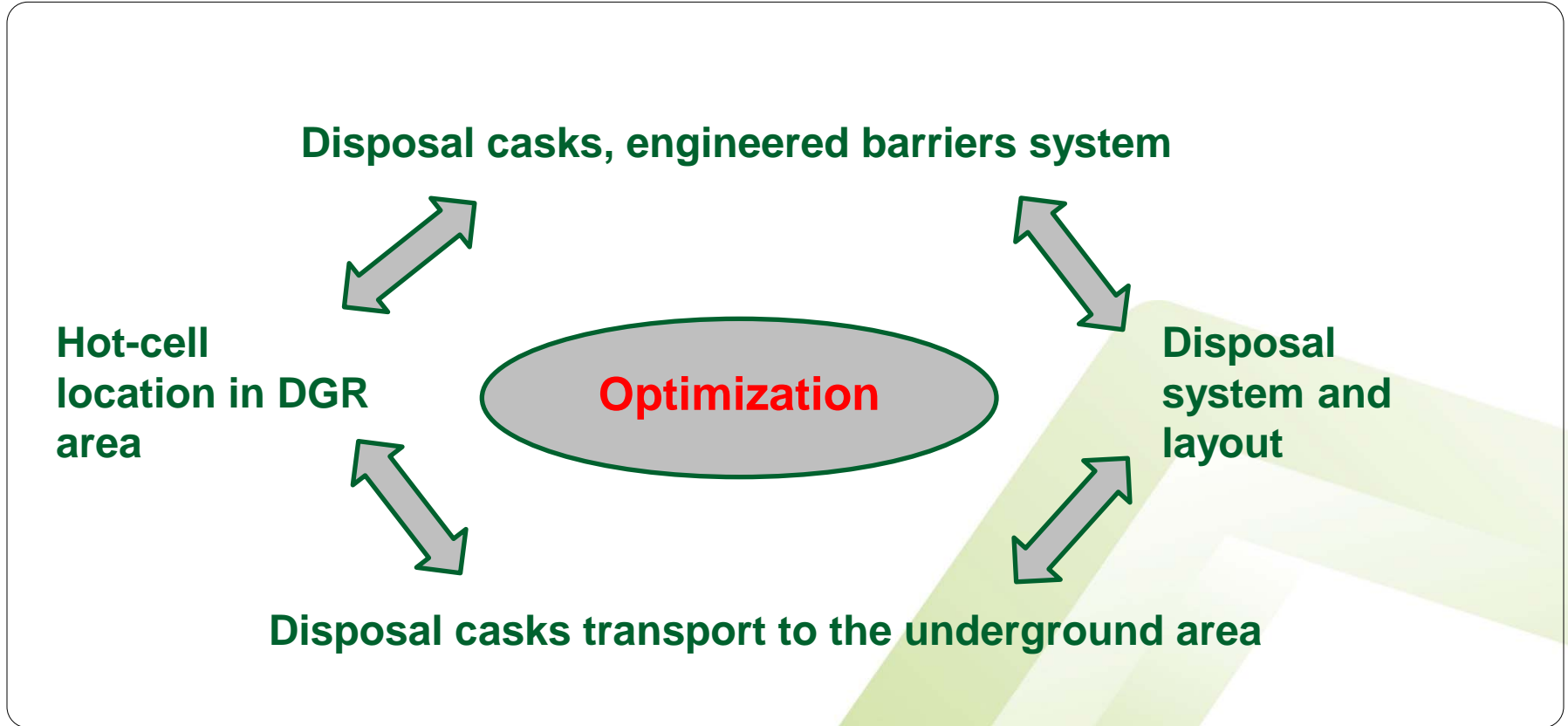


DGR design optimization

Radioactive Waste Repository Authority

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29th November 2012, Paris



Disposal casks, engineered barriers system

Optimization

- **Material tests** (verification of material properties in DGR expected conditions, irradiation and temperature degradation)
- **Verification thermo-technical calculations** (to specify and prove the amount of SNF placed into the cask, the thickness of backfill)
- **Strength calculations** (verification of swelling pressure of bentonite to cask's surface, shear stress due to movement of rock blocks at possible tectonic events)
- **Long-term safety verification** (in the case of modification)

Disposal casks transport to the underground

Shaft	Incline drift
<ul style="list-style-type: none"> • Smaller amount of excavated rock 	<ul style="list-style-type: none"> • Higher operational safety
<ul style="list-style-type: none"> • Smaller expensiveness of transport 	<ul style="list-style-type: none"> • Less complicated clearing away of accident impacts



Optimization

In dependence on cask's construction to check:

- **Operational safety protection** (especially in the case of shaft transport to the underground area)
- **Possibilities of safe accident impacts removing, evaluation of impacts**

Hot-cell location in DGR area (Czech background)

pros	cons
<ul style="list-style-type: none"> Nowadays used storage containers (CASTOR) are declared both for storage and transport. (<i>Not necessity to design new transport casing for DGR disposal casks</i>) 	<ul style="list-style-type: none"> Necessity of construction of technological background (<i>Hot-cells, located in NPP areas could use NPP's background</i>)
<ul style="list-style-type: none"> Noticeable decrease of transports between NPP and DGR areas (<i>EDU 12x, ETE 6-7x</i>) 	<ul style="list-style-type: none"> Necessity of more extensive areal
	<ul style="list-style-type: none"> Public acceptance (<i>Threatness of workplace with non-sealed sources</i>)



Optimization

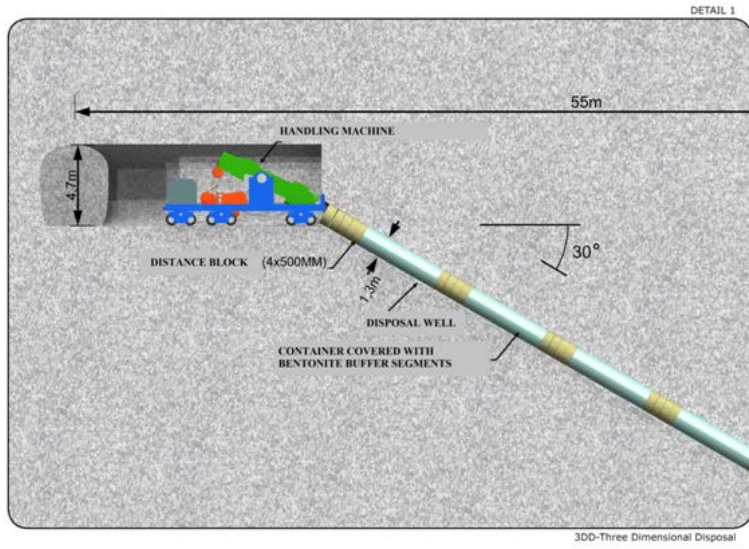
- Common decision with CEZ, a.s. about construction and operation of hot-cell**
(location of hot-cell could be influenced by locality selection and distance of DGR from NPPs)
(location of hot-cell could be influenced/have influence to NPP's decommissioning scenario selection)

Disposal system and layout

Horizontal		Vertical	
pros	cons	pros	cons
<ul style="list-style-type: none"> • Need of smaler area 	<ul style="list-style-type: none"> • More demanding manipulation with casks and bentonite blocks (<i>long disposal drifts</i>) 	<ul style="list-style-type: none"> • More simple manipulation with casks and bentonite (<i>1 cask's boreholes</i>) 	<ul style="list-style-type: none"> • Need of large area
<ul style="list-style-type: none"> • Smaller amount of excavated rock 	<ul style="list-style-type: none"> • Geological survey can give more restriction (<i>craks x long disposal drifts</i>) 	<ul style="list-style-type: none"> • More flexible application of geological survey (<i>cracks</i>) 	<ul style="list-style-type: none"> • Bigger amount of excavated rock



Combination?

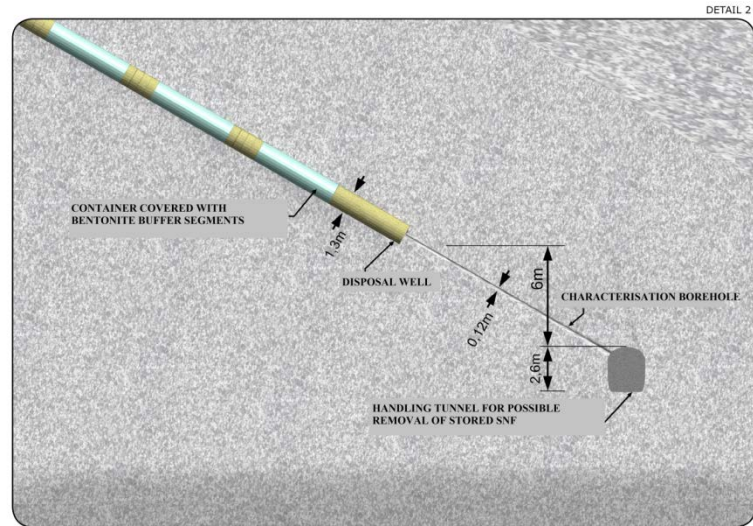


Disposal system and layout (cont.)

INCLINE SYSTEM

WHY?

- **Economic aspects**
 - ✓ Possibility to remove disposal casks with SNF
- **Technical aspects**
 - ✓ Better utilization of the host rock (*limited size of host rock complying with requirements - CZ conditions*)
 - ✓ Simplified handling both the disposal cask and the bentonite buffer segments

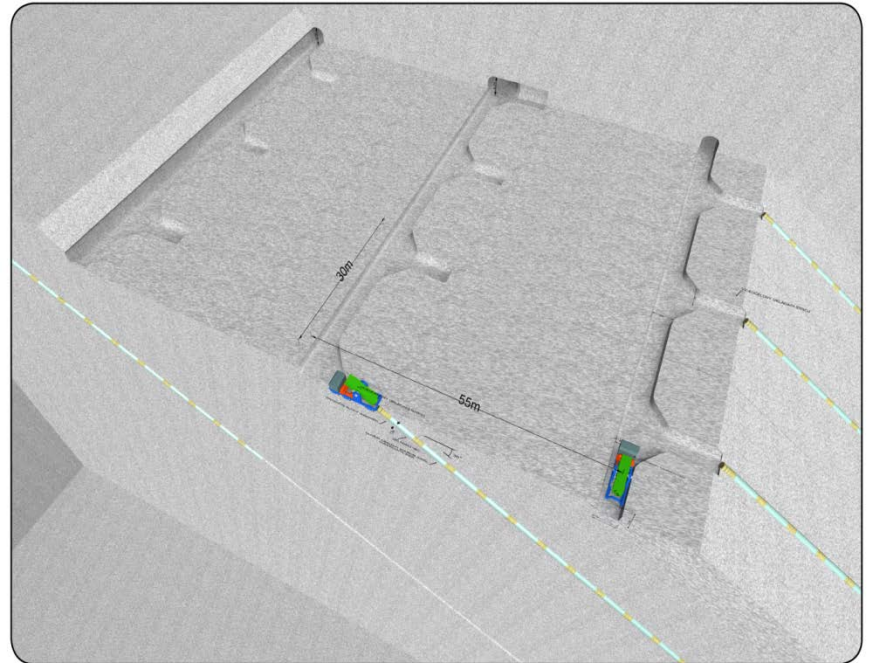


Disposal system and layout (cont.)

BUT...

There are many questions to be clarified...

- Long-term mechanical resistance (*in dependence to disposal drift inclination*)
- Analyse of threatnes in the case of cask deformation (*upper casks can increase the risk of SNF destruction in lower damaged cask due to its mass – nuclear safety*)
- The time of economic favourableness (*quality/mechanical damages of SNF assemblies*)
- ... ?

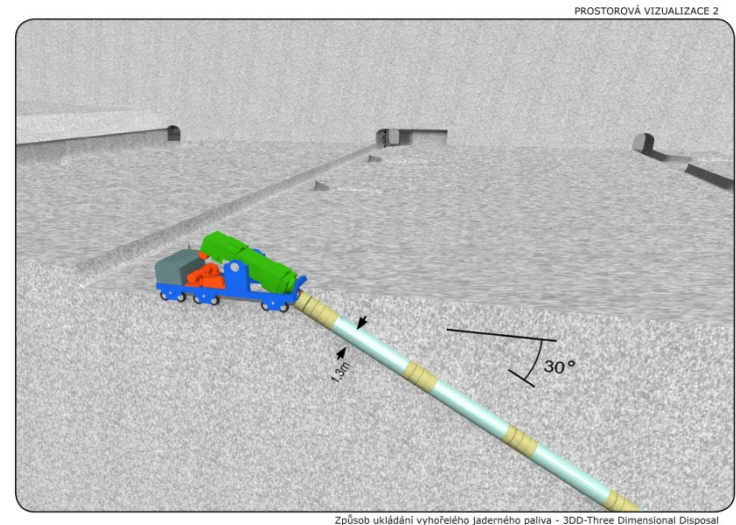


3DD-Three Dimensional Disposal

Disposal system and layout (cont.)

... SOLUTION?

- 1) SWOT analyse
- 2) Definon of the topics to be worked up
- 3) Elaboration of relevant supporting studies
- 4) Optimal technological solution, based on long term safety analyses assessment requirements
- 5) Case study



Disposal system and layout (cont.)

International cooperation

pros	cons
Sophisticated solution	-



Thank you for your attention

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