MINISTRY
OF NATIONAL DEVELOPMENT

Nuclear energy and industry of Hungary: prospects, trends, development potential

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1. National Energy Strategy 2030
2. Operation beyond design lifetime
3. Stress Test – Hungarian experiences
4. New nuclear build in Hungary

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National Energy Strategy 2030

Reducing energy dependency

The National Energy Strategy guaranties:

- long-term sustainability
- safety of supply
- economic competitiveness - principle of least cost



***Cornerstones**:*

- energy saving
- renewable energy (decentralised)
- integration with Europe's energy infrastructures
- safe nuclear energy
- environmentally friendly utilization of our own coal, lignit and unconventional gas resources (CC, CCS)

Operation beyond design lifetime

Milestones

2000: feasibility study

2003: application for environmental license

2005 : consent of the Parliament

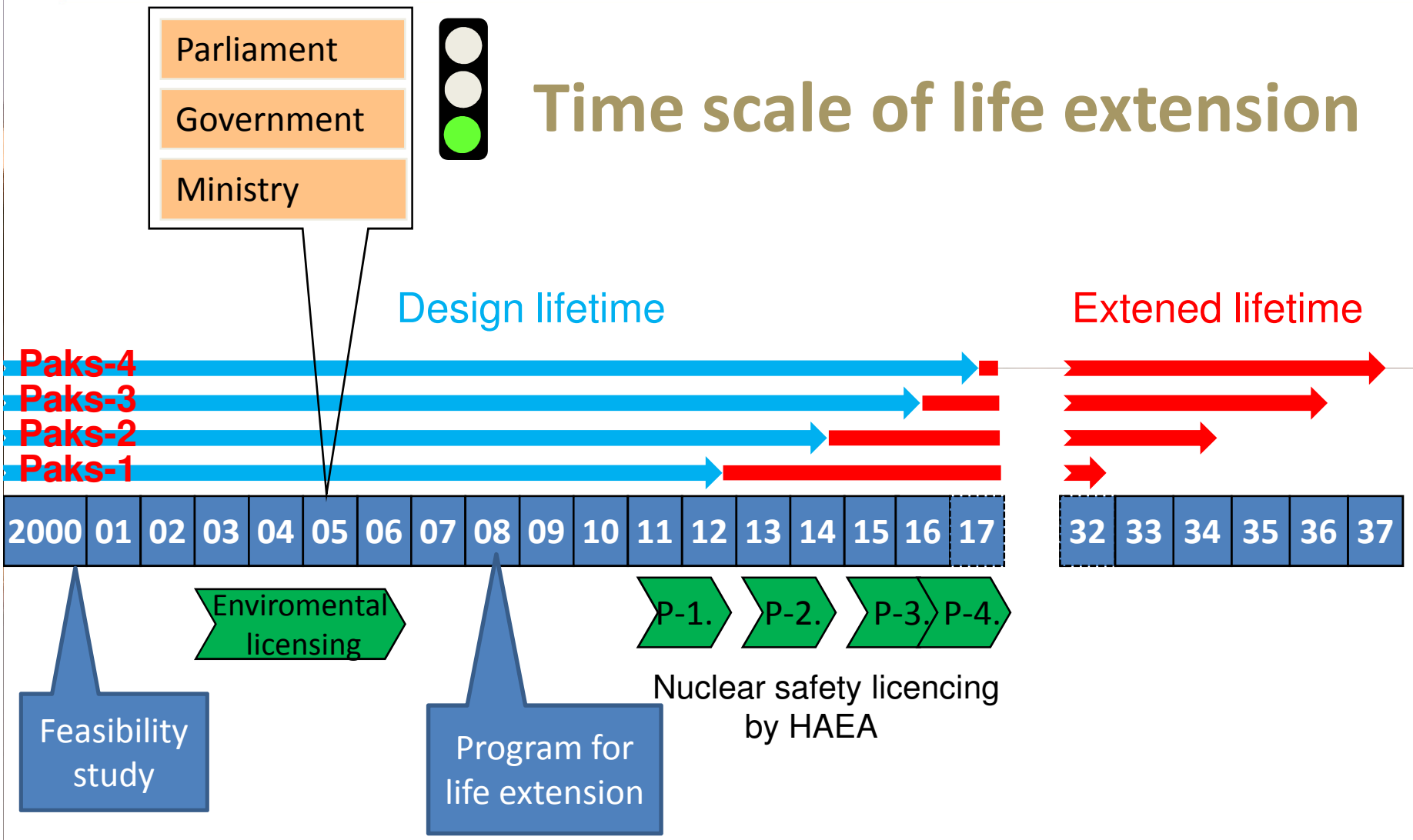
2006: environmental license

2008: submission of the program for the lifetime extension to the Hungarian Atomic Energy Agency (HAEA)

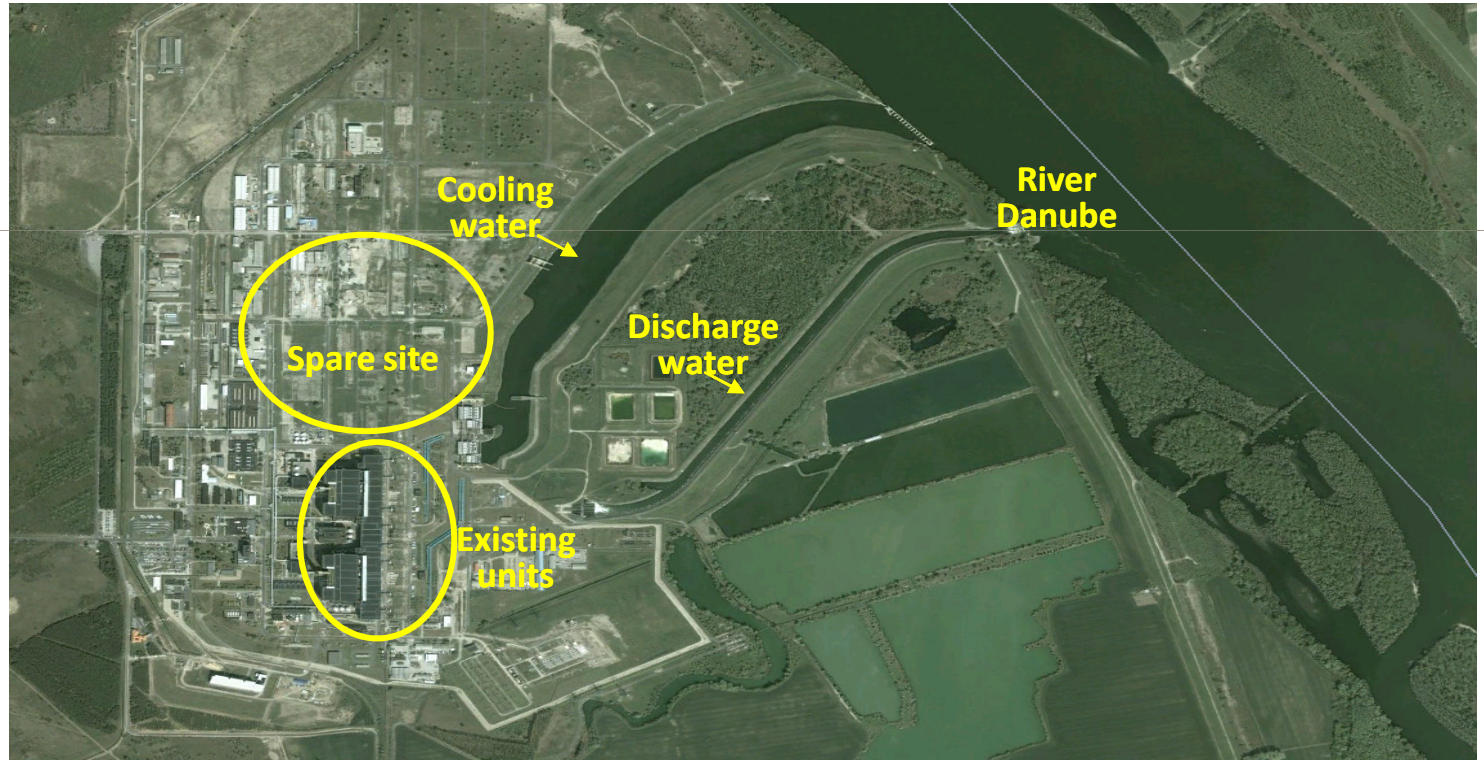
2009: program accepted by HAEA

5 December, 2011: application for the extension of the operating license of the first unit

Time scale of life extension



Stress Test – Hungarian experiences



National Report

- The units at Paks NPP are satisfactorily protected against the key events and no immediate measures are needed

- Corrective actions identified to further enhance safety

National Report of Hungary
on the Targeted Safety Re-assessment
of Paks Nuclear Power Plant

Compiled for the European Commission
by the Hungarian Atomic Energy Authority

Hungarian Atomic Energy Authority
Budapest, December 29, 2011

	Name, assignment	Signature	Date
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International peer review

- 12-13 March, 2012: Country and plant visit by team of experts (A, BG, SLO, D, CZ, RO,EC)
- 26 April, 2012: Peer review report on EU Stress Test for Hungary
- 4 October, 2012: Communication of the Commission

New nuclear build in Hungary

Milestones

- 2007: Teller Project: preparatory studies for the Parliament
- 2009: Principal consent of the Hungarian Parliament
- 2009: Lévai Project
- 9 May, 2012: MVM's decision on setting up a project company
- 30 May, 2012: adoption of tree Government Resolutions
- 18 June, 2012: promulgation of Government Resolutions

Nuclear capacity increase in Hungary

- Power uprate (past)
  - the four Paks NPP units now on 108%
  - 440 → 460 → 500 MW

- Lifetime extension (present)
  - 30 + 20 years
  - licensing is in progress

- New nuclear build (future)
  - political support exists
  - preparation started

Government resolutions

Adopted: 30/May/2012
Promulgated: 18 /June/2012

Declaration

of strategic importance

Government commission

- **Prime Minister**
- **Minister for National Economy**
- **Minister for National Development**
  - *Project finance*
  - *Model of financing*
  - *Ownership sturcture*
  - *Etc.*

Tasks, deadlines, Responsibilities

- ***Review of legislation***
- ***Financing***
- ***Ownership structure***
- ***Strengthening authorities***
- ***Education, R&D***
- ***Spent fuel and radioactive waste management***
- ***Communication***
- ***Etc.***

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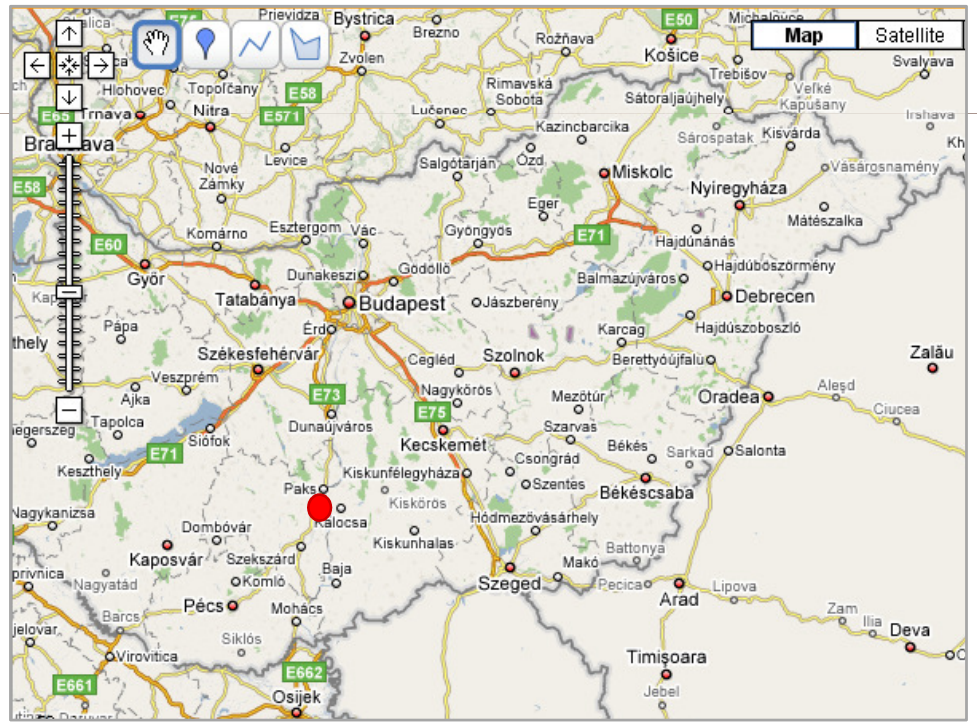
Fundamentals for new Units

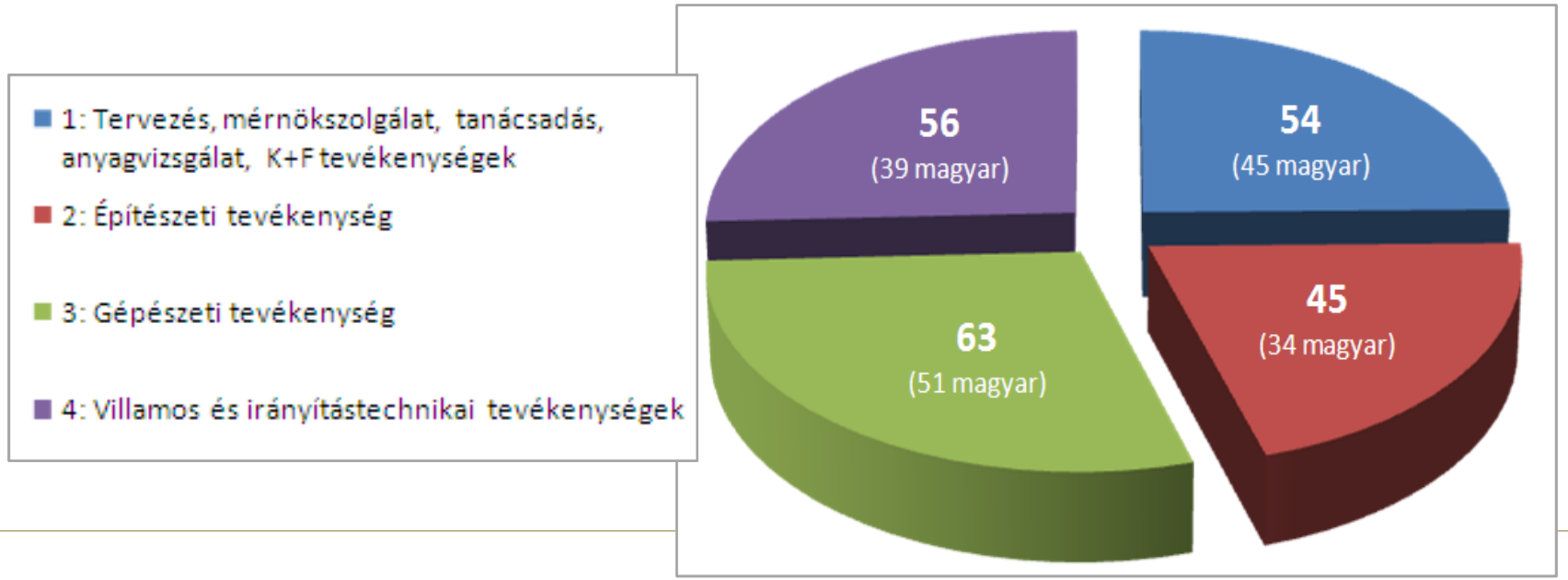
- Power rate: grid and economy calculations
  1000-1600 MW (Existing designs)
- Siting: Paks
- Not first of a kind
- 60 years lifetime
- Pressurized light-water reactor (PWR)
- Load following capacity (50-100%)



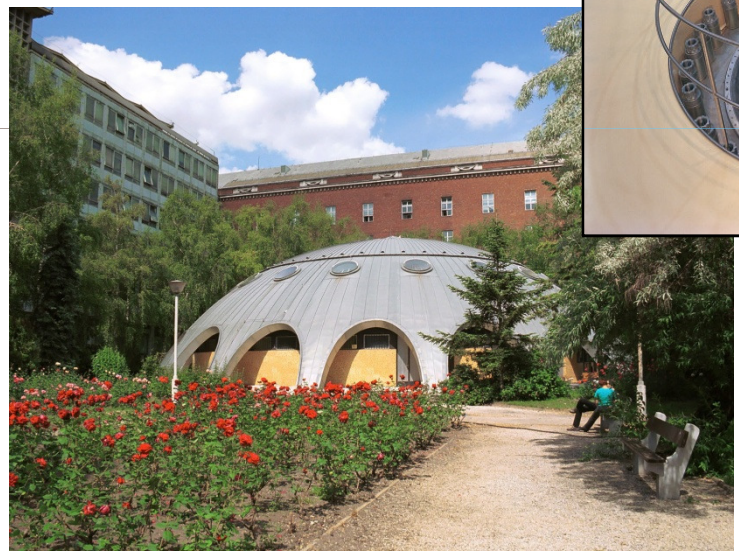
Hungarian localisation

Social and economic relations

- Hungarian localisation - to reach a min. of 30%
- Nuclear cluster
- 218 companies were tested



- Nuclear education & training
- Nuclear R&D
- Engineering
- Production
- Construction



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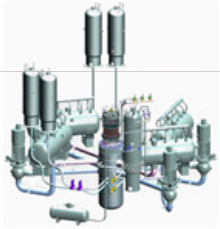
Potential NPP types

AES-2006 (MIR-1200)

- **The recent 1200 MW Russian PWR**

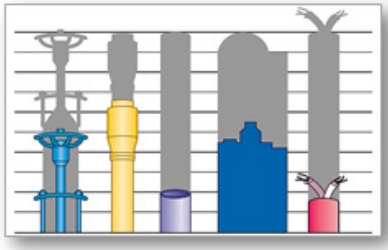
- **Pros**
  - known technology (tradition, knowledge),
  - fits into the grid
- **Cons**
  - slow (1500 rot/min) turbine is under deve



AP1000

- **More innovative, than evolutionary**
- **Simple, standard, passive**

- **Pros**
  - quick build,
  - US NRC license,
  - fits into the grid
- **Cons**
  - cycle length < 24 mon



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EPR

- **Best mix of proven solution**
- **Synthesis of very successfu**
  - N4 (1450 MW, Framatome)
    - = Chooz 1-2, Civaux 1-2
  - Konvoi (1300 MW, Siemens)
    - = Neckar 2, Emsland, Isar 2
- **1600 MW**

- **Pros**
  - very safe,
  - licensed (FI, FR)
  - in build
- **Cons**
  - too big for our grid,
  - high investment cost

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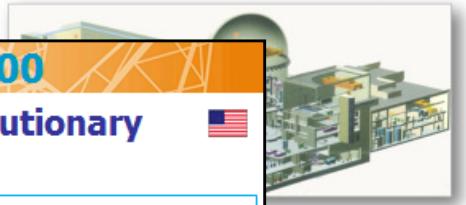
APR1400

1970-	1980-	1990-	2000-
startup	knowledge buildup	become independent	breakout to the world market



- Westinghouse CE Sytem 80+
- Korean Standard NPP KSNP, KSNP+
- Optimized Power Reactor OPR1000
- Advanced Power Reactor APR1400

- **Cons**
  - non EU/euro-atlantic
  - no core catcher,
  - single wall containment

ATMEA1

f the future, 1000-1150 MW

middle size G3+ NPP

- **Pros**
  - best practices,
  - evolutionary design,
  - fits into the grid
- **Cons**
  - basic design comleted only in late 2009,
  - nowhere licensed yet,
  - no prototype in build

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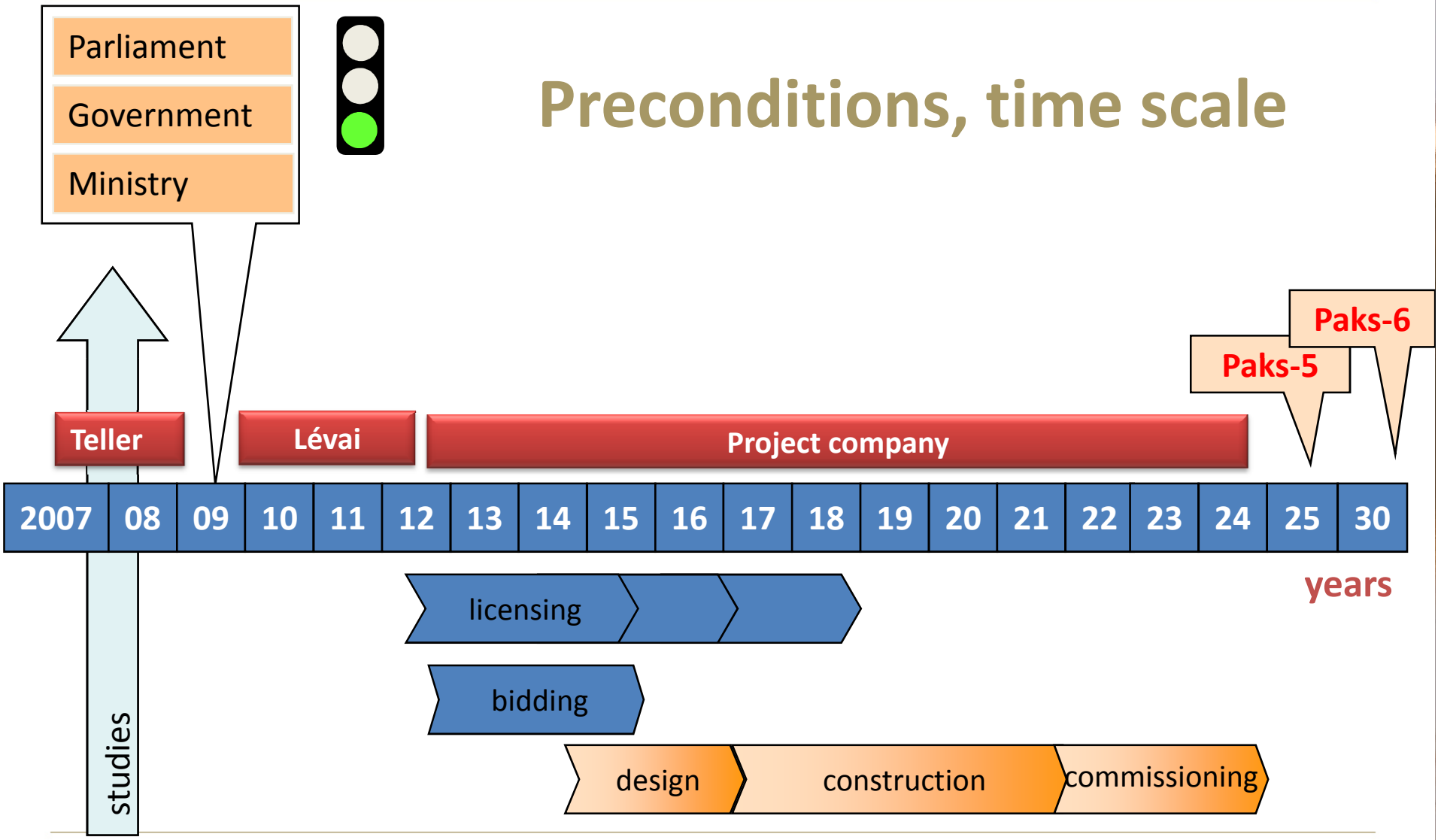
Preconditions, time scale



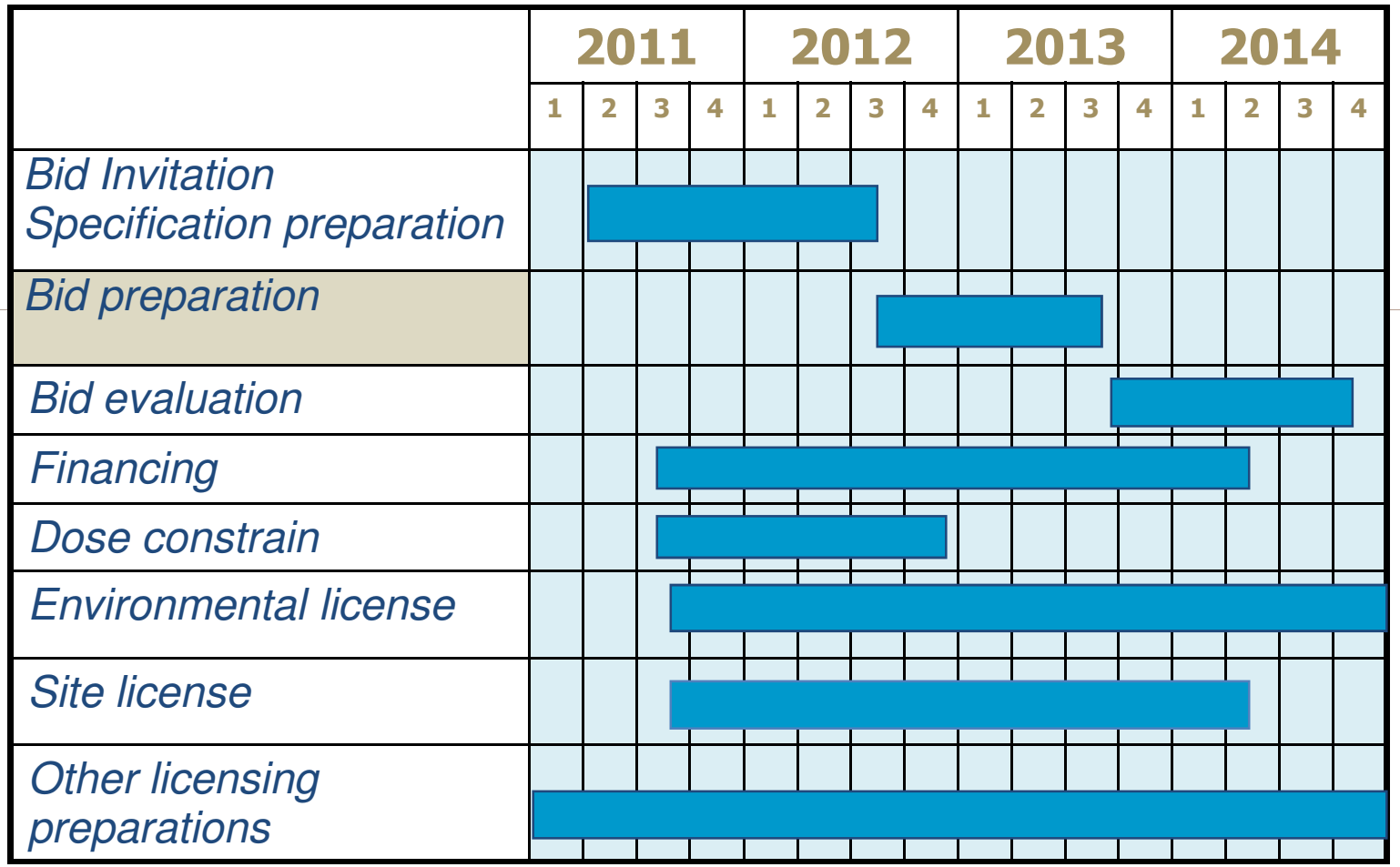
Tasks on preparation of new nuclear units implementation

1. **Licensing issues - licensing environment**
   - Environmental licence
   - Site licence
   - Dose constrain
2. **Tendering**
   - Preparation of the Bid Invitation Specification (technical and economical requirements, tendering rules)
   - Financing
   - Legal issues
3. **Economic and technical issues**
   - Consumer's demand after 2020
   - Electrical system regulation, standby-, grid development demands;
   - Cooling possibilities of new Paks units
4. **Establishment of the project company**
5. **Localization**
   - Preparation of nuclear cluster

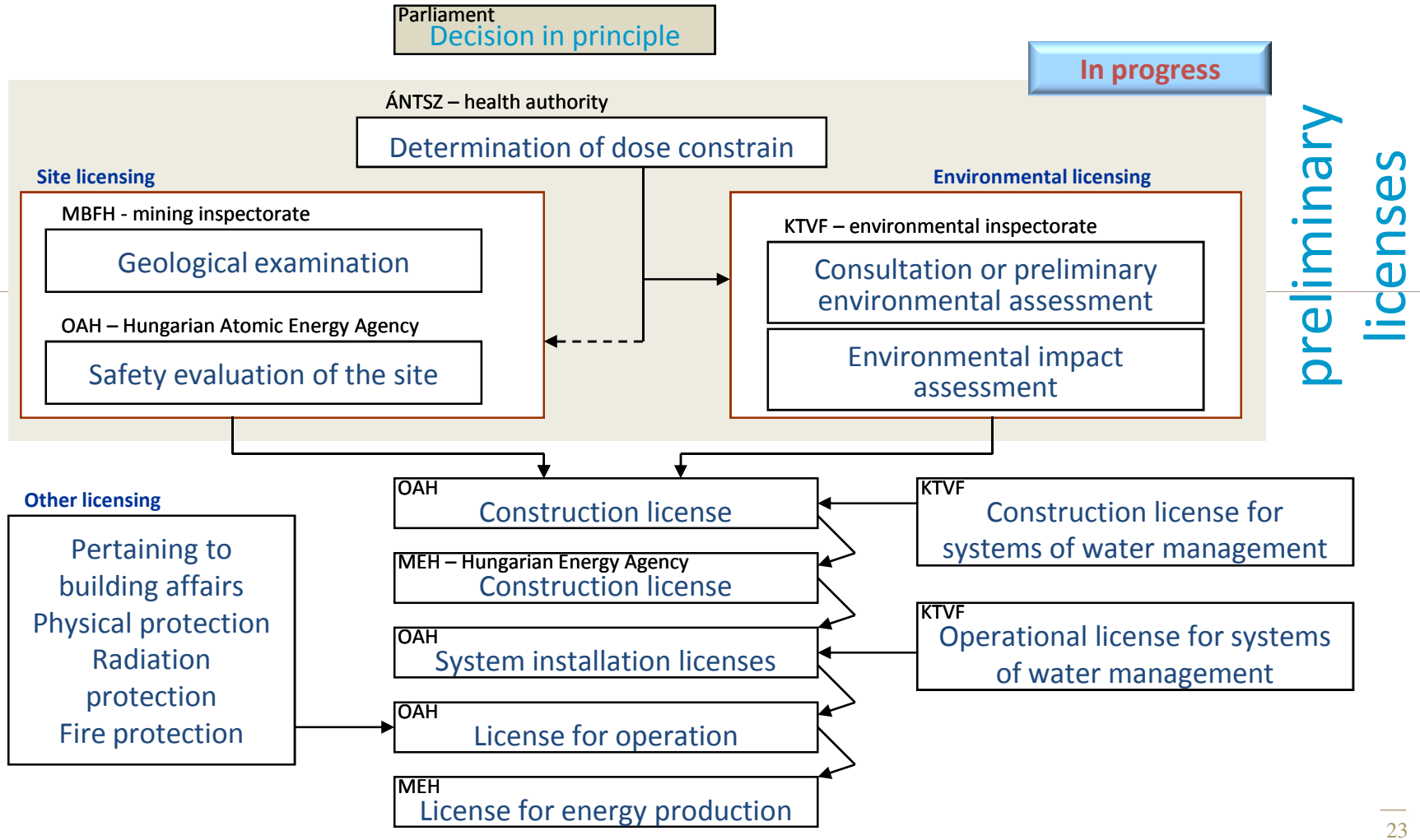
General short term schedule

Tendering

Licensing



Licensing steps



Paks, bird's-eye view


Thank you for your attention!