SOME ASPECTS OF NUCLEAR POWER INTRODUCTION IN NEWCOMER COUNTRIES
More than 50 countries considering or planning a first nuclear power plant
NUCLEAR POWER LAUNCH PROGRAMME

FACTORS for CONSIDERATION

NPP operation

NPP construction

National Infrastructure building

Nuclear Energy Planning

- Timescales
- Human resources and training
- Regulatory aspects
- Available Technology
- Costs
- Funding and economics
- Fuel supply security
- Technology support and organization
- Legislation
- Decommissioning
- Used fuel and waste management
- Public information

IAEA, 2007, Considerations to launch a nuclear power programme
TOP ISSUES OF THE NEWCOMER

Newcomers’ starting conditions are different, but the issues are mostly the same

HOW TO DO IT?
more than a half hundred countries are interested in developing nuclear energy and some countries interviewed by IAEA

HOW MUCH? WHERE CAN I FIND MONEY?
most of the Newcomers are developing countries and the capital cost of NPP is high

HOW TO GET STAFF?
some thousand professionals are needed

WHAT REACTOR IS SUITABLE?
there are several suppliers and different reactors

WHAT TO DO WITH WASTE?
WHERE TO GET FUEL?
and so on…
SUPPLIER-NEWCOMER COOPERATIONS’ OPPORTUNITY

- Consulting in Nuclear Power Program
- Establishment of infrastructure of national nuclear power
- Required level of safety, security and proliferation resistance
- Support for financing, risk allocation
- Help in Education and Training
- Construction of the first NPP
- Sustained NPP operation (availability of fuel, parts, service)
- Spent fuel management and take-back option
From Supplier To Newcomer:
CONSULTING SERVICES
on establishment of national infrastructure for nuclear power engineering

● Creation of an organizational chart for the management of the national nuclear power engineering

● Creation of legislative and regulatory framework for nuclear power engineering

● Development of new requirements to the selection of an NPP site; feasibility study implementation

● Analysis of nuclear power engineering technologies available in the world market with an eye to the demands and engineering potential of the country

● Creation of a national system for the management of nuclear materials and radioactive waste

● Evaluation of nuclear facilities’ environmental impact

● Development of schemes of funding the NPP construction project

● Creation of national structure for nuclear power engineering
COOPERATION THROUGH THE WHOLE NPP’s LIFE CYCLE

- PERSONAL TRAINING for NPP
- ESTABLISHMENT and OPERATION of FUEL FABRICATION PLANT
- NPP DESIGNING, R&D
- EQUIPMENT MANUFACTURING
- REMOVAL of SPENT NUCLEAR FUEL, TREATMENT of RADIOACTIVE WASTES
- DECOMMISSIONING
- MAINTENANCE, UP-GRADES
- NPP CONSTRUCTION
- NPP OPERATION

National Nuclear Power Programme
RUSSIA/USSR EXPERIENCE IN DEVELOPMENT OF THE NUCLEAR POWER INFRASTRUCTURE

For implementation of the wide-scale NPP construction in the USSR, the powerful diversified infrastructure was established to unite scientific, engineering and production cooperation of the countries-partners within the framework of the Council for Mutual Economic Cooperation (COMECON).

**USSR: AREAS OF DEVELOPMENT OF INTERNATIONAL COOPERATION WITH THE COUNTRIES OF EASTERN EUROPE**

- creation of nuclear scientific and research centers
- construction of manufacturing enterprises
- construction of a pilot and prototype NPP
- exchange of scientific and engineering experience
- training of engineering, technical and scientific staff
As a result of the cooperation, NPPs were constructed in Germany, Bulgaria, Hungary, Czech Republic, Slovak Republic, Finland and China.

In the last ten years 7 NPPs were constructed.

OUTSIDE RUSSIA
- constructed: 48
- in operation: 52
- under construction: 5

NPP with VVER outside Russia
PERSONNEL EDUCATION AND TRAINING
for National Nuclear Power Programmes

Training and performance of all categories of personnel and for various phases of the nuclear facility life cycle (including construction, commissioning and operation).

TRAINING PURPOSES

- educating in general nuclear technology or nuclear physics
- gaining experience in research or power reactor operation
- training researchers at scientifically used research reactors
- educating people working with radiation at facilities other than reactors
- training experts on licensing of nuclear facilities of all kinds

The content of training programmes and projects is based upon the Customer’s needs.
JSC Atomstroyexport provides training of more than 7 thousands Iranian personnel for independent operation of the 1st unit of Bushehr NPP after its start-up.

Theoretical preparation and part of practical lessons were carried out at Novovoronezh Training Center and Balakovo NPP, Russia.

A number of groups of Iranian personnel (welders, metrologists, defect control specialists, specialists on load-lifting machines) are trained in specialized Russian organizations.

Now some hundred persons of the Iranian personnel work along the Russian specialists at Bushehr NPP.
Evolutionary design MIR-1200

The integrity of MIR-1200 design is based on the following evolutionary technologies:

• Optimized safety system configuration with active and passive elements on the diversity principle (four safety trains)
• Digital Instrumentation & Control system
• Higher fuel utilization

High performance of MIR-1200 is achieved due to the following advantages:

▪ Finalized design in full compliance with European rules and standards
▪ Construction and schedule management enabling 54 month on-site works from the first concrete till the start-up
▪ Life cycle up to 60 years with the extension possibility
▪ Serial and experience-proved equipment integration
▪ Overall repairs – once in 8-10 years and replacement of equipment according to its actual condition
**FORMS OF COOPERATION**

**In the frame of Intergovernmental Agreements**

- **Tianwan NPP, China**
  - 2 VVER-1000
- **Bushehr NPP, Iran**
  - 1 VVER-1000
- **Kudankulam NPP, India**
  - 2 VVER-1000

**New economic conditions – TENDERS**

- **Open partnership and international cooperation**
  - **Belene NPP, Bulgaria**
    - 2 VVER-1000
- **BUILD-OWN-OPERATE Project (participation on bid)**
  - **Akkuyu NPP, Turkey**
    - 4 VVER-1200
OPEN PARTNERSHIP PRINCIPLE

VENDOR (ASE)

Engineering / EPC companies

Machine-building companies

Civil and installation companies

Financial organizations

Customers: operating companies/operators for electric power trade

Directions of cooperation

1. Marketing competences in prospective markets
2. Implementation of projects with energy companies and electric power trade operators
3. Foreign engineering:
   1. Expert review of Russian NPP designs
   2. Unification of Russian NPP design with the international norms and requirements
   3. Project management competences
4. Arrangement of financing of large-scale energy projects, including NPP construction projects
ASE vision on implementing of BOO model

- General contractor – BUILD
- Utility – OWN
- Operator – OPERATE

NPP construction

NPP operation

NPP electricity trading

**Capitalization growth**

**Corporate development for currently important requirements of the market**

**Minimization of EPC-business risks**

**Advantages of direct investment in the authorized capital of generating facilities (as compared to crediting)**

- On the basis of core EPC-business of ASE, diversification in related segments:
  - business on electric power trade possessing advantages of stability
  - optimization of risk distribution between the customer and the supplier

- Development format – strategic alliances and mergers with dedicated enterprises for target market development

**Russian-Turkish consortium's project to build Turkey's first nuclear power plant would create a precedent for the use of the BOO (Build-Own-Operate) model, where a nuclear power scheme would be privately financed with the state guaranteeing the purchase of energy**
THANK YOU FOR YOUR ATTENTION!

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