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Academic Infrastructure in Nuclear Education
and
Involvement in Current Projects

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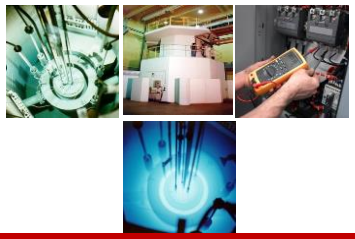

- Current status of nuclear power plant projects in Turkey
- Nuclear education in Turkey
- Involvement of academia in nuclear projects

Current status of NPP Projects in Turkey

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- **Akkuyu Site**
  - IGA with Russian Federation in 2010
  - 4 units VVER-1200 (1200 MW)
  - BOO –built, own, operate- model
  - Site was licensed in 1976
  - Environmental Impact Assessment was approved by Ministry of Environment and Urban Planning in 2015
  - 'Akkuyu Nükleer' gave 'Site Parameters Report' to Turkish Atomic Energy Authority last month
- What is next?
  - If the site parameters are approved - application for 'Construction License'

Sinop Site

- EÜAŞ was recognized as the owner of the project by TAEK in 2012
- IGA with Japan in 2013
- 4 units ATMEA-I (1150 MW)
- 49% belongs to EÜAŞ
- French side (ENGIE-old GDF Suez) owns 21%
- Japan side (ITOCHU and MITSUBISHI HEAVY INDUSTRIES) owns 30%
- Site evaluation studies is underway to get a site license

Third site ?

- Turkey plans to design and build it by itself !

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Nuclear education in Turkey

- 1956, Signature of Atom for Peace
- 1961, Istanbul Technical University (ITU) Nuclear Energy Institute, Istanbul
- 1966, Ege University (EU) Radioisotope Research Center, Izmir
- 1977, Hacettepe University (HU) Nuclear Engineering Institute, Ankara
- 1982, HU Department of Nuclear Engineering, Ankara
- 1983, Transformation to EU Institute of Nuclear Science, Izmir
- 2002, Transformation to ITU Energy Institute, Istanbul
- 2006, Ankara University (AU) Institute of Nuclear Science, Ankara
- 2014, Sinop University Nuclear Engineering Department, Sinop
- 2015, Turkey and Japan signed an agreement to establish Turkey-Japan University in Turkey, Istanbul

Istanbul Technical University Energy Institute

- The first institute in Turkey in the field of Nuclear Technology
- It is an advanced research and education center on different aspects of energy
- No undergraduate program
- 24 faculty members, 25 faculty members from other departments, 14 research/teaching assistants
- Approximately 300 graduates
  - working in Turkey and abroad
  - seeking higher education in Turkey and abroad

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- Courses are in English or Turkish
- 2 graduate programs
  - Energy Science & Technology (MS and PhD)
  - Radiation Science & Technology (MS)
- It has 5 divisions
  - Nuclear Research
  - Renewable Energy
  - Energy Planning and Management
  - Conventional Energy
  - Energy Science and Technology
- Effective relations with industry
  - Industrially Supported Research Assistants (ISRA)
  - Industrially Supported Research Projects (ISRP)
  - Industrially Supported Education Activities (ISEA)

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Laboratories

Industry established

- Energy Storage Technologies Test & Research
- İnci Akü Battery
- Ericom Flow Battery
- Ground Source Heat Pump Test & Research
- Energy Efficiency and Illumination Techniques Laboratory
- Cryogenic Energy Storage
- Thermal Test
- New Energy Technologies

University established

- Renewable Energy Data Analysis and Signal Processing
- Material Characterization and Production
- Energy Efficiency and Lighting Techniques
- Computational Nano Energy Research
- Triga Mark-II Training and Research Reactor
- Gamma Spectroscopy
- Low Level Radiation Measurement
- Industrial Radiography
- Radiation Measurements and Health Physics

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Turkey's First Thematic Technopolis: ENERGY TECHNOPOLIS

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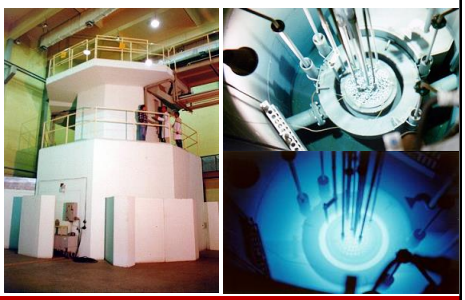
- Turkey's one and only working nuclear reactor: ITU TRIGA-MARK II
- It was first operated on March 11, 1979
- Maximum steady-state power: 250 kW
- Maximum pulse power: 1200 MW (for 20 ms)
- Used for
  - graduate education (lectures, M.Sc. and Ph.D. Researches)
  - Technical personnel training
  - Neutron activation analysis
  - Gammagraphy
  - Neutrongraphy
- Irradiation Facilities
  - Central thimble
  - Piercing, Tangential, Epithermal tubes
  - Thermal column
  - Rabbit system



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- **ITU Nuclear Energy Information Center**
- For school children and public
- To inform visitors about scientific facts on nuclear energy and radiation
- 7x4 m panoramic screen
- 26 seats
- 45 min. interactive video including quizzes and games
- Questions and answers sessions after video screening
- 4 sessions per day
- Free of charge

Hacettepe University Department of Nuclear Engineering

- The first department in Turkey which offers an undergraduate degree in the field of Nuclear Engineering
- Higher education on Nuclear Sciences and Nuclear Technology
- 6 faculty members, 6 research/teaching assistants
- Approximately 400 graduates
  - working in Turkey and abroad
  - seeking higher education in Turkey and abroad

ISTANBUL TECHNICAL UNIVERSITY
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- All the courses are in English
- First two years
  - mathematics, computer programming, classical, modern and nuclear physics, electronics, thermodynamics, and materials science
- Third year
  - numerical analysis, heat transfer and fluid mechanics, introductory courses in nuclear engineering
- Fourth year
  - detailed analysis of reactor systems, nuclear fuel cycle, nuclear materials, nuclear reactor analysis, control and design
- Research projects by use of computer codes
- Experimental studies
  - in radiation detection and measurement laboratory
  - thermal-fluid laboratory
- International level highly theoretical education

Ege University Institute of Nuclear Science

- Post graduate education on
  - nuclear science, technology, and applications (MS, PhD)
- Nuclear techniques on
  - earthquake researches
  - sea and lake sedimentation velocity determination
  - earth erosion
  - radioecology
  - dosimetry
- Studies on
  - uranium and thorium mining and characterization
- Nuclear spectroscopy
- Radiation detection

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Ankara University Institute of Nuclear Science

- Post graduate education on
  - Health physics (MS, PhD)
  - Medical physics (PhD)
  - Nuclear research and technology (MS)
- Studies on
  - radiation physics
  - radiation protection
  - radiation detection
  - medical applications of radiation

- Services for
  - routine quality control and acceptance tests of imaging modalities
- Radiation measurements of
  - all kinds of food and environmental samples

Involvement of academia in nuclear projects

- What is needed?
  - Human resource development
  - Creating awareness in public
  - Strategic planning
  - Infrastructure assessment – Industrial localization
  - Empowerment of companies
  - Creating nuclear safety culture
  - R&D activities

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- Mission/Strategic Role of Academia
  - To work with local industry to enhance their capability
    - human resources
    - technology
  - Educate and train technical personnel with relevant competence
    - Nuclear Engineers (Hacettepe University, B.S., M.S., Ph.D.)
    - Train engineers with relevant nuclear technology knowledge (ITU, M.S., Ph.D)
  - Highlighted Areas
    - Nuclear materials
    - Advanced manufacturing
    - Nuclear reactor safety
    - Risk assessment and management
    - Licensing
    - Test and inspection

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- Action Plan
  - International collaboration
  - Nuclear Industry R&D Center
  - Nuclear Industry Cluster (ITU is the leading partner) to be supported by Ministry of Industry

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Thanks

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