World uranium resources are ample to meet requirements for the foreseeable future but timely investment in facilities will be needed to make sure production keeps pace with growing demand, according to a new edition of the flagship Red Book.

Officially named Uranium 2011: Resources, production and demand, this is the 24th edition of a periodic assessment published by the OECD Nuclear Energy Agency (NEA) and the International Atomic Energy Agency (IAEA). Universally known as the Red Book, it is currently published every two years and draws together official data on uranium exploration, resources and production, and uranium demand related to its use in nuclear reactors. The new edition covers data to the end of 2010.

Total identified uranium resources have increased by over 12% since the last edition, which covered data up to 2009, although lower cost resources have decreased significantly because of increased mining costs. Nevertheless, with total identified resources standing at 7,096,600 tU recoverable at costs of up to $260 per kg, identified resources are sufficient for over 100 years of supply for the world's nuclear fleet. (An additional 124,100 tU of resources have been reported by companies but are not included in official national figures.) So-called undiscovered resources - resources expected to exist based on existing geological knowledge but requiring significant exploration to confirm and define them - currently stand at 10,400,500 tU.

The increase in the resource base is the result of concerted exploration and development efforts. Some $2 billion was spent on uranium exploration and mine development in 2010, a 22% increase on 2008 figures, with a focus on areas with the potential for hosting in-situ leach (ISL) recovery operations.

**ISL takes the lead**
The report confirms Kazakhstan's position as the world's leading uranium producer in a period when global production has increased by over 25% since 2008, standing at 54,670 tU in 2010. Two more countries have joined the list of those reporting uranium production figures since the previous Red Book: Malawi, which started uranium production in 2009, and Germany, where uranium production resumed through uranium recovery from mine remediation work.

Globally, ISL is now the dominant mining method, accounting for 39% of 2010 production thanks to significant ISL production increases in Kazakhstan. Underground mining's share stood at 32%, open pit mining 23% and co-product and by-product recovery from gold and copper mining operations making up 6%.

Meeting demand

440 commercial nuclear power reactors were in operation around the world at the end of 2010, representing 375 GWe of capacity and cumulatively requiring 63,875 tU per year. By 2035, the report found, this can be expected to grow to between 540 GWe of capacity requiring 97,645 tU and 746 GWe needing 136,385 tU. The scenarios take into account the effects of policies introduced by some countries following the March 2011 Fukushima accident.

Currently defined uranium resources are "more than adequate" to meet the high case demand to 2035, but not without "timely investments" in uranium production facilities, the report warns. "Significant investment and technical expertise will be required to bring these resources to the market and to identify additional resources. Sufficiently high uranium market prices will be needed to fund these activities, especially in light of the rising costs of production," it notes.

Secondary sources of uranium (stockpiles of natural and enriched uranium, downblended weapons-grade uranium, reprocessed used fuel and the re-enrichment of depleted uranium tails) will still continue to be required, although their role is expected to decline post-2013 when agreements between Russia and the USA to downblend ex-military highly enriched uranium for use in nuclear fuel expire.

"Regardless of the role that nuclear energy ultimately plays in meeting future electricity demand,
the uranium resource base... is more than adequate to meet projected requirements for the foreseeable future. The challenge is to continue developing environmentally sustainable mining operations to bring increasing quantities of uranium to the market in a timely fashion," the report concludes.