Stable Isotopes For Nuclear Power: Lithium-7 (Li-7)

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Lithium-7 Background

Even though natural lithium is very abundant, pure separated Li-7 does not naturally occur.

- Natural Lithium: two isotopes, 92.5% **Li-7** and 7.5% Li-6.
- **Li-7** – civilian nuclear reactors, prevent corrosion and minimize **tritium** production.
- 17% of US electrical power comes from pressurized water nuclear reactors that require **Li-7** compounds.
- Currently there is no qualified replacement for **Li-7** for use in these nuclear reactors.
- Li-6 – nuclear weapons.

Lithium-7 Current and Future Supply

Future lithium-7 supplies are uncertain, and Russia could soon be the dominant (or only) exporter.

- **China and Russia** are the only suppliers of pure **Li-7**.
- Chinese and Russian production capacity and stockpiles are unknown.
- A shortage of **Li-7** could idle some pressurized water reactors in the US or elsewhere.
- The US no longer separates lithium, and residual US stocks of **Li-7** are only about 800kg.
- The main process using large amounts of mercury was banned by US law in 2008.

“Radioactive tritium leaks found at 48 US nuke sites….” (June 2011)

Tritium production at civilian nuclear power plants is a serious ongoing problem.

A shortage of Li-7 could force the US to choose between greater tritium production at aging civilian plants or idling those plants.

http://www.msnbc.msn.com/id/43475479/ns/us_news-environment/t/radioactive-tritium-leaks-found-us-nuke-sites/

Lithium-7 Current and Future Demand

Demand for Li-7 is rising and could accelerate dramatically in the next few years.

- US consumption ~175kg/yr. (World ~400kg/yr)
- Future demand for **lithium-7** is expected to rise dramatically due to rapid construction of new nuclear power plants primarily in China.
- Leading up to 2017 we may see a surge in demand as China also gathers **Li-7** for its first thorium **molten salt** reactor.
- Additionally, the US is considering a **molten salt** cooled advanced high temperature reactor that will require **Li-7.**
- **Molten salt** reactors will require **tons of Li-7** compared to current demand of 100's of kgs.

Lithium-7 Options

- Several alternative lithium separation approaches exist but have not been developed.
- Development of new lithium separation capacity outside the US would raise nuclear proliferation concerns due to coproduction of Li-6.
- The National Labs have the capability to test and evaluate the various alternative separation options relatively inexpensively and rapidly if asked.
- Due to small demand and the Li-6 coproduction issue, private industry is unlikely to develop a new process without a National Lab partner.