Overview of Arab Nuclear Power Programms and Prospects of Cooperation with India

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22 member states in LAS

African Countries

1. Egypt
2. Libya
3. Sudan
4. Tunisia
5. Mauritania
6. Morocco
7. Algeria
8. Comoros
9. Djibouti
10. Somalia

Asian Countries

1. Jordan
2. Lebanon
3. Iraq
4. Palestine
5. Syria
6. Yemen
7. Bahrain
8. KSA
9. Kuwait
10. Oman
11. Qatar
12. UAE

The AAEA

- It is a sub organization of The Arab league.
- 14 Arab states are members of AAEA
- The structure of AAEA is similar to that of IAEA and shares the same principles and objectives.

AAEA Missions

- coordinates between member states to achieve the objective of strengthening their basic infrastructure for NPP program and to assist in manpower development, technology transfer and effective cooperation with IAEA and relevant regional and international organizations in (EU, USA, Korea, China, ⟶ India)
- Assists in human resources development and transfer of knowledge and information concerning nuclear sciences & technologies,
- Raise the public awareness of benefits and hazards of atomic energy.

AAEA Roles and Goals

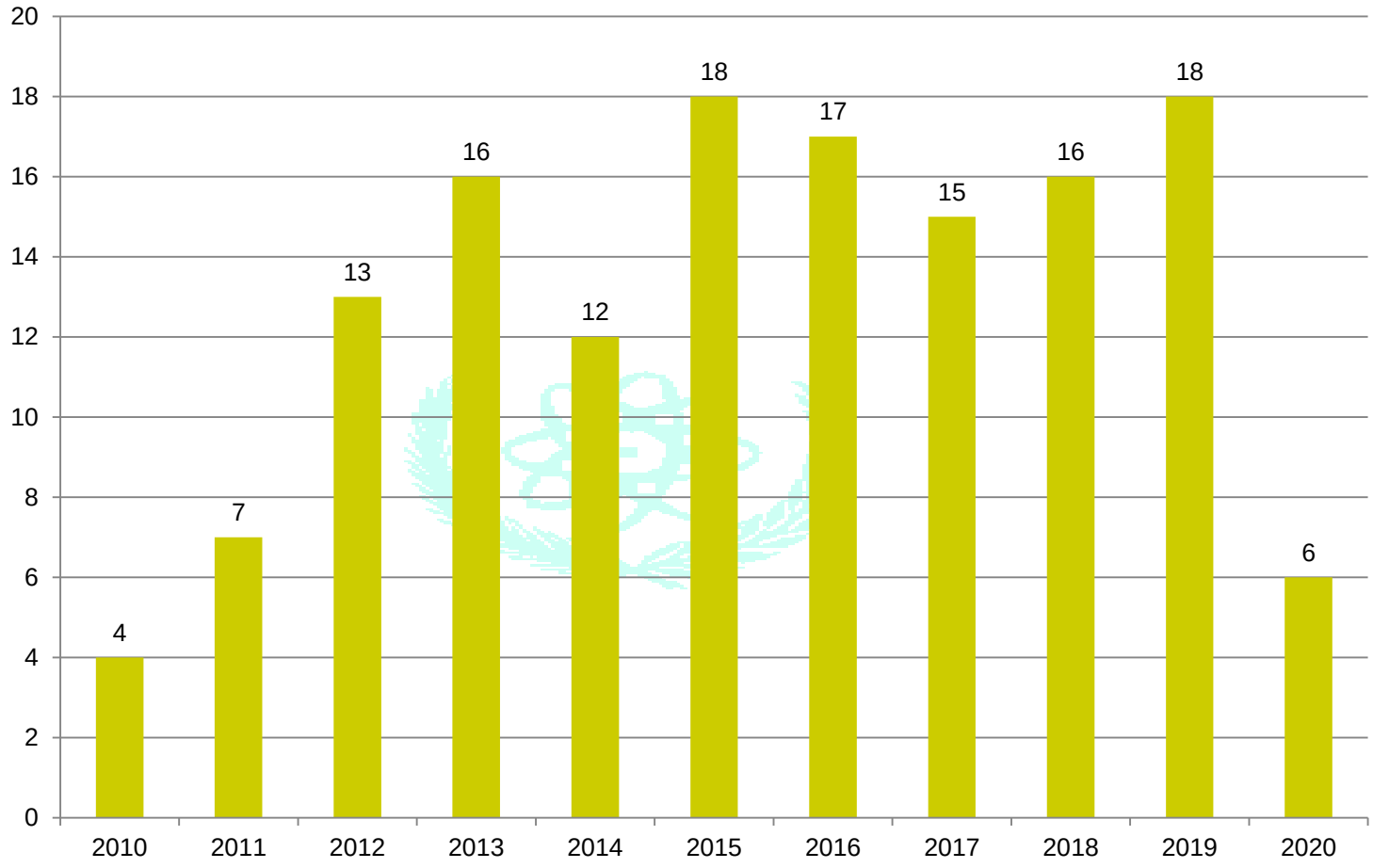
- AAEA works hard to enhance the economical and social development in the Arab countries by promoting the peaceful applications of atomic energy in many aspects of life
- AAEA sponsors many activities to achieve its objectives, these activities include; training courses, coordinated research projects, experts meetings and missions, scientific visits, on-the-job training, workshops, conferences. These activities contribute to build and develop the human resources needed for nuclear programs.

- AAEA developed with member states “The Arab Strategy for Peaceful use of Atomic Energy” Approved by the Arab summit,
- AAEA is ready to assist Arab states to develop their nuclear infrastructure and act as coordinator between member states to foster exchange of experiences.
- Many Arab countries still have insufficient training capabilities in nuclear fields, and are experiencing problems with high staff turnover and shortage of specialized professionals in key areas.

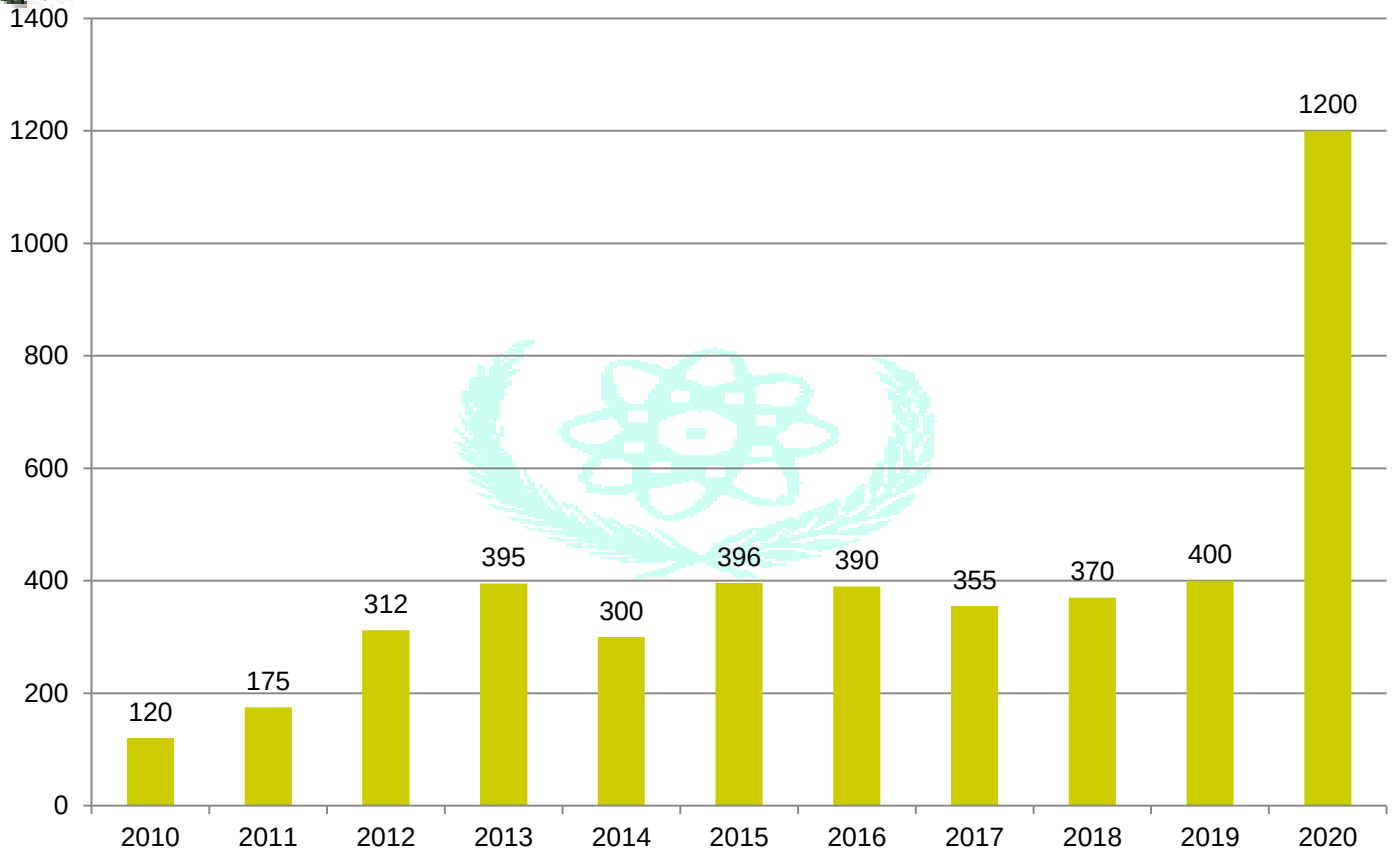
The following strategic projects are related to the Arab nuclear power programs :

- Enhancement of infrastructure for NPP building in Arab countries; energy planning and feasibility study as a first stage
- Strengthening the regulatory and legislative frameworks for nuclear and radiation activities in Arab countries
- Strengthening the Arab and national capabilities for response to nuclear and radiation emergency
- Building capacity of radioactive waste management in Arab countries
- Introduction of nuclear sciences and technologies in Arab education systems

Number of Training Events per Year



Number of trainees per year



ENERGY OVERVIEW IN ARAB COUNTRIES

- Consume about 1TWh /year (2020) of electricity;
- ≈ 2100 KWh per capita , Installed Capacity ≈ 264 MW
- North America consumes about 14000 KWh per capita.
- The electricity consumption in Arab countries will be doubled by 2030 due increase in demand and population
- Oil and gas constitute the main sources of electricity generation in the region today and probably well over 2030.
- The non-fossil sources of energy play a very minor role in the region's energy supply.

NPP programmes

- Arab countries have 10 operating RRs in 7 countries and 5 countries consider building RR.
- Many Arab countries expressed their interest to embark on nuclear power programme.
- One country in the region now operating a nuclear power plant (UAE), while other one in construction phase (Egypt).
- Few countries are actively involved in planning to build nuclear power plants.

Status of NPP programs in Arab Countries

Country	Operating Reactors	Reactors under construction	Reactors Planned	Reactors Proposed
UAE	1 1345MWe	3 4200 MWe	0 0	0
Egypt			4 4800 MWe	
Jordan				1 1000 MWe SMR
KSA				16 17000 MWe
India	23 6885MWe	6 4600 MWe	14 10500 MWe	28 32000 MWe

Key drivers of ACs interest in nuclear power

- Growing energy demand – to double by 2030
- Domestic security of energy supply concerns
- Volatility of fossil fuel prices and low operational costs of NPPs
- Global climate change
- Nuclear industry's increasing experience and improved safety and security record
- Ability to apply nuclear power to desalination
- Desire to sell hydrocarbons profitably in international markets

Nuclear Power

- NP offers a medium to long term alternative electricity option for the Arab Countries
- Worldwide Safety of NP is improving despite Fukushima
- The barriers facing the development of the NPP in Arab Countries are:
  - Government commitment
  - Public acceptance
  - Reactor and fuel cycle safety
  - Disposal of high-level nuclear waste
  - Proliferation risk
  - Nuclear security
  - Economic competitiveness

Benefits for the Economy

- Provides economically competitive electricity
- Reduces pollution and greenhouse gas emissions
- Displaces use of oil
- Creates demand for new services and products
- Creates new employment opportunities in high-tech and manufacturing
- Enhances industrial development and higher standard of living
- Provides low cost energy source for seawater desalination & process heat

Near Term Challenges

- High investment cost
- Human resources
- International & regional political climate
- Infrastructure
  - Fabrication and manufacturing capacity
  - Engineering capability
  - Skilled construction trades
  - Transmission grid & reliability

Building NPP

- Infrastructures include:
  a) "hard"; material facilities, site, grid, radioactive waste equipments
  b) "soft"; legislative, regulatory and administrative frameworks, human and financial resources development
  c) activities and arrangements needed to implement the project
- All partners in the project interested that the national infrastructure needed should be available
- developing a nuclear program requires commitment of many subjects and activities related with infrastructure sustainability during the operation, decommissioning and disposal of radioactive waste for about 100 year

Infrastructure Issues for Nuclear Power Program

- National Position
- Nuclear Safety
- Management
- Funding & Financing
- Legislative Framework
- Safeguards
- Regulatory Framework
- Radiation Protection
- Electrical Grid
- Human Resources Development

AAEA assists by its activities to enhance most of the 19 NPP issues set by IAEA.

Infrastructure Issues for Nuclear Power Program

- Stakeholder Involvement
- Site & Supporting Facilities
- Environmental Protection
- Emergency Planning
- Security & Physical Protection
- Nuclear Fuel Cycle
- Radioactive Waste
- Industrial Involvement
- Procurement

AAEA assists by its activities to enhance most of the 19 NPP issues set by IAEA.

The Needs

Most Arab countries have currently limited capabilities and there is a clear need for:

- National infrastructure and capacity building at an institutional, organizational and technical levels to initiate and sustain a safe and secure utilization of nuclear technology and power programmes.
- Human resources development especially in NPP
- Development of the infrastructures and capabilities for the legislative and regulatory framework, nuclear safety, nuclear security, emergency preparedness and response and radioactive waste management activities.
- Sharing knowledge, best practices and lessons learned related to S&S matters

Needs

To establish an infrastructure to ensure safe and secure utilization of NPP, RR, RS including:

- A comprehensive legal regime
- Competent, adequately financed, independent regulatory body
- Sound educational system
- Technological capabilities
- Well developed Management system
- Spread safety & security culture

AAEA addresses these issues in its multiple activities.

Need for national RB

ACs need to establish, develop and sustain a national regulatory bodies in relation to nuclear safety, and security framework based on IAEA Nuclear Safety & Security Standards and Guidelines.

The RB has to be:

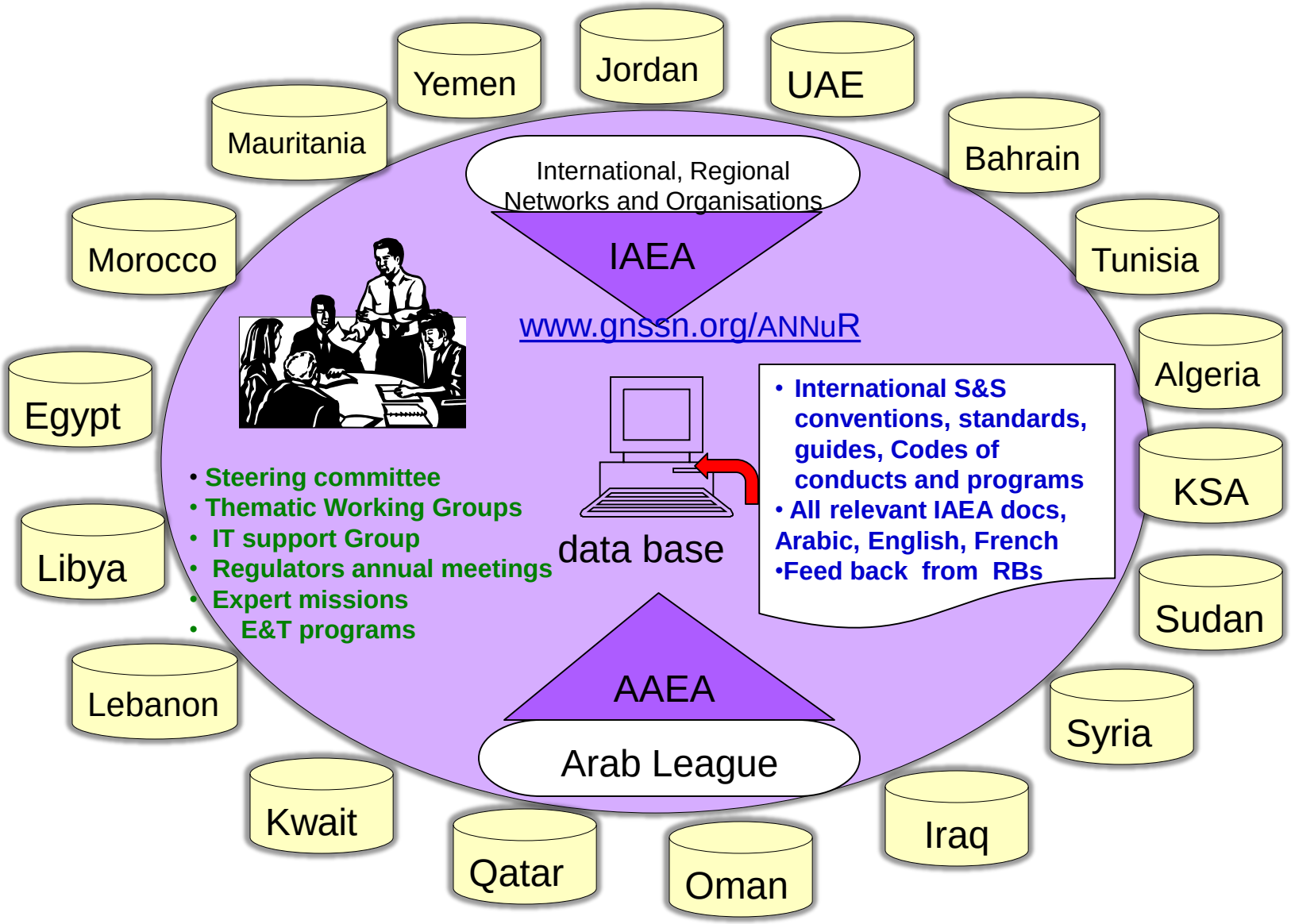
Independent, Transparent , Efficient, Reliable, Robust, Competent

- Many Arab countries have already established a legal and regulatory infrastructure, to ensure high standards of safety and to develop an efficient and effective regulatory body.
- Responding to the evident need for Arab Regulatory authorities to be strengthened and to collaborate and interact between competent people and organizations relevant to nuclear regulation, therefore **ANNuR** has been established, January 2010.

Key objectives of ANNuR

- Strong human and IT network to pool, analyse and share nuclear safety knowledge and experience
- Sustainable regional cooperation, coordination and collaboration to continuously improve nuclear safety
- Strong need of capacity building to fulfil current and future needs of Arab Regulatory Bodies

ANNuR


Yemen
Jordan
UAE
Mauritania
Bahrain
International, Regional
Networks and Organisations
IAEA
Morocco
Tunisia
www.gnssn.org/ANNuR
Algeria
Egypt
• International S&S conventions, standards, guides, Codes of conducts and programs
• All relevant IAEA docs, Arabic, English, French
•Feed back from RBs
KSA
• Steering committee
• Thematic Working Groups
• IT support Group
• Regulators annual meetings
• Expert missions
• E&T programs
Libya
data base
Sudan
AAEA
Lebanon
Syria
Arab League
Kwait
Iraq
Qatar
Oman

Cooperation between ACs in Building NPP

- AAEA foresees the cooperation between Arab countries in building jointly nuclear power reactors is promising.
- Burden of infrastructure can be reduced significantly if an Arab country forms a sharing partnership with other Arab countries.
- Sharing can be between two or more Arab states. It can include physical facilities, common programs and knowledge, which will reflect in economic benefits.
- Sharing contributes in a significant manner to harmonization of codes and standards in general and regulatory framework in particular.
- AAEA plays and will play a key role in introducing Arab countries into the nuclear era through its various activities.

AAEA strategy 2021-2030

- As the first phase of AAEA strategy is completed, AAEA put the second phase of the strategy in the period 2020-2030.
- The main component of the strategy apart from continuing the previous long term projects is to build an Arab training center for peaceful uses and applications of atomic energy and to promote joint Arab NPP projects.
- India may assist in implement this strategy, in particular, The Arab Training Center

AAEA Intend to Build a NPP Simulator

The Nuclear Power Reactor Simulator

objectives :

- To develop, enhance and strengthen the skills and capabilities of personnel in Arab countries working in nuclear power programs and research reactors,
- To strengthen the academic scientific infrastructure through using the simulator in education and training programmes for professionals and future workers in the nuclear power program and research and training reactors,
- To establish a well needed training center for young Arab nuclear engineers to develop their knowledge and skills regarding reactors theory and operation as well as to exchange experiences and
- To have a realistic, hands-on training of normal operations, start-ups and shutdowns, upsets and emergency situations without compromising the health and safety of the operators, the well integrity and the surrounding environment.

Overview of Indian Nuclear Power Program

- India has a largely indigenous nuclear power programme.
- The Indian government is committed to growing its nuclear power capacity as part of its massive infrastructure development programme.
- The government has set ambitious targets to grow nuclear capacity.
- India has uniquely been developing a nuclear fuel cycle to exploit its reserves of thorium.
- India has 23 operating rectors, 6 under construction,14 planned and 28 proposed.

Indo-Arab Cooperation in NPP

AAEA suggests that Indian relevant Institutions assist, in general, to strengthen the basic nuclear infrastructure of Arab countries who want to embark on nuclear power program for the first time and participate in implementing the Arab strategy for peaceful use of atomic energy up to 2030 in its nuclear power program part. The human resources development and capacity building are of utmost importance at this stage

Possible Area of Cooperation

- Training and Capacity Building
- Energy Planning
- Nuclear Power Program Project Management
- NPP Site Selection
- Uranium and Thorium Mining and Exploring
- Emergency preparedness and response and radioactive waste management.

We look forward for a close Indo-Arab Cooperation in field of nuclear technologies in General and Power rectors in particular.

The AAEA highly values the Indo-Arab cooperation in the field of energy and works hard to establish a relationship in nuclear field for the benefit of both nations.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Thank you