paks nuclear power plant

Paks NPP, Hungary

Public acceptance of nuclear energy

ATOMEX Asia 2014

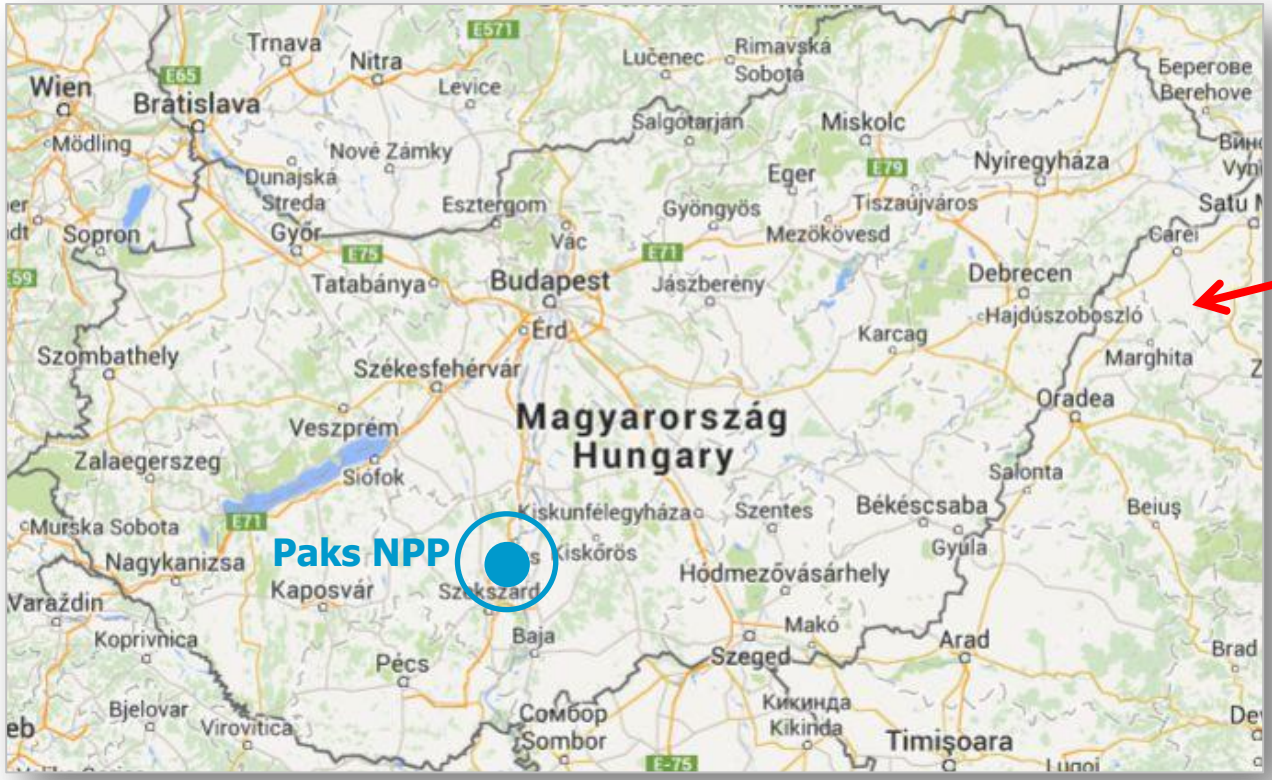
20 November 2014, Ho Chi Minh City, Vietnam

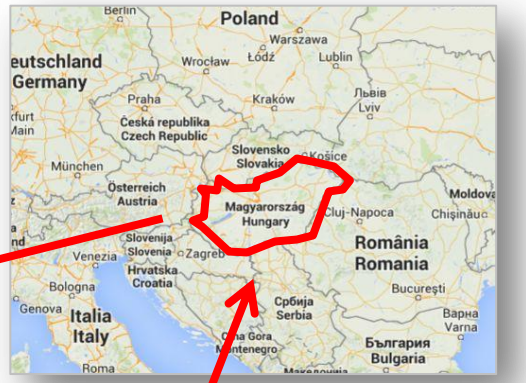
András CSERHÁTI

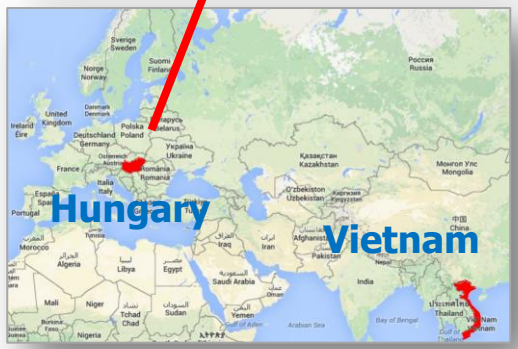
senior expert

Hungary location

Paks NPP location





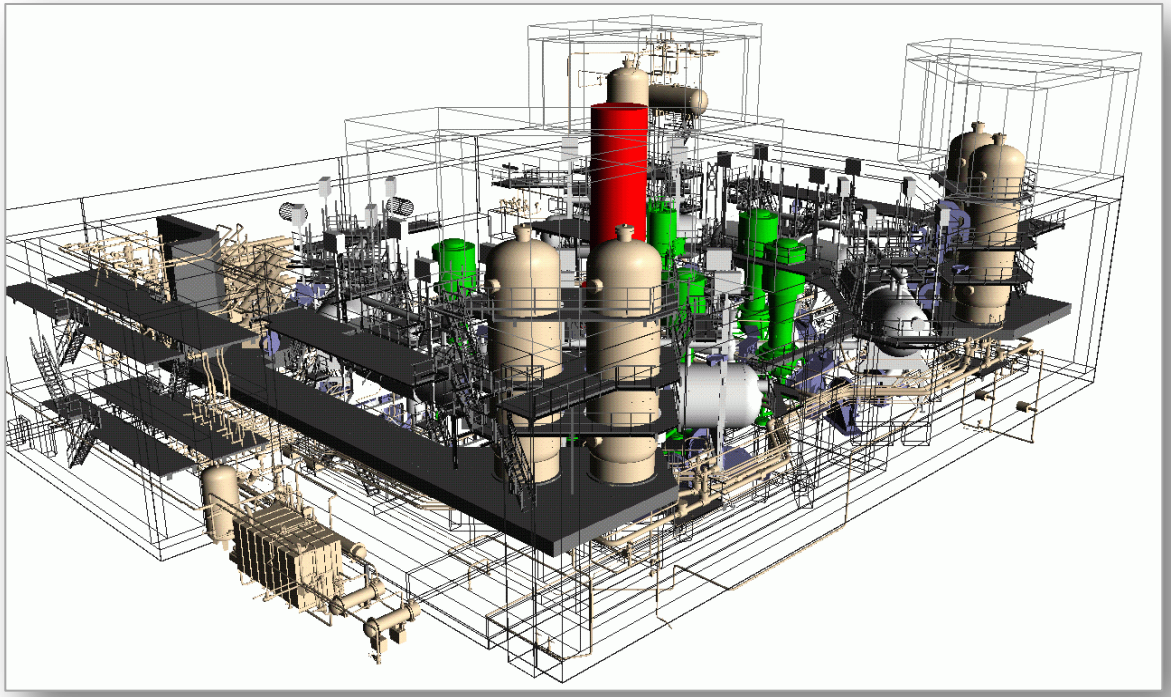


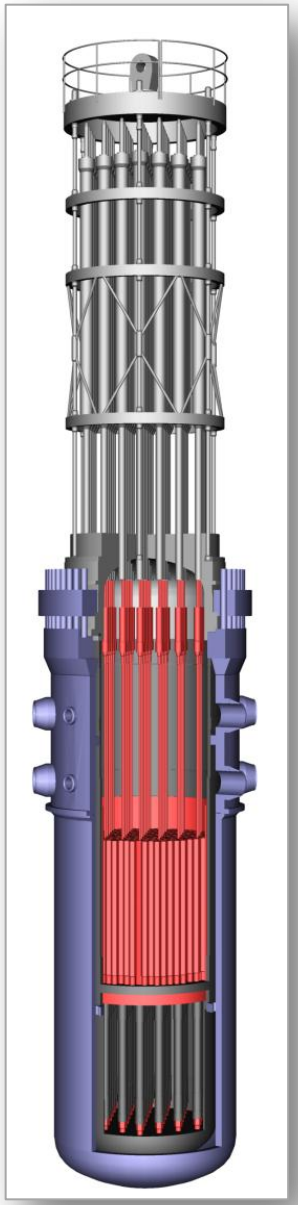
- **On the right bank of Danube river**

NPP site overview

Paks NPP in general

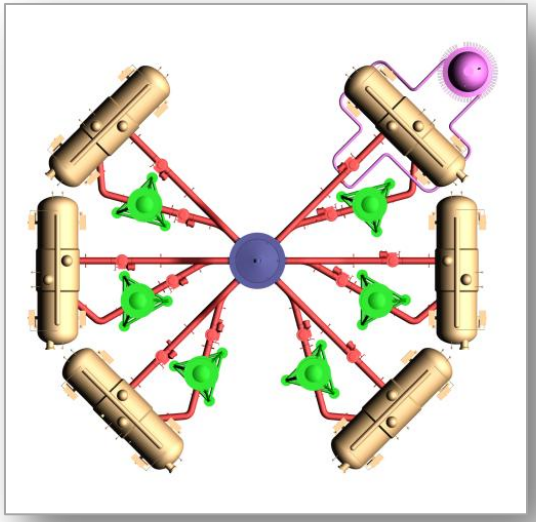
- **Units started in 1982,-83,-86,-87**
- **Type: VVER** (soviet PWR)
  - second generation, VVER-440/V213
- **Power: initially 440 MWe**





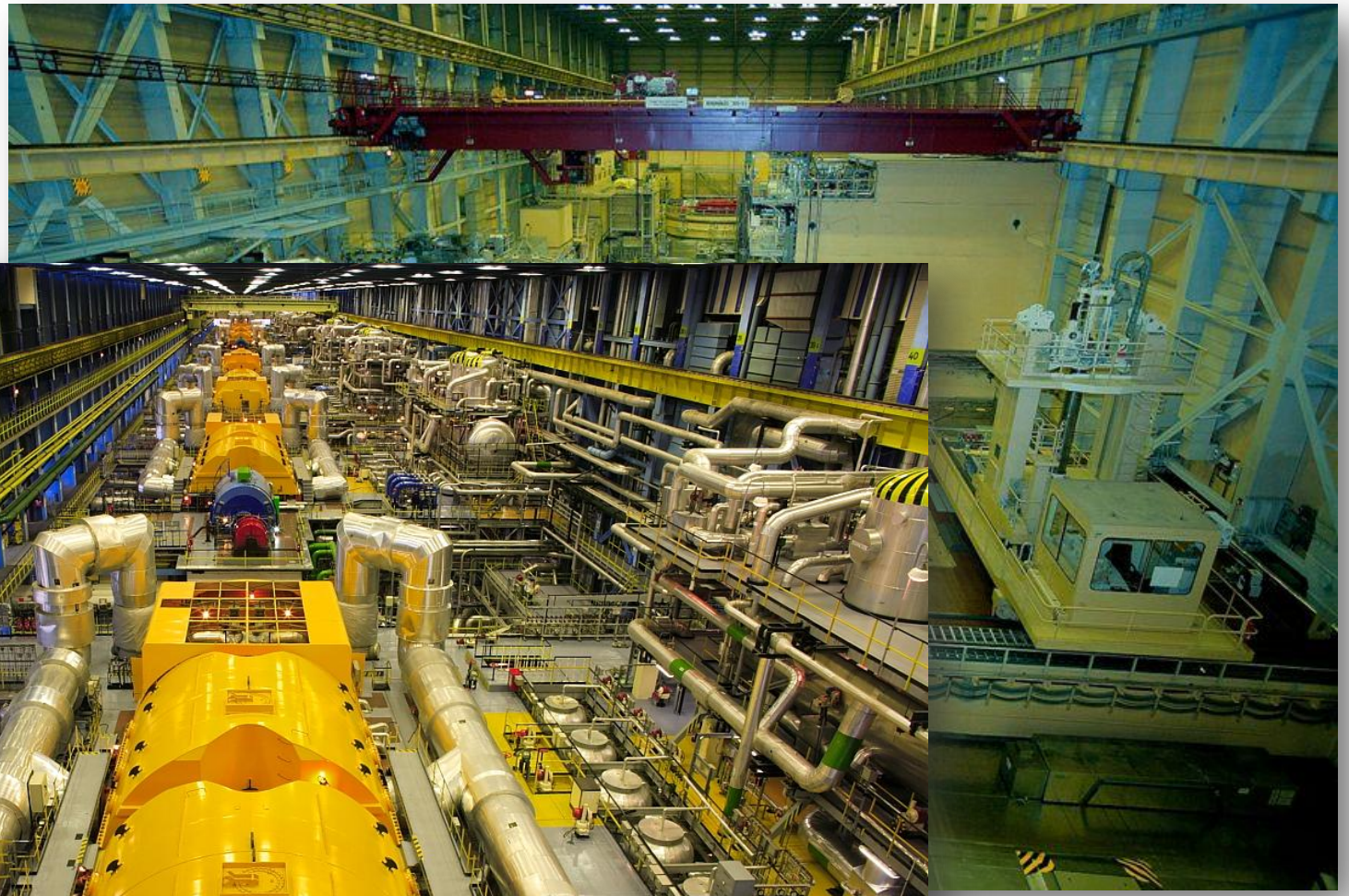
Basic features

- **Old, but safe design**
- **30 years design lifetime**
- **Good performance**
  - with permanent improvements
- **Large number of equipment**
  - 6 loops, 2 turbogenerators for a unit
  - more maintenance required
  - large staff demand



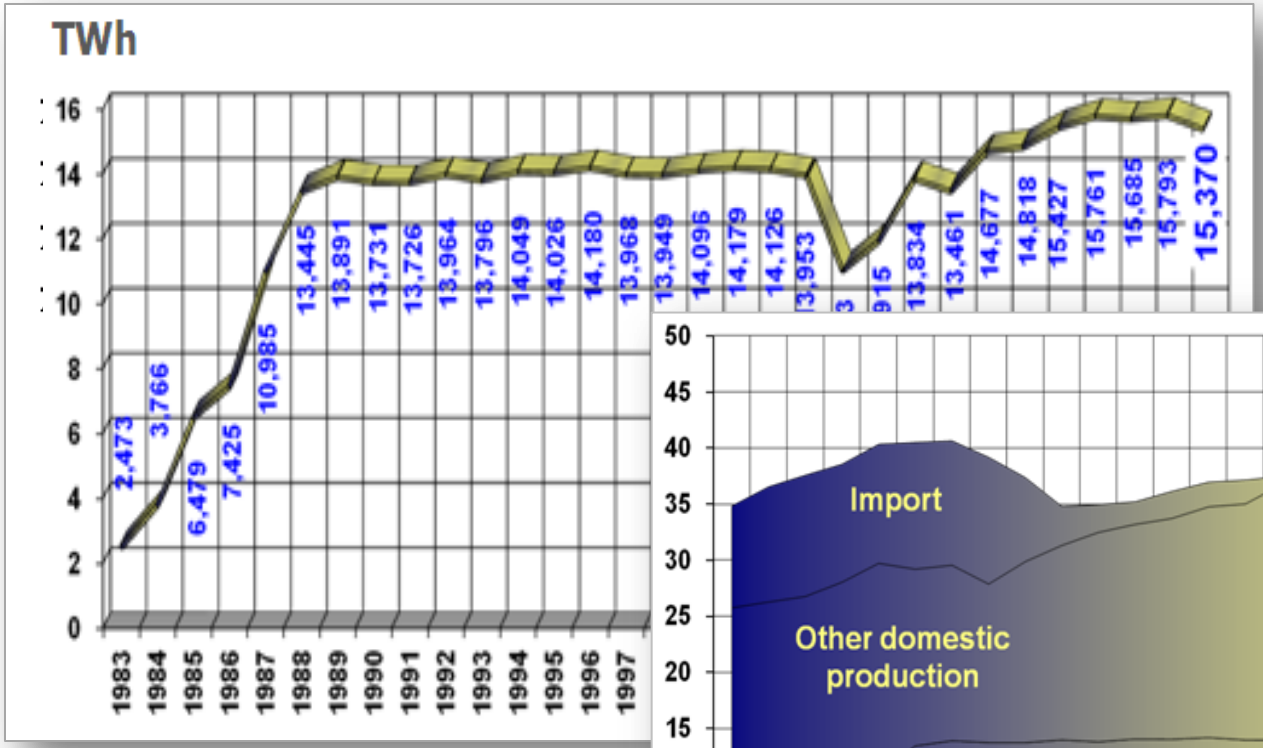
Inside views

- Reactor hall



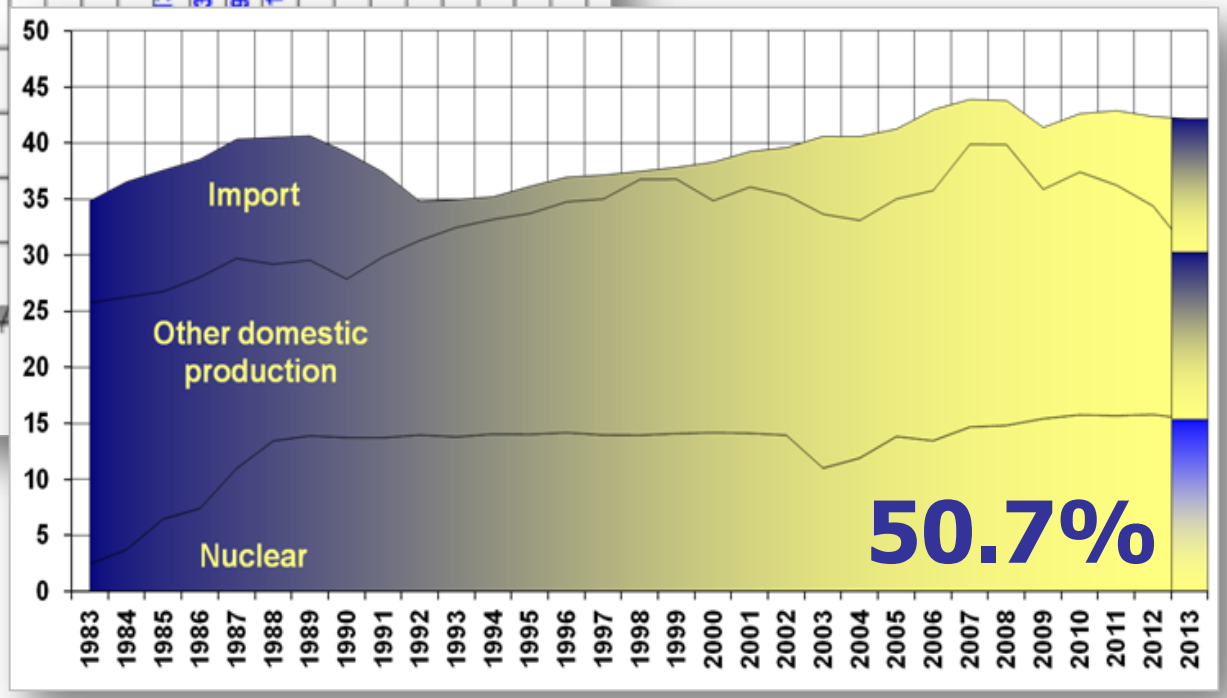
- Turbine hall

NPP performance



Production

until Feb 2014:
400 TWh



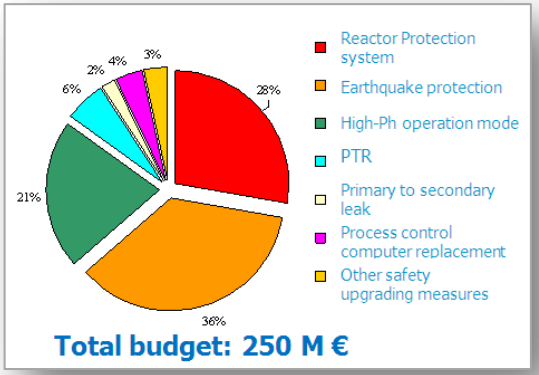
Nuclear share

Plant load factor for 2013: 87.7%

Plant cumulative load factor: 85.3%

Management of safety

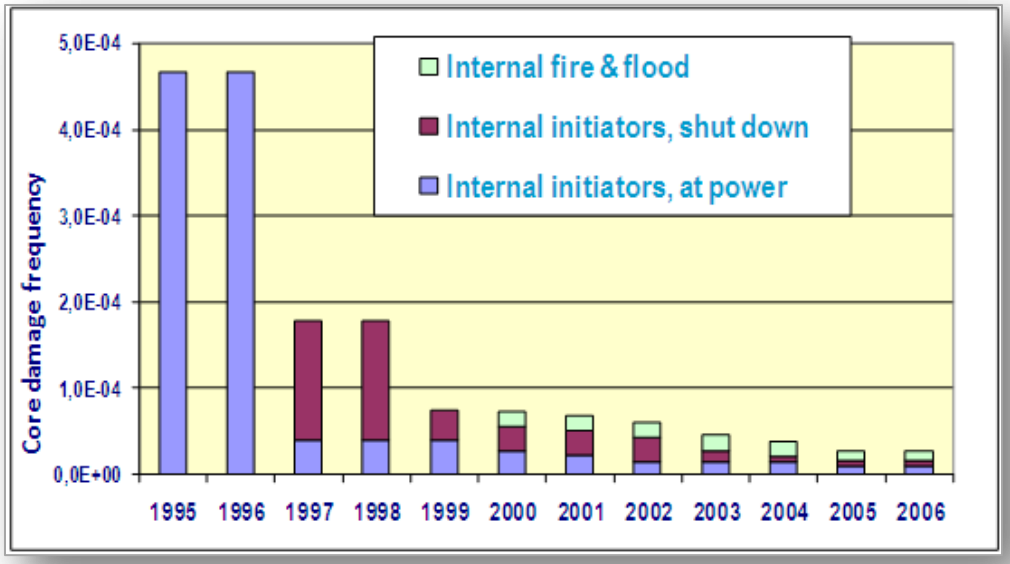
- **1991-1994 The AGNES project**
  - safety reassessment of the plant
- **1995-1999 1st Periodic Safety Review**
- **1996-2002 Safety improvements**
  - improvement of incident and accident management
  - increasing safety system reliability
  - decreasing load on equipment
  - support of operations staff
  - containment re-assessment
  - improved earthquake resistance
  - enhanced fire safety



- **1998-2004 Revisions of FSAR**
- **2004- Annual update of FSAR**
- **2011-2012 Post-Fukushima stress test**

Management of safety

- **Achievments in safety**



– International professional reputation is positive (IAEA, WANO; EU-WENRA):

„A comprehensive safety upgrading program has been accomplished on all four units at Paks thus improving them to a safety level that compares with western reactor designs of similar age.”

Nuclear capacity increase

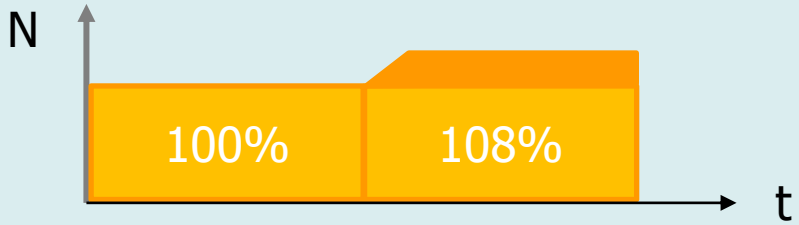
- **Power uprate** (past)
  - the four Paks NPP units now on 108%
  - 440 -> 460 -> 500 MW

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

- **Cycle length expansion** (near future)
  - shift from 12 to 15 month fuel cycle
  - rare shutdown, more production

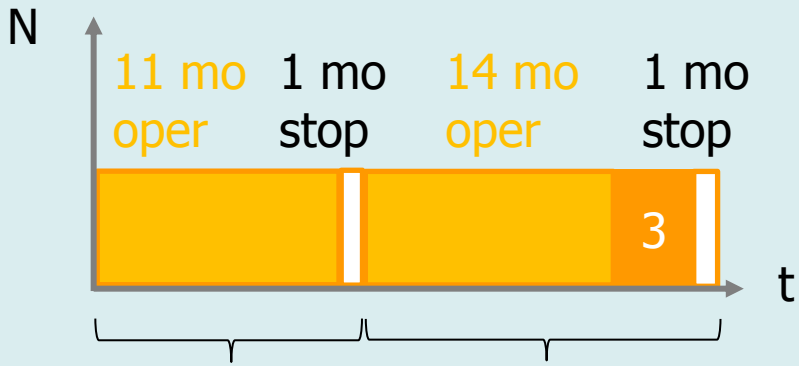
- **New nuclear build** (future)
  - political support exists
  - preparation started

Capacity increase graphically

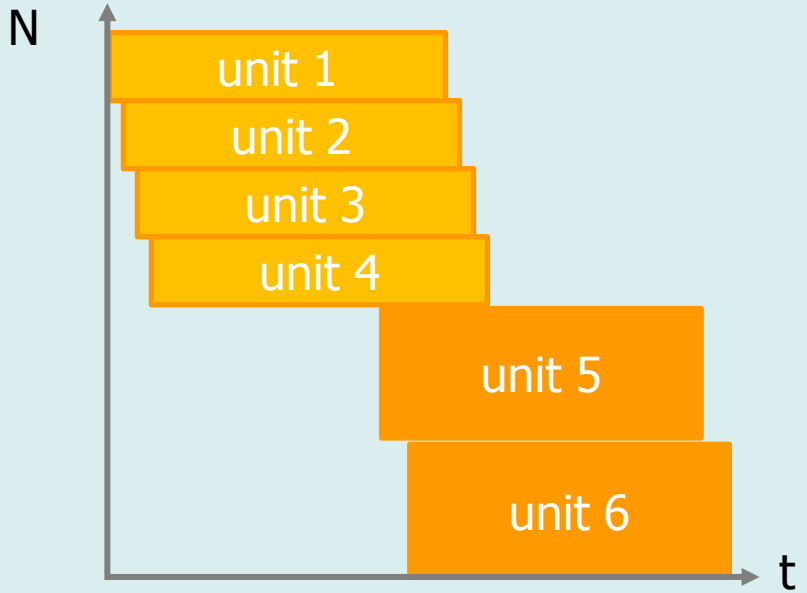


power uprate

lifetime extension



cycle length expansion

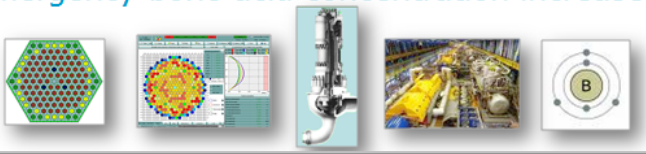


new build

Power uprate

- **Feasibility Study** — 108%
  - 8% increase is feasible, safe — 500MW
- **Concept**
  - principles: untouched safety, life length, failure rate and maintenance costs, economic return during remainder of the original life
- **Safety analyzes**
  - all repeat for 108+4% power level
- **Licensing**
  - there wasn't such a complex authorization yet!
  - multi-stage process
    - = permits - common principal ~, units specific ~, authorities' (environmental, water etc.) specialized ~ , fuel use ~, modification ~, operation ~

- **Technical items, modifications**
  - the introduction of new fuel assemblies
  - primary pressure regulator replacement
  - core monitoring system refurbishment
  - new reactor protection system set points
  - changes in passive emergency core cooling, accumulator parameters
  - main circulating pump impeller modification (unit 2)
  - turbine conversion
  - emergency boric acid concentration increase



- **Economics**
  - 120 MW new capacity for 4.8 billion HUF
  - investment is profitable after 3.5
  - 0.50 HUF/kWh cost reductions

types of plants	mil HUF/MW	bil HUF/120 MW
biomass	400	48
lignite	350	42
gas turbines	125	15
nuclear with power uprate	40	5

since 2006 an additional unit at every year

winner of **National Innovation Grand Prix**

AEKI, VEIKI, Erőterv — Hidropress, Kurchatov I., TVEL — Turboatom

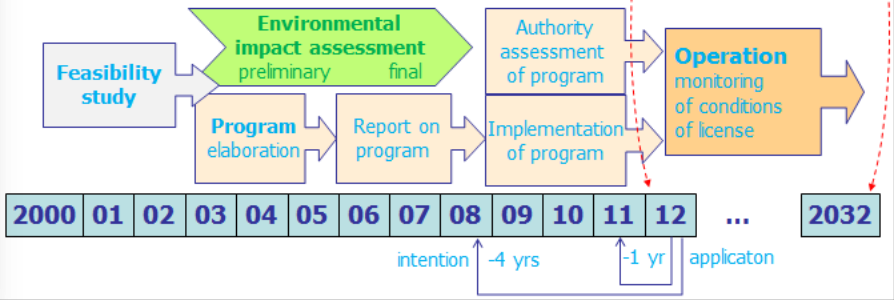
Lifetime extension

- **Feasibility study**
  - Viable, good investment
- **Expression of strategic goal**
  - 30+20 yeas
- **Need for regulatory permit**
- **Parliamentary approval**
  - 2005: accepted with 96.6% of votes
- **Environmental licensing**
  - Environmental impact assessment
  - Public hearings
  - License issued
  - Green legal campaigns, their failure

- **Dates**

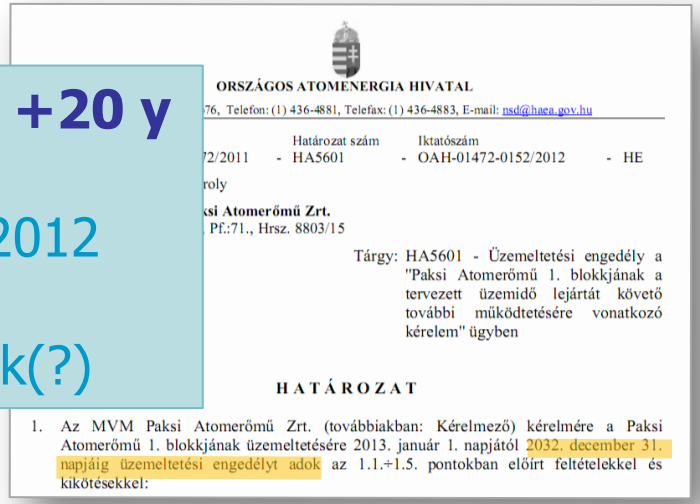
Unit	Started	30 yrs	50 yrs
1.	1982	**2012**	**2032**
2.	1984	2014	2034
3.	1986	2016	2036
4.	1987	2017	2037

- **Main preparatory steps, schedule**



- **Engineering tasks**
  - Range (status, equipment aging, qualification)
  - Prerequisite (modern IT system)
  - LTO program (task list, submission)
  - Regulatory assessment, task-setting
  - Implementation Program
- **Economics**
  - Fully financed by the NPP
  - Ernst & Young, KPMG: very profitable project
    = costs: 1/3 of CCGT investment, 1/2 of CCGT O/M
  - return on capital
  - dividends even to 4.4x if investment

Permit +20 y
Unit 1
17 Dec 2012
Unit 2
this week(?)



ORSZÁGOS ATOMENERGIA HIVATAL

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Határozat szám - Iktatószám

72/2011 - HA5601 - OAH-01472-0152/2012 - HE

roly

si Atomerőmű Zrt.
Pf.:71., Hrsz. 8803/15

Tárgy: HA5601 - Üzemeltetési engedély a "Paksi Atomerőmű 1. blokkjának a tervezett üzemidő lejártát követő további működtetésére vonatkozó kérelem" ügyben

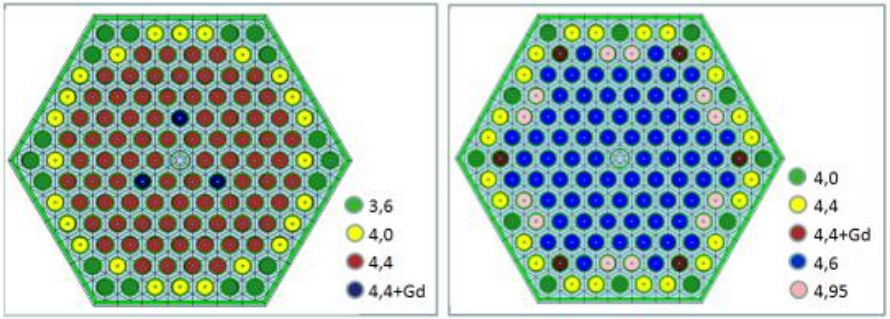
HATÁROZAT

1. Az MVM Paksi Atomerőmű Zrt. (továbbiakban: Kérelmező) kérelmére a Paksi Atomerőmű 1. blokkjának üzemeltetésére 2013. január 1. napjától 2032. december 31. napjáig üzemeltetési engedélyt adok az 1.1.÷1.5. pontokban előírt feltételekkel és kikötésekkel:

The C15 project

- **VVER fuel cycles** (operation and shutdown)
  - now: 12 mo
  - later: 15 mo

- **Need for fuel with higher enrichment**



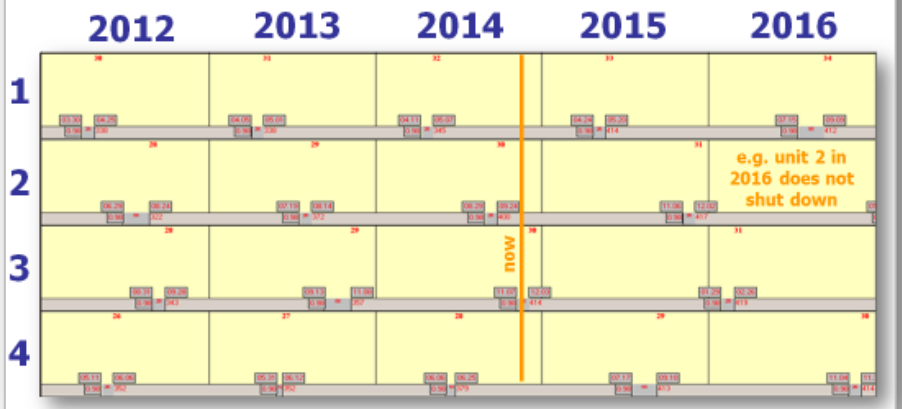
now 4.2% average

instead 4.7%

- **For 5 years**
  - 4 shutdowns instead 5
  - +25 days/year operation
  - -20% maintenance cost

- check the maintenance cycles,
- renew the safety assessment

Σ ~200 tasks



Present activities

- Submission of license application to regulatory body
- Load of 12 test fuel assembly delivered by air

New build

Early competitors

- **Confidential political preparation**
- **Decision on the rejection of the tender**
- **Information to EURATOM**
- **14 Jan: Intergovernmental agreement**
  - Rosatom supplies two >1000 MW units,
  - Russian loan for 80% of cost, 3,9-4,9% interest rate

- **Parliamentary approval**

Recent events

Parliamentary support for nuclear

2010	Party	2014
68%	**Fidesz – Hungarian Civic Union** **KDNP – Christian Democratic People's Party** Fidesz Magyar Polgári Szövetség, Kereszténydemokrata Néppárt conservative and centre-right parties	67%
15%	**MSzP – Hungarian Socialist Party** Magyar Szocialista Párt social democratic left wing party	**MSzP** **Együtt - PM** **Democratic Coalition** **Hungarian Liberals** election coalition	18%
12%	**Jobbik – The Movement for a Better Hungary** Jobbik Magyarországért Mozgalom populist and extremist right wing party		12%
4%	**LMP – Politics Can Be Different** Lehet Más a Politika! green liberal party for sustainable development and environmental protection		3%

pronuclear antinuclear

Top10 antinuclear NGOs

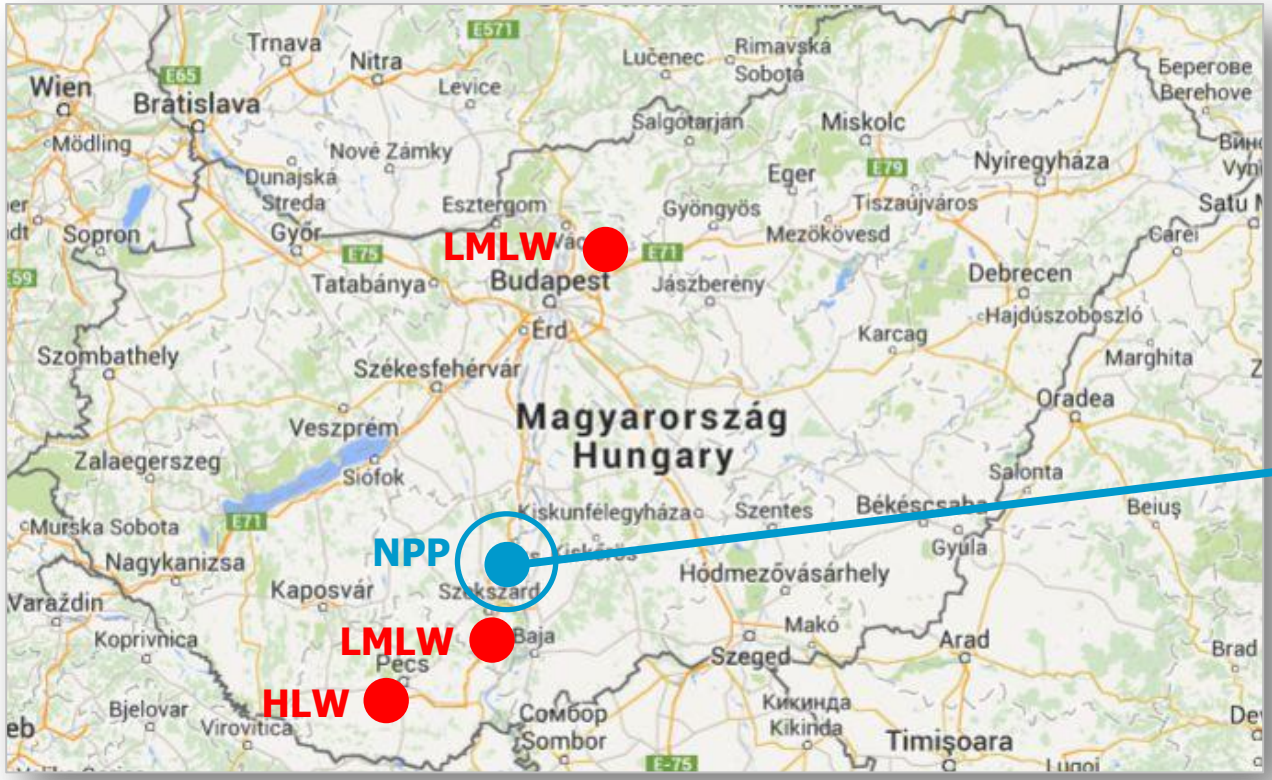
Organization	Profile, activity, important facts	Staff support	Anti nuke
Air Task Force Levegő Munkacsoport	– climate protection programs – information, approach framing – against the new nuclear build	18 Demján Soros	+++
Living Chain for Hungary Élőlánc Magyarországért	– eco-party with active leadership of known environmentalists – planned and gradual replacement of fossil and nuclear energy	?	+++
Antinuclear Task Force Antinukleáris Munkacsoport	– founders: Energy Club, E-mission, Conservationists – nuclear power has many alternatives – reject this particularly dangerous energy	?	+++
ATTAC Hungary	– anti-globalization movement – protested against the plant lifetime extension	50	++

Organization	Profile, activity, important facts	Staff support	Anti nuke
Protect the Future	– eco-politics, eco-philosophy	32 700	+++
		23	++
		90 sub-groups	+++

Organization	Profile, activity, important facts	Staff support	Anti nuke
Energy Club Environmental	– new sights / attitude to energy for policy makers, producers	21	+++
		?	+
		10	+++

our task is to monitor their activity

Munincipal associations



Paks vicinity

other nuclear facilities,
with similar associations

T E I T

Social Control, Information & Development Association

- since 1992
- 12 km radius circle
- 13 joined munincipalities
- 60.000 people

Bridge between people & NPP

- **The association is a legal person**
  - written agreement between two parties
- **Goals and tasks**
  - maintain confidence on safety,
  - transparecy, civil control of NPP
    - = control committee,
    - = independent environmental monitoring system (γ dose rate stations, water chemistry lab),
    - = measurement comparisons (NPP - authority - TEIT),
    - = background radiation display system at 3 places
  - dialogue with local public (site visits, open days)
  - chanelling of financial assistance to members
    - = significant impact on the budget of the municipalities

member of

GMF
GROUP OF EUROPEAN MUNICIPALITIES WITH NUCLEAR FACILITIES

See Annex: Symbiose (in Hu, computer translation in En, Vn)

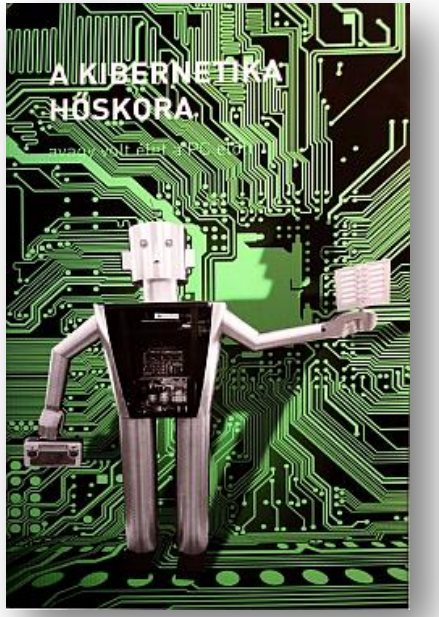
Communication tools

- **Energy of future**
  - moving exhibition
    = mounted on truck trailer,
    = visits towns/villages, youth festivals, other mass events

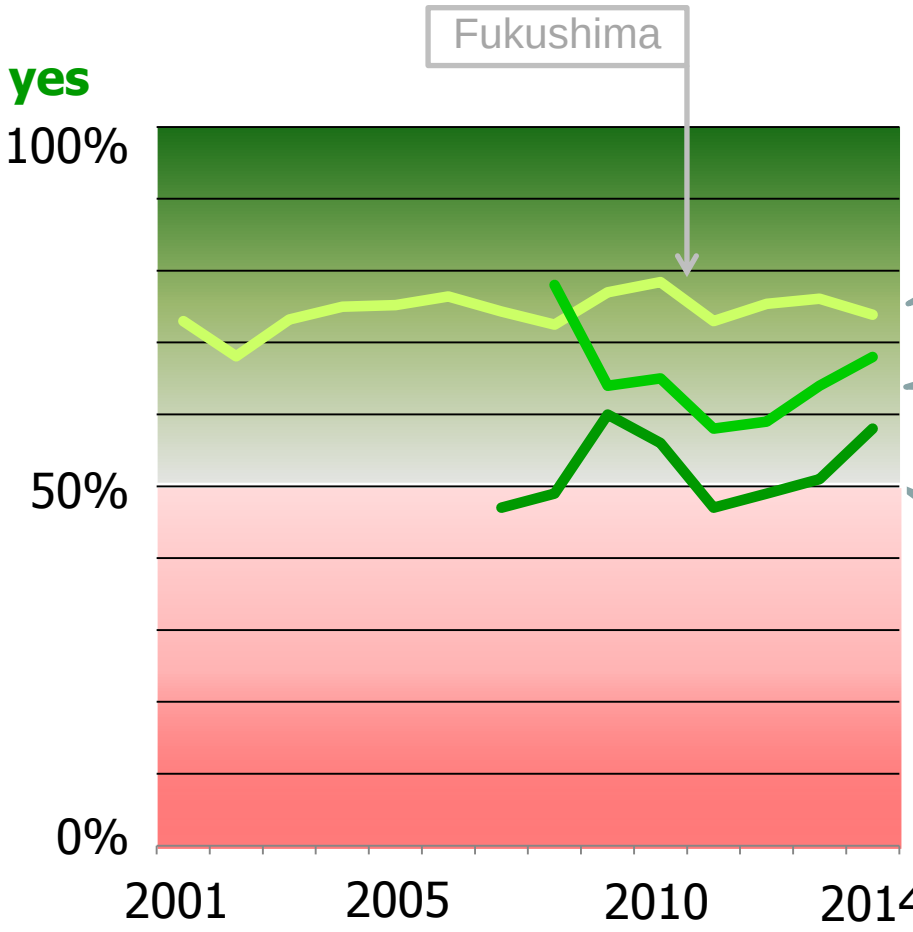
  - some figures
    = 2009-2013,
    = 766 days of opening,
    = 389 settlements,
    = 181 659 visitors.

Communication tools

- **Atomic Energy Museum**
  - opened 2 years ago,
  - in 2000 m^2 warehouse
  - collection
    - = NPP history
    - = instruments, large equipment,
    - = 6 other institutional relics
    - = personal memories
  - services
    - = library, data storage, video/photo archive
    - = temporary exhibitions: **Life before the PC**
    - = museum pedagogy
      (field physics classes, camps).



Opinion polls



Do you agree with...

... the operation of Paks NPP?

... the lifetime extension of units?

... the new nuclear build at Paks site?

Representative sample of 1,000 people, (age, education, place of residence). The questions abbreviated here, slightly changed over the years.

TNS Hoffmann Public perception: energy sources & Paks NPP. 2014

It wasn't a simple internet poll. Used scientific methodology, significant statistic.

Arousing interest of students

- **The nuclear energy is**
  - part of the high-tech
- **New units will be built**
- **Need for HR with knowledge**
  - for design and construction (5-6 years)
  - for startup and operation (60+? years)
  - for decommissioning (~ decades)
- **Long-term, stable job - at the home country**
- **High income, moral ranking**
- **Attractive career goal for students**

Please, transmit this message to others!

Thank you for attention!