Nuclear power has a bright outlook and information on uranium resources is our duty.

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- 1.Introduction: bright outlook, tough questions and challenges ahead …
- 2.Nuclear power scenarios and resulting uranium needs
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Forget the short term and focus on future

- Financial crisis => slowdown of major economies
  - Main current concern
  - Much of the public debates and political efforts
- Impact on the “Nuclear Renaissance”?
  - New nuclear power plants = large capital expenditures
  - Financial crisis = credit crunch!
  - World population growth unchanged
  - Higher level of "development“ quest from emerging economies
  - Climate change issues => CO2-constrained power sources.
- Might be just the opposite
  - Needs are still there, even if temporarily softened
  - Right timing to combine large infrastructure programs and prepare the future growth through productive investments.

Prospect for new nuclear: no way for slowdown

- China and India: the 2 most populated countries need all sources of energy, including nuclear at the scale of their population and are building their programs accordingly i.e. about + the EU or USA current by around 2030
- Large existing fleets of NPPs in developed countries must be replaced and increased to cover future needs in accordance with GHG emissions targets and in particular to supplement « alternative power sources » such as wind-mills or solar cells when there is no wind and/or no sun.
- Substantial power sources, must be added to address water desalination and electric cars needs
- New countries not yet equipped with NPPs are willing to access to this clean source of electricity

Even when anticipating licensing and construction time-span, thinking about fueling the fleet is an urgent matter

Tough Questions?

- **Old ones still often asked:**
  - Is there enough uranium resource to justify investing in new nuclear?
  - Won't it be better to wait for Gen4 reactors?
  - Why the uranium price is so high with so large cheap resources in the Red Book?
- **More recent ones starting to be more frequently asked:**
  - Why invest in nuclear as it will soon emit more CO2 than burning fossil fuels?
  - Why invest in nuclear as nuclear fuel production will soon consumes more energy than it yields?

We, U geologists and miners community, must answer these!

Challenges ahead

- Launching, financing, licensing, building new NPPs are challenging tasks for a number of reasons
- Launching, financing, licensing, building, starting new fuel cycle facilities and especially uranium mines are also very challenging in term of
  - Public acceptance
  - Financing capability
  - Skilled manpower
  - Timely Resources Development
  - …and
  - Volatile market situation & resulting unclear signals (more ST focused than LT driven?)

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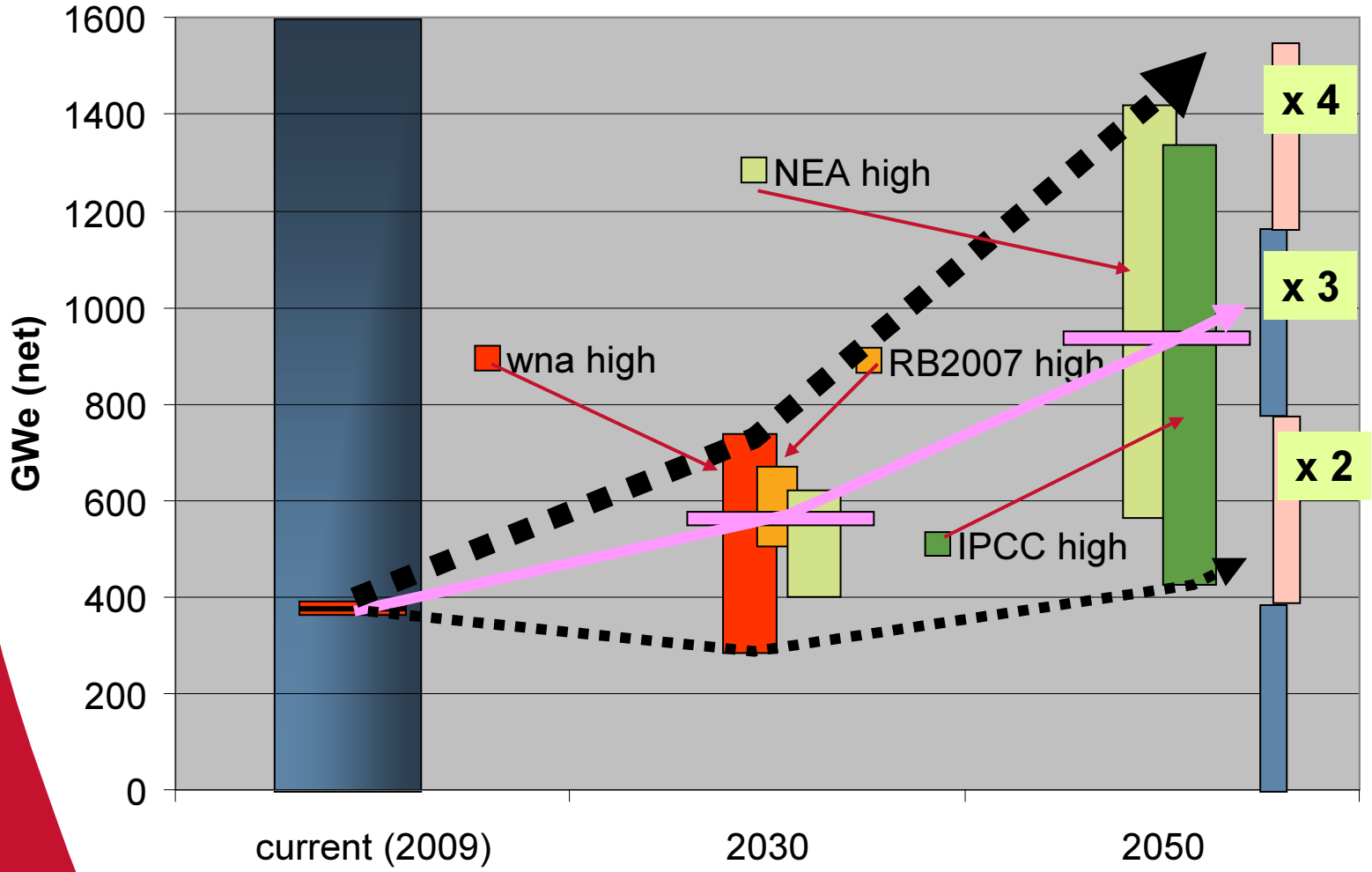
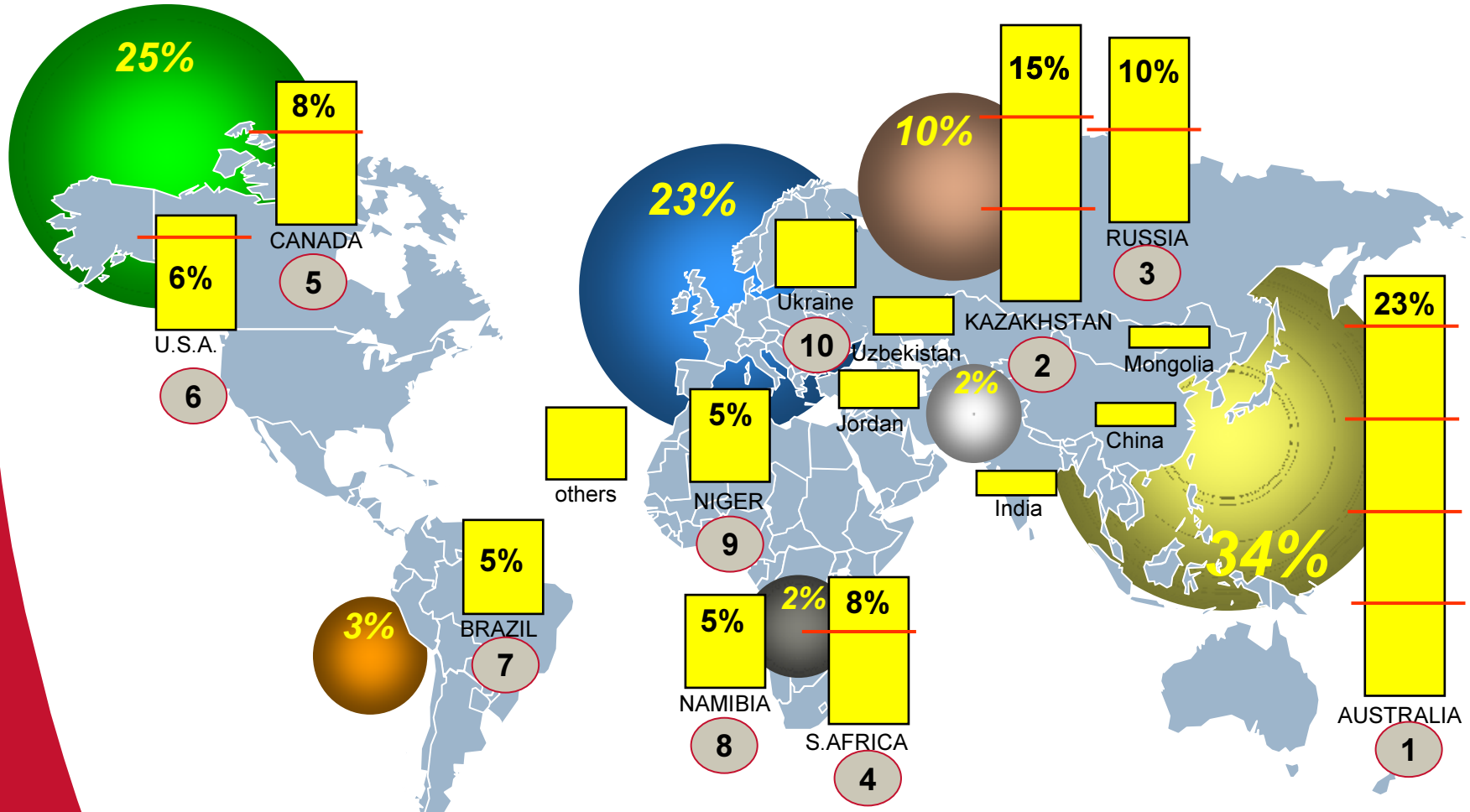
A bright outlook; Projected Nuclear Power

- **Upper scenarios: some are even higher for 2050**
  - **Doubling by 2030**
  - **More than tripling by 2050**



Geographical distribution of Identified uranium resources * & NPP fleet needs (2030**)

- **Top 10 countries (88%) + 5 next (96%)**



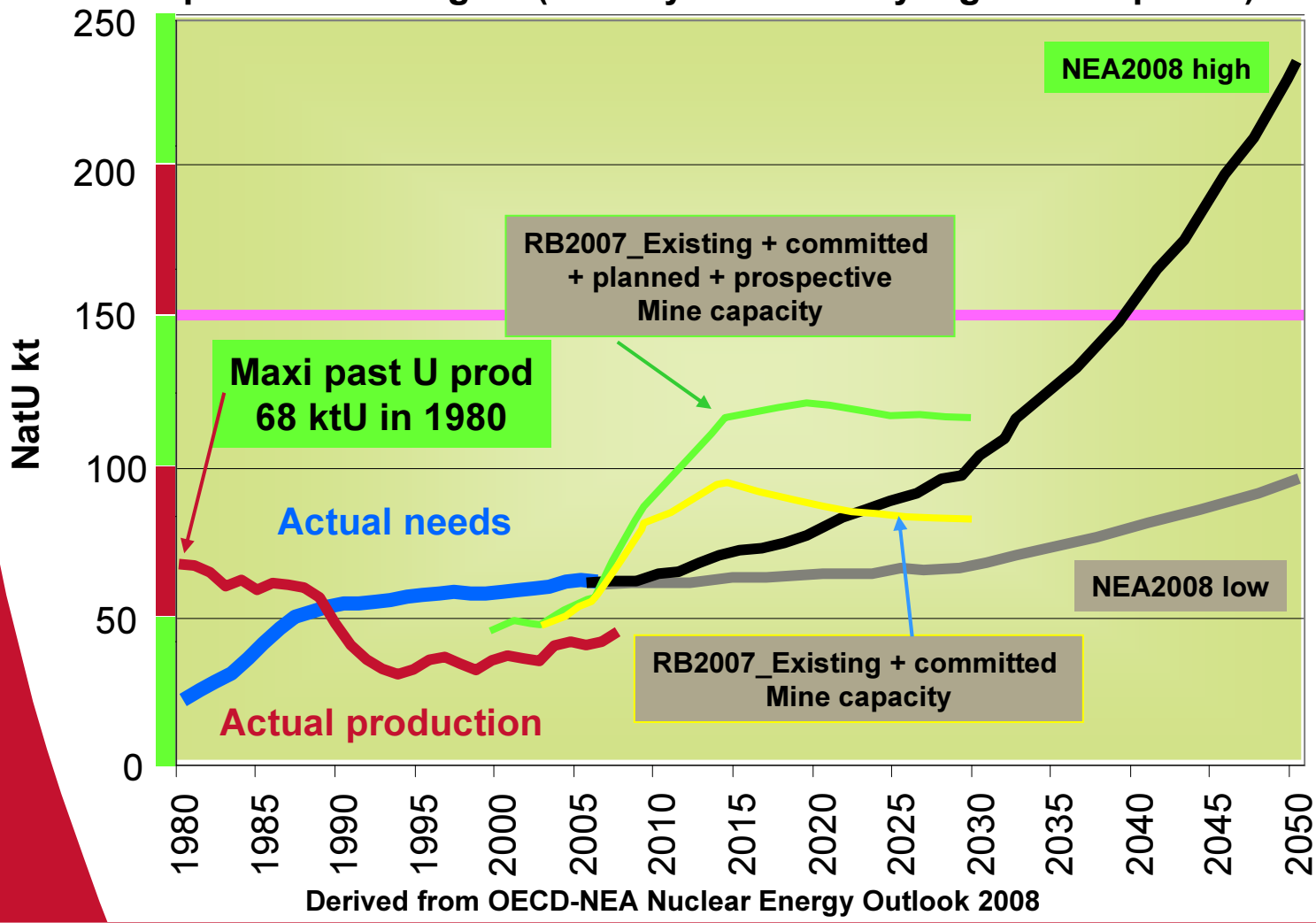
*** Id. Resources recoverable at less than 130$/kgU or 50 $/lbU3O8**

Total 5.47 MtU as of 1/01/07

Source OECD-NEA–IAEA « Red Book » & **WNA

Will it be – easy, possible, difficult – impossible to fuel the projected nuclear reactor fleet?

- **Say up to 150 ktU /y, the resources in the ground are there, the projects are identified… So, what is needed?**
- **Adequate market signal (durably "sufficiently high" NatU prices)!**



Derived from OECD-NEA Nuclear Energy Outlook 2008

Paradigm shifts for Nuclear Power & need for a greener and expandable nuclear fuel supply chain

- 1960's – 1970's: replace limited fossil fuel resources to massively produce electricity for a developing and growing world population (Atoms for Peace follow-up)
- 1980's- 1990's: under construction and existing NPPs must remain competitive against coal in an oil rich world showing less development than expected and more energy efficiency (the"Ice Age for Nuclear")
- 2000's: produce a "CO2 free electricity" and contribute to fight against Global Warming (the "Nuclear Renaissance")
- 2010's-2020's and beyond; become a massive & sustainable base-load power source as a "system" i.e entire fuel cycle included, combining
  - All conditions availability (no wind, no sun…)
  - Small GHG emissions
  - Limited environmental footprint
  - Limited and well mastered legacy
- What will be implemented now can be named the "Nuclear Modernity" – Uranium Mining must be part of it.

Uranium savings potential from technology improvements

- Savings from reactor evolution (current technology)
  - Large modern reactors will help saving uranium
    - Improved neutron balance
    - Improved thermal efficiency
    - Increased share for in core recycled products
  - Improved conversion factor…
- Savings from enrichment technologies
  - Lower tails assays
  - Stockpiled tails re-enrichment
- Savings from widespread SF recycling
  - Regional SF treatment platforms
  - MOX use where suitable
  - Will prepare infrastructures to FBR shift

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There's a long way from uranium on the map to uranium in the can!

- **In case of classic conventional ores**
  - **Exploration time span**
  - **Resource Development and Mining laws**
  - **Feasibility studies (pre- and full scope)**
  - **Public acceptance**
  - **Licensing**
  - **Taxation, royalties and other**
  - **Remediation cost, time frame and regulatory frame**
- **In case of less classic, very low grade and/or unconventional ores**
  - **Same as above, plus**
  - **Recovery techniques & rates issues**
  - **Environmental and lifecycle issues**
  - **Main, co or byproducts issues**

What we had in mind in the 1970's as « ultimate uranium ores » are maybe just not workable because of the shift to a more environmentally constrained industry

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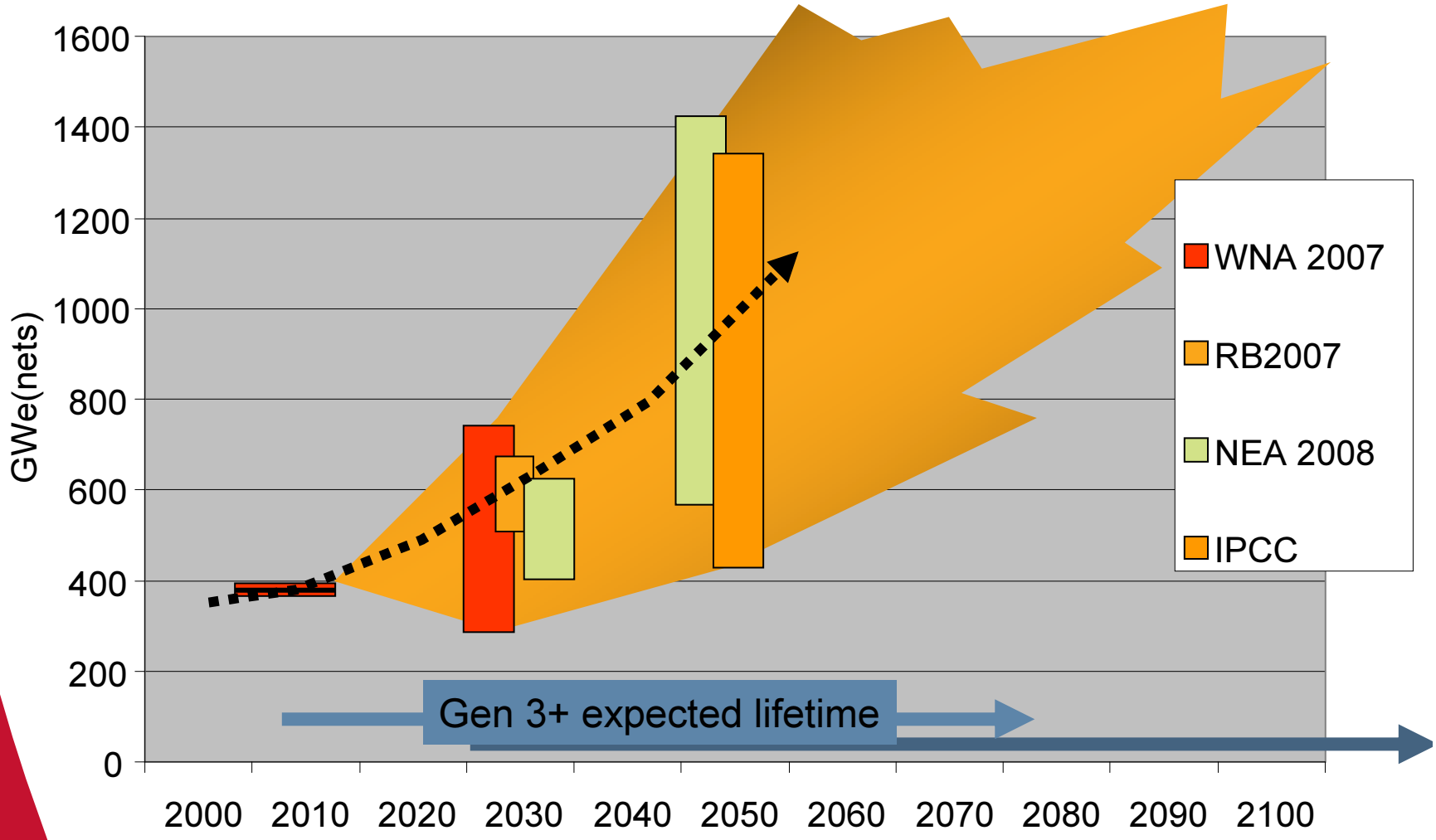
Projections for a sustainable nuclear fuel cycle

- **Gen3+ reactor put into operation now will operate until 2070-2090, thus the question of U supply until around 2100**



Sources: ref. (1), (2) and (3).

Conventional fissile resources represent more than 200 years of 2007 world demand

CATEGORY of Uranium resources (million tons = Mt)				
	Conventional			
	Identified (deposits)		Undiscovered	
Cost of recovery $/kgU	Reasonably Assured Resources	Inferred Resources ❶	Prognosticated Resources ❷	Speculative Resources ❸

❶ Based on direct geological evidence

❷ Based on indirect geological evidence

❸ Extrapolated values

Think LT: forget that!

Retain this!

Unconventional

7 to 22

General total conventional resources: **16,000 000 t**

World demand in 2007: **less than 70,000 t**

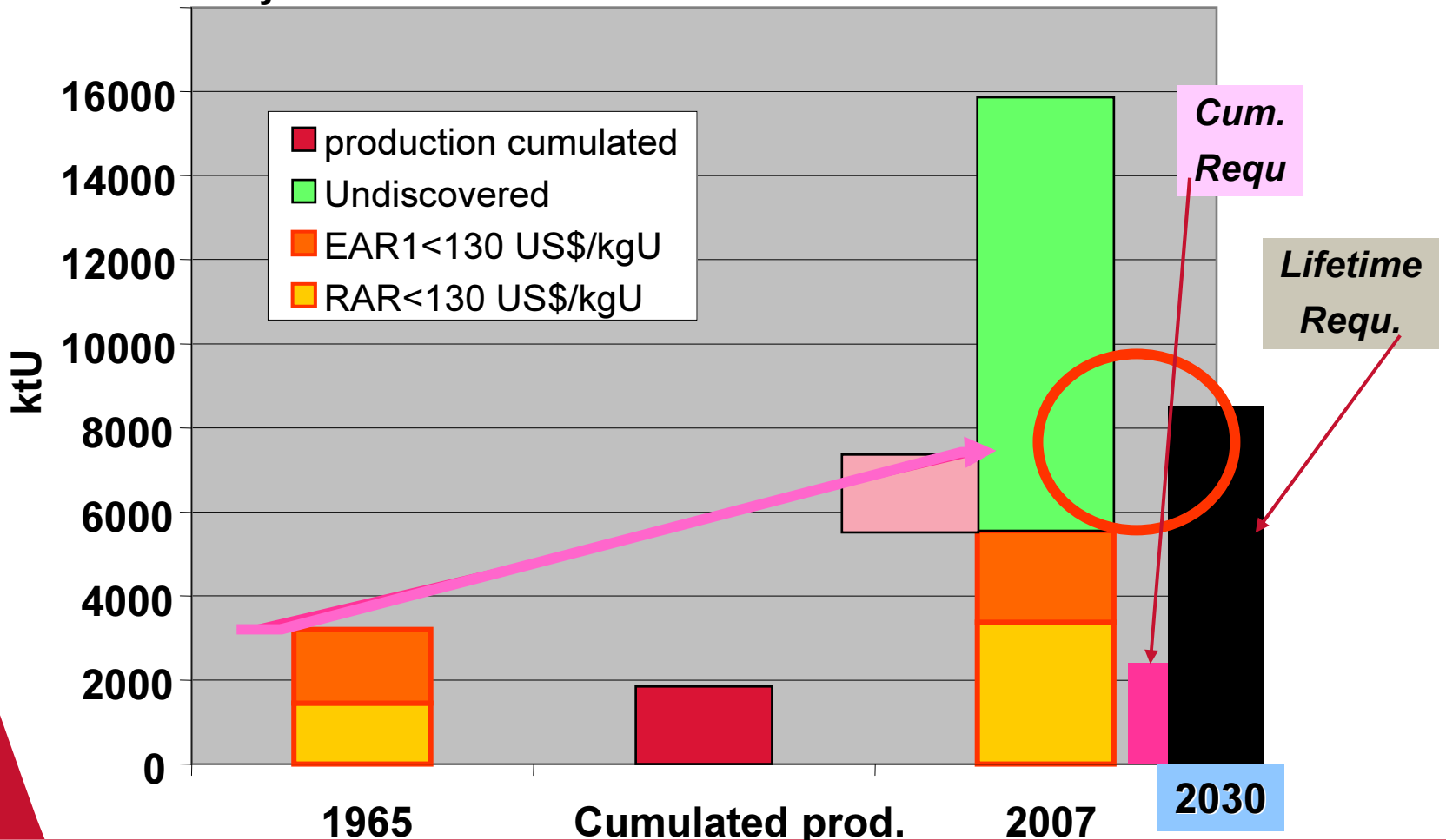
Resources: > 200 times 2007 demand

+ With Gen IV Fast Breeder Reactor, resources are virtually unlimited…

Source: OECD Nuclear Energy Agency & IAEA "Uranium 2007: Resources, Production and Demand"

Current Resources situation and future needs anticipation

- Far from being short of U at that date, by 2030 currently Identified Resources will not cover the lifetime requirements of a more than doubled fleet.
- Task for Uranium Exploration: discover at least 3 MtU before 2030; Duty for the RB: verify we are on track



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Conclusion

- With increasing needs for more uranium production, a continuously improved information is definitely needed.
- This information, mostly aimed at addressing LT views must consist in
  - Regularly updated identified resource data
  - Updated undiscovered resources evaluation
  - Broad information explaining U geology, mining and related economic issues to non-specialists
  - Synthesis on uranium mining potential environmental impacts, mitigation measures and monitoring
  - Update on “Social license to operate” and related implementations
  - Update on exploration, mining and use best pratices
- The Red-Book, a joint NEA-IAEA best seller and the associated products, is already fulfilling many of the above mentioned topics
- Being the sole source of global information on U resources and related subjects, the RB, the Scientific Secretaries and the Uranium Group duties are to provide the best available information as a communication tool shared between Industry, Governments and the Public

Don’t blame the « Red-Book »!

- This unique and sole source of information on world uranium resources
  - 1) can only bring what it is (was?) designed for
  - 2) can only report member countries input

Help improve its content!

The End