Safety culture in the Paks II. Project

Paks II. Ltd.

PAKS II. ZRT.

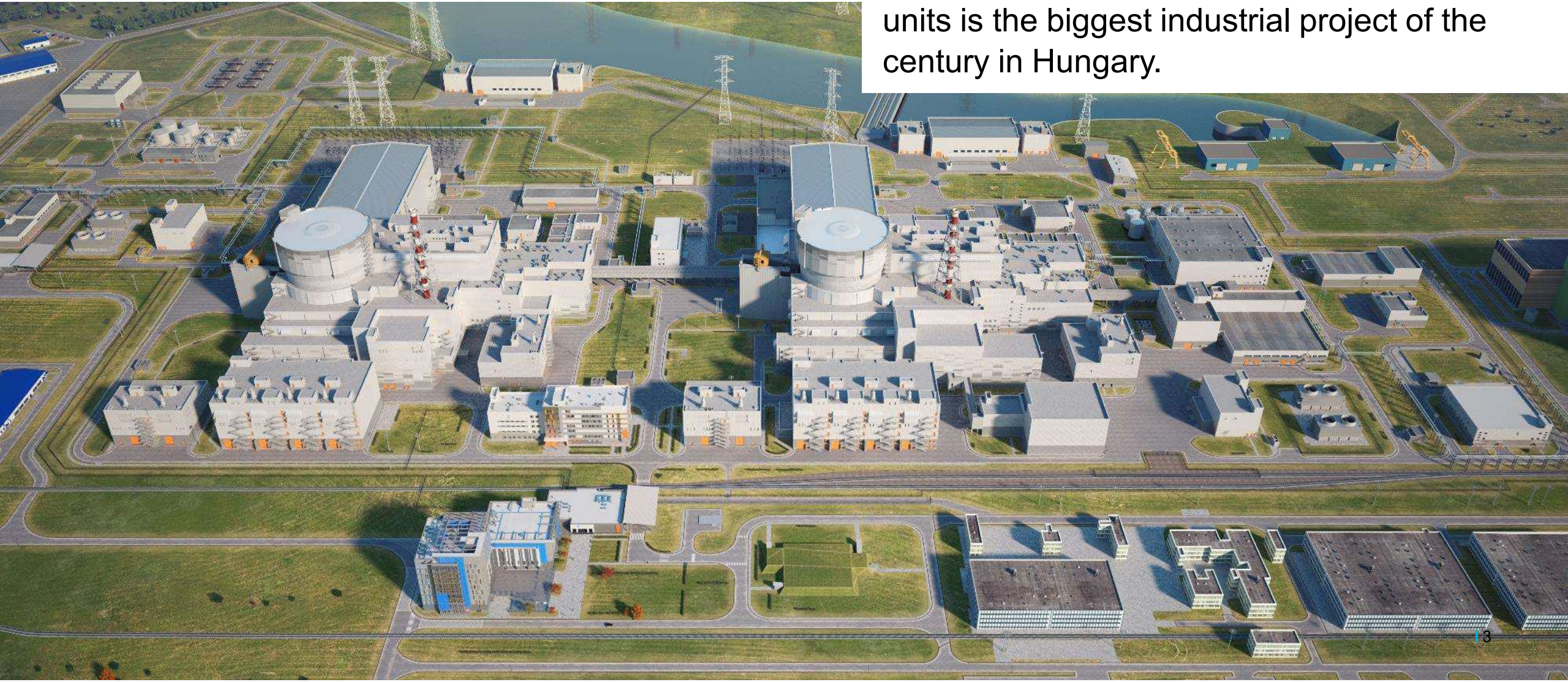
2026.

What are we building in Paks?

Presentation of the Paks II. Nuclear Power Plant Project

Mission of Paks II. Ltd.

The construction of new nuclear power plant units is the biggest industrial project of the century in Hungary.



Mission of Paks II. Ltd.

► The task of Paks II. Ltd. is to prepare the construction of the two new nuclear power plant units at the Paks site, obtain the necessary licenses, implement the project, and subsequently operate the new units.

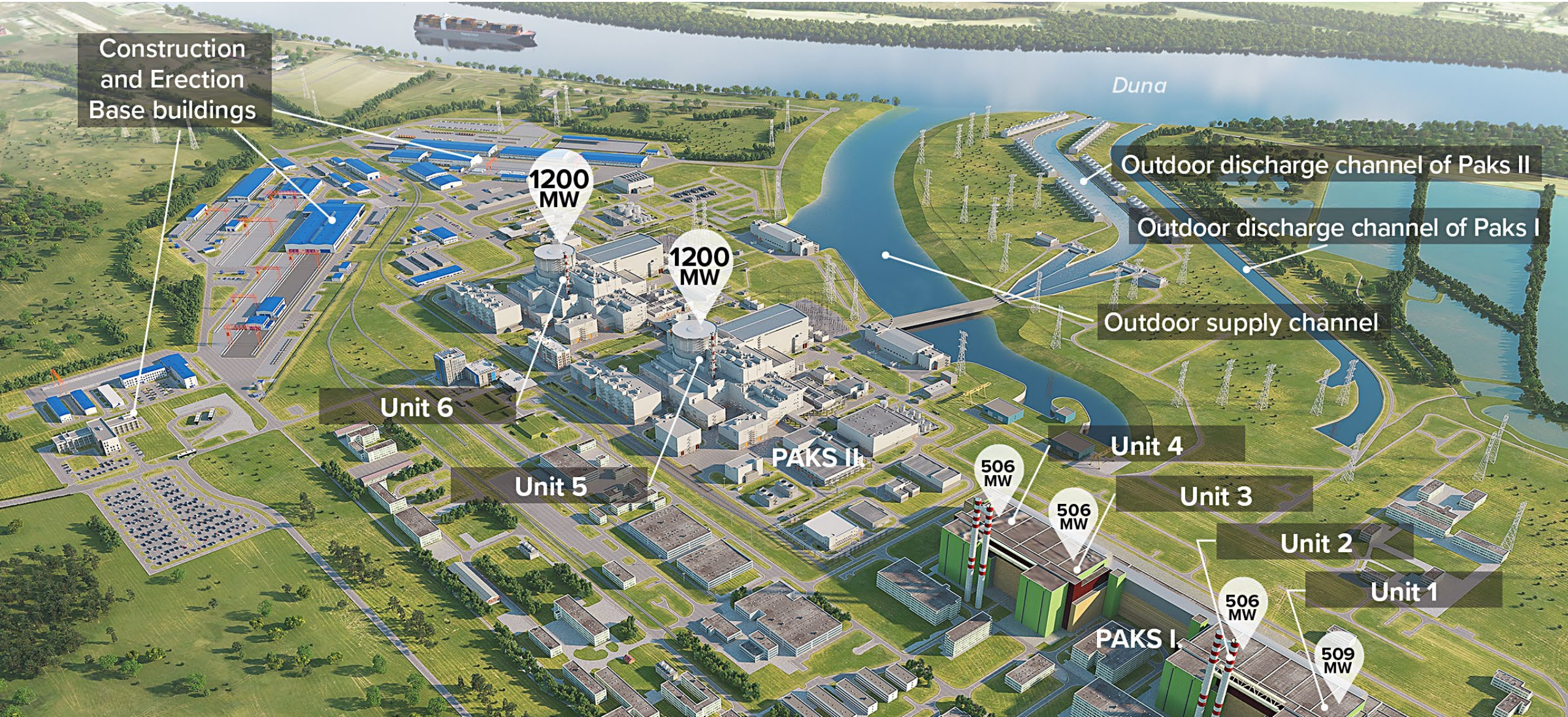
► Paks II. Project:

- makes a significant contribution to the economic growth and maintenance of secure, affordable, and climate-friendly electricity supply in Hungary.

- is considered a major international project: the production of the first turbine elements for Unit 5 is in progress in France, while in Russia, in Saint Petersburg - at one of Europe's largest automated forging plants - the reactor vessels for Units 5 and 6 are being manufactured.

- is the largest and most advanced nuclear project in the European Union. The VVER-1200 reactor type planned to be constructed in Paks meets both European and international nuclear safety requirements.

The site


Construction and Erection Base buildings
Duna
Outdoor discharge channel of Paks II
Outdoor discharge channel of Paks I
Outdoor supply channel
1200 MW
1200 MW
Unit 6
Unit 5
PAKS II
Unit 4
Unit 3
Unit 2
Unit 1
506 MW
506 MW
506 MW
509 MW
PAKS I

Why do we need the Paks II. Project?

- Nearly half of the electricity generated in Hungary **and approximately one third of the electricity consumed in this country is provided by the currently operating nuclear power plant**.
- **The new power units will enhance the energy supply security of Hungary**, as the necessary amount of electricity will be ensured from within the country's borders, thereby reducing the national dependence on imports.

Construction works

Cut-off-wall

- A 2.7-kilometre-long, 1-metre-wide, and on the average 32-metre-deep cut-off-wall has been built around the units.
- The purpose of the underground waterproof wall is to ensure that only the minimal amount of the groundwater can enter the excavation pit in a controlled manner and to prevent the decrease of the groundwater level beyond the cut-off-wall, which is particularly important due to the four operating units.
- Bauer Hungary operated three 99 t MC-76 type duty-cycle cranes on the construction site around the clock.

Soil improvement

- The soil improvement under the safety-related buildings and structures of Units 5 and 6 has been completed, and the work continues at the remaining buildings.
- It is necessary due to the fact that the site is located near the Danube next to the operating nuclear facility, and the buildings of the new units will have an extremely large weight.
- Soil improvement is required to enhance seismic resistance and to prevent soil liquefaction; at the same time, it also helps to avoid the subsidence and tilting of buildings.
- For the purpose of soil improvement, the internationally acknowledged, so-called deep soil mixing (DSM) technology is used.
- One million tons of cement will be used during the performance of these works.

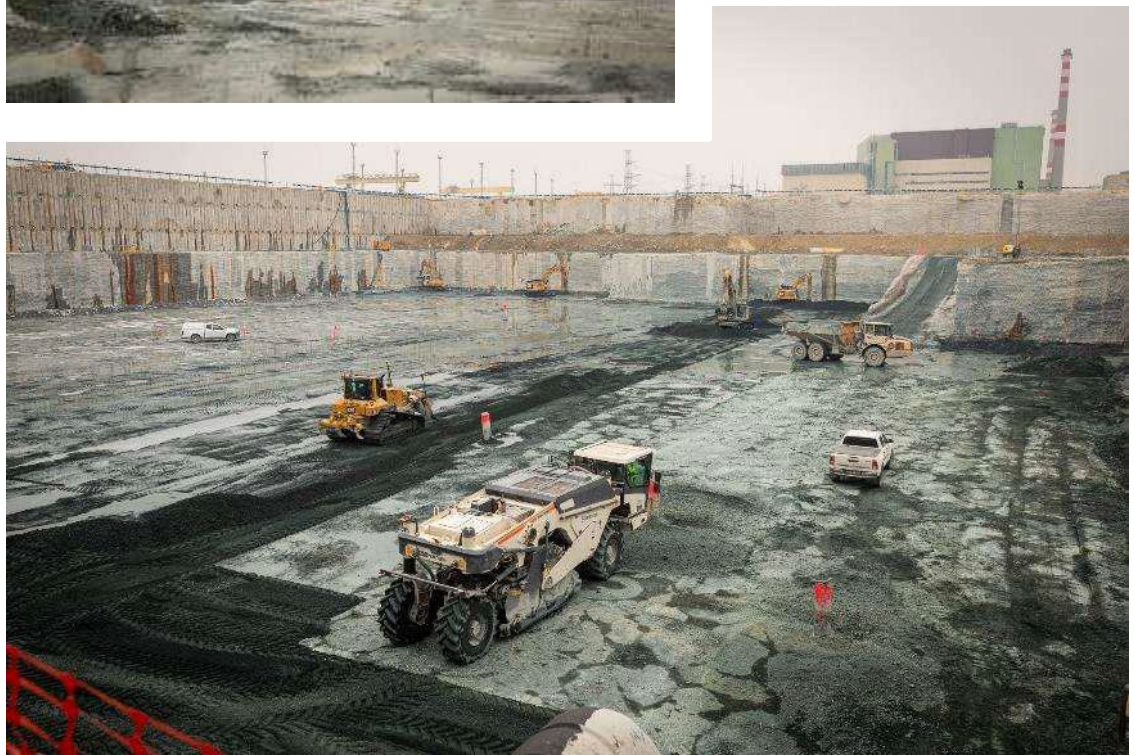
To improve the soil under the new nuclear power plant units, a total of **65,000** cement-stabilized soil columns will be constructed, of which approximately **43,000** have already been completed.

Construction and Erection Base / CEB

- 124 CEB facilities are required for the implementation of the project, grouped into 15 functional categories.
- The Hungarian Atomic Energy Authority has issued construction licenses for all 71 structures requiring such authorization.
- Size of the construction and erection base: 75 hectares

The Project in pictures

The Project in pictures // Soil removal – formation of the excavation pit

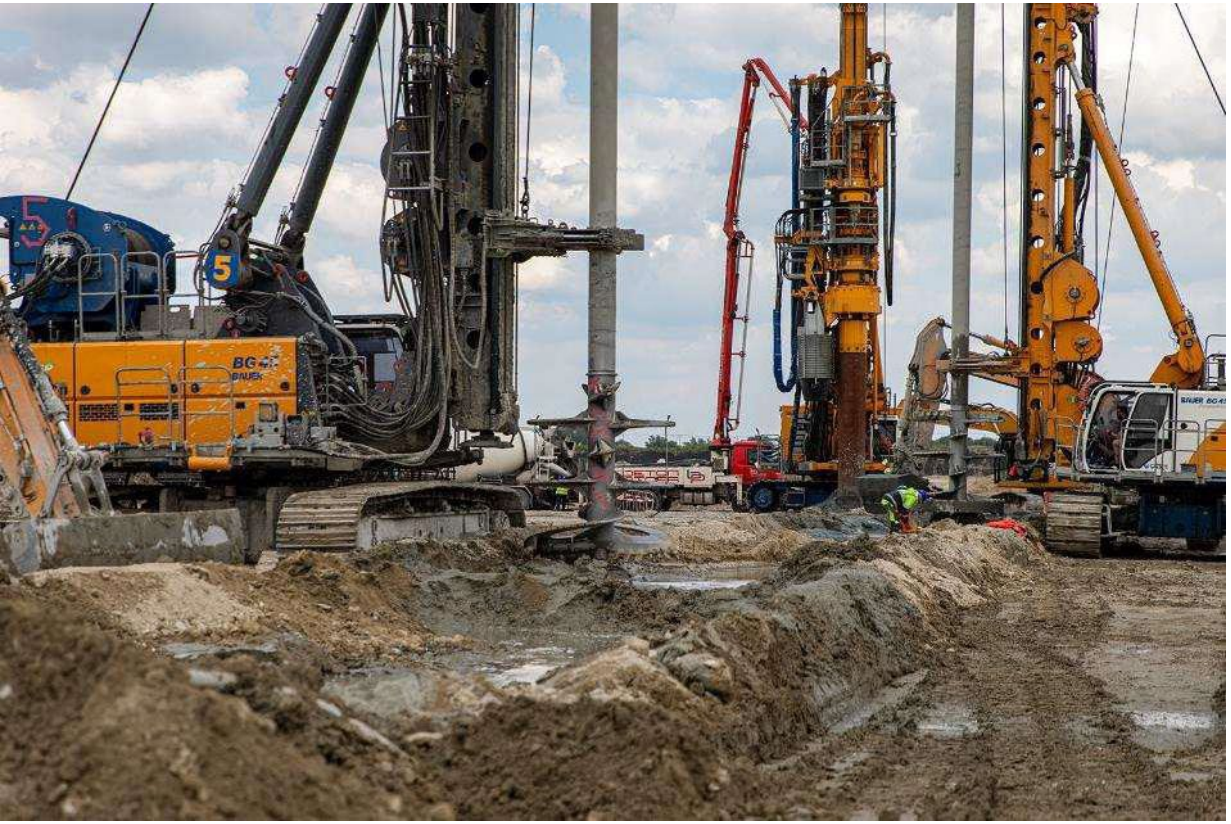


The Project in pictures // Cut-off-wall construction

The Project in pictures // Cut-off-wall construction

The Project in pictures // Soil removal

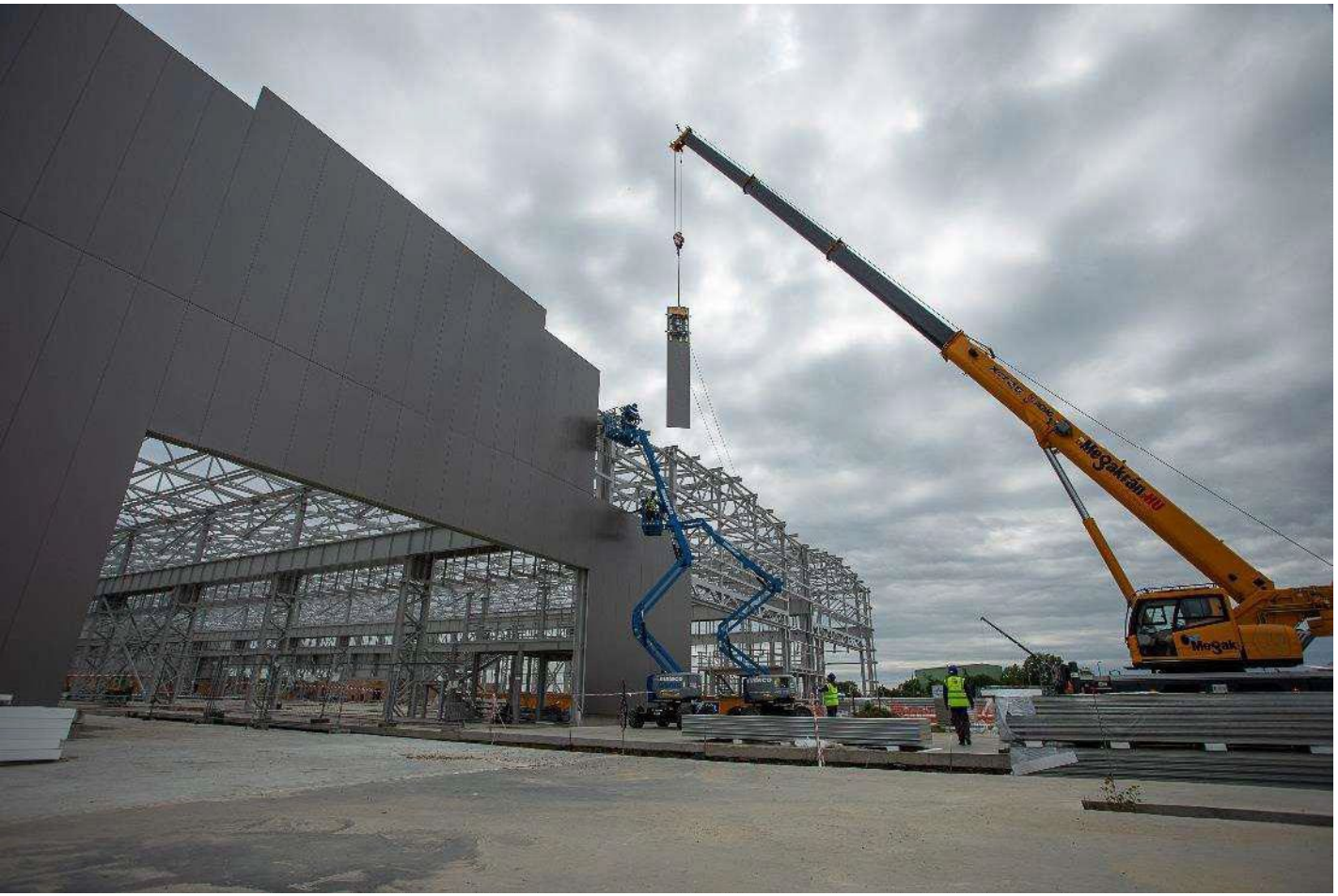
The Project in pictures // Soil improvement



The Project in pictures // Soil improvement

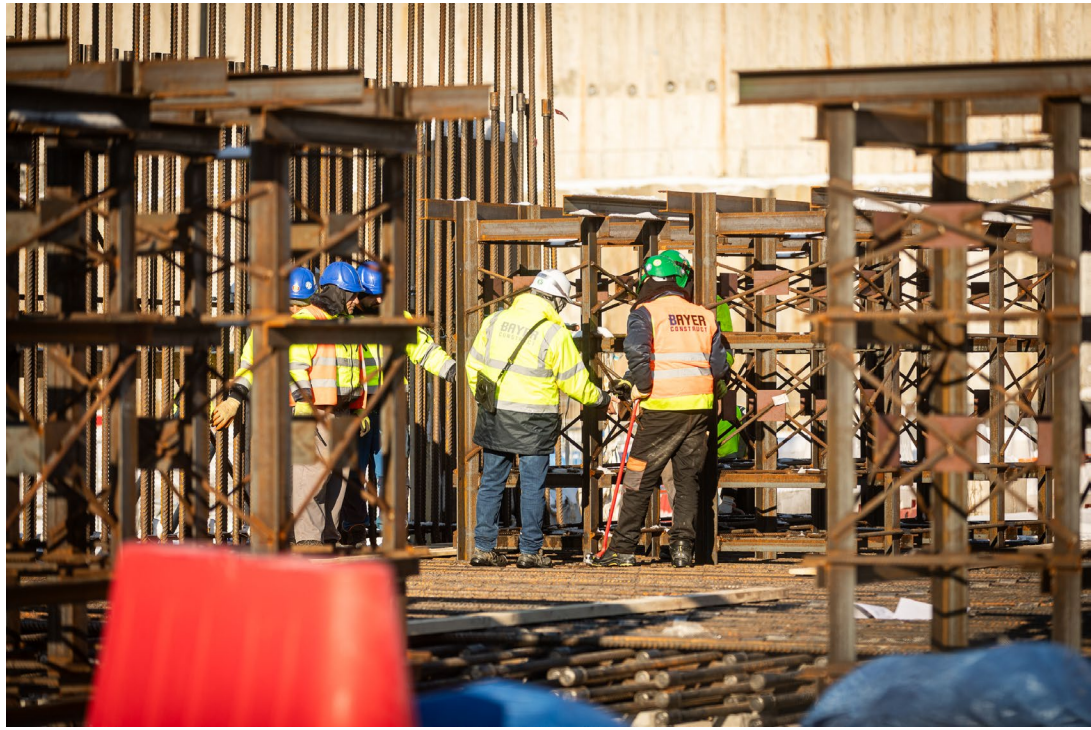
The Project in pictures // CEB facilities

The Project in pictures // CEB facilities



The Project in pictures // Preparation for the first concrete pouring

The project in pictures // Levelling concrete, reinforcement works



The project in pictures // The first concrete pouring

Safety culture in the Paks II. Project

Definition of safety culture

Safety culture is the shared attitude to safety embraced the management and the employees.

Nuclear safety

Why do we speak about **nuclear** safety culture during the construction phase of the nuclear power plant?

HAEA Decree No. 1/2022 (IV. 29.) on the nuclear safety requirements of nuclear facilities and on related regulatory activities

“Ensuring the compliance with nuclear safety requirements and provisions is mandatory for all those who carry out activities requiring a regulatory licence or notification acknowledgement under the Atomic Energy Act and this regulation, who participate in such activities, or who submit an application for a licence or file a notification for the performance of such activities." Section 1

“The licensee shall develop such a written safety policy in which guarantees that safety is paramount during all activities related to the nuclear facility. The safety policy shall specify easily observable and unambiguously worded safety objectives and tasks for their implementation, which shall be appropriate for the fulfilment of the safety policy and for the continuous monitoring of the safety performance.”

“All employees and suppliers working in positions important to safety shall be familiarized with the safety policy in such a manner that ensures its appropriate implementation during their activities.

“The licensee, taking into consideration both internal and external design, construction, commissioning operational experience and any new knowledge of nuclear safety relevance, shall continuously improve the level of nuclear safety, and shall include the commitment towards that in the safety policy.” Section 8

The licensee shall ensure regular, continuous collection, analysis and assessment of experience regarding construction, commissioning and operation of the nuclear facility, in order to maintain and improve the safety level of the nuclear facility, and to substantiate the decommissioning plan.” Section 15

Nuclear safety

Regulations applicable specifically to suppliers

HAEA Decree No. 1/2022 (IV. 29.) on the nuclear safety requirements of nuclear facilities and on related regulatory activities

2.2.2.0100.
The managements of the licensee organisation and the supplier organisations shall consistently and definitely expect and support the attitude required for a strong safety culture at all levels and shall ensure that the employees recognise and understand the key considerations of safety culture. Among other things, they shall implement this in such a way that they do not support excessive self-confidence and encourage an open reporting culture and a questioning attitude, which prevent activities and conditions unfavourable from a safety point of view. All individuals in the organization, starting from the senior management, shall contribute to fostering and sustaining a strong safety culture.

9.2.1.0710.
In agreement with Section 2.2.2 of Annex 2, the organisations involved in the design, construction and commissioning, including suppliers and concerned authorities, shall establish a work environment that facilitates a high-standard safety culture and encourages the employees to clarify their questions relating to their work in accordance with documented rules.

Principles of a safety culture

Recommendations of IAEA and WANO

In the case of nuclear facilities, the International Atomic Energy Agency (IAEA) and the World Association of Nuclear Operators (WANO) develop suggestions and recommendations based on international experience, with the shared objective of ensuring the long-term sustainability of nuclear power generation, whose cornerstone is the safe operation of nuclear facilities.

IAEA and **WANO** define safety culture in various documents

INSAG 3-4 Safety culture
INSAG -13 Management of operational safety in nuclear power plants
INSAG -15 Key practical issues in strengthening safety culture

WANO GL 2001-01 Guidelines for the organisation and administration of nuclear power plants
WANO GL 2002-02 Principles for excellence in human performance
WANO GL 2006-02 Principles for a strong safety culture
WANO GL 2013-1 Traits of a healthy nuclear safety culture

IAEA International Atomic Energy Agency
Atoms for Peace and Development

WANO

Fundamental principles of safety culture in the Paks II. Project

Nuclear safety is an overriding priority in all project-related activities and decisions.

Commitment

- Safety first.
- Take responsibility.
- Set a good example.

Consciousness

- Be aware of what you do and of why you do it.

Transparency

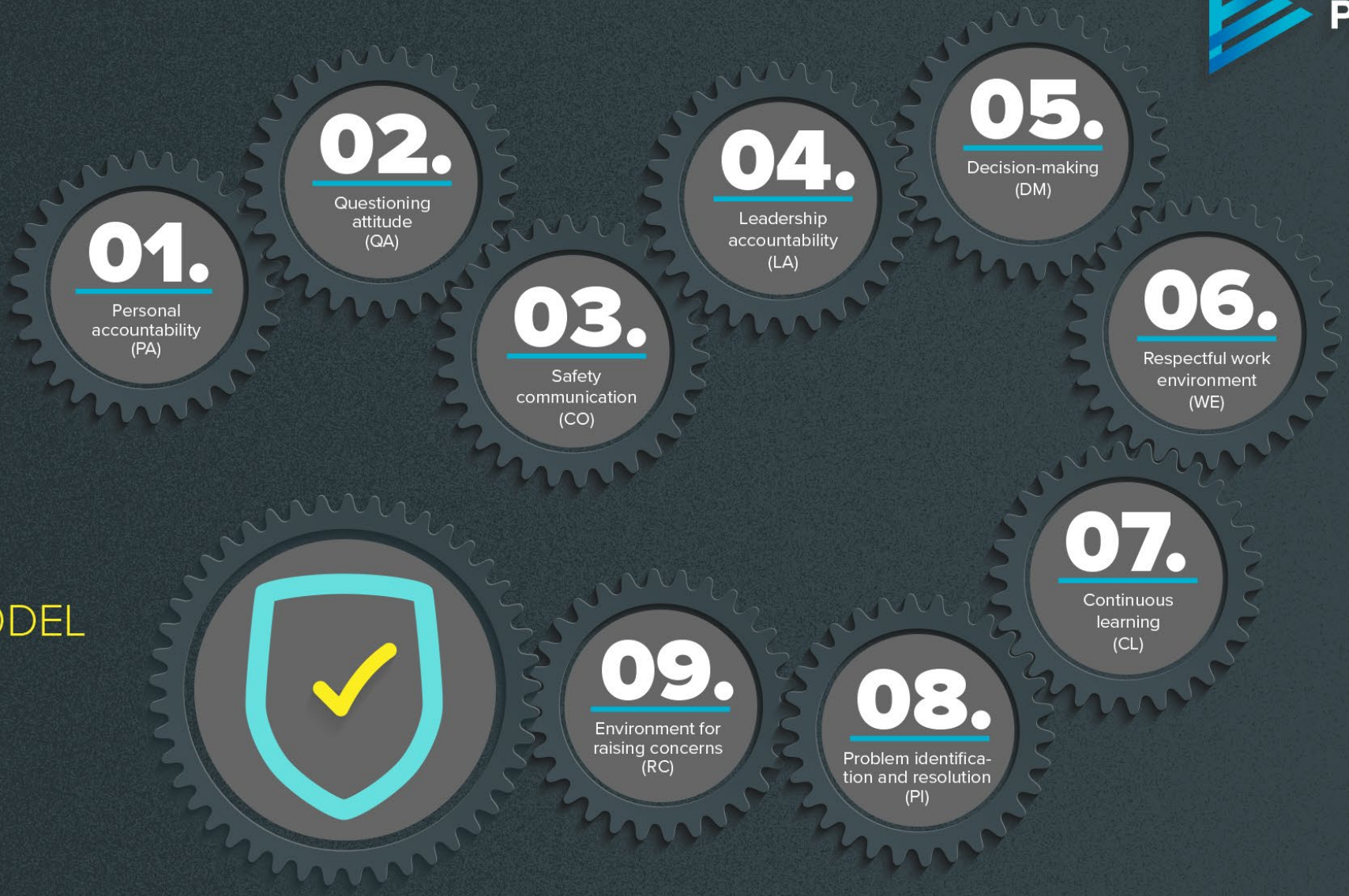
- Communicate and cooperate.

Continuous development

- Take initiative
- Strive to learn.

STRONG SAFETY CULTURE

SAFETY CULTURE MODEL OF PAKS II LTD.



Connection between safety culture and suppliers

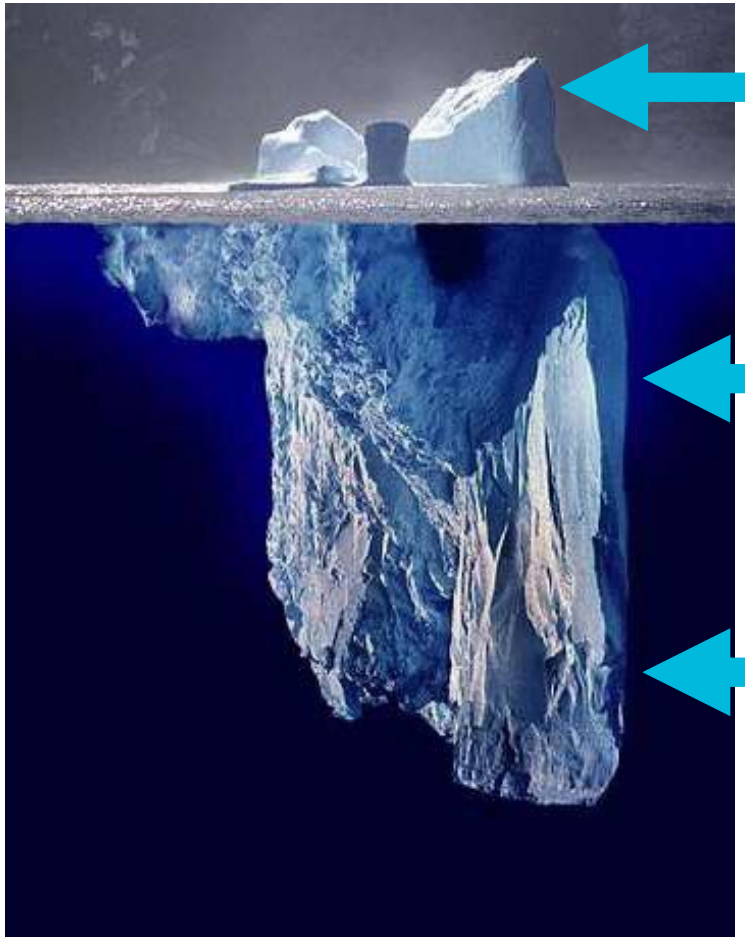
CONNECTION BETWEEN SAFETY CULTURE AND SUPPLIERS

TRAITS OF A STRONG SAFETY CULTURE

Guideline AKFN2.18, Assessment of Safety Culture and Utilization of the Results in Nuclear Facilities, HAEA, 2022.

Connection between safety culture and suppliers

Nuclear safety culture is the set of values and behaviours that, as a result of the commitment of the organisation's and the suppliers' leaders and employees, ensures that safety is given priority over all other competing goals in order to protect people and the environment.



Visible manifestations

- safety performance and indicators
- processes
- individual and leadership attitude

Supported values

- strategies
- objectives
- behavioural standards

Core values

- beliefs
- attitudes
- perceptions

As a part of organisational culture, safety culture fundamentally depends on the commitment and attitudes of the leaders and employees within the organisation.

/Approach to the Safety Culture in Everyday Life of a Nuclear Power Station, 2016/

Connection between safety culture and suppliers - STOP technique

S — Step back
Collect yourself from the moment, distancing yourself

T — Think
Identify a space where you can think clearly and independently

Gain clarity:
- What am I trying to accomplish?
- What is the priority?
- What do I need?
- How and what am I feeling?
- What could be the consequences?

O — Organise your Thoughts
Order your thoughts, priorities and actions for a "conscious decision"

P — Proceed
Now that your next steps are clear, focus on one thing and take a small step at a time

What should we do in an unexpected situation during work?

- Step back
- Think
- Organise your thoughts
- Proceed

Connection between safety culture and suppliers

- It is essential to have up-to-date knowledge of works being carried out on the construction site.
- In all situations, we shall keep safety culture in mind: housekeeping, compliance with requirements, performance of work only upon approval etc.
- When anomalies and problems arise, immediate intervention is required. This requires **clear, unambiguous rules and responsibilities, as well as competent personnel** (including the determination of who may propose or carry out certain types of interventions, and for example, the conditions under which the work shall be stopped).
- Safety culture provides a **structured** framework for analysing the performance on the construction site. This also requires **competent professionals**.
- Issues and **employees' feedback** related to safety culture should be addressed at the organisational level.

Connection between safety culture and suppliers - practical implementation

▸It is important to ensure the compliance with the requirements established by the Hungarian Atomic Energy Authority and Paks II Ltd.

- Safety is paramount and during the decision-making shall have priority over schedules or costs.
- Training of employees and pre-job briefings shall be given priority for the on-site work performance.
- Risk analysis and precaution, as well as strict compliance with physical protection rules play a key role.
- Possibility of control shall be ensured for the HAEA and Paks II Ltd. *(audits, ad-hoc inspections).*
- All reports shall be examined with due care, and the reporting employee shall not be subject to any form of retaliation.
- **Keep your eyes open:** if you notice any kind of problem, report it to your supervisor! It is important to comply with safety requirements already during the construction phase!
- **STOP** technique in use.

Connection between safety culture and suppliers – Entry to the construction site

Conditions for receiving an independent entry permit:

- eligibility (an employee shall have a valid contract for the performance of works on site).
- submission of the entry permit application based on the relevant contract number.
- valid public security clearance.
- documentation completion of occupational health-, safety- and fire protection training (to be verified by the contractor when assessing the entry permit application).

A person holding an independent entry permit may enter and remain on the site and carry out work without supervision, once the permit has been verified.

Construction experiences from other projects

Hinkley Point C – project owner's experiences

During this UK investment project, the following challenges related to safety culture were identified:

Achieving a balance between the schedule and safety

Reducing typical "builder-type" thinking in order to improve safety consciousness

Complex contractual framework

A wide range of subcultures and stakeholders complicates the harmonisation of cultural expectations

Commitment of senior and on-site management

Nuclear safety culture shall be a priority already now, not only in the future

Large headcount and personnel turnover

The high turnover rate of personnel makes maintaining continuity challenging

Over 9,000 workers representing 50 nations are present on site every day!

Barakah Nuclear Power Plant – project owner's experiences

INCORRECT SUSPENSION OF THE STEAM GENERATOR FOR LIFTING / 1.

- Wooden pads were placed between one of the lifting slings and the steam generator to compensate for the excessive length of the sling.

Barakah Nuclear Power Plant – Project owner's experiences

Incorrect suspension of the steam generator for lifting / 2.

- Three companies were involved in the lifting operation: the Contractor, the crane operator and the company performing rigging.
- On that day, the 781-tonne steam generator was suspended with four lifting slings to install it into the containment.
- One of the slings turned out to be longer than the others, which had not been detected during the sling inspection carried out the previous day. A new sling was ordered; however, it would not have arrived in time for the planned lifting operation.
- Then 12 wooden pads were placed between the longer sling and the steam generator. The rigger and the Contractor's representative considered the non-standard solution adequate, and the safety inspector of the lifting company authorized the lifting operation.
- At the tension of 300 tonnes, the wooden pads were examined, followed by instructions to carry out the lifting with 500 tonnes. The crane operator refused to carry out this instruction, and the supervisors he called to the site suspended the lifting.
- The next day, the sling of the correct length arrived, and the lifting operation was completed.

Barakah Nuclear Power Plant – Project owner's experiences

Incorrect suspension of the steam generator for lifting / 3.

Root cause

►The incoming inspection of the lifting slings did not reveal the difference in length.

► The difference in length of one of the lifting slings was identified; however, an inappropriate solution was selected in terms of the lifting equipment.

► The applicable procedure was not adhered to.

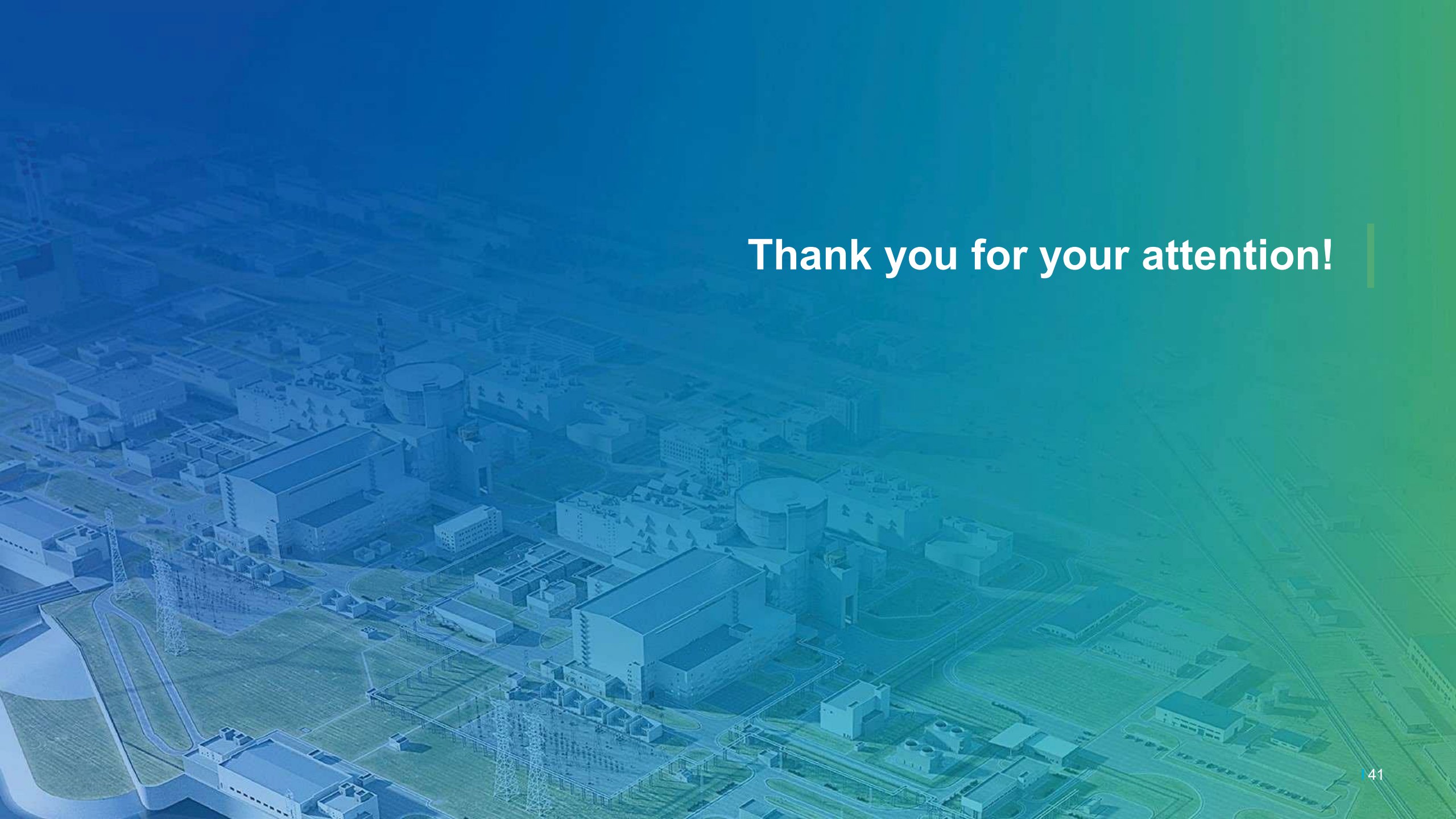
Contributory cause

► No pre-job briefing was conducted prior to the beginning of lifting works.

► The documentation work package did not have an adequate level of detail.

► There was no proper communication protocol established between the companies involved in the lifting operation.

► The personnel involved were reluctant to raise objections against improper work performance.



Thank you for your attention!