URANIUM MINING
IN THE CZECH REPUBLIC

The Festival of the Future in Berlin, Germany

September 10, 2016

Olga Kališová, MSc.

Calla - Association for Preservation of the Environment

OUTLINE

- **Milestones:** Raw Material Policy 1999 vs. mining in Dolní Rožínka
- **Uranium facts:** production, employment
- **Uranium mining sites**: Jáchymov, Příbram, MAPE Mydlovary, Stráž pod Ralskem, Dolní Rožínka
- **State subsidies:** a phase-out plan & social and health costs
- **Environmental impact**
- **Unmined uranium deposits**
- **Brzkov**: a new uranium mining?
- **CALLA's vision for the year 2030 (in response to a request by BMUB)**
- **Faces of Uranium**
- **The siting process for a** Geological Disposal Facility **(GDF)** for radwaste and spent fuel
- **Calla**'s activities
- **Farewell**

MILESTONES – URANIUM MINING 1945-1999

- **1945, Nov 23** – international agreement between the Czechoslovak Republic and the Soviet Union about **prospecting, extraction and supply of radioactive materials to the Soviet Union** (e.g uranium concentrate powder "yellowcake")
- **1945-1992** - **Czechoslovak Uranium Industry** (Československý uranový průmysl, ČSUP) - the state enterprise **in charge of** all uranium activities
- **1989, Oct 19** – Czechoslovak Socialist Government Bureau adopted **Resolution No. 94** on the **URANIUM MINING PHASE-OUT**
- **1993-onwards** - the state enterprise **DIAMO in charge of** all uranium activities
- **The Raw Material Policy 1999**
  - = the fundamental conceptual national document in relation to mineral resources and raw materials …

Source: DIAMO

THE RAW MATERIAL POLICY 1999

- "To **terminate uranium mining** and **ensure the protection of its major resources** for possible future use"

- "To ensure **remediation** of the long-term consequences of uranium mining"

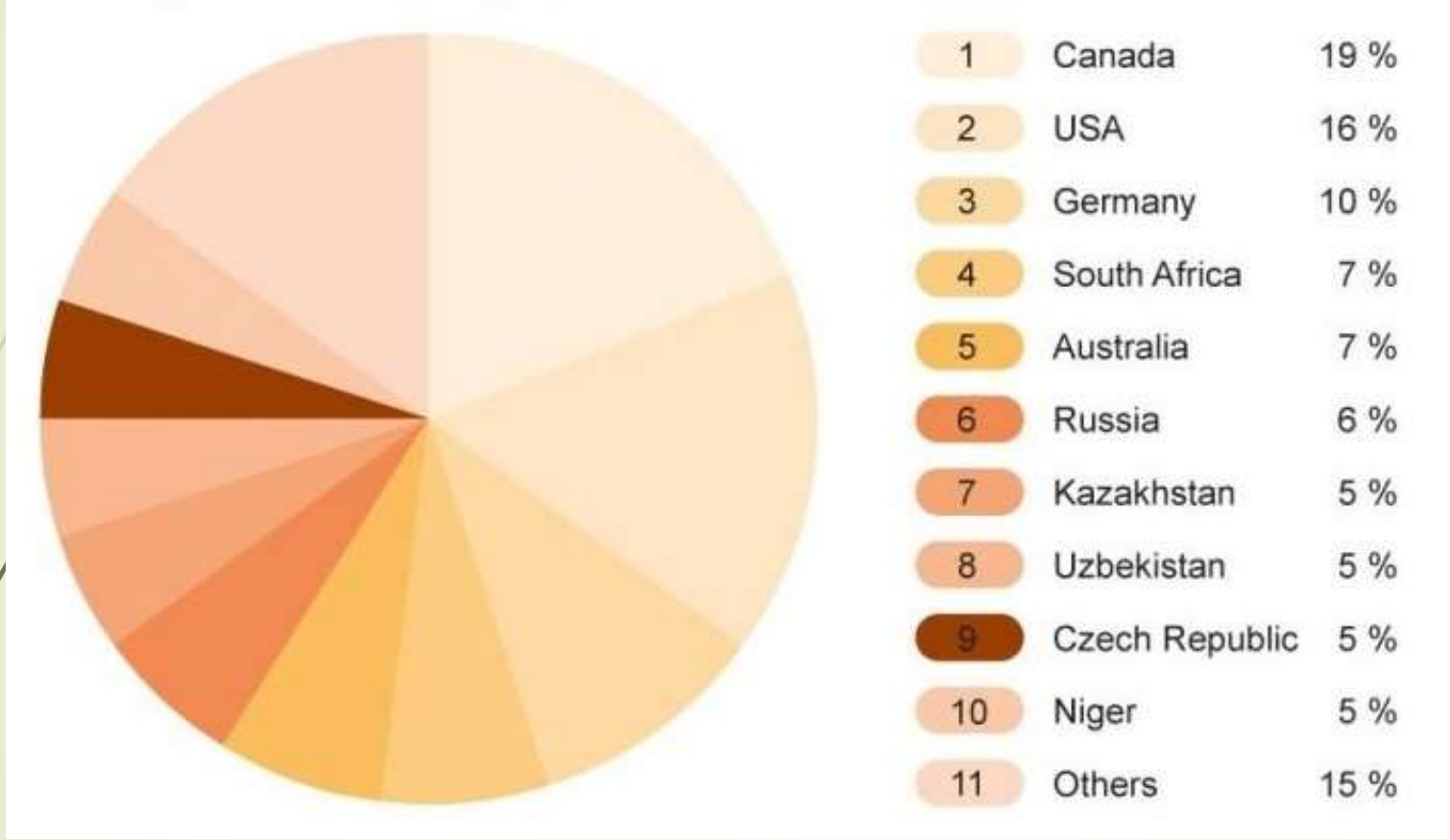
Source: Ministry of Industry and Trade

VS. CONTINUOUS URANIUM MINING AND PROCESSING IN DOLNÍ ROŽÍNKA

- **2005** - Government Resolution No. 1316 (the Rožná mine)
- **2006-2007** - 1st round of request by the Australian Urania Mining Ltd. to extend the protected deposit area in Brzkov (refused by the Ministry of the Environment)
- **2007** – Gov. Res. No. 565 (the Rožná mine)
- **2014** – Gov. Res. No. 1086 (the Brzkov mine)

Source: The Ux Consulting Company, LLC

RANKING OF WORLD URANIUM PRODUCERS 1945 - 2007



Source: DIAMO

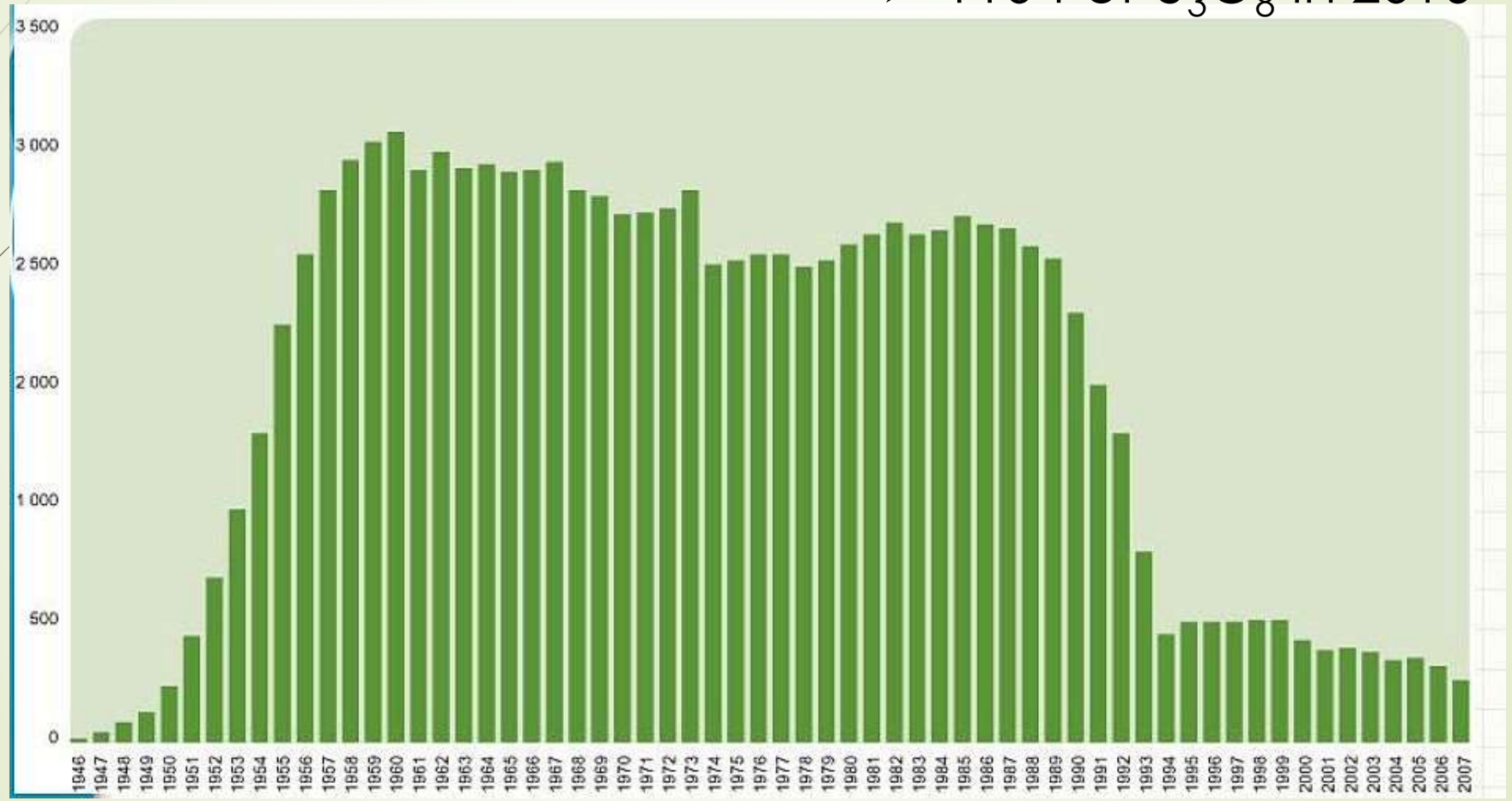
IN 2014:
193 t/year

= 0,35 %
(the mine ROŽNÁ)

Source:
World Nuclear Association

URANIUM PRODUCTION 1946 - 2007

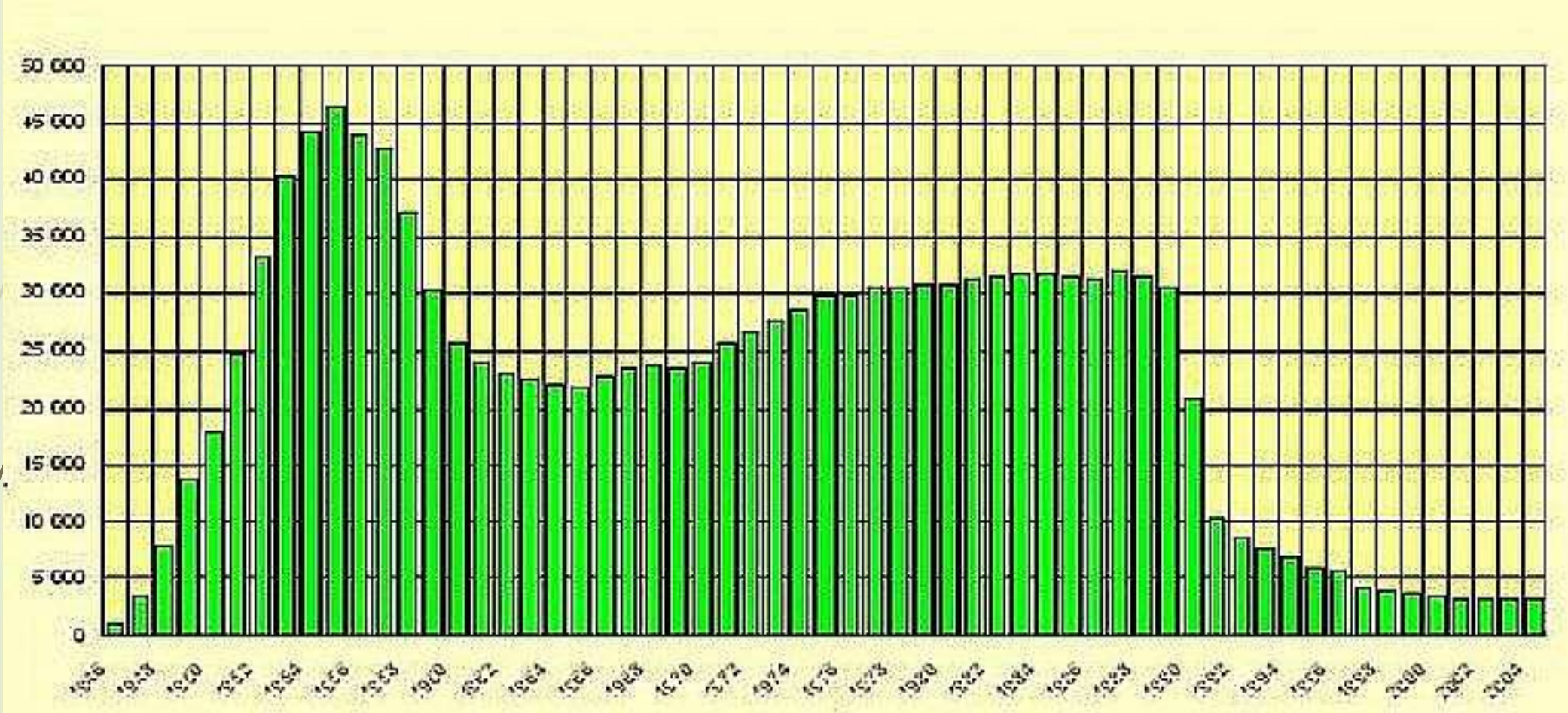
- cca 112 thousand t of U_3O_8 produced till 2016
  - 110 t of U_3O_8 in 2016



Source: DIAMO

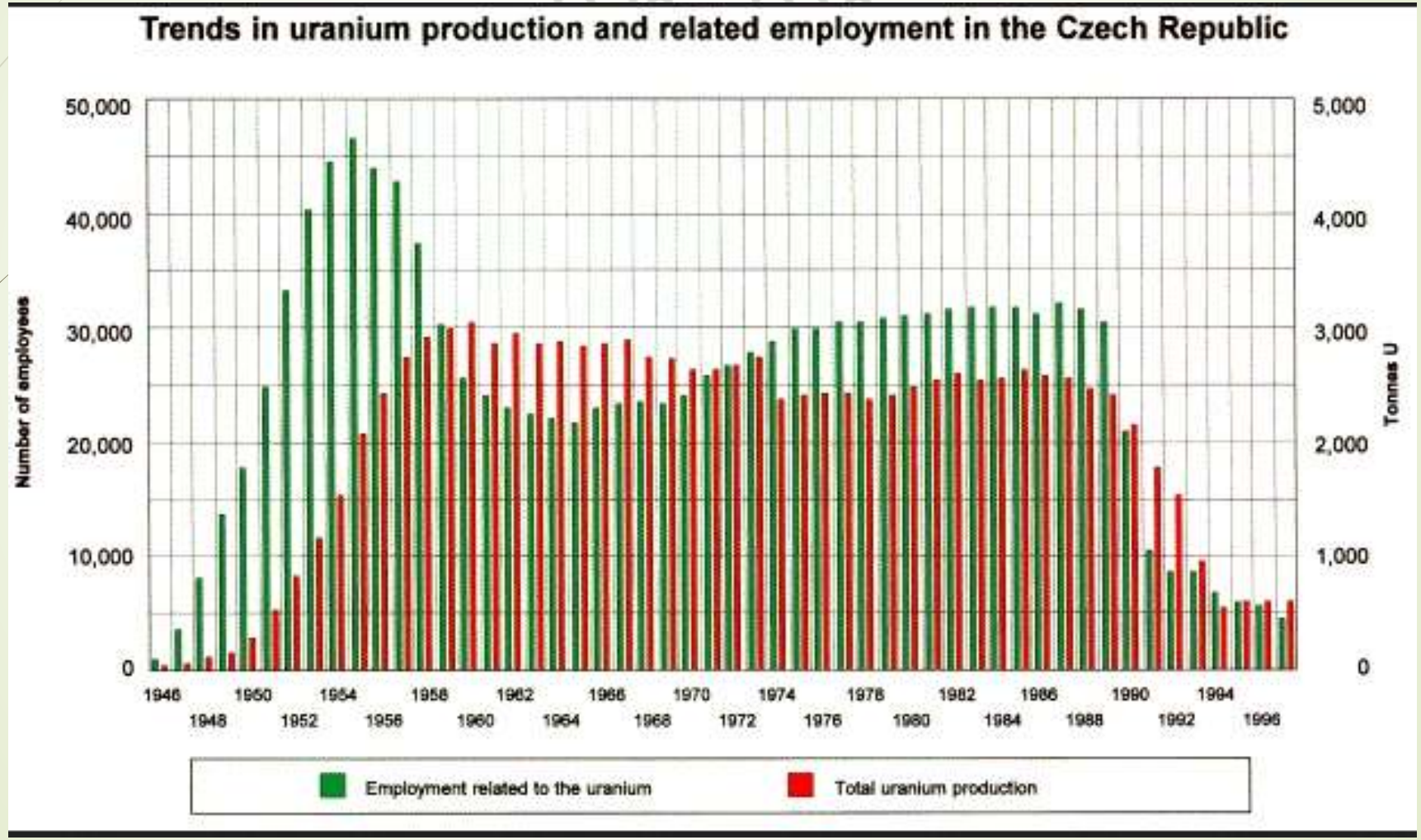
THE URANIUM INDUSTRY EMPLOYMENT 1946-2004

- Max. 46,351 employees in 1955, about 3,300 employees per year after 2004



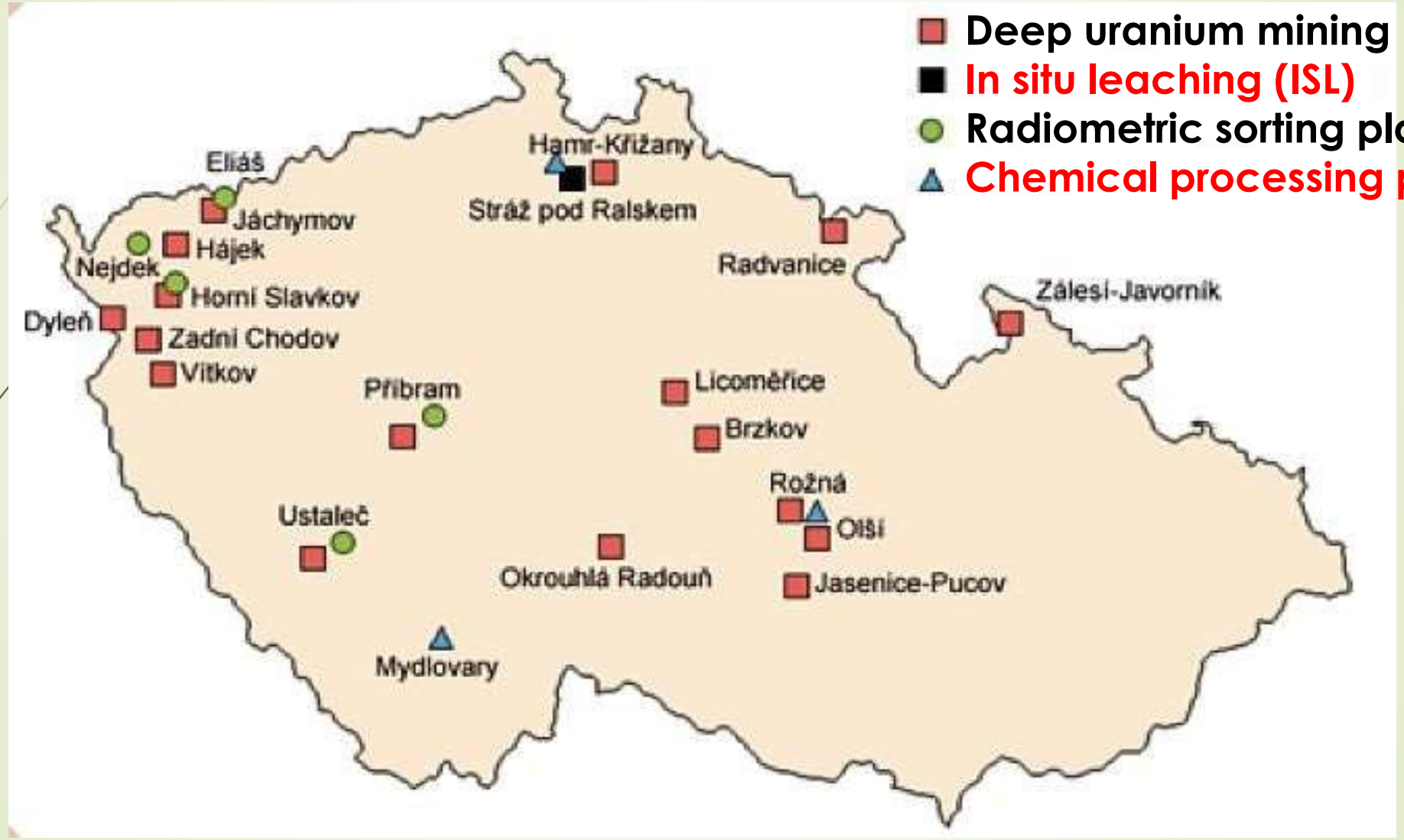
Source: Proatom, 2006

THE EMPLOYMENT & URANIUM PRODUCTION 1946 - 1996



Source: lc.century.cz

ALL URANIUM MINING SITES



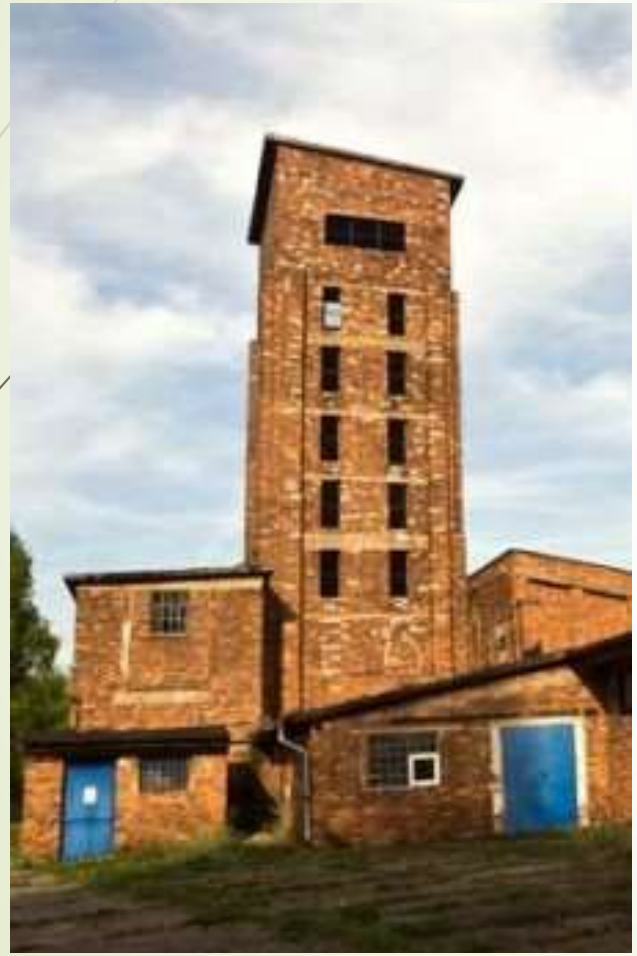
Map: DIAMO

JÁCHYMOV 1948 -1962

- **Jáchymov mines** - cca **7,000 t of U** extracted
  - Liquidation of mines after 1964 and 2009
- **tailings ponds** Eliáš + Nejdek (surface and groundwater contamination)
- **radiometric sorting plant of U ore** (from Jáchymov, Horní Slavkov, Zadní Chodov and Příbram mines)
- **Interesting facts:**
  - The "Death Tower" - **political prisoners** dying of radiation disease in 1950s
  - The **first Soviet atomic bomb** made from the Jáchymov uranium
  - 1906 - the **first radon spa** in the world (still in operation nowadays)
  - 1898 - the discovery of radium by **Marie Sklodowska Curie** in Jáchymov
  - since **1516** - uranium mining as a by-product of **silver ore mining**

Source: DIAMO & Hornictvi.info

JÁCHYMOV 1948 -1962



Left: **The "Death Tower"**. Right**: Deep Uranium Mine Svornost** | Foto: © Václav Vašků

PŘÍBRAM 1950-1991

- **Příbram mines** of **57.6 km2**
- **48,432 t of U** processed at
  - physical processing plant in **Bytíz** from **1958**
  - chemical treatment plant in **MAPE Mydlovary** from **1962**
- **tailings ponds** in Bytíz – clean-ups after **1993** (Tomas, 2001)
- **large waste rock piles**
- **Interesting facts:**
  - **political prisoners** in a labour camp Tábor Vojna
  - still cca **13 mil t of waste rocks** with cca **700 t of U** in it in **2015** (iDnes, 2015)

Source: DIAMO

PŘÍBRAM 1950-1991

Left: **Waste Rock Piles**. Right: **Labour Camp Tábor Vojna with a former prisoner** | Foto: © Václav Vašků

MAPE MYDLOVARY 1962-1991

- **Chemical treatment plant**
  - processed **17 mil t of U** (from 5 sites: Zadní Chodov, Okrouhlá Radouň, Příbram, Dolní Rožínka, Stráž pod Ralskem)
  - **1979-1983** processed over **700 thousand t of U/year**
  - produced **28,000 t of U_3O_8**
  - Tailings ponds - **36 mil m³** of radioactive sludge (24 sludge/17 water) on **286 ha**

Source: Švehla, 2008

- **Interesting facts** (Source: **Vacek** - MAPE Mydlovary, 2015)**:**
  - 6 decontamination stations filter **20-50 thousand m³** of water from tailings ponds **per year**
  - Cca **150 ha** still need to be recultivated **by cca 2024**
  - Costs of recultivation: **120 mil CZK = 4.4 mil EUR in 2015**

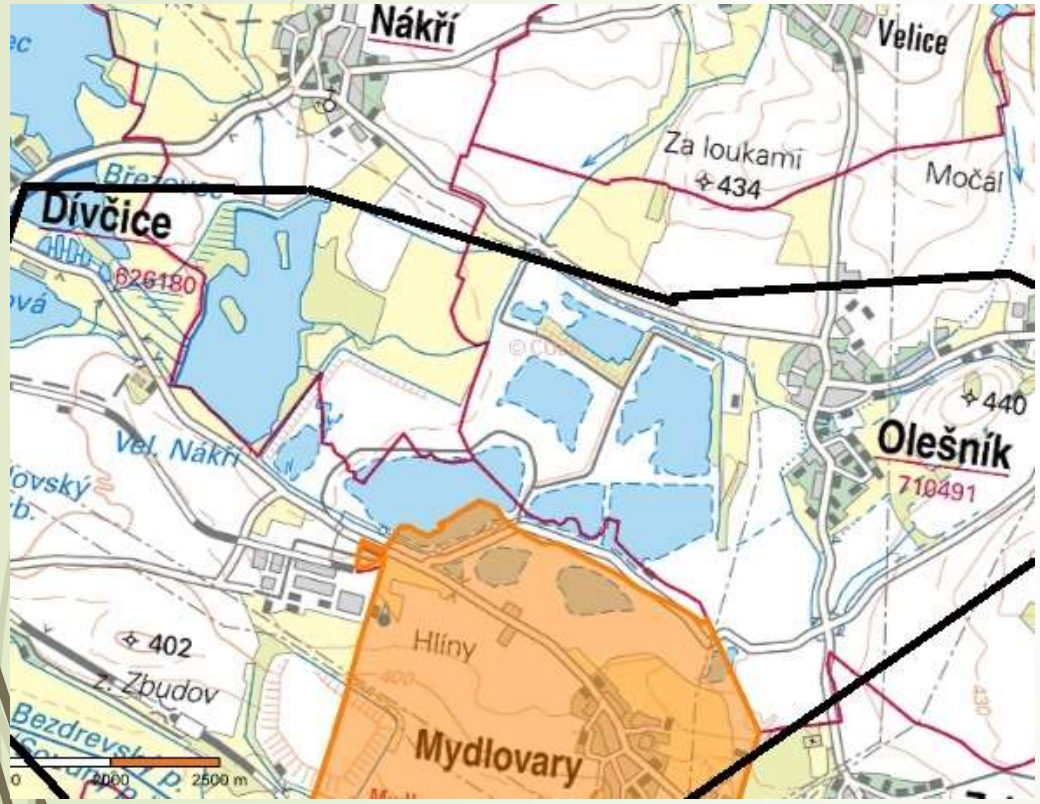
➨ **TOTAL REMEDIATION COSTS BY 2024:**
2-4 bill CZK = 74 -148 mil EUR

MAPE MYDLOVARY

Source: Calla's archive

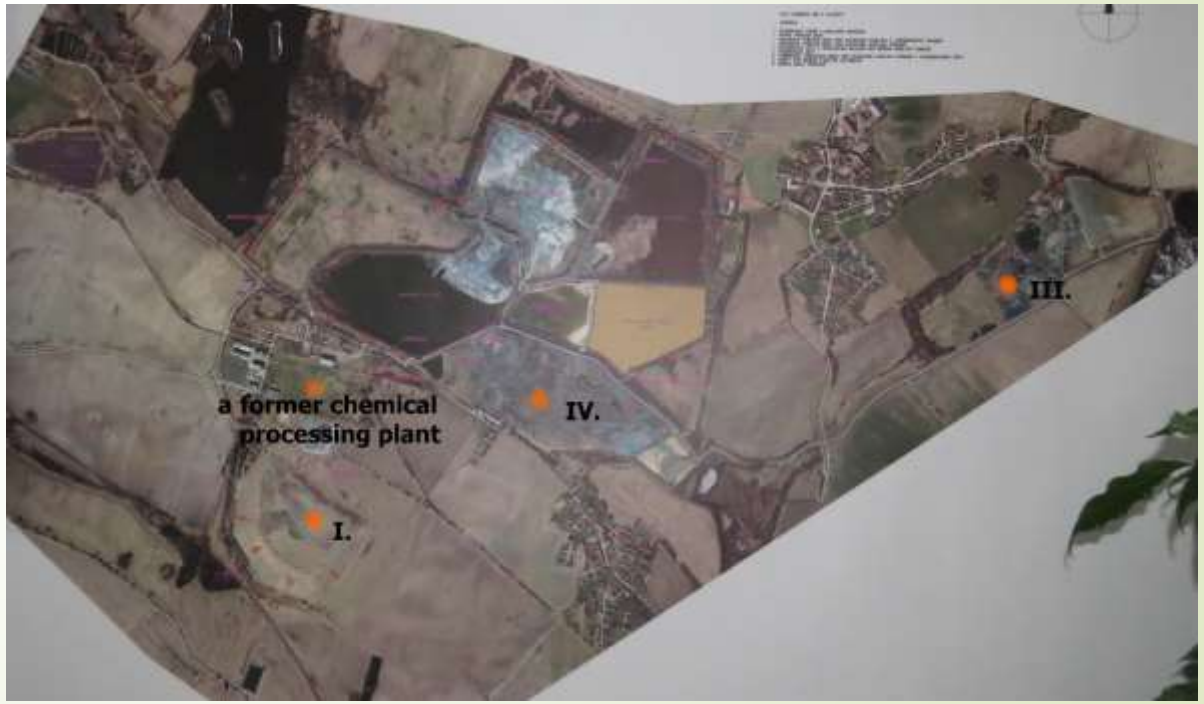
Up: **Ongoing recultivation of tailings pond III. in 2015 (31 ha; ash, tires, municipal waste, clay, compost, grass**).
Down: **Recultivated tailings pond I. in 2015 (25 ha, 25 m high, cca 100 monitoring drill holes** | Foto: © Olga Kališová

MAPE MYDLOVARY 1990 vs. 2015



Source: VDP CÚZK, 1990

MAPE Mydlovary, 2015 | Foto: © Olga Kališová



STRÁŽ POD RALSKEM 1966-1996

- **Deep uranium mining** in Hamr pod Ralskem (1972-1993)
  - Cca **13,000 t of U**
  - Complete liquidation of the mine in **2015**

- **IN SITU LEACHING (ISL) !** – chemical uranium mining
  - 1966 – 1996
  - 15,000 t of U >> **30,000 t of U_3O_8**
  - Chemical processing plant in liquidation

Source: Mužák – DIAMO, 2008

STRÁŽ POD RALSKEM 1966-1996

DRINKING WATER SOURCE

- chalk deposits from Turon (a geological level of the Upper Cretaceous 93 - 89 Ma before present)

BARRIER LAYER

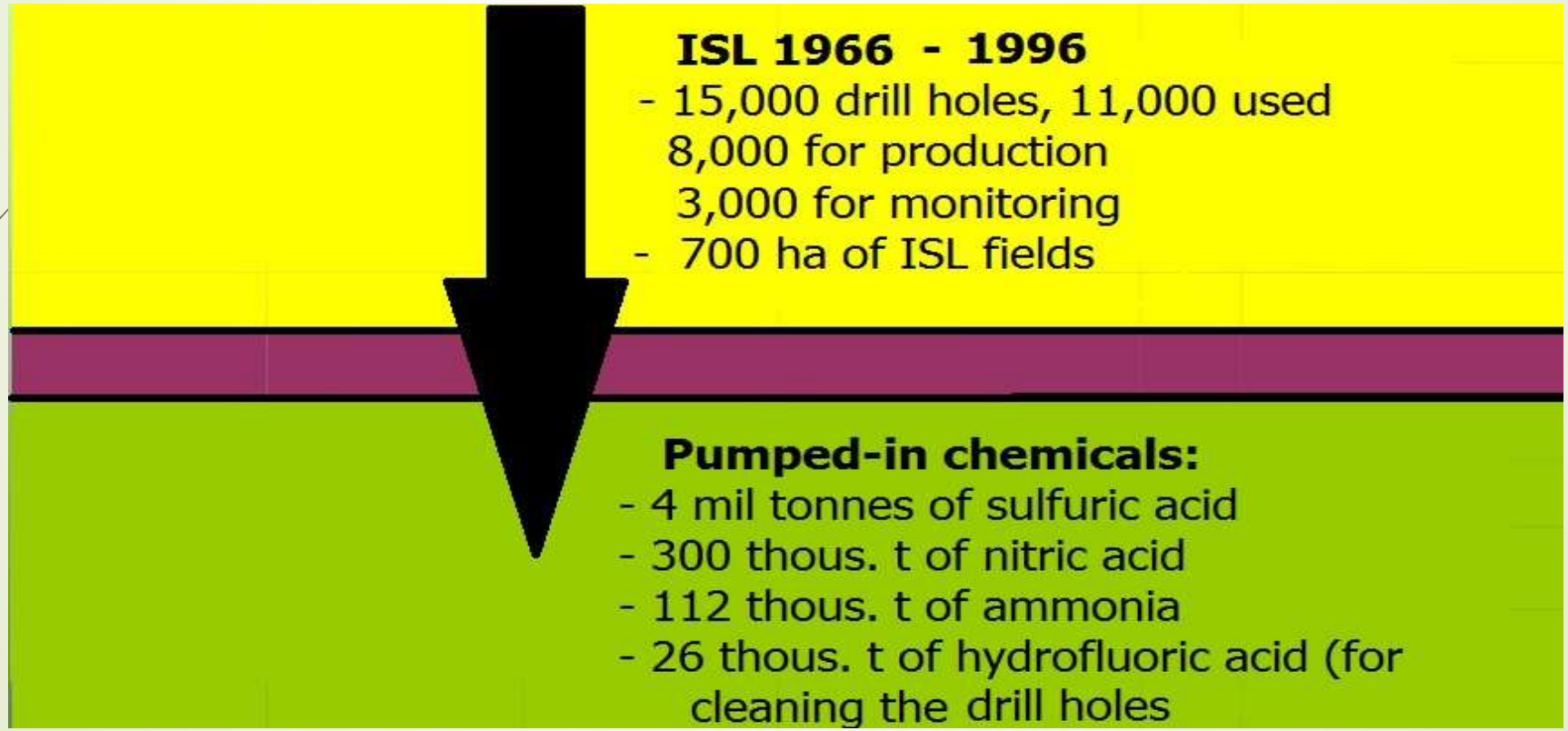
URANIUM MINERALIZATION

- chalk deposits from Cenoman (the early Late Cretaceous 99 - 93 Ma before present)

Naše Podještědí NGO, 2015

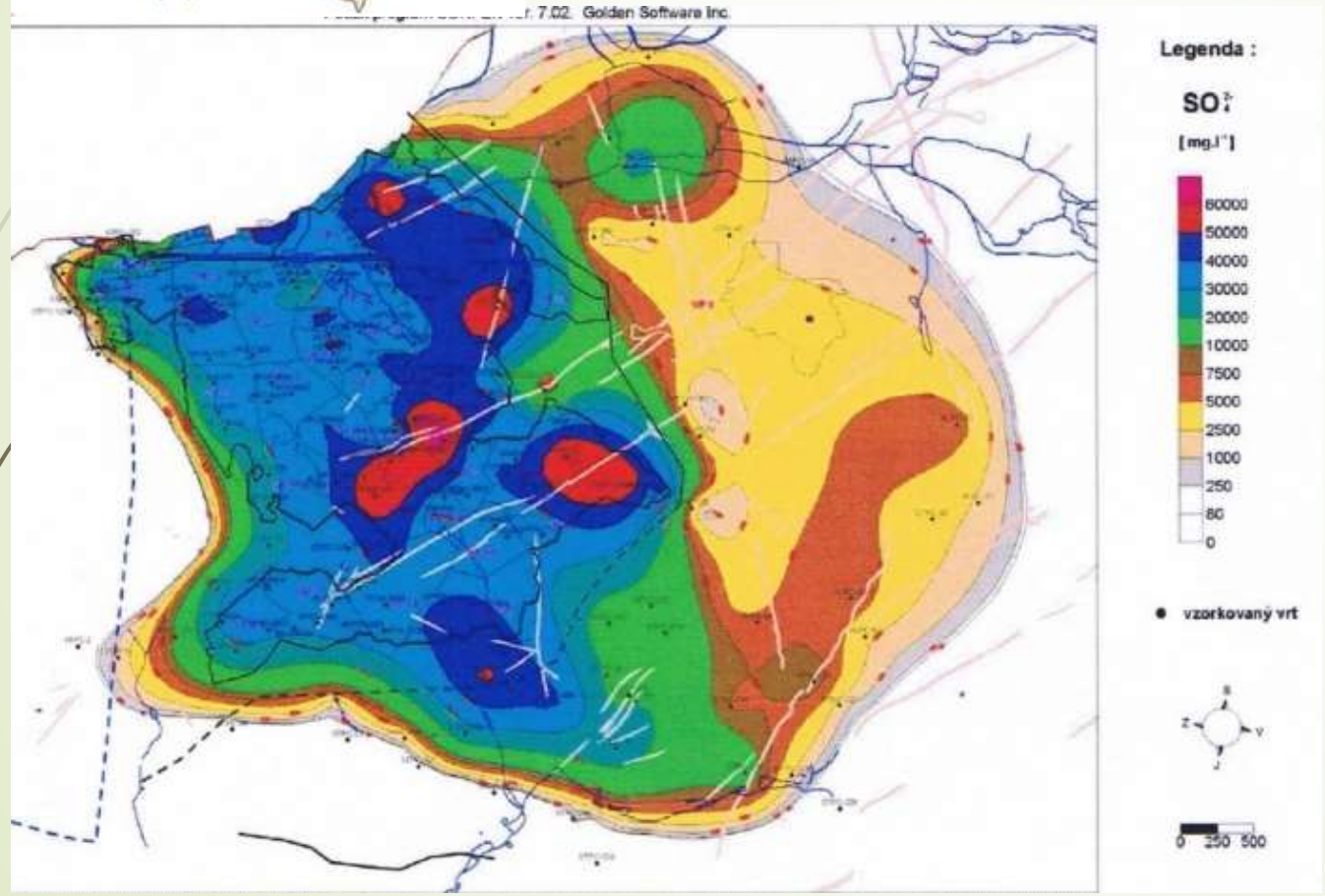
STRÁŽ POD RALSKEM 1966-1996

370 mil m³ groundwater contaminated in 2009 by 5 mil contaminants (mainly sulphuric acid)
//compared with 193 mil m³ in 1994//



Source: Mužák – DIAMO, 2008 & Naše Podještědí NGO, 2015

STRÁŽ POD RALSKEM 1966-1996

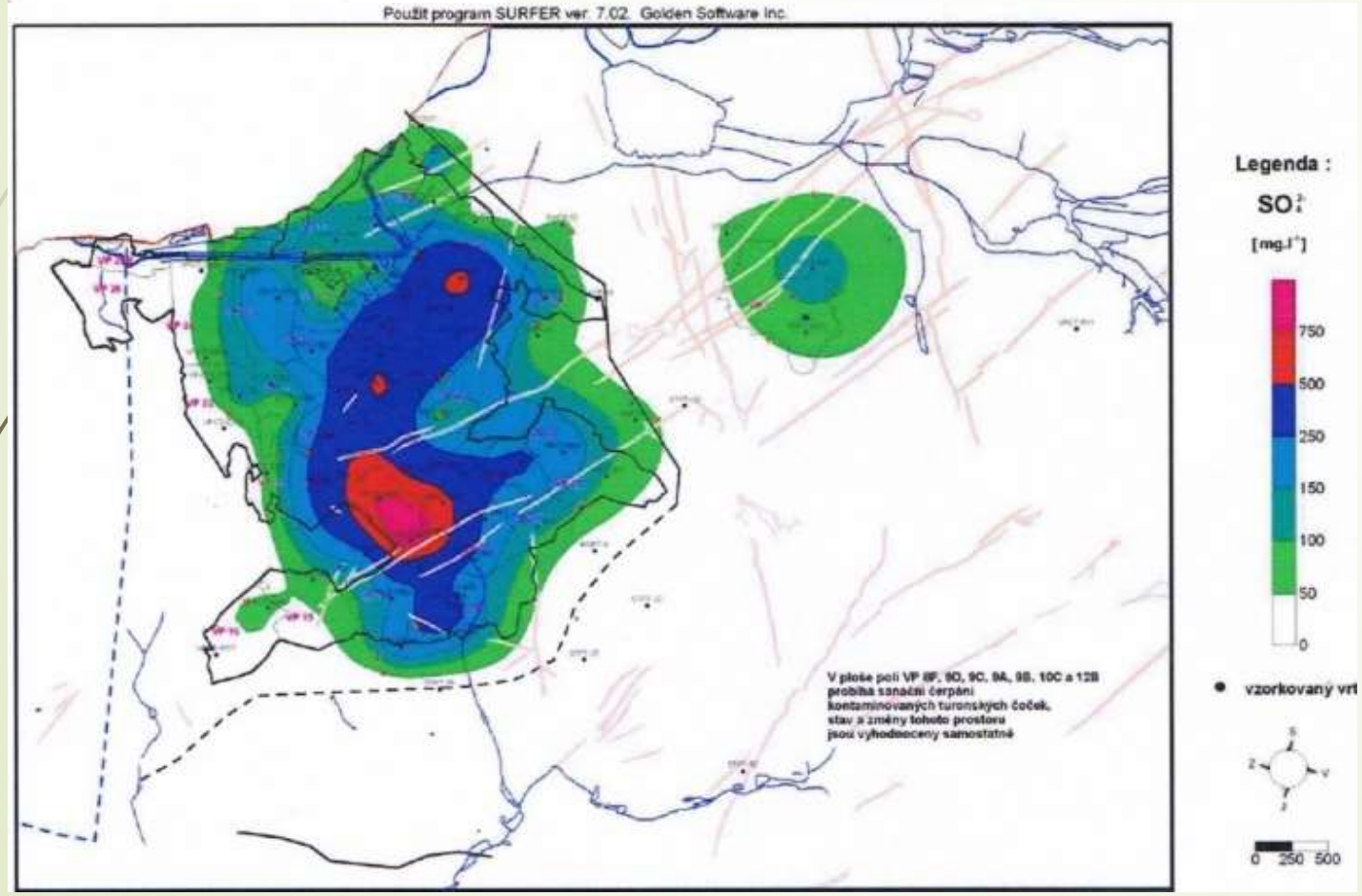


Source: Naše Podještědí NGO, 2015

CONTAMINATED CENOMANIAN AQUIFER by SULPHURIC ACID in 2006

(the lower green layer with uranium mineralization)

STRÁŽ POD RALSKEM 1966-1996



Source: Naše Podještědí NGO, 2015

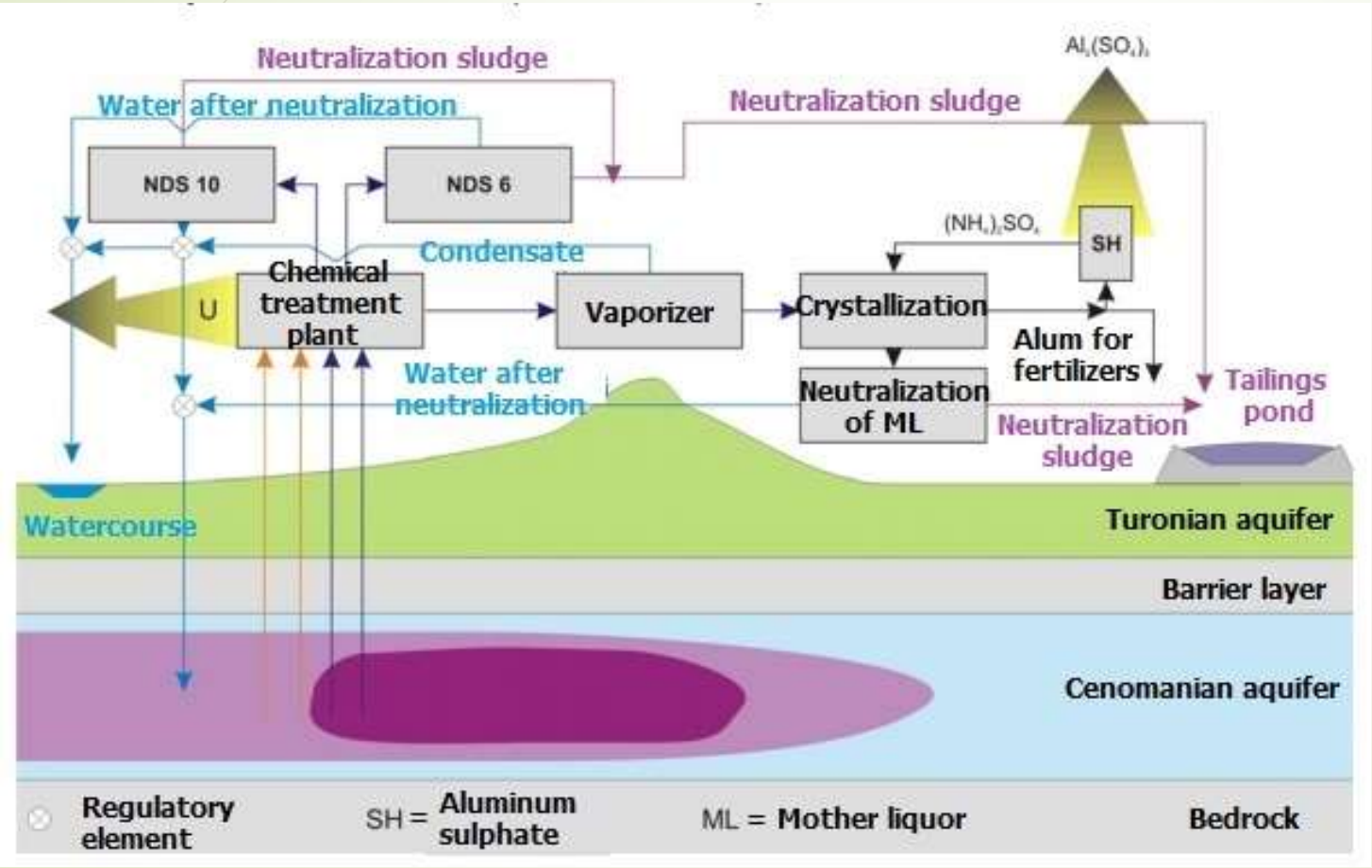
CONTAMINATED TURONIAN AQUIFER with SULPHURIC ACID in 2006

(the upper yellow layer with drinking water)

STRÁŽ POD RALSKEM

NEUTRALISATION DECONTAMINATION STATION (NDS)

after 2013



NDS 2006-2014:
over 700,000 t of contaminants processed

NDS till 2037:
- processing
80,000 -160,000 t contaminants/year

Source: Mužák – DIAMO, 2008

STRÁŽ POD RALSKEM / IN-SITU LEACHING SCHEDULE AND COSTS OF CLEAN-UPS AND REMEDIATION

- **PLANNED SCHEDULE FOR FINISHING THE CLEAN-UPS :**
  - Turonian aquifer – 2017
  - Cenomanian aquifer – 2037
- **TARGET = 7 g** of contaminants **per litre**
- **PLANNED SCHEDULE FOR FINISHING THE REMEDIATION:**
  - 2042
- **COSTS SO FAR**
  - **1996-2015: cca 20 bill CZK = 740 mil EUR**
  - **2012-2042: cca 31 bill CZK = 1 bill EUR**

Stráž pod Ralskem |
Foto: © Václav Vašků

Source: DIAMO, 2012

STRÁŽ POD RALSKEM – MINE HAMR I.

Left: **A view from the top of NDS at the tailings pond (100 ha) where the radioactive waste from the mine Hamr I. will be disposed of (cca 7 mil m³) until 2023.** | Foto: © Olga Kališová, 2015
Right**: The Hamr I. mine – now liquidated (COSTS OF 619 mil CZK = 22 mil EUR)** | Foto: © Václav Vašků

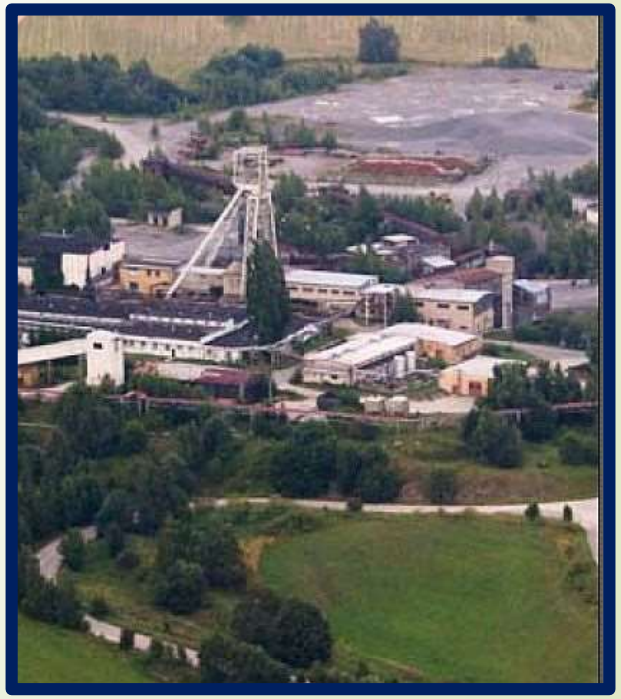
DOLNÍ ROŽÍNKA 1958 – 2017

- Deep uranium mining in **Rožná**: cca **18,500 t of U** extracted before 2007, max. **200 t/year** since 2007
- Chemical treatment plant since 1968
- tailings ponds K1 and K2 with cca **10 mil m³** of sludge on **90 ha**

Source: DIAMO & Faces of Uranium, 2009

MINING AT ROŽNÁ SHOULD FINISH IN 2017

Source: Ministry of Industry and Trade



The Mine Rožná | Foto: © Václav Vašků

DOLNÍ ROŽÍNKA 1958 – 2017

Chemical processing plant | Foto: © Olga Kališová, 2014

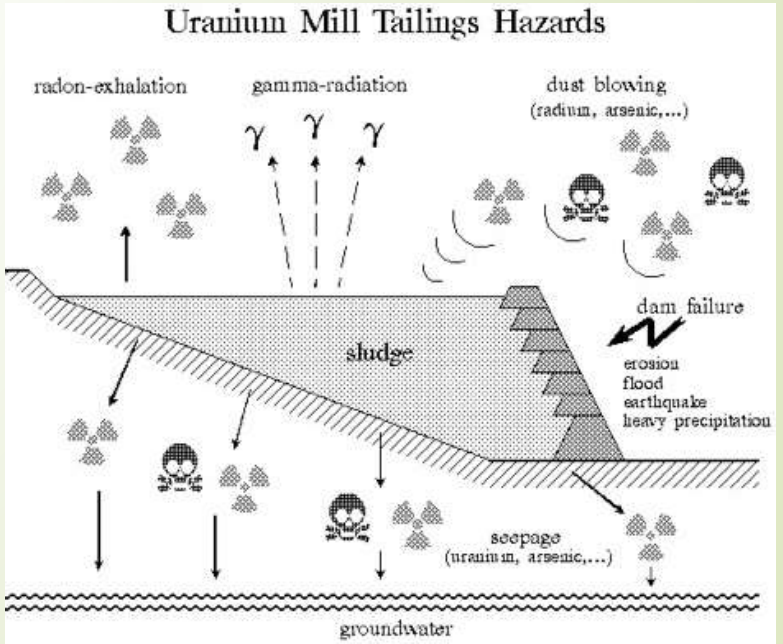
Tailings ponds K1 (up) and K2 (below) | Foto: © Václav Vašků

TAILINGS PONDS K1 & K2 IN DOLNÍ ROŽÍNKA

- DIAMO and the Ministry of Industry and Trade conceal the information regarding:

1. Identification and estimation of the significance of **impacts** of construction and operation **on population and the environment**
2. **Increasing the capacity** of tailings ponds **in connection with** possible new mining **in Brzkov**
3. **Slope stability** calculations

Source: Sequens, 2015

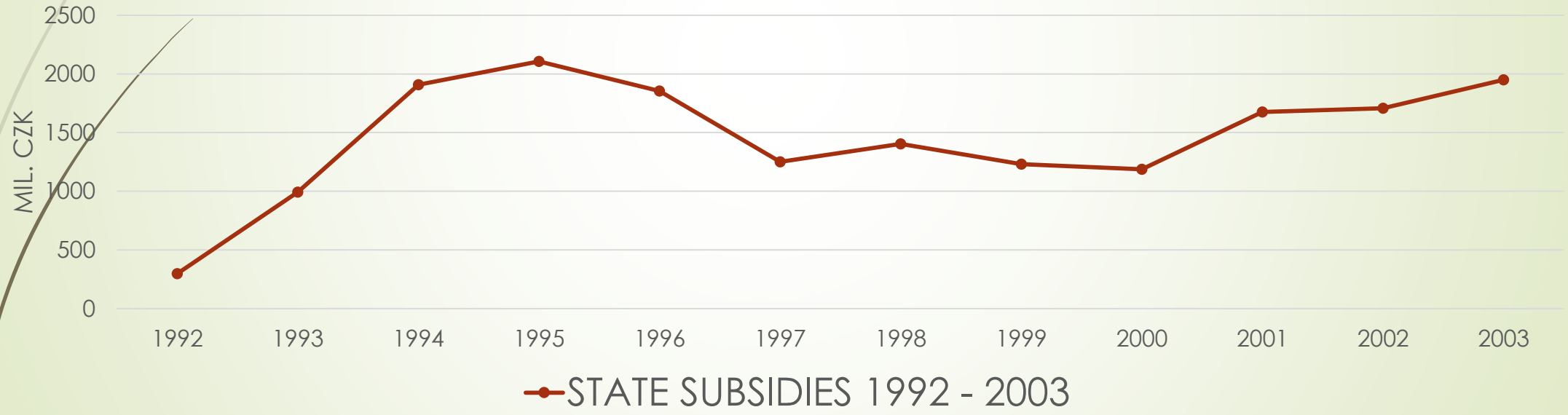


Source of image: Obscuredbyclouds.com.au

STATE SUBSIDIES – a PHASE-OUT PLAN & MANDATORY SOCIAL AND HEALTH COSTS

17.6 billion CZK (650 mil EUR) from 1992-2003

After 2004 no longer monitored how much subsidies for uranium mining (all industries (coal, ores, uranium) merged into one category "MINING IN TOTAL" !)



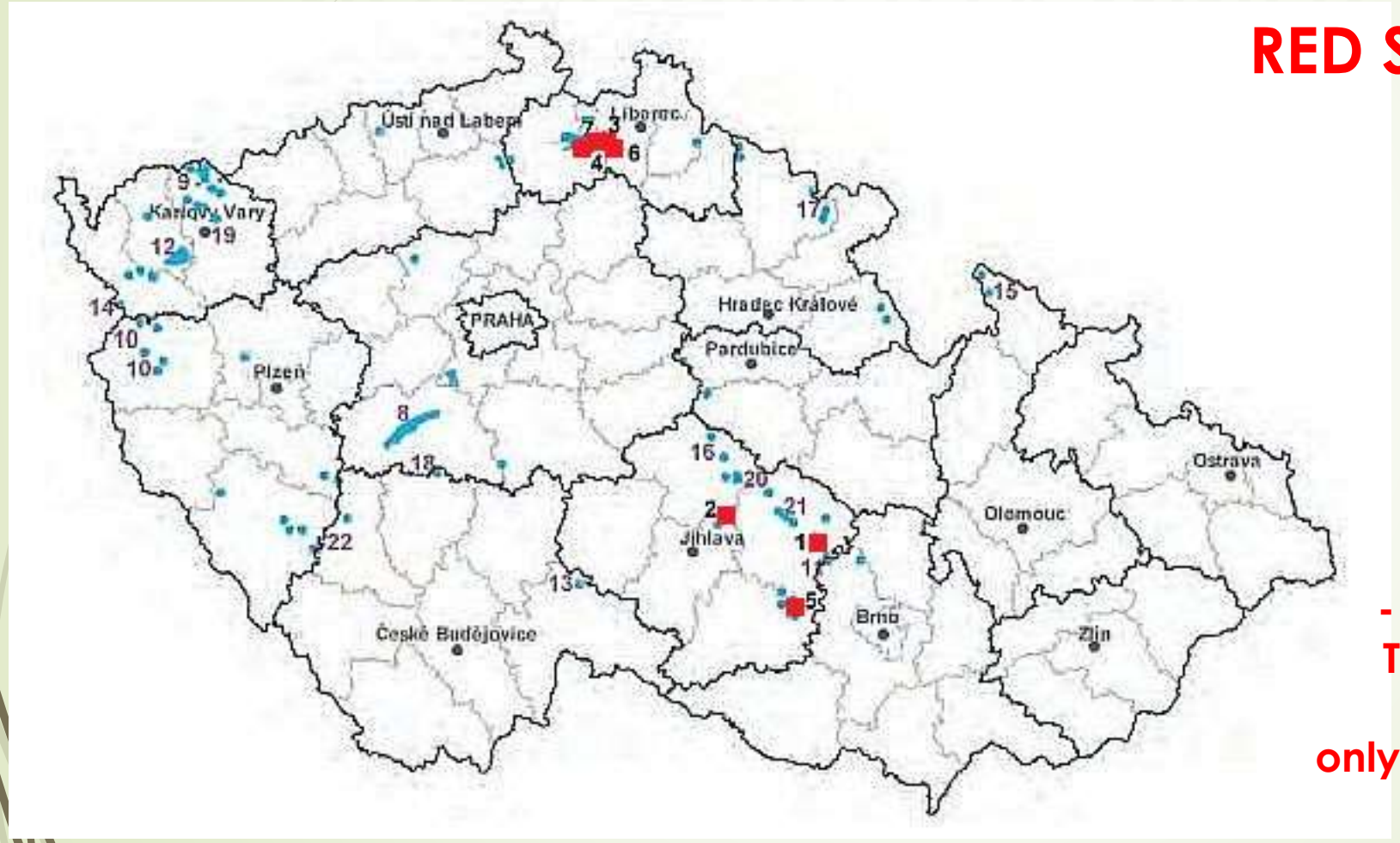
Source: Czech Geology Service pp.135, 2014

ENVIRONMENTAL IMPACT OF URANIUM MINING in 2015

	Volume in mil. m^3	Area in mil. m^2
Waste rock piles	**50**	**4.7**
Tailings ponds	**52.9**	**5.9**

Source: DIAMO – Table 6.1-2, 2015

NOT COMPLETELY MINED OUT YET…



RED SITES IN THE MAP:

Highlands:

1. Rožná
2. Brzkov
5. Jasenice-Pucov

Northern Bohemia:

3. Břevniště pod Ralskem
4. Hamr pod Ralskem
6. Osečná Kotel
7. Stráž pod Ralskem

- up to 112 thousand t of U.
The majority of the deposit possible to be mined only using ISL method again!!!

Source: Czech Geology Service, 2014

BRZKOV

- Government Resolution No. 1086 dated **December 22, 2014**: **to start preparations for a new uranium mining VS. THE RAW MATERIAL POLICY 1999**
- **a draft of new Policy dated Dec 2015 is pro-uranium mining**
  - **However, HAS NOT BEEN APPROVED YET !**
- **the deposit of Brzkov - Horní Věžnice**
  - exploration work carried out from **1976 to 1990**
  - experimental mining since **1984**
  - protected deposit area (**CHLÚ**) of **106.4 ha** declared in **1990**
  - the mine flooded and the pit backfilled in **2004**

Source: DIAMO a Ministry of Industry and Trade

The Brzkov deposit | Foto: © Olga Kališová, 2014

HOW MUCH OF URANIUM IN BRZKOV?

- **According to the optimal scenario of the "Assessment of the preparation for opening the deposit of Brzkov – Věžnice" by GEAM DIAMO dated July 2014:**
  - **4,440 t of extractable Uranium**
  - Max. 175 t of U to be mined per year

- **Dukovany & Temelín NPPs** need cca **600 t of U per year**
  - 4,440 t from the **Brzkov-Horní Věžnice** deposit **would cover only cca 7 years of both NPPs' operation**

THE ECONOMICS OF THE PROJECT?

- **Government's decision how to finance** the construction of the mine & reconstruction of the chemical treatment plant and tailings ponds in Dolní Rožínka **(ABOUT 3 bill CZK = 111 mil EUR)** should be taken **by January 2018 (possible mining after 2022)**

POSITIVE economy of the exploitation only **if 4,440 t of U** are extracted at the price **higher than USD 60/lb of U_3O_8**

If less than 4,440 t of U are extracted, the price **at least USD 90/lb of U_3O_8**

Source: ČSOB Advisory

Source: The Ux Consulting Company, LLC

THE EXAMPLES OF LOCALS' PROTESTS

Actions Against New Uranium Mining
| Foto: © Olga Kališová

THE EXTENSION OF THE PROTECTED DEPOSIT AREA (CHLÚ) IN BRZKOV-HORNÍ VĚŽNICE

- The extension of **CHLÚ** = **a step closer to the mining and the obstacle for the development of the municipality**
- the extension of CHLÚ should have been **finished by August 2015**, **but is not**
  - **4 municipalities (of Brzkov, Věžnice, Polná and Přibyslav) & 4 private landowners & Our Future Without Uranium NGO /all represented by the attorney Kliment/ highlighted the shortcomings of the DIAMO's procedure >>**
  - the **Ministry of the Environment** gave DIAMO the one-year **deadline** (by June 30, 2017) to obtain **the missing documents** in order to be able to apply for the extension of CHLÚ
  - More on **Brzkov**: www.nuclear-heritage.net

Source: Brzkov, August 30, 2016

THE REAL CAUSE BEHIND MINING 4,440 T OF U IN BRZKOV?

- **DIAMO** gaining time before getting at the uranium reserves near **Stráž pod Ralskem** – 8 deposits with up to 112 thousand t of U
- **Project TB010CBU002** commissioned by the Czech Technological Agency and conducted by MEGA Ltd. And Masaryk University in Brno from **2012 to 2014**: "**New technological possibilities of mining uranium deposits in the Czech Republic with respect to minimizing environmental impact and providing a legislative backup**"
  - it recommended the method of in-situ leaching (!)
  - the Government took the final report of the project into account on **Dec 22, 2014**

Source: Sequens, 2015

1. What is CALLA's vision for the year 2030 in relation to the uranium industry in the CZ?

- NO uranium mining
- Remediation works – not completed yet, but clearly earmarked financial resources reserved for them
- Civil society (CS) realizes that jobs can be created otherwise than by irreversible destruction of the environment & health
- NO expansion of two existing Nuclear Power Plants (NPPs) – their costly decommissioning instead
- **Transformation of the Czech energy sector towards Renewable Energy**

2. What kind of environmental challenges and which need for action do you see within the uranium industry in the CZ?

- **CHALLENGES:**
  - Remediation works must not be rushed, but must be dealt with diligently & with full attention and focus
  - Accessibility of impartial & unbiased information on the remediation process

- **NEED FOR ACTION:**
  - A vibrant & awakened civil society worldwide
  - International & local non-governmental (NGO) networking with policy makers
  - Financial & other support for NGO projects

3. Which political steps are necessary in your view, to make your vision real?

- The Czech Raw Material Policy: "no new uranium mining in the future"
- National Planning Policy Framework: remediation works with official deadlines for their implementation, including cost estimates
- Carbon tax & external costs & the whole nuclear cycle reflected truly in the cost of nuclear (& coal) power > renewables no longer need to be subsidized in order to be competitive on the market
- Electing policy makers with no short-term financial gains, but with long-term objectives of real energy autonomy and nature conservation - will lead a constructive dialogue with CS whom they will respect as their equal
  - Requires people (CS) who
    - understand interconnectedness and a causal relationship between their action
    - protect nature & their health
    - know the right tools to defend themselves against those who are still "OUT OF TUNE"

FACES OF URANIUM (2009)

- Photos by a photographer Václav Vašků
- Photo exhibitions co-organized by Calla since 2009
- Publication "Faces of Uranium" (photos with captions)

THE SITING PROCESS FOR A GEOLOGICAL DISPOSAL FACILITY FOR RADIOACTIVE WASTE AND SPENT FUEL SINCE 2001

CALLA's PRESS RELEASES in English

Radioactive Waste Repository Authority (RAWRA/SÚRAO) has selected **THE SEVEN SITES** for a GDF.

THE TWO SITES near the Dukovany and Temelín **NPPs** are also being considered.

RAWRA wants to select **the final site by 2025, however, is behind the schedule due to the public resistance etc.**

More on **"WE DO NOT WANT A GDF"** www.nechcemeuloziste.cz

CALLA'S ACTIVITIES RELATED TO URANIUM

- **Participation in administrative proceedings (**such as in relation to **a SEA on the Draft Raw Material Policy dated 2015** and **an EIA on uranium mining in Brzkov)**
- **Publication** of newsletters, articles, press releases, brochures regarding mining and its health effects
- **Networking** with & **consultation** addressed to people affected by uranium events
- **Participation** in & **co-organization** of public **debates** (such as in Brzkov or Bystřice nad Pernštejnem) and **seminars**
- Regular **updates of Calla.cz** focused on uranium situation in the Czech Republic, **Temelin.cz** and Facebook **Atomic State**
- Distribution of **up-to-date information** via "uran-l" email
- **Guided tours** for locals and international activists and journalists
- Co-organization of **photo exhibition** Faces of Uranium since 2009

Public debate about a nuclear fuel plant with Peter Diehl and Dalibor Stráský in Bystřice n. P. on Oct 1, 2014 | Foto: © Olga Kališová

THANK YOU FOR LISTENING

Calla – Association for Preservation of the Environment
Fráni Šrámka 35, 370 01 České Budějovice, Czech Republic
olga.kalisova@calla.cz, www.calla.cz
Mobile: +420 720 995 944 / Tel.: +420 384 971 930