National Programs for New NPP Construction

New Nuclear Build in Hungary

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Generation units in Hungary owned by MVM

Sites/Capacities

Power Plant Capacities of the main Players in Hungary

- **MVM***
- GdF-Suez
- AES
- EDF**
- E.ON
- RWE
- Euroinvest

* MVM including the capacities of Dunamenti and Mátra
** EDF including the capacity of Dalkia
Hungary’s Electricity production

The Paks Nuclear Power Plant has produced **382.6 TWh** electrical energy since the date of the first connection of Unit 1 to the grid, the load factor is **89.90%** (2012).
MVM Paks Nuclear Power Plant Ltd.

4 units - VVER-440 design (PWR Second generation, safe model)

- Capacity after power upgrading: 4x500 MW
- Following the lifetime extension, the units are expected to operate until 2032 to 2037
- Continuous safety upgrading - good safety and technical performance
- The safety of the nuclear power plant is guaranteed by:
  - highly qualified, safety conscious and greatly committed personnel
  - continued developments, safety enhancement measures and
  - reconstructions intended to replace the obsolescent items of equipment.
Domestic demand-supply

Minimal capacity needs

Gross capacity [MW]

2010 2015 2020 2025 2030

BPP  SPP  Import  New units

Peak demand

existing
Project preliminaries

MVM Teller Project
- Feasibility study

Decision in Principle of the Parliament
- 30th March 2009.
- 330 yes, 6 no and 10 abstaining

MVM Lévai Project
- Preparation work of the planned project. Background work for successful decision making process.

National Energy Strategy
- Parliament’s decision on 3rd October 2011.

MVM Paks II. Nuclear Power Plant Development Co.
- Continues the work of Lévai Project from 26th July 2012 – as an independent company.
National Energy Strategy 2030

Main Targets

- Maintaining the existing nuclear capacities
- Integrating the Central European grid network and constructing the required cross border capacities – necessary to 1000-1200 MW export
- Increasing energy savings, efficiency
- Increasing the share of renewable energy up to 1350 MW
- Utilizing the domestic coal and lignite resources in eco-friendly manner for power generation - 440 MW

1 The Hungarian Parliament approved the National Energy Strategy in its Resolution No. 77/2011. (X.14.)
Fundamentals for new Units

- High nuclear safety: Generation III+
- Pressurized light-water reactor (PWR)
- Power rate: 1000-1600 MW
- Load following capacity (50-100%)
- 60 years lifetime
- Siting: Paks
- Not first of a kind (FOAK)
- Low quantity of nuclear waste
Bird’s eye view of the site
Hungarian Government

• A Hungarian Governmental Committee was established in 18 June 2012 to handle the strategic questions of the new builds program;

• 15 Working Groups were launched to deal with different strategic questions;

• Government decision No.1196/2012.(VI.18.): highlighted importance of the new power plant unit(s) investment being established on Paks site
Project company was established on 26th July 2012

Basic tasks

• **Tendering**
  • To compile the Bid Invitation Specification
  • Preparing EPC, long term fuel supply; O&M contracts.
  • BID evaluation
  • To set up the financing model

• **Licensing**
  • Impact assessments, investigations and studies for site licensing and environmental licensing.

• **Communication** (to provide information to stakeholders)
Other tasks

- Economical studies
  - Examination of the role of Government
  - Financing possibilities
  - Market and price investigations
  - CfD examination
- Technical studies (Grid connection studies, Cooling methods)
- Role of regional and domestic suppliers during the project
- Legal aspects of preparation and licensing work
- Education and training programs
- Risk allocations
• The most important criteria is the nuclear safety

The GEN 3+ reactors characteristics:
• Standardization ⇒ shorter licensing and construction time
• Increased passive safety systems
• Higher protection against internal and external events
• Mitigation and prevention of severe accidents
• Longer cycles (18 - 24 months)
• Shorter maintenance period (<20 days)
• Less radioactive waste
• More than 90% LF (in base load operation mode)
Safety requirements

Safety increasing solutions

- High volume and strong pressure-tested concrete containment
- Hydrogen removal by passive recombinators
- Melted core cooling (with core catcher if applicable)
- Long term and reliable containment cooling
- Independent safety systems including power supply

Protection against external hazards

- Seismic hazards
- Extreme meteorology
- Drought
- Thunder bolt
- Airplane crash
- Accidents from other industrial sources
- Electromagnetic interference
Potential reactor types 1/2

**APR 1400** ~1450 MW
**Under construction:**
- Baraka-1-4 United Arab Emirates
- Shin Kori-3,4-Shin Ulchin-1,2 Korea
- (Shin Kori-5,6-Shin Ulchin-3,4)

**ATMEA** ~1150 MW
**Pre-qualification obtained:**
- Atucha-3. Argentina
**Specification under evaluation:**
- Jordan

**AP 1000** ~1100 MW
**Under construction:**
- Sanmen-1,2 Haiyang-1,2 China
- Vogtle USA
- VC Summer
**EPR** ~1600 MW

**Under construction:**
- Flamanville-3 *France*
- Olkiluoto-3 *Finland*
- Taishan-1,2 *China*

**VVER** ~1000-1200 MW

**Operating:**
- Tianwan-1,2 *China* (AES-91)
- Busher-1 *Iran*

**Under construction:**
- Leningrad-2 *Russia* (AES-2006)
- Novovoronezh-2 (AES-2006)
- Khmelnitski-3,4 (*Ukraine*)
- Kudankulam-1,2 *India* (AES - 2006)
- Rostov-*Russia* (AES-2006)
Building public confidence in nuclear

Public Acceptance

• Communication tour in the country
  – Exhibition about the nuclear power plant, its activities and about its future plans (lifetime extension, new unit(s))

• Communication campaign (carrier days at universities)

• Frequent public opinion surveys

• Articles, and media appearances
Do you accept that a nuclear power plant operates in Hungary?
Public acceptance

Do you accept that a nuclear power plant operates in Hungary?

Do you accept new nuclear unit(s) to be built in Paks site?

The diagrams are based on the data of Századvég.
Preparation of the Bid Invitation Specification (BIS)

- Commercial parts of BIS
- Technical parts of BIS
  - Information provided by the owner
  - Safety and technical requirements
  - Information requested from the bidders
- Financing
- Legal issues
- Tendering rules
Technical part of BIS (structure)

Main aspects:
- Project description and site conditions
- Description of the Hungarian legislative framework
- Detailed safety and technical requirements (HNSR, IAEA, WENRA, EUR)
- Scope and limits of supply with the highest possible support of national industrial infrastructures
- Quality assurance, Quality management program
- Warranty
Analysis, impact assessment: Grid connection

**Detailed studies on:**

Investigation of:
- Power flow
- Voltage and reactive power regulation
- Static stability
- Short circuit currents
- Dynamic stability

Grid expansion optimization, need of:
- New high voltage lines
- New high voltage substation and substation expansions
- New network transformers

New stand-by power plants for tercier regulation reserves
Analysis, impact assessment: Feasibility study of cooling possibilities

Paks Unit 1-4: Once through cooling (Danube river)

Cooling method of the new Paks units?

Technical & economic study for decision making

- Explore cooling possibilities (site features)
- Identify alternatives
- Possible point of views & circumstances (economical, environmental protection, public acceptance etc.)
- Parallel operation with the existing units for a limited time period
Licensing steps

**Site licensing**

- MBFH - mining inspectorate
  - Geological examination
- OAH – Hungarian Atomic Energy Agency
  - Safety evaluation of the site

**Environmental licensing**

- KTVF – environmental inspectorate
  - Consultation or preliminary environmental assessment
  - Environmental impact assessment

**Other licensing**

- Pertaining to building affairs
- Physical protection
- Radiation protection
- Fire protection

**Construction license**

- OAH
- MEKH

**System installation licenses**

- OAH

**License for operation**

- OAH
- MEKH

**License for energy production**

- MEKH

**MEKH – Hungarian Energy and Public Utility Regulatory Authority**
Licensing issues

**Environmental licence**
- The environmental site test framework program has been completed
- Licensing documents are under elaboration.

**Site licence**
- The framework program and the geological investigation plan are ready and reviewed by the International Atomic Energy Agency (IAEA).
- The execution of the geological and site investigation will be started after the approval of the Hungarian Nuclear Safety Authority.
- The licensing documents (EIA) could be elaborated after the end of the investigation program.

**Dose constraint**
License was issued in 2012
Licensing issues - Environmental licence

Environmental inspection programme

- Env. Imp. A. (EIA)
- Domestic period
- International consultation
- Consultation
- Authority opinion

Preliminary Consultation
Scope of activities and number of the firms included in the List of Potential Suppliers

Social and economic relations
- Hungarian localisation - to reach a min. of 30%
- Nuclear cluster
- List of Potential Suppliers – 158 qualified firms

- A firm in 100% Hungarian ownership
  (according to the information provided by the firm itself)

1: Design, engineering, consultation services, material tests , R&D activities
2: Building activities
3: Mechanical engineering activities
4: Electrical and Instrumentation & Control activities

34 (Hungarian*: 29)
46 (Hungarian*: 36)
34 (Hungarian*: 18)
44 (Hungarian*: 30)
7. § (2) For the start of preparation of new nuclear unit, or storage facility or extension of the existing NPPs by new unit is necessary to obtain the prior principal agreement of the Parliament.

Atomic Law
Thank You For Your Kind Attention!

mvm

paks II.