ČEZ, a. s.

Data management

running units vs. new units

30th May; 2016

Martin Uhlir
New Dukovany NPP project manager
martin.uhlir@cez.cz

ČEZ IS OPERATING 6 NUCLEAR UNITS ON 2 SITES

DUKOVANY NPP 4 x 500 MWe

- *In operation since **1985***
- *Type of reactor: **VVER 440 type V 213***
- *Power uprating from 440 MW to **500 MW***
- *Dukovany NPP among top NPPs world-wide as per operational and safety performance indicators*
- *Safety long time operation program*
- *Total electricity production over 300 TWh*

TEMELÍN NPP 2 x 1000 MWe

- *First connection to the grid **2000***
- *Type of reactor: **VVER 1000 type V320***
- *Installed capacity 2 x **1000 MW***
- *Temelín NPP is built and designed at the highest level of safety*
- *Planned power uprating up to 1080 MW (till 2015)*
- *Total electricity production over 130 TWh*

DUKOVANY NPP

- 1974 - Beginning of Dukovany NPP construction
- 1977 – Design changed – containment with bubble condenser
- 1985 – 1987 – commissioning of units No. 1, 2, 3, 4

There was not any information system at that time… only a paper

- 1991 - 1998 – Implementation of technical improvements to enhance nuclear safety
- 1999 – 2009 – Morava – Modernization program based on IAEA Safety Issues
  (new I&C, seismic improvement…)
- 2009 – 2012 – Power uprating to 113%
- 2013 – 2016 – Stress test issue implementation
  (SBO DG, Additional fan cooling towers, In vessel corium retention,
  3. SG feed water system, H_2 recombiner)

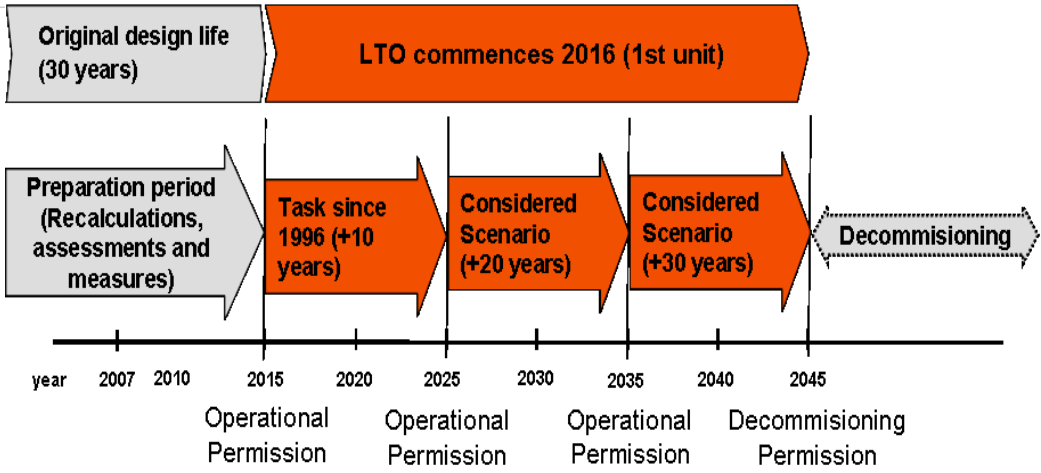
Live cycle data management is essential for technical modifications and maintenance of NPP

Long Term Operation Program IN DUKOVANY NPP

- 2003 – 2009 Preliminary phase
  Feasibility study
  Verification of preconditions

- 2009 – 2015 LTO assessment
  Scoping, screening, assessment SCs
  Ageing Management Reports
  Specific summary reports
  Effective Maintenance strategy
  Time Limited Aging Analyses
  Health Reports

- 2014 – 2017 LTO approval
  Regulatory oversight
  Implementation of Regulatory requirements



New Operational Permit for Unit 1 was issued on May 30th 2016 for an indefinite period.

…ongoing works on other permits

All of these information have to be effectively stored

TEMELIN NPP

- 1987 - Beginning of 4 Temelin units NPP construction
- 1990 – Construction of units 3 and 4 suspended, canceled
- 1997 – Digitalization of documents project was launched
- 2001 – 2002 – commissioning of units No. 1 and 2

Temelin NPP is the newest in Europe
… but it was mostly design in classical paper form

- 2004 – 2007 – Project D – outage optimization
- 2007 – 2012 – Project B15T – Safety, Production, Maintenance, Supplier System Reliability enhancement, Fuel reliability improvement
- 2008 – 2013 - Power uprating to 104%
- 2013 – 2016 – Stress test issue implementation

Information Management System to operate NPP

- Enterprise Content Management - ECM SW
  Steering legislation – processes and workflows description

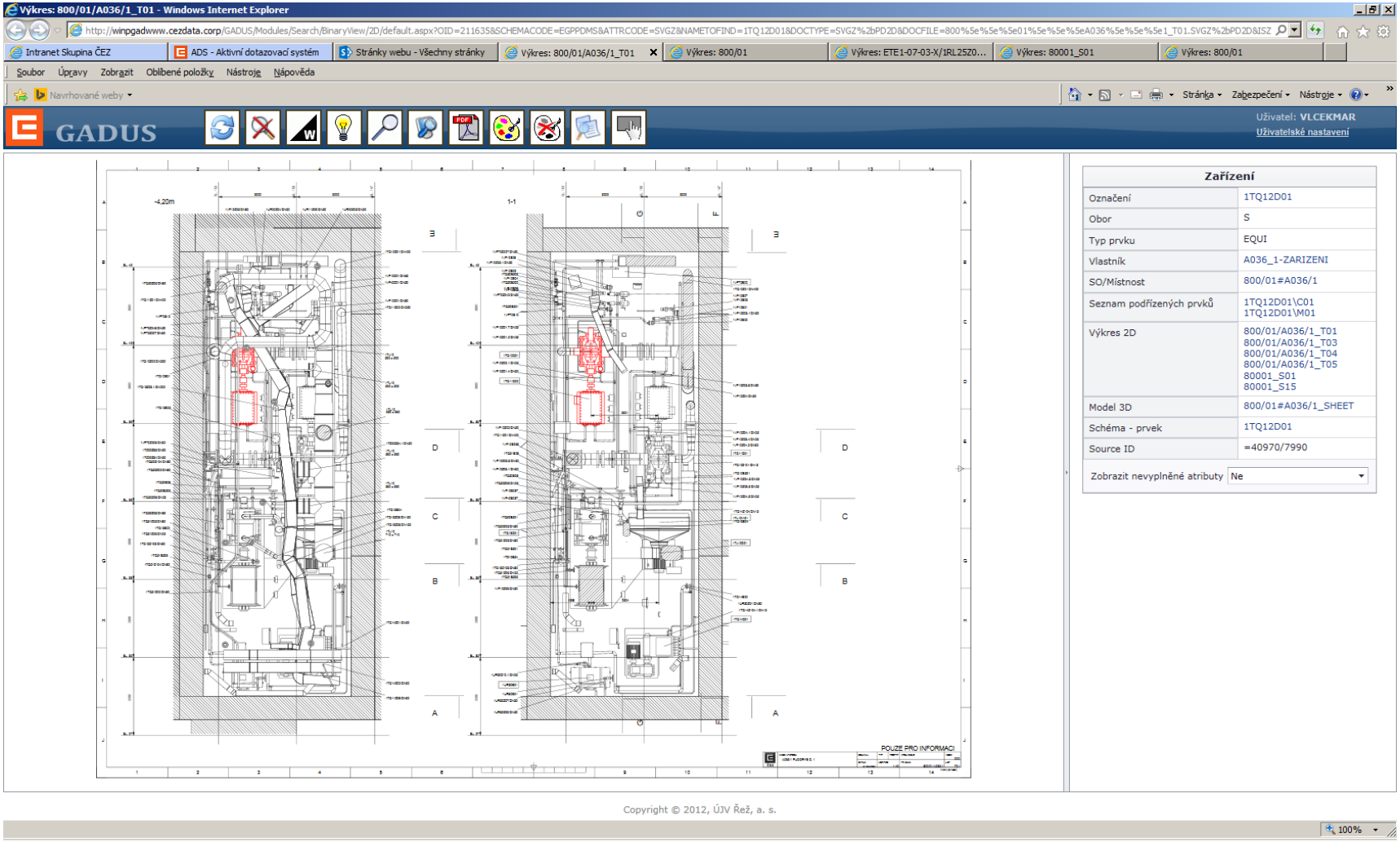
- ISSPD SW
  Operational documents, instruction, programs – how to operate nuclear facilities

- MNT Graf (we are going to abandon it in near future)
  2D visualization of the operational schemes and logical interconnections of the equipment - more efficient maintenance, reduction of the outage period

- AVEVA Plant Design Management System and AVEVA Everything 3D/PDMS
  3D operational schemes and logical interconnections – Nuclear Island

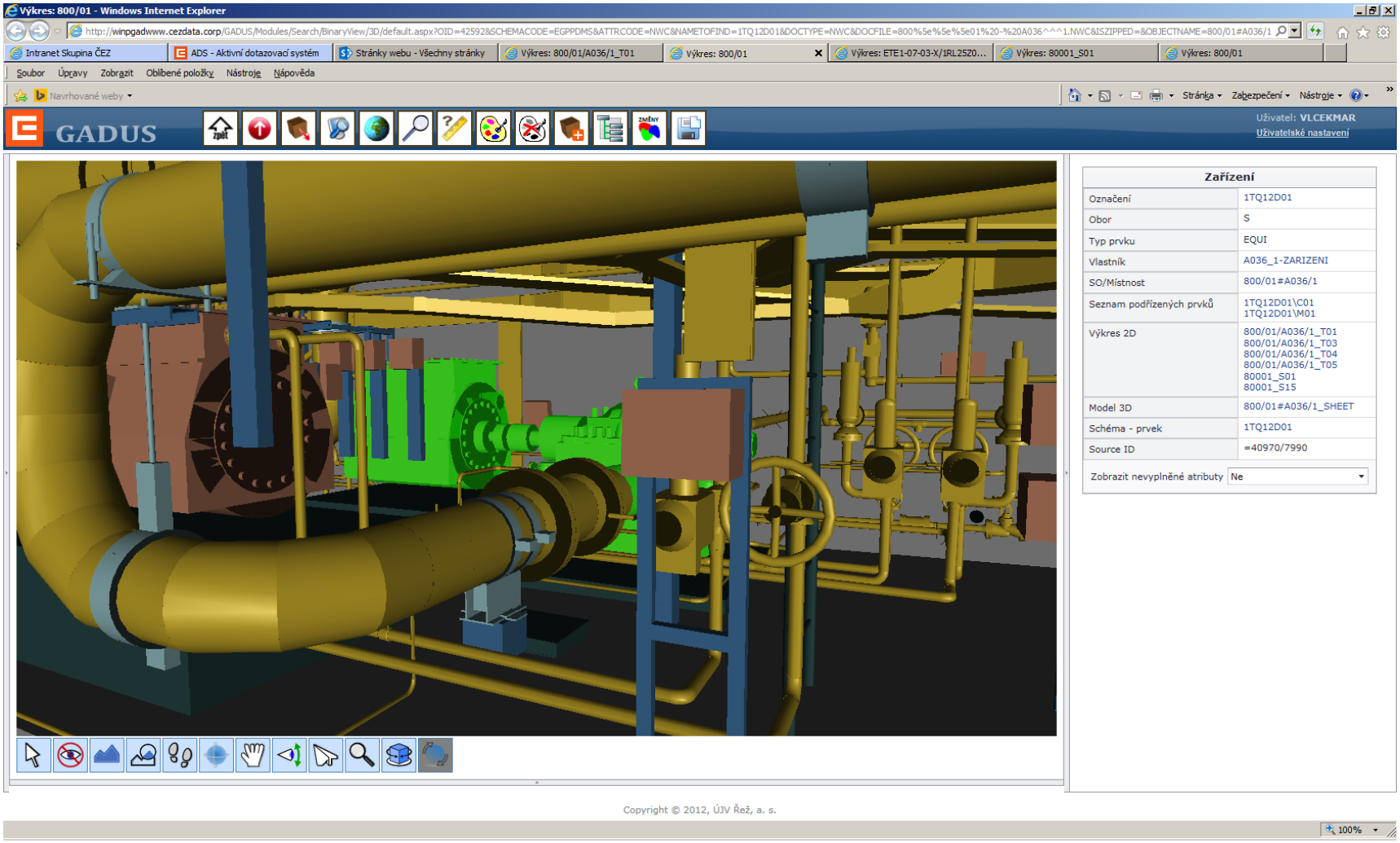
- Passport AS6
  Technical and design documents, information
  Support for maintenance and outage management

Ability of 3d model
Design Drawings Generation

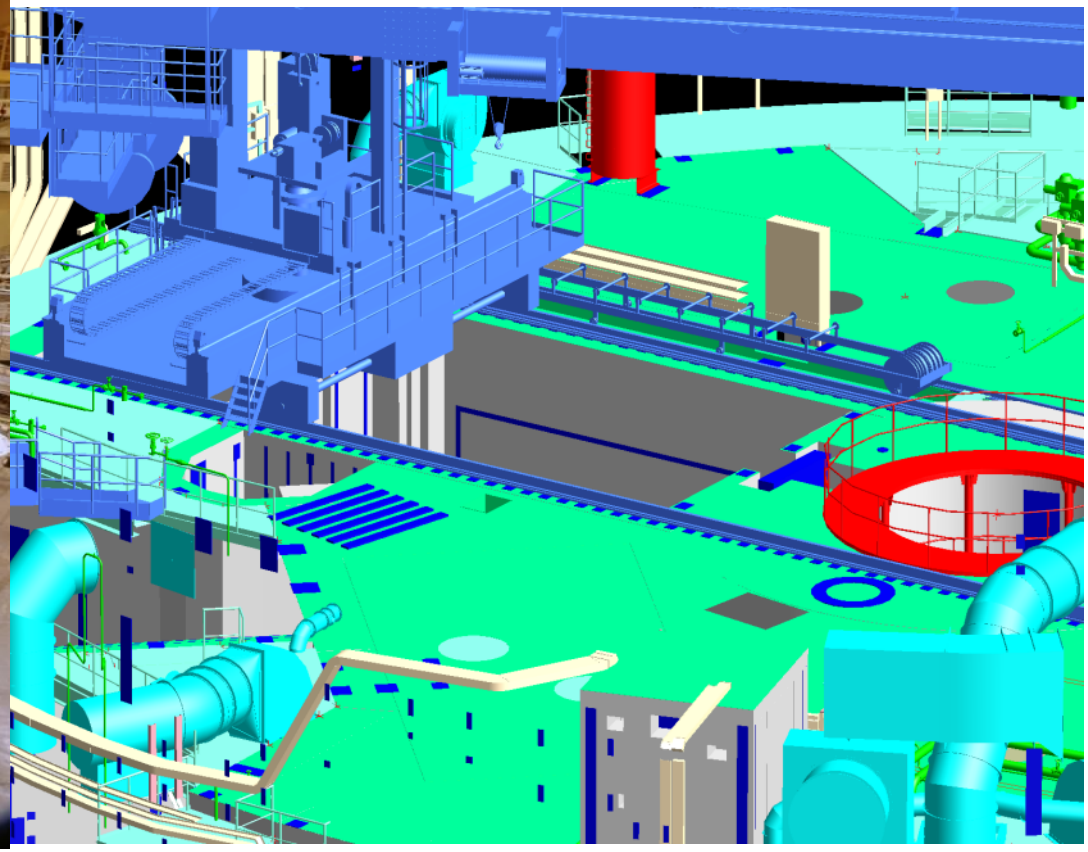


GADUS – SW for interface with users

Ability of 3d model
Personal Training, Maintenance Optimization



Ability of 3d model
Plan were to put components during outage



Ability of 3d model
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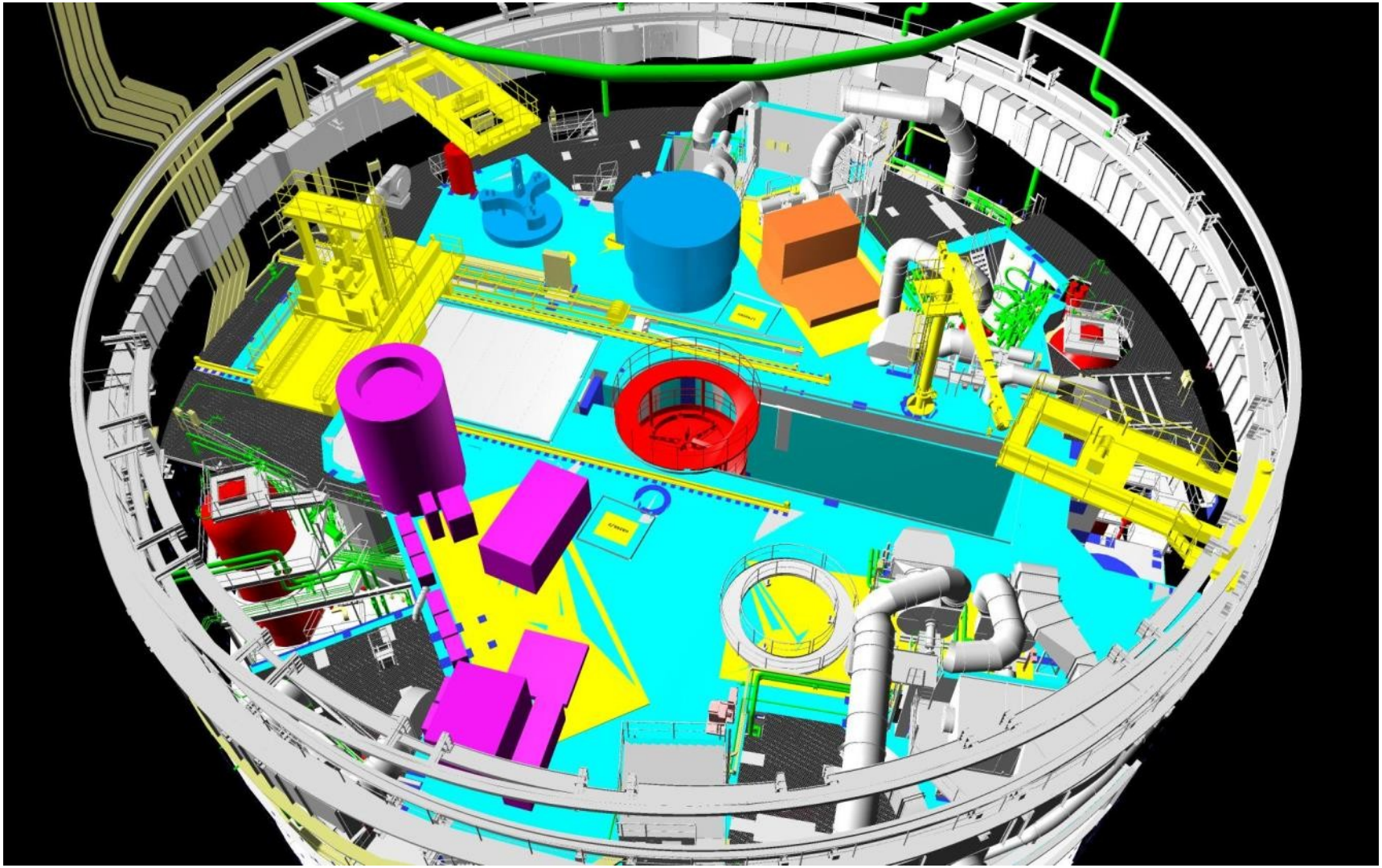
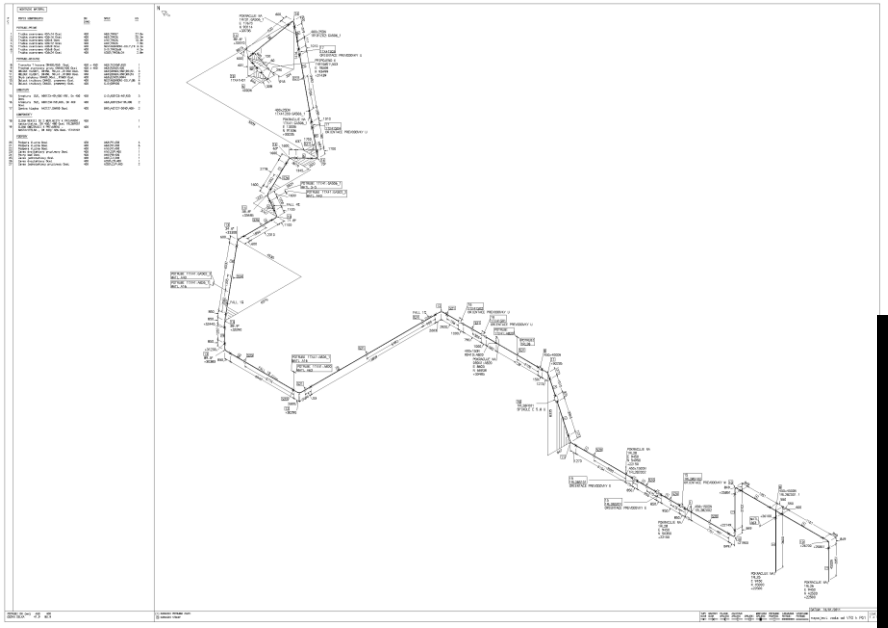
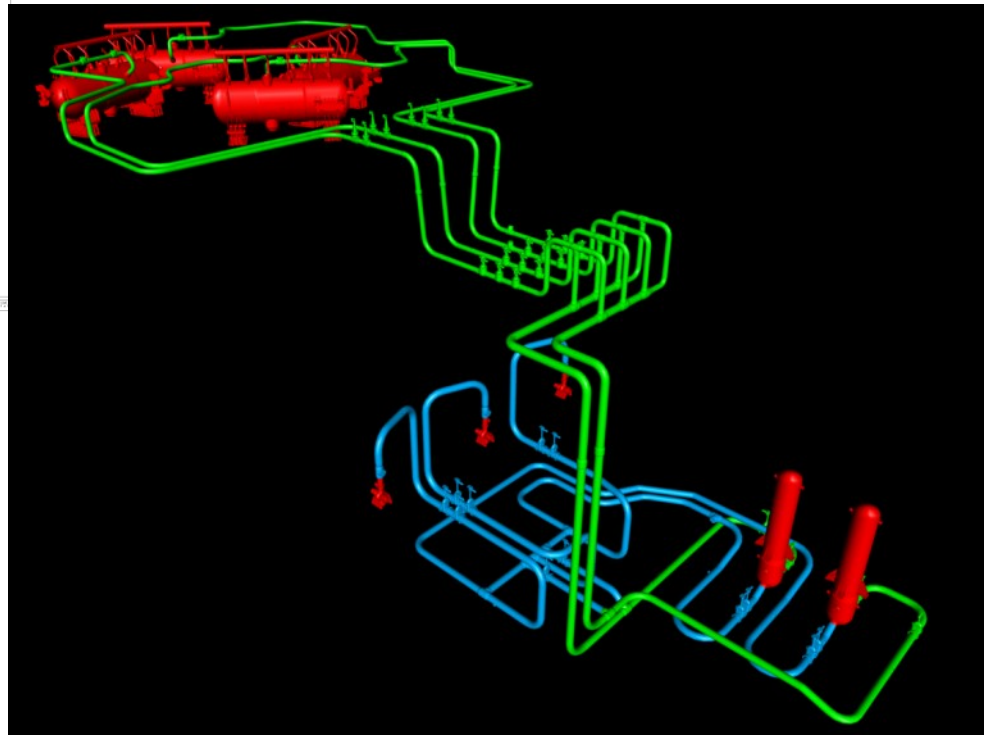
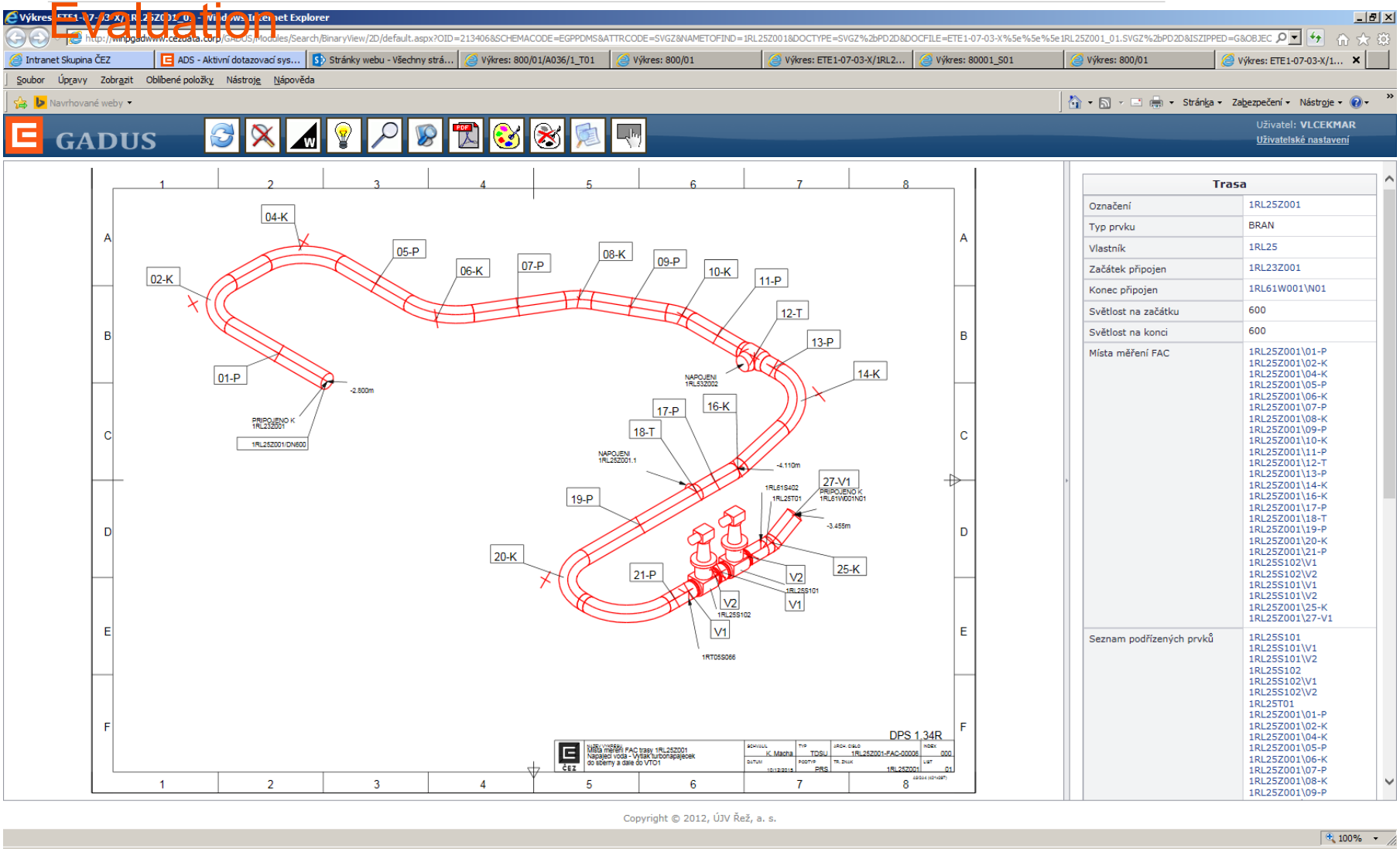


Ability of 3d model
Design Drawings of Technical Modifications

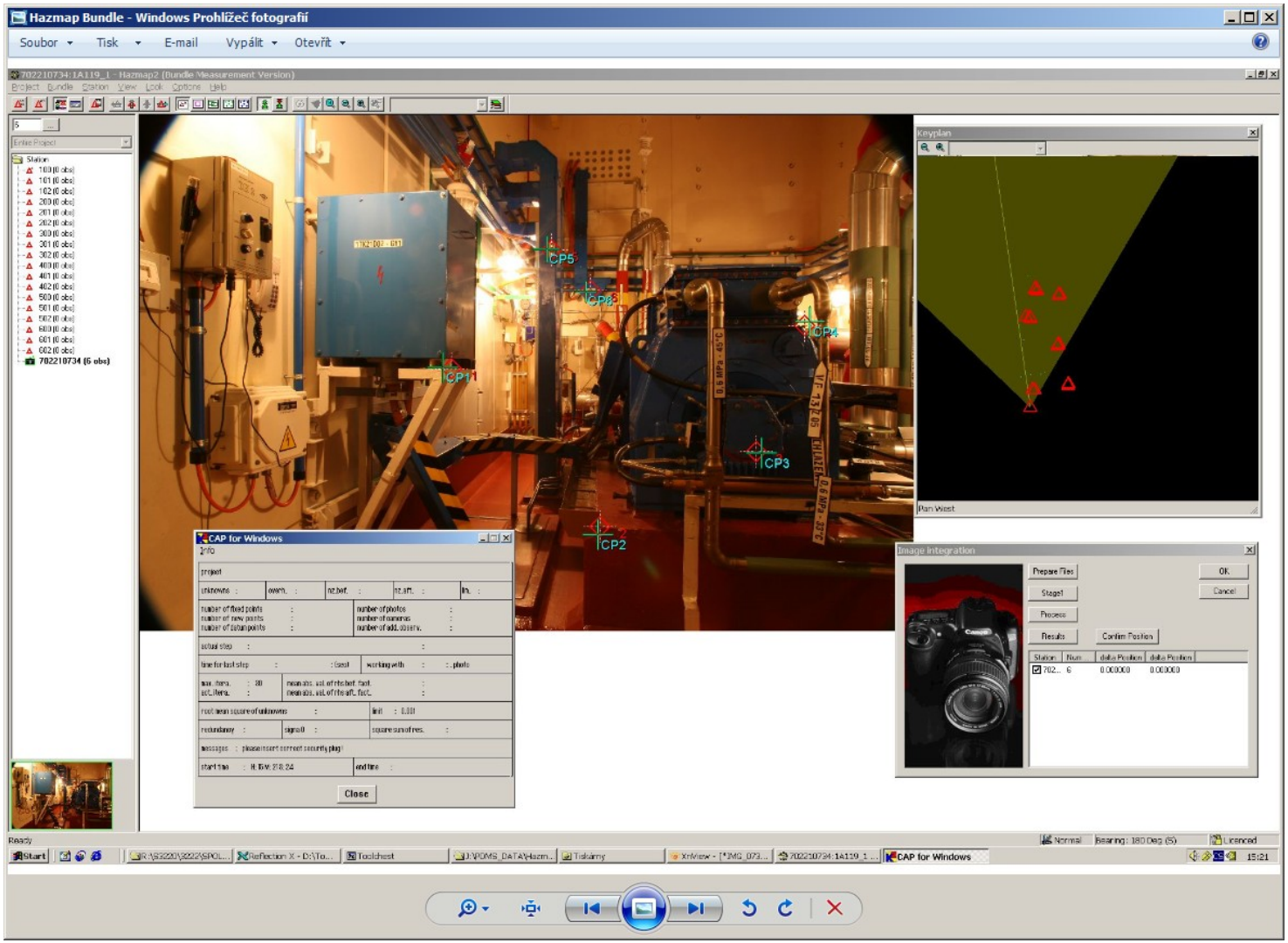




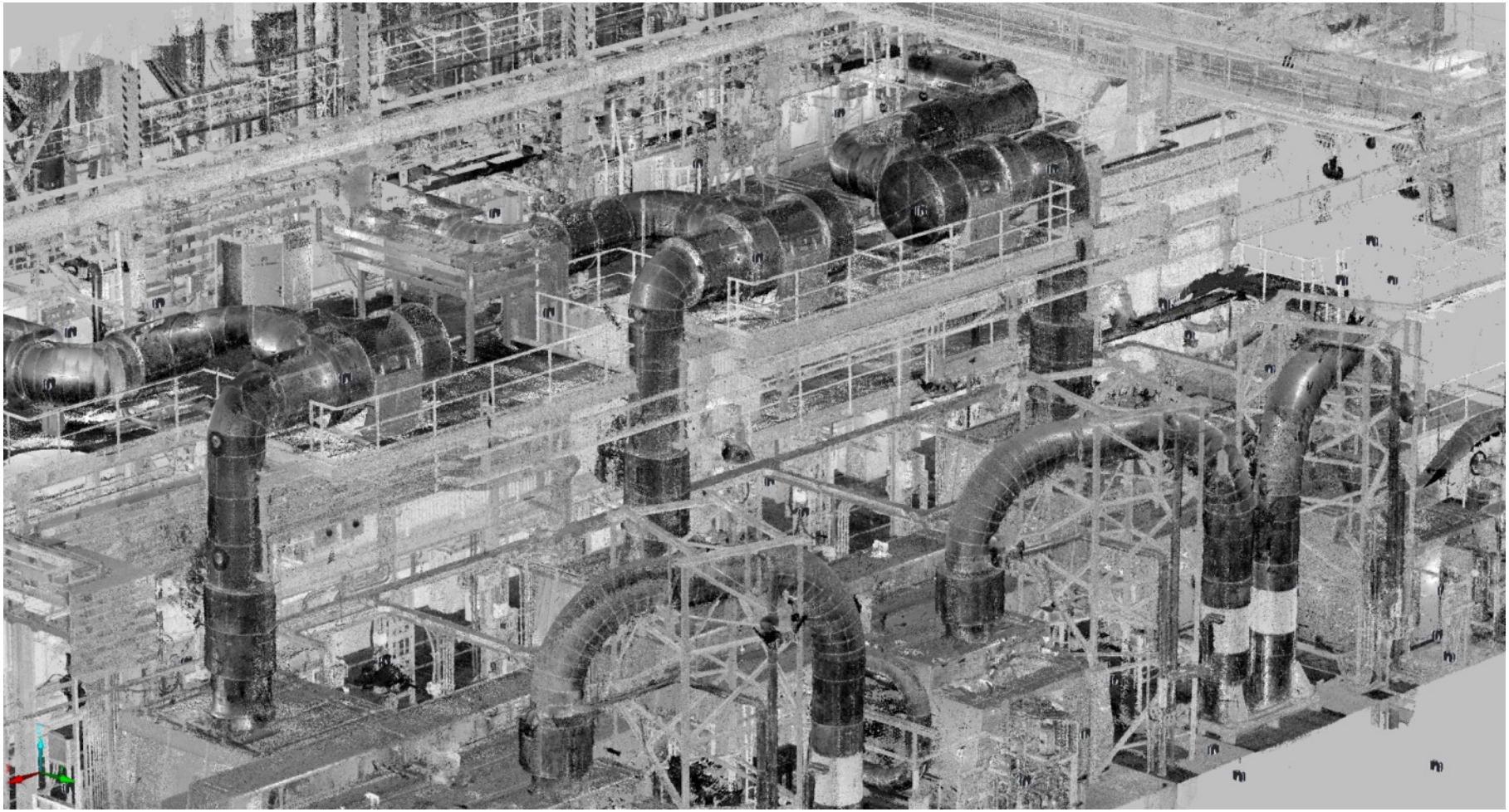
Ability of 3d model
Measuring Spots for Erosion and Corrosion Evaluation



Ability of 3d model
Creation of As-Built Model - Digital Photometry



Ability of 3d model
Creation of As-Built Model - Laser Scanning



ČEZ‘s PLANS FOR NEW NPP‘s BUILDS

Dukovany
- *Construction of Unit 5&6*
- *Pressurized Water Reactor (PWR)*

Temelín
- *Construction of Units 3&4*
- *Pressurized Water Reactor (PWR)*

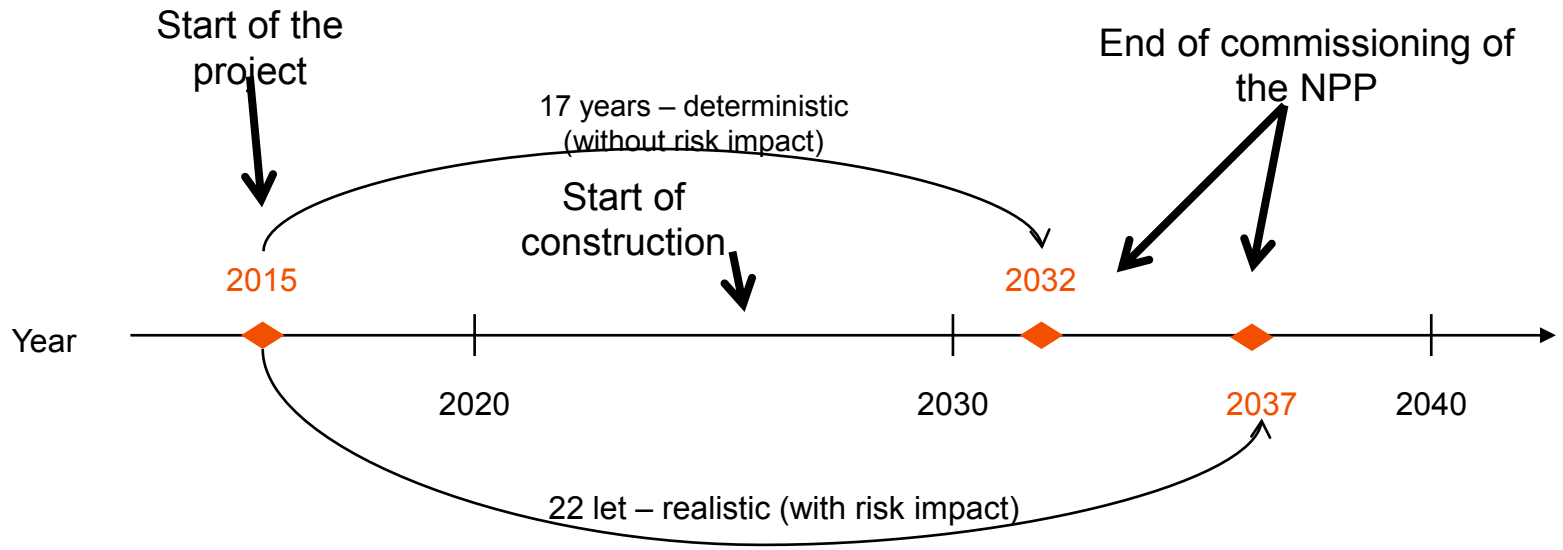
Jaslovské Bohunice
- *Pressurized Water Reactor (PWR)*

Czech Energy Policy and National Action Plan to Develop new NPPs

Both state documents were approved in 2015

Czech Energy Policy Main outcomes:

- Nuclear energy will reach approx. **50% share** of total production of electrical energy
- Construction of NPP up to **2500MW** (20 TWh) till **2035**
- Long term operation of **existing NPP Dukovany** (at least **50 years**, it means till 2035-7)
- Construction of **new units in NPP Dukovany** in order to replace existing NPP Dukovany



Czech Energy Policy and National Action Plan to Develop new NPPs

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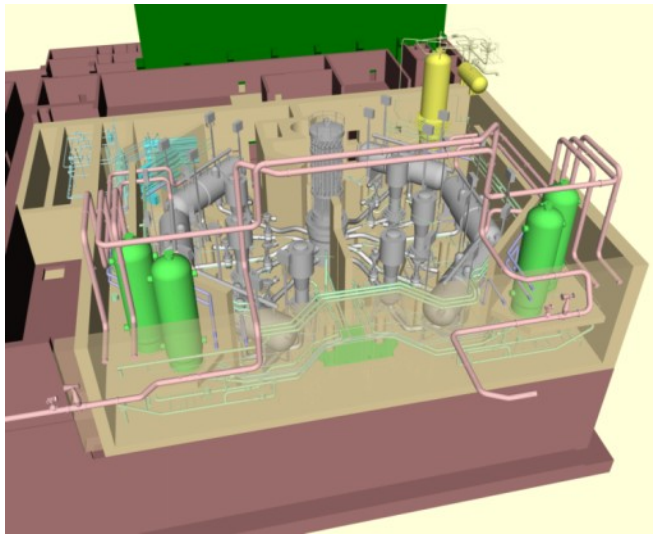
National Action Plan Main outcomes:

- **Restart preparation works on NPP Temelín project and continue on NPP Dukovany project**
  - Preparation works to be done for 2 units on each site (land, permits, licenses)
  - Current expectation is to build 1 unit on each site only
  - However with possible extension to 2 units on respective site in case of need
- **Carve out both projects into project companies** to enable future entry of the state or strategic partner
- **Start the discussion with EU** (tender approach, allowable financing models, assurance of the project feasibility)
- **Decide and approve the final investment and delivery model** in order to assure feasibility of the project .
- **Preparation of the Czech legislation modification** in order to enable acceleration of the preparation works

Bid Invitation Specification (BIS)

Structure of BIS

- *Qualification Documents (QD)*
- *Letter of Invitation (LI)*
- *Instruction to Bidders (IB)*
- *Scope of Supply (SS)*
- *Technical Requirements (TR)*
- *Technical Data Sheets (DS)*
- *Nuclear Fuel (NF)*
- *Project Organization (PO)*
- *Economic and Financial Requirements (EF)*
- *Draft Contract (DC) /Legal Specifications (LS)*
- *Evaluation Criteria (EC)*



Requirements on new Information Management System were put to BIS

Information Management System of New NPP

Requirements on new IMS system are based on:

- EUR requirements – chapter 2.12
- And CEZ experience

- IMS will be delivered and operated by vendor during construction
- All design work of vendor are published and stored in IMS
- IMS will allow workflow and approval of documents
- IMS information are available for all companies which works on NPP construction
- All data will be transferred to investor at the end of construction (necessary for Configuration management and Change management during operation)

CONCLUSION

- It is easier to build new IMS before construction of new NPP than reconstruct IMS during operation of NPP
- IMS is effective tool for design modification and maintenance
- IMS save money and human forces
- IMS prevents human errors, enhance safety