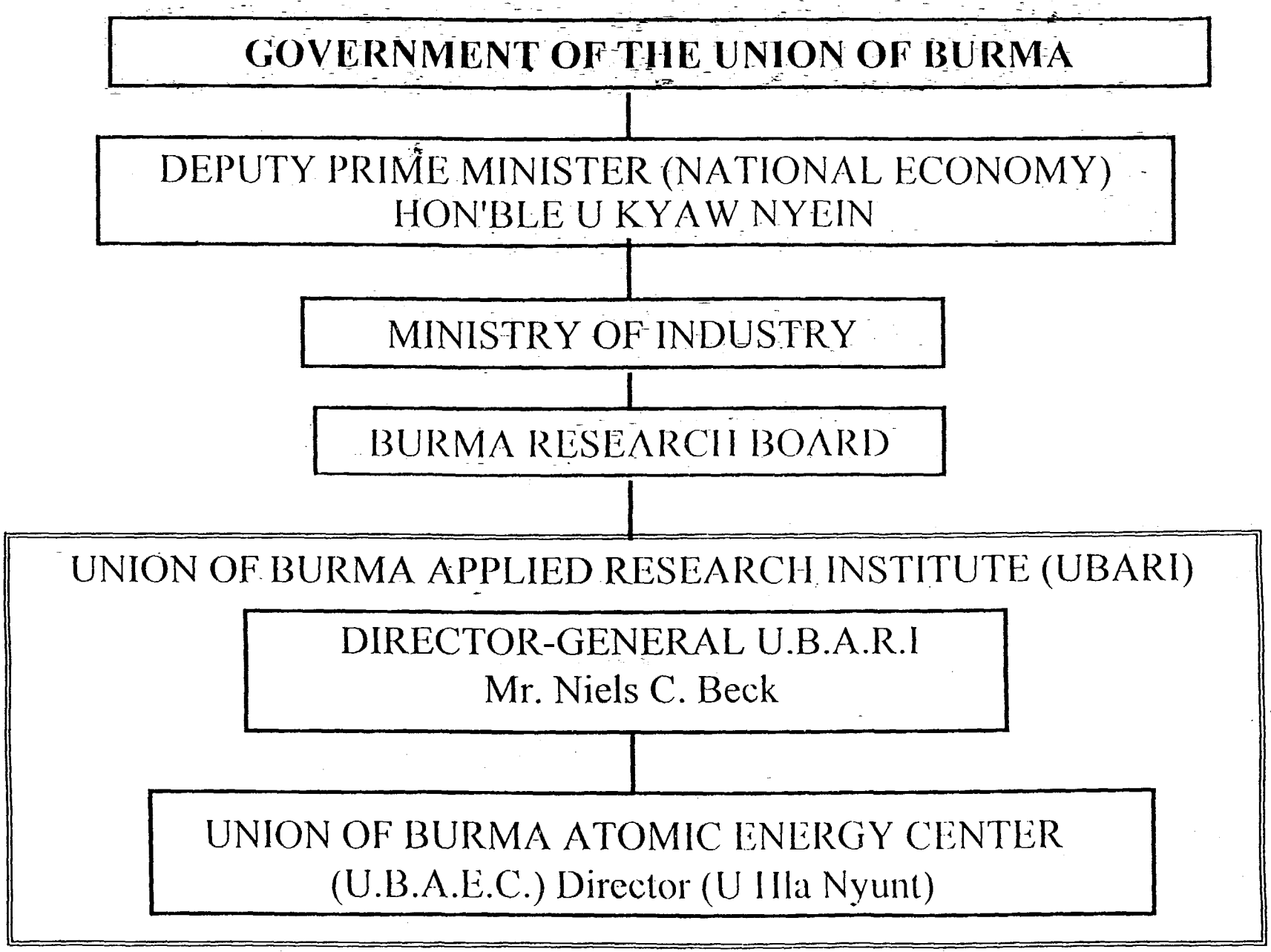
- After independence, science and technology teachingimproved; numbers of students and teachers improved.

- In the 50's- UBARI was Organised.

- Many state scholars were sent abroad for Science & Technology

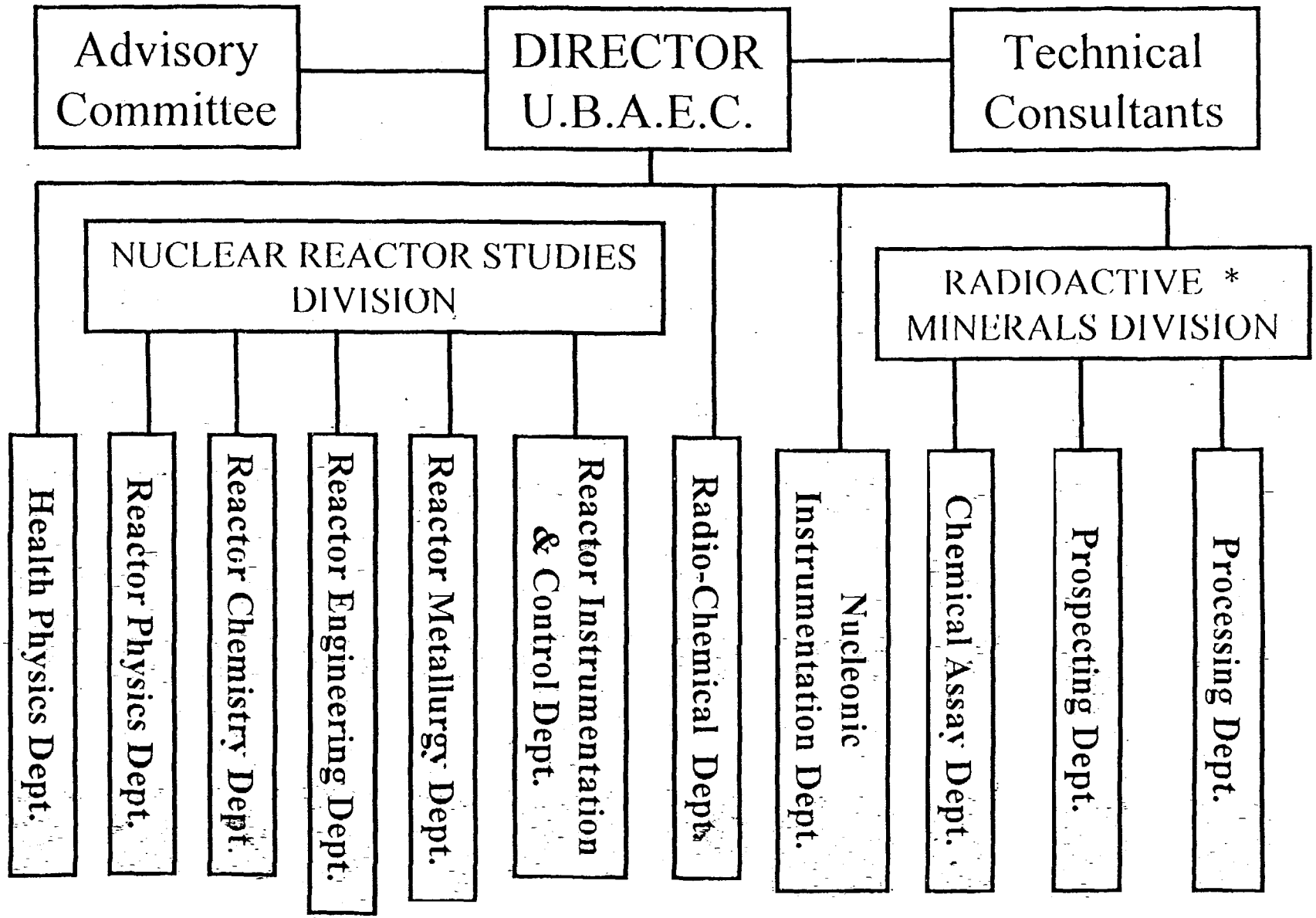
- 1960's new education System emphasizes on professional and Science & Technology education
- Initial results were good
  - todays hard core in Science &Technology were trained then
- 1970's and 80's- there were set-backs
  - growth in Student numbers
  - decline in quality
- In research UBARI transformed to CRO; later CRO renamed MSTRD.

EXTERNAL ORGANISATION OF U.B.A.E.C



UNION OF BURMA ATOMIC ENERGY CENTER

INTERNAL ORGANISATION CHART



* For the Sake of continuity, the Radioactive Minerals Division is temporarily under the Director of Research during 1957-58.

FUNCTIONS OF UBAEC

Health Physics Department

1. Personnel Monitoring
2. Area Monitoring
3. Radioactive Fallout Monitoring

Reactor Physics Department

1. Reactor Theory
2. Solid State Physics
3. Physics of Reactor Design
4. Nuclear Physics Research and Experiments

Reactor Chemistry Department

1. Chemical Reprocessing of Fuel Elements
2. Nuclear Chemistry Research and Experiments
3. Effects of Irradiation
4. Processing of Waste Disposal

Reactor Engineering Department

1. Fuel Cycle Technology
2. Power Reactor Technology
3. Engineering Services
4. Heat Transfer
5. Reactor Design

Reactor Metallurgy Department

1. Reactor Fuel Materials
2. Reactor Fuel Element Fabrication
3. Reactor Structural Materials
4. Radiation Damage

Reactor Instrumentation & Control Department

1. Design of Control System
2. Operator Control Instruments
3. Servomechanisms and Automatic Controls
4. Reactor Simulator
5. Reactor Operation

Radiochemical Department

1. Procurement of Isotopes
2. Production of Isotopes
3. Tracer Chemistry
4. Analytical Chemistry
5. Radiation Chemistry

Nucleonic Instrumentation Department

1. Procurement of all radiation equipment
2. Maintenance of all radiation equipment
3. Use of all radiation equipment
4. Radiometric Analysis

1996 awards

- 1996 Oct formation of Ministry of Science and Technology

- Basic Activities
  (i) Human Resources Development
  (ii) Research and Development

- Brief History of MOST
  - started with MSTRD
    - 1997 Technological Institutes and Computer Institute placed under MOST

- **New set up**

  * **DAE**

  * **DAST**

  * **DTPC**

  * **Ela Metallurgical Research Centre attached to MSTRD**

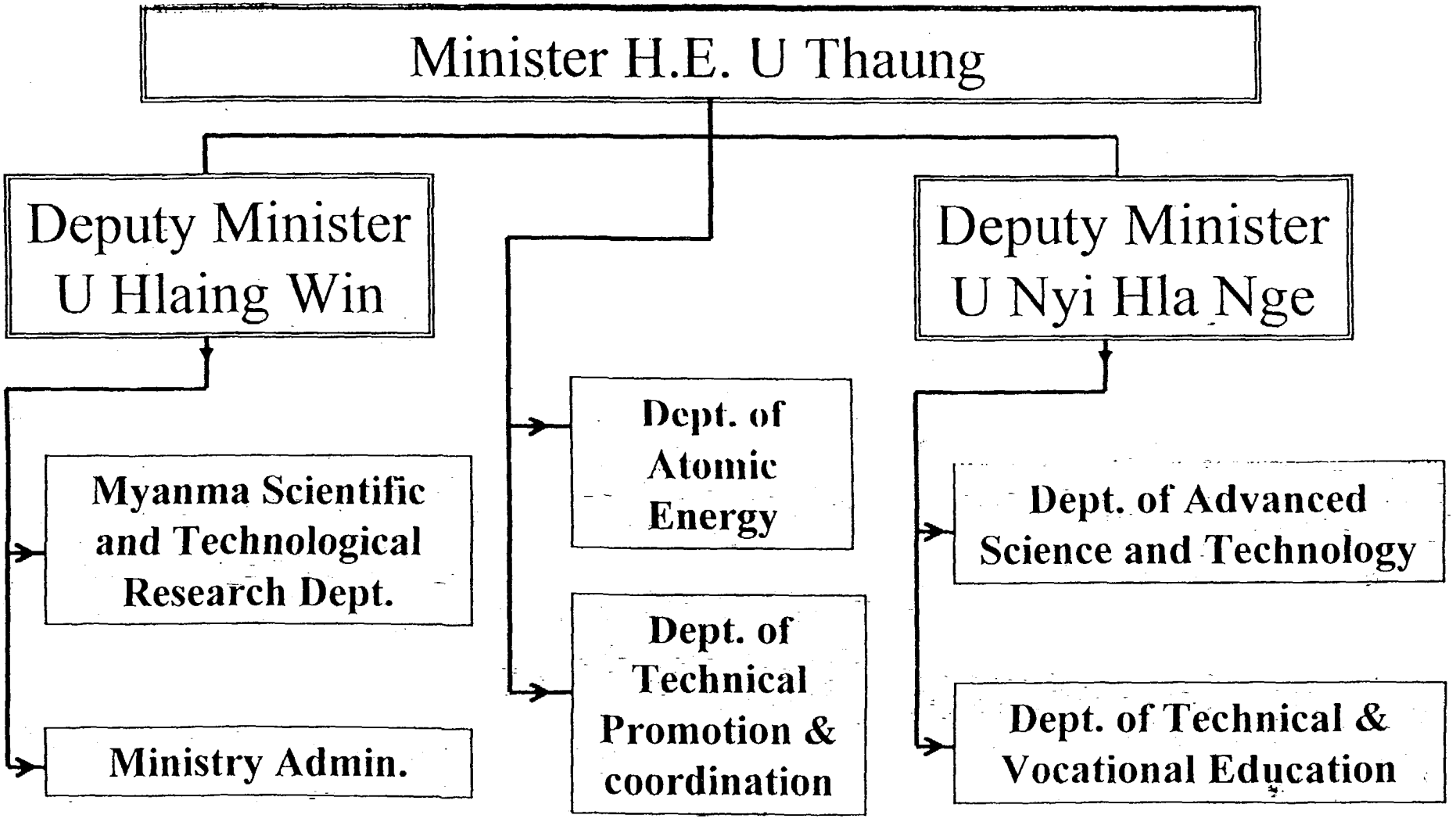
  * **Technological Universities**

    Yangon, Mandalay, Pyay

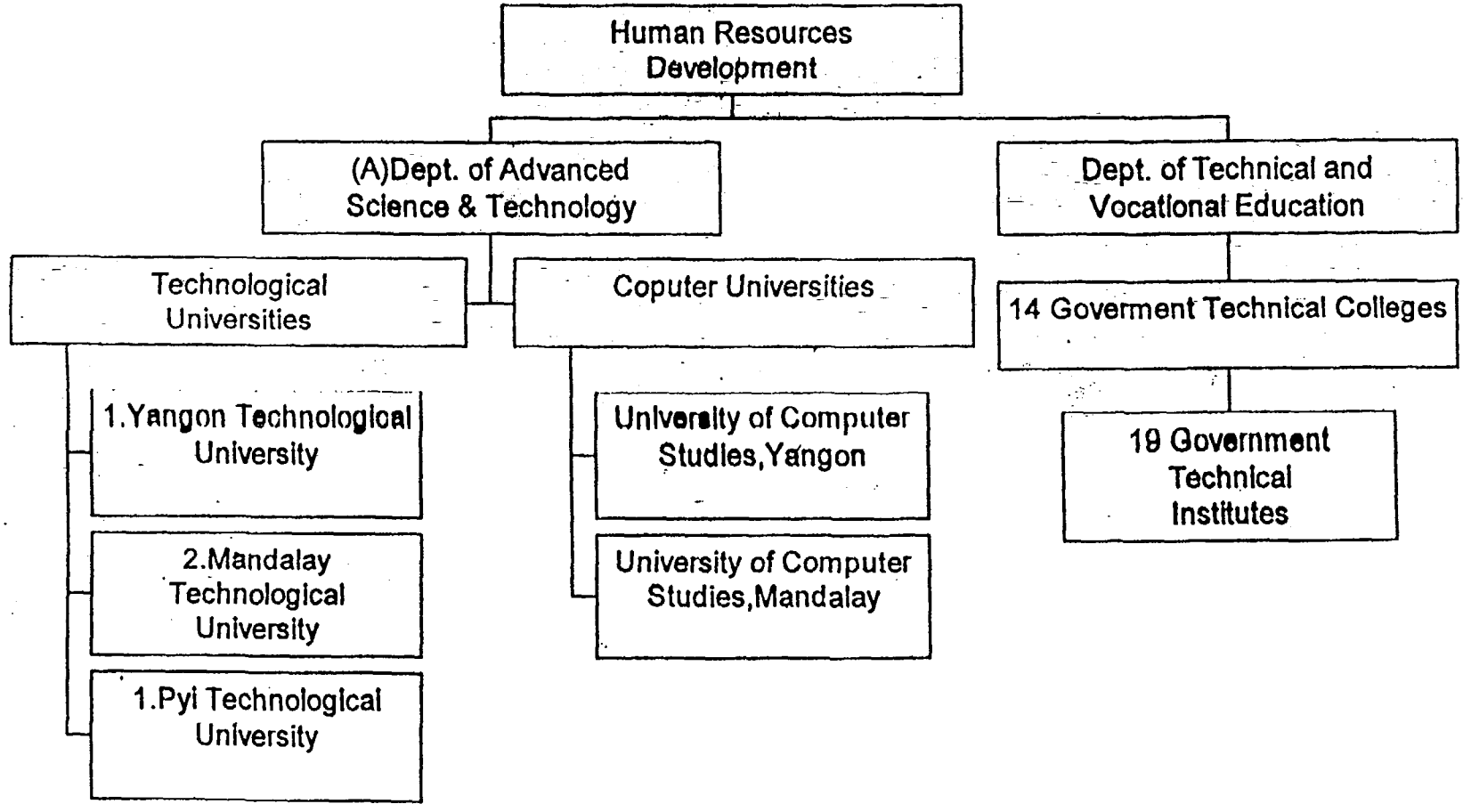
* DTVE * **Govt. Technical Colleges**

  * **Govt. Technical Institutes**

MINISTRY OF SCIENCE AND TECHNOLOGY



Ministry of Science & Technology



- **Activities of MSTRD**
  - **•.Analysis Department**
  - **•.Applied Chemistry Research Department**
  - **•.Pharmaceutical Research Department**
  - **•.Food Research**
  - **•.Pulp and Paper**
  - **•.Ceramics Research**
  - **•.Metallurgical Research**
  - **•.Pilot plant Department**
  - **•.Standards Department**
  - **•.Atomic Energy Department**
  - **•.Technical Information Centre**
  - **•.Technical Planing Section**
  - **•.Administration and Accounts**

Department of Atomic Energy

History: (1) Started as AEC as a division in UBARI. It had very ambitious programmes which did not succeed.

(2) Only a few scientists/engineers continue to work for AEC

(3) AEC continued its existance with zero growth untill 1993.

(4) TC and RCA programs re-started in 1993-94.

New Setup: Reorganised as a new directorate in 1997.

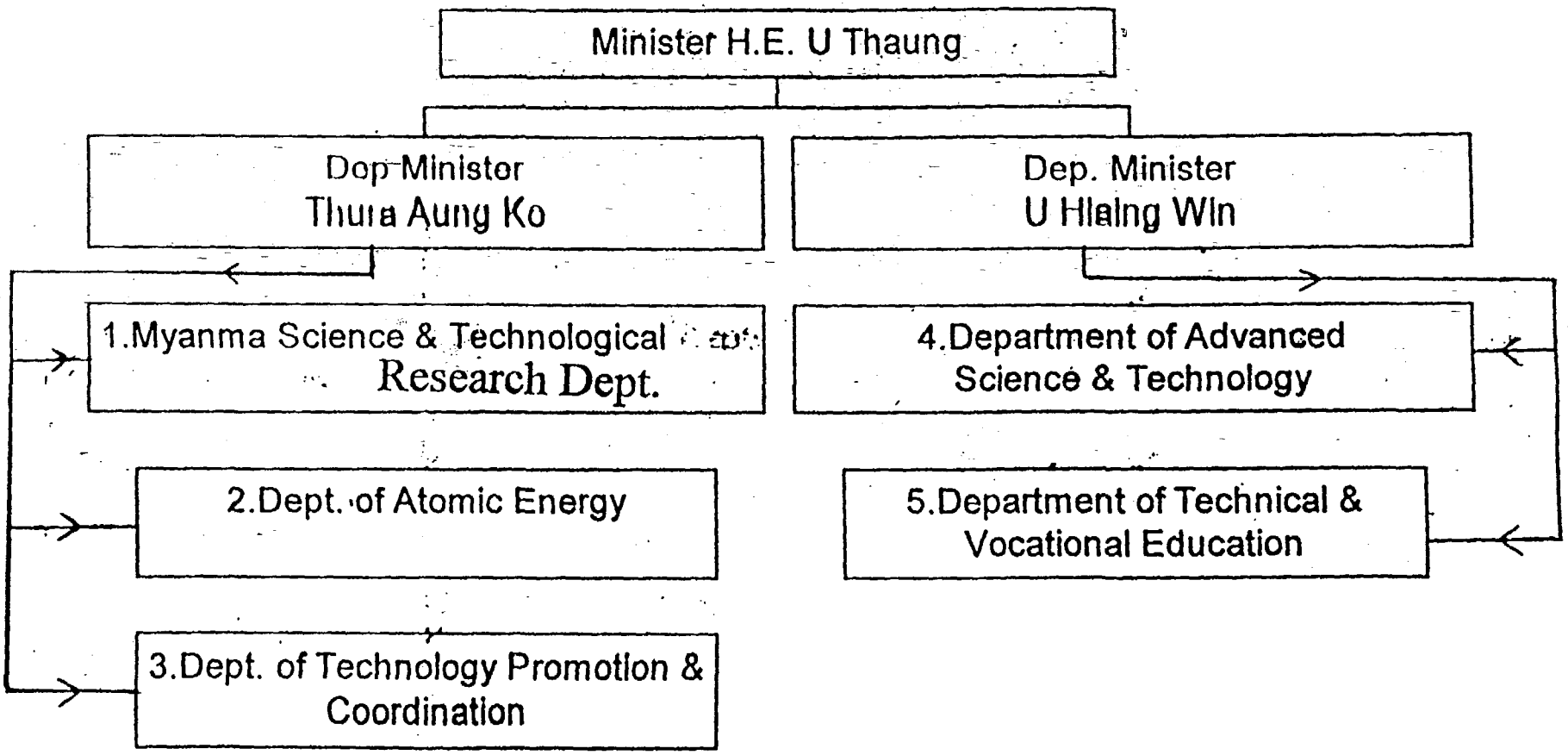
Developments:

- **Atomic Energy Law (enacted 1998)**
- **Radiation Protection Regulation (in preparation)**
- **IAEA assisted projects**

Present Facilities:

1. **Radiation Measurement Lab.**
2. **Instrumentation Lab.**
3. **TLD Lab.**
4. **NDT Lab. (still under MSTRD)**
5. **Gamma Chamber 5000**

Ministry Of Science & Technology
Established October 2, 1996



Research & Development

Human Resources Development

Organization Chart of the Departmant of Atomic Energy