



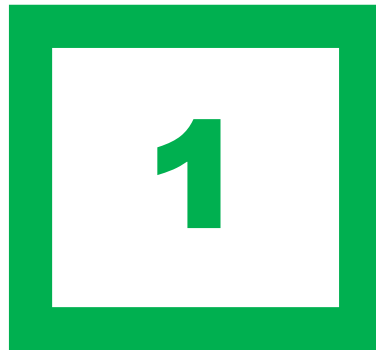
KHNP Solution with APR1400 for Poland

16 May, 2023

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KHNP Overview

KHNP Overview

28%

Produces 1/3 of
Domestic Demand

Top 3

Nuclear Utility in the World

KHNP

The Largest
Power Generator
in Korea

30,030 MW

34 NPPs Construction Experience

24 NPPs in Operation in Korea

4 NPPs under Construction

- 3 in Korea and 1 in UAE

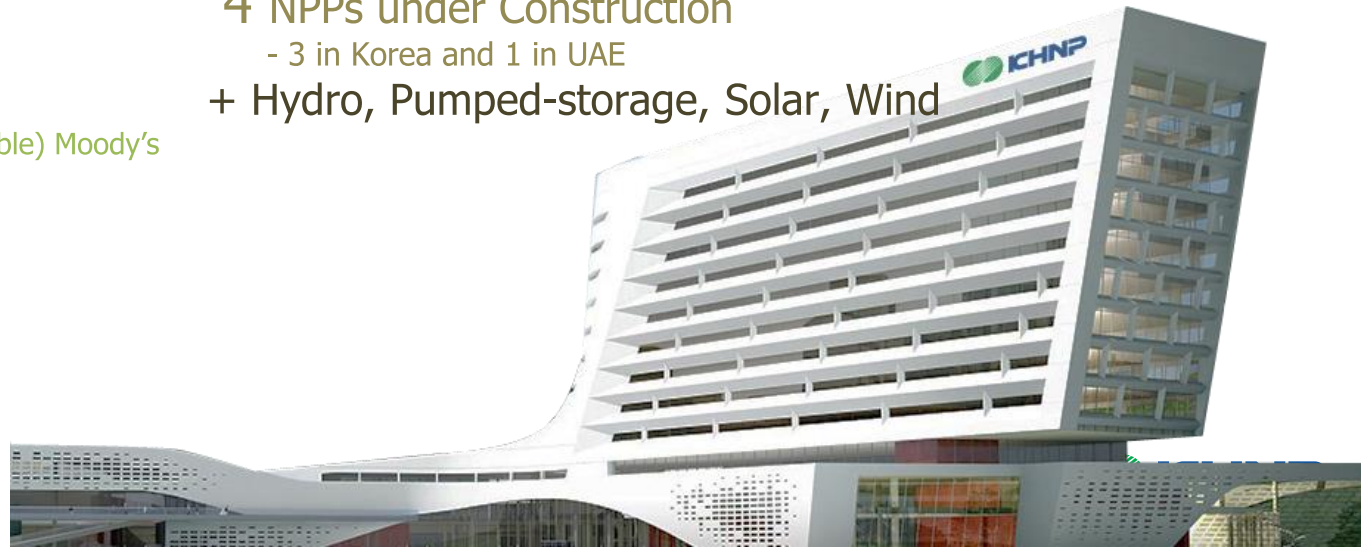
+ Hydro, Pumped-storage, Solar, Wind

€ 47.8 BN

Total Asset

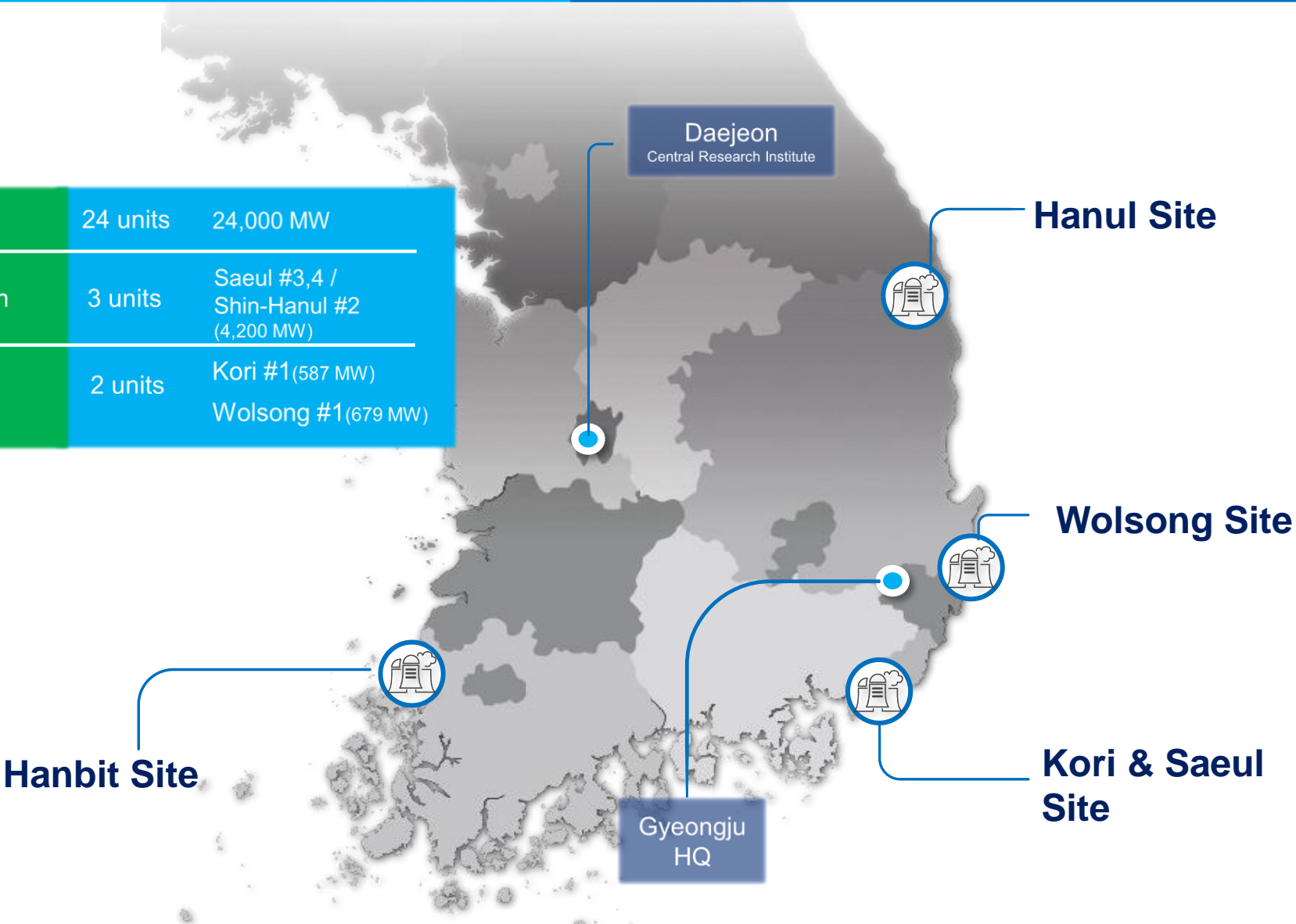
Sales : EUR 6 BN

Credit rating : Aa2 (stable) Moody's



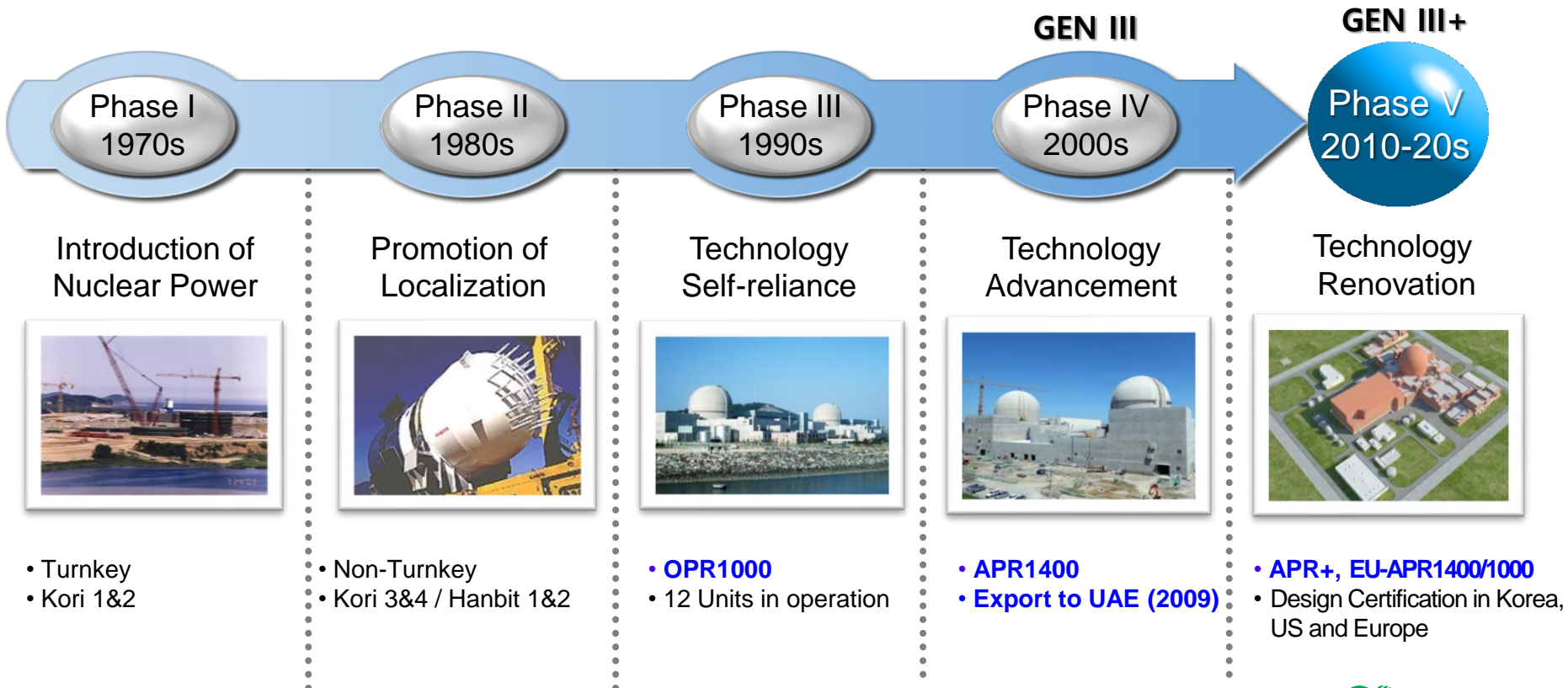
KHNP Nuclear Power Plants

Operation	24 units	24,000 MW
Construction	3 units	Saeul #3,4 / Shin-Hanul #2 (4,200 MW)
Permanent Shutdown	2 units	Kori #1 (587 MW) Wolsong #1 (679 MW)



History of Nuclear Technology in KHNP

- **Continuous Construction and Development of NPPs since 1971**
 - 24 operating units, 4 units under construction (3 in Korea & 1 in the UAE)
- **Development of GEN III+ reactors for domestic/overseas projects**
 - Technology advancement and renovation





Advanced Technology - APR1400

Status of APR1400 Operation and Construction

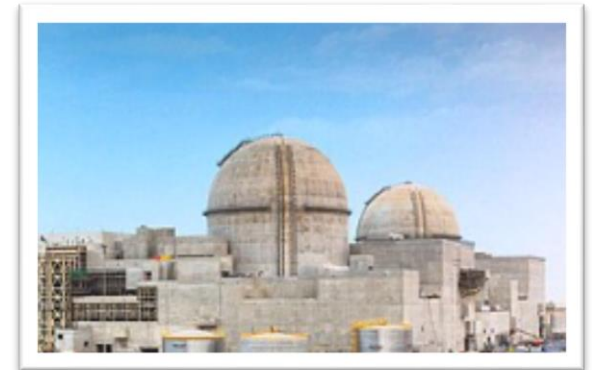
● APR1400 in Korea

- Operating and Construction status
 - 3 units successfully operating
 - Saeul Unit 1 (2016) & 2 (2019)
 - Shin-Hanul Unit 1 (2022)
 - 3 units under construction
 - Shin-Hanul Unit 2 (2023)
 - Saeul Unit 3 (2024) & 4 (2025)
- * *Shin-Hanul Units 3 & 4 under preparation*



● APR1400 in the UAE

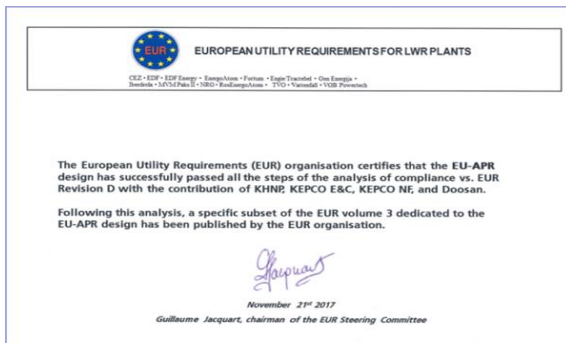
- Operating and Construction status
 - 3 units successfully operating
 - Barakah Unit 1 (2021) & 2 (2022) & 3 (2023)
 - 1 unit under construction
 - Barakah Unit 4 (2024)



APR Design Certifications

● Design Development

- Std. Design Approval by Korean nuclear regulatory body (KINS) in 2002
- EUR Design Certification (EU-APR1400) in 2017
- NRC Design Certification (US-APR1400) in 2019
- EUR Design Certification (EU-APR1000) in 2023



EUR Certification
(2017)



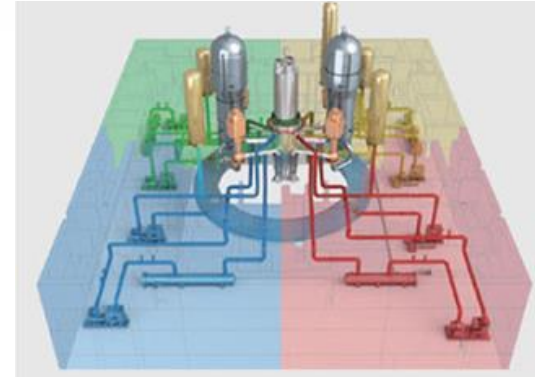
US NRC Certification
(2019)



EUR Certification
(2023)

APR1400 Design Features

- **Capacity / Lifetime: 1400 MWe / 60 years**
- **Seismic Design Basis: 0.3g**
- **Enhanced Safety Features**
 - ✓ **Improved Safety Systems**
 - 4 Independent Train Safety Injection System
 - ✓ **Mitigation of Severe Accident**
 - Passive Autocatalytic Recombiner (PAR) & Hydrogen Ignitor
 - Improved Performance of Containment Spray System
 - Cavity Flooding System
 - ✓ **Provision for Beyond Design Basis External Events**
 - Enhanced design against Beyond Design Basis External Events
 - Aircraft crash protection Design
- **Advanced Technology**
 - ✓ **Fully Digitalized I&C System with Diverse Platforms**
 - Man-Machine Interface System (MMIS)
- * **Flexible to modify APR1400 design based on the site characteristics and requirements from owner and regulator**





3

Strengths in KHNP

Supply Chain

Project Management



Localization

- **Why KHNP needs to cooperate with local companies in Poland NPP project**
 - **Economic Growth and Employment Increase**
 - **Boost of the Nuclear Industry**
 - **Continuous O&M Service from Local Companies**
 - **Flexible Procurement for Spare Parts**
 - **Technology Development via Knowledge Transfer**

WIN-WIN : Localization is essential for KHNP as well as for the Owner

- **Fulfillment of Owner's Requirements**
- **Cost Saving in terms of Equipment Logistics, Workforce**
- **Risk Reduction in terms of Regulation**
- **Supply Chain Establishment for Next European NPP Project**

KHNP

Status of APR1400 Operation and Construction

● APR1400 in Korea

- Operating and Construction status
 - 3 units successfully operating
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- * *Shin-Hanul Units 3 & 4 under preparation*

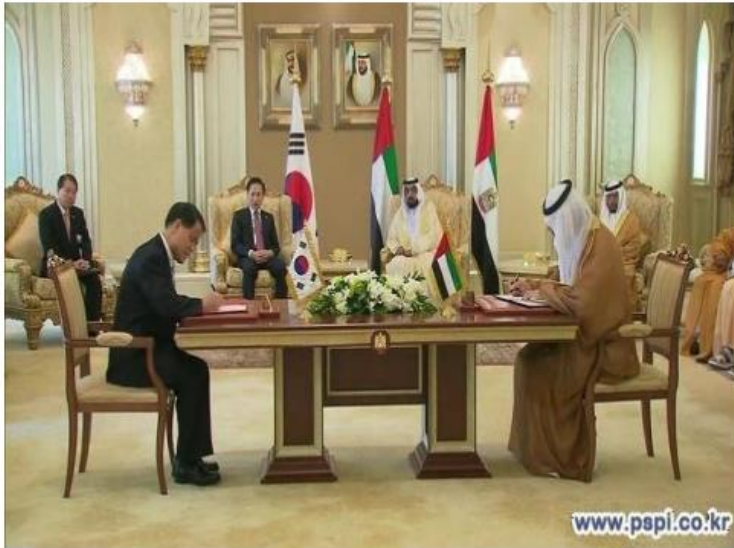


● APR1400 in the UAE

- Operating and Construction status
 - 3 units successfully operating
 - Barakah Unit 1 (2021) & 2 (2022) & 3 (2023)
 - 1 unit under construction
 - Barakah Unit 4 (2024)



On Time, On Budget – UAE Barakah Project



Contract Date	Dec. 27, 2009
Owner	ENEC
Scope	APR1400 x 4 Units (5,600MW) Nuclear Fuel (3 Cycles) Operating Support Service
Ref. Plant	Saeul unit 1 & 2



Providing nearly 25% of the UAE Electricity Demand

Unit 4	Unit 3	Unit 2	Unit 1
Under Commissioning	Commercial Operation	Commercial Operation	Commercial Operation
(2024)	(2023)	(2022)	(2021)

On Time, On Budget – UAE Barakah Project

Challenges at BNPP

Weather Challenges

Working schedule

- Summer Break (12:00 PM – 3:00 PM)
- Increasing Chiller Tanks.
- Increasing Air-conditioned Shelter.

Variation of the equipment

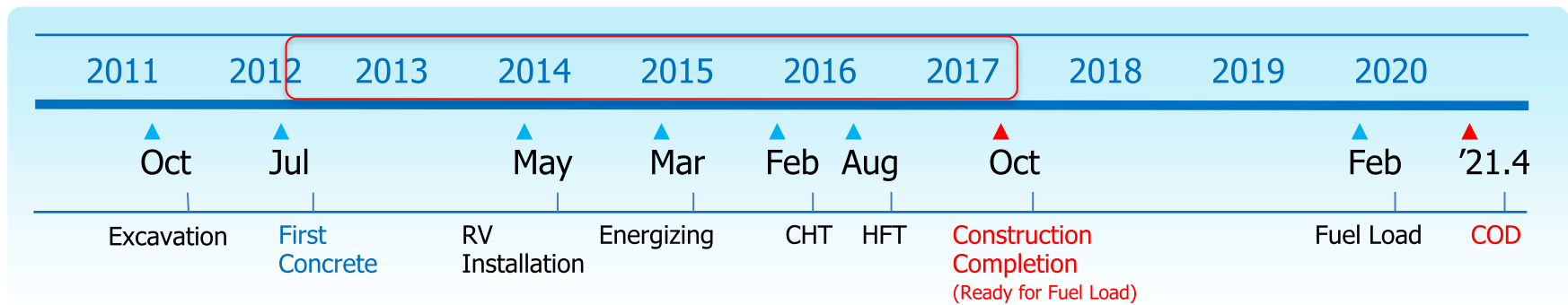
- Increasing Flow Rate in the Pumps for Equipment such as ESW and CCW.

ESW : Essential Service Water
CCW : Component Cooling Water



On Time, On Budget – UAE Barakah Project

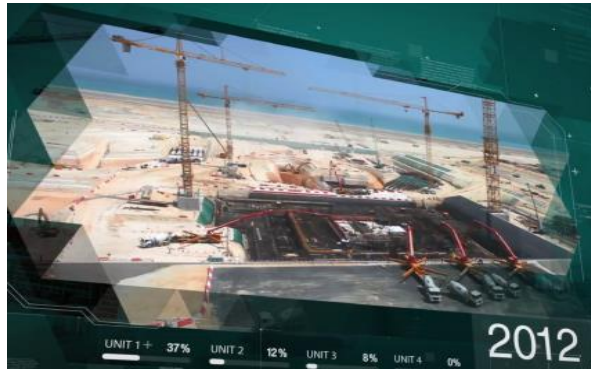
● BNPP unit 1 construction completion : 6 years as planned



● How did we overcome the BNPP challenges?

- Timely action to address risk factors, using our **One Team** approach and depth of knowledge
- Provided qualified and experienced manpower in advance (1,100 KHNP manpower in peak)
- Systematically managed multinational workforce (18,000 laborers from 15 countries)

On Time, On Budget – UAE Barakah Project



Cooperation in Academy

● **KINGS (International Nuclear Graduate School)**

- KHNP established the Graduate Univ. for international students for nuclear study
 - Graduated 447 students from 29 countries
 - Students from 22 countries in 2023
 - 5 students in Poland



● **Nuclear Youth Summer Program (NYSP)**

- Invited 22 students from Poland and Czech
 - Opportunity to experience nuclear industry and visit nuclear power plant and key suppliers in Korea (Aug. 2022)





4

Construction of APR1400

NPP Construction Process

Grading Excavation FC RV set CHT HFT FL COD

Project Preparation

- ✓ Feasibility Study
- ✓ EIA
- ✓ Site Survey
- ✓ EPC Contract
- ✓ Prepare PSAR
- ✓ License

Civil Work

- ✓ Site Grading
- ✓ Excavation

Architectural Work

- ✓ RC Building
- ✓ Aux Building
- ✓ Compound Building
- ✓ T/G Building
- ✓ Other Building

Mech/Elec/I&C Work

- ✓ Reactor
- ✓ Turbine
- ✓ Generator
- ✓ Mech./Pipe
- ✓ Electrical
- ✓ I & C

Commissioning

- ✓ CHT
- ✓ HFT
- ✓ Fuel Load
- ✓ PAT
- ✓ Other tests
- ✓ Commercial Operation

FC: First Concrete

CHT : Cold Hydrostatic Test

HFT: Hot Functional Test

FL: Fuel Load

COD: Commercial Operation Date

NPP Construction – Civil Work



[Site Grading]

[Excavation]

NPP Construction – Architectural Work

- Reactor Containment Building



[Basemat]



[Basemat Concrete]



[Liner Plate]



[Shell concrete]

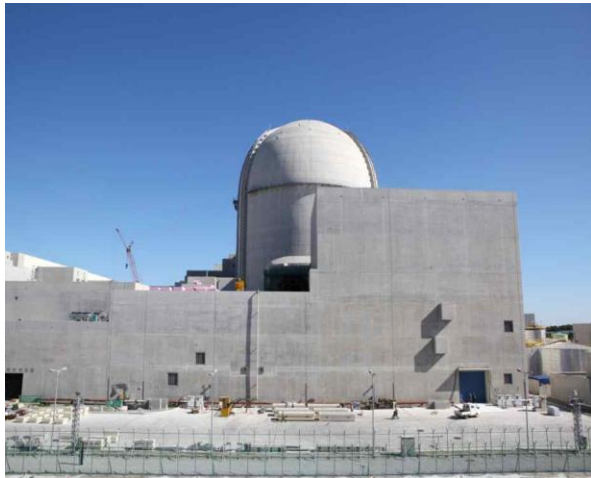


[Upper Dome Liner]



[Dome Concrete]

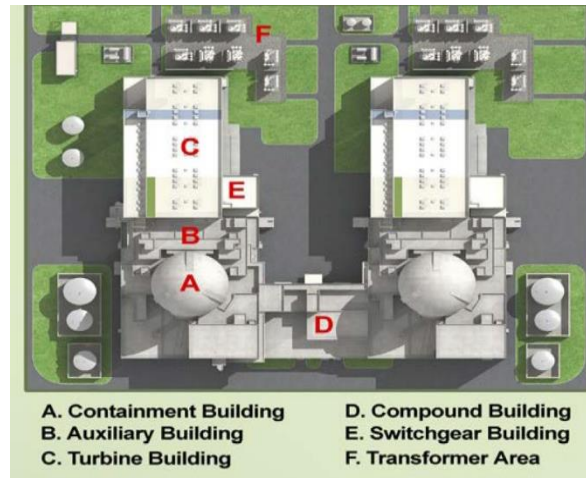
NPP Construction – Architectural Work



[Auxiliary BLDG]



[Compound BLDG]



[T/G BLDG]



[Transformer Area]

NPP Construction – Mech./Elec./ I&C Work



[Reactor Vessel]



[Steam Generator]



[Turbine]



[Generator]



[Cable]



[I&C-MMIS]



PGE PAK Nuclear Energy & KHNP Project

PGE PAK Energia Jądrowa & KHNP Project

● Project Summary

- Konin/Pątnów in the Wielkopolska
- At least 2 APR1400 Nuclear Power Plant
- Total Capacity of 2,800 MW

NPP will supply Polish home and business with about 12% of today's energy consumption in Poland



PGE PAK Energia Jądrowa & KHNP Project

● What we have done

- 31.10.2022 Singing of LOI by KHNP, PGE, ZE PAK
- 12.31.2022 Preliminary feasibility study completed
- 07.03.2023 Preliminary agreement on establishment of Special Purpose Vehicle for NPP construction Project between PGE and ZE PAK
- 29.03.2023 Approval of OCCP for SPV
- 13.04.2023 PGE PAK Energia Jądrowa is established



● What we will do

- 2023-2025 Feasibility Study, Detailed Site Survey, Environmental Impact Assessment
- 2025-2034 EPC Contract and Construction
- 2035 Connection to Grid



Closing Remark

Closing Remark

Technology Advancement

- Accomplished technology advancement based on step-by step approach through continuous R&D and construction projects for the last 50 years

APR1400 Licensability

- Abundant operation experience in Korea and the UAE
- Acquisition of NRC DC and EUR certificate for APR1400 & EUR certificate for APR1000

Optimized Supply Chain

- Optimized supply chain established through the last 50 years
- Best partner for Polish companies for localization

Reliable Partner

- On-time within-budget construction and delivery promised and guaranteed through previous project success in the UAE & Korea

Dziękuję

