Q&A on Uranium

(1) Predictions that uranium might run out are similar to the predictions made by the Club of Rome in the 1970s aren't they and will turn out to be equally wrong?
http://www.world-nuclear.org/info/inf75.html

It is tempting the view the uranium resource figures provided by the nuclear industry as showing that the amounts of uranium available for generation of nuclear energy are practically limitless. From a geological point of view there are no reasons to dispute their accuracy. However, it is a misconception to believe that every uranium atom in the accessible earth's crust would be extractable from its host rock at no net energy cost. As the richer ores become exhausted and poorer and poorer ores are used, the continuing use of nuclear reactors will finally result in the production of more CO_2 than if fossil fuels were to be burned directly.The implications of this are that it is very unlikely that an energy gain can be obtained by mining the vast quantities of uranium in unconventional resources. The question is, not whether there is sufficient uranium available, but whether the uranium can be exploited without a large increase in carbon emissions from the nuclear life-cycle? [1]

(2) Most uranium comes from mines in Canada and Australia with ISO environmental certificates, so uranium mining isn't any more damaging to the environment than mining for other metals is it?
http://www.world-nuclear.org/info/inf25.html

Digging uranium out of the ground is an even messier business than mining other ores. Uranium ores have a uranium content of perhaps several percent down to as low as 0.1%. So large amounts of ore have to be mined to get at the uranium. [2] The wastes produced are a threat to health and the environment after closure of the mine due to their release of radon gas and the leaching of water containing radioactive and toxic materials. To keep groundwater out of the mine during operation, large amounts of contaminated water are pumped out and released to rivers and lakes. When the pumps are shut down after closure of the mine, there is a risk of groundwater contamination from the rising water level.

The new Beverley mine in South Australia, uses a process known as in situ leaching where acid is pumped underground to leach out the uranium, and then the uranium bearing acid is pumped back to the surface. [3] The small amount of uranium is separated at the surface. The liquid waste — which contains radioactive particles, heavy metals and acid — is simply dumped in groundwater. Inert and immobile in the ore body, the radionuclides and heavy metals are then bioavailable and mobile in the aquifer. There have been over 20 spills of radioactive solutions at Beverley. [4]

In 2005, Energy Resources of Australia (ERA), which operates the Ranger mine was prosecuted following a series of severe radiation safety failures. [5] Ranger has so far had more than 120 documented leaks, spills and licence breaches since the mine opened in 1981. The incidents have got more severe and more frequent as the infrastructure has aged. [6] The Olympic Dam mine in South Australia has extracted over 30 million litres of water from the Great Artesian Basin, adversely affecting the fragile ecology. [7]

Waste management standards at the two recently opened mines in Canada have been criticised. The Inter-Church Uranium Committee Educational Cooperative (ICUCEC) is concerned that uranium tailings at Areva's McClean Lake Mine will contaminate groundwater with toxic chemicals including arsenic, radium & heavy metals, and that Canadian laws are grossly inadequate to protect the health of people and the environment. [8] Cameco's McArthur River mine has also been criticised by the Canadian Nuclear Safety Commission for its handling in 2003 of a cave-in and flood of radioactive water. [9]

(3) The World Nuclear Association says Reasonably Assured Resources are sufficient to last us 70 years at current rates of consumption. This represents a higher level of assured resources than is normal for most minerals. Further exploration and higher prices will yield further resources. In fact

IAEA-NEA figures suggest all conventional resources would be enough to last us 200 years. This ignores unconventional resources such as phosphate deposits and seawater, which would be uneconomic to extract at the moment, but this could change. At ten times the current price, seawater might become a potential source of vast amounts of uranium. Doesn't sound like a resource that will run out soon, does it? http://www.world-nuclear.org/info/inf75.html

Reactors built today would be expected to operate for 60 years. Within the lifetime of these new reactors, sufficiently high-grade uranium resources could become severely depleted. The use of lower grade uranium would increase nuclear CO_2 emissions to the level of a gas-fired power station by 2070. If the use of nuclear power expands this could happen much earlier.

(4) By using fast reactors we could increase the utilisation of uranium sixty-fold or more. Doesn't this mean that we have enough conventional uranium to last 12,000 years?

We could attempt to use fast reactor technology to lengthen the life of world uranium resources. These reactors can theoretically convert the non-fissile portion of uranium (U-238) into fissile plutonium, and thus lengthen the 85-year life of conventional uranium resources to 2,500 years. [10] But this would involve returning to the separation and transport of weapons-useable plutonium from spent nuclear waste fuel with all the attendant security problems that would entail. The United Nations IPCC said the security threat of trying to tackle climate change with a global fast reactor programme "would be colossal" [11]

Fifty years of intensive research in seven countries (USA, UK, France, Germany, former USSR now Russia, Japan and India), with investments of many of tens of billions of dollars has so far have failed to demonstrate that fast reactor technology is technically feasible. Even if the technology were to start working flawlessly next year, the share of fast reactor power could only become significant by the end of this century. A recent Massachusetts Institute of Technology study concluded that fast reactors would not come into operation for at least thirty years. [12]

(5) Thorium is about three times more abundant than uranium. Couldn't we run our reactors on thorium? (Th-232 can capture a neutron in a reactor to become fissile uranium-233)
http://www.world-nuclear.org/info/inf75.html

The thorium breeder is based on the conversion by neutron capture of non-fissile thorium-232 into fissile uranium-233, by a similar system as the uranium-plutonium breeder. The feasibility of the thorium breeder is even more remote than that of the U-Pu breeder. Besides, only minute quantities of U233 exist in the world at this moment. It would take decades to obtain sufficient U233 from special reactors to start up the first operating Th232–U233 breeder system. It would take at least two centuries to attain a thorium breeder capacity equal to current nuclear capacity. [13]

(6) Unlike gas, uranium supplies come mostly from stable countries. Over half the world's production comes from mines in Australia and Canada. These are pretty secure sources aren't they?
http://www.world-nuclear.org/info/inf23.html

It is true, Australia and Canada are run by friendly democratic governments. However it is still by no means certain that there will be no future threats to supplies of uranium. In Australia only one new mine has opened in the past decade. The opposition Labor Party has a policy against opening any new mines and this has helped to stifle expansion. Labor currently holds power in all States and territories, so its policy is crucial. In Canada the province of British Columbia had a seven-year moratorium on exploration and mining in the 1980s.

Currently existing uranium production facilities are only satisfying around 80% of demand. The deficit is made up by stockpiles of weapons-grade uranium released from nuclear weapons stockpiles. In order to satisfy the demand that would accompany a large expansion in nuclear power there would have to be a significant effort to explore and develop new deposits. New uranium mines can take between 10 and 20 years to come on line. The IAEA has estimated that nearly 15% of uranium recoverable by 2050 might be at risk from environmental opposition – mainly in Australia and the United States. So there could be uranium production capacity problems if there is a rapid expansion of nuclear power. [14]

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[14] Smith B, Insurmountable Risks, IEER, 2006. Section A2.
http://www.no2nuclearpower.org.uk/reviews/index.php