

Isotope Initiatives

Joe Glaser

Sixth Workshop on Isotope Federal Supply and Demand

November 15, 2018



Initiative Status

- Li-6/Li-7
- Heavy Water
- He-3

Li-6

Applications: Dosimetry, He-3 neutron detector alternative for Portal and possibly vehicle-mounted detectors, e-cars

- Recent upsurge in demand:
 - Recovered 180 kg in FY2017 which was quickly sold and an additional 150 kg in FY2018 processed
 - Processing an additional 150 kg in FY2019
- **Information on longer term need would help in our production planning**
- DHS has been actively pursuing He-3 alternatives for non-Portal detectors; are DOD and NNSA aware of the DHS effort (more information in the He-3 section)

Li-7

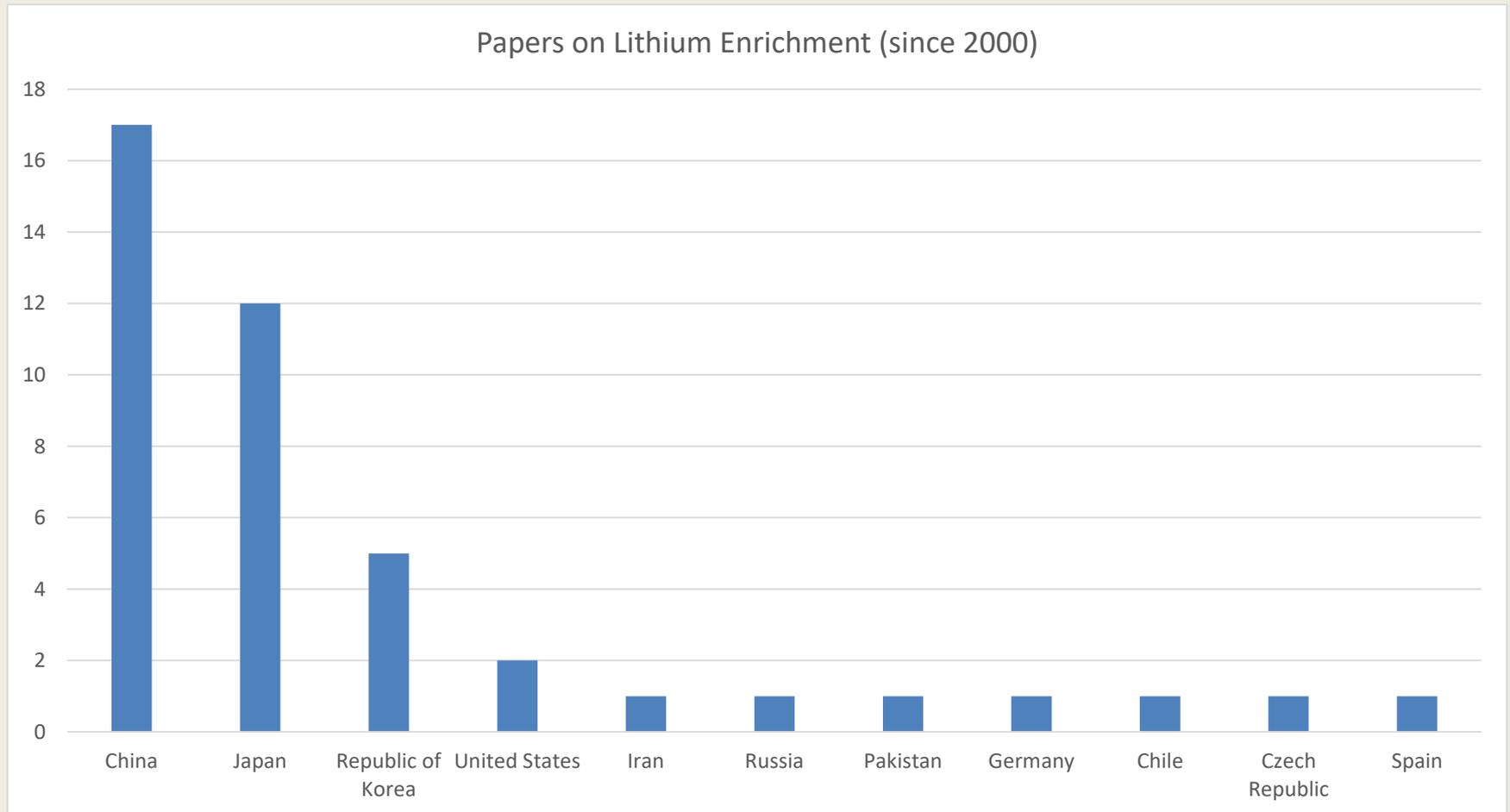
Applications: Water chemistry balance for current PWR fleet (99.9% enrichment), some next generation molten salt reactors, Science applications (99.995% enrichment)

- U.S. does not produce new enriched Li-7, but is entirely dependent upon Russia and China for supply
- PWR community has a rolling 18 month stockpile
- Isotope program efforts are underway to re-establish national production capabilities

Li-7 Efforts

- Remediation (99.9% enriched from 92.5% natural abundance)
 - 500 kg enriched Li-7 as an emergency supply for U.S. PWR reactors for one reactor cycle (approximately 18 month supply)
 - Industry response to solicitation is being concluded
- Enrichment (99.995% enrichment)
 - Two R&D projects being funded designed to achieve 99.995% enrichment
 - This is the next generation reactor spec and possible SC project need (IsoDAR/DAEdALUS phased neutrino experiments projects a need of 400 kg)
 - ORNL (liquid-liquid extraction) and Y-12 (chromatographic separation)
 - Both projects are expected to be completed this year, after which IP will decide on next steps
 - Classification questions need to be resolved
- Industry
 - Discussions with MSR developers on their needs
 - Discussions with GC on working with production companies

Global Focus on Li Enrichment



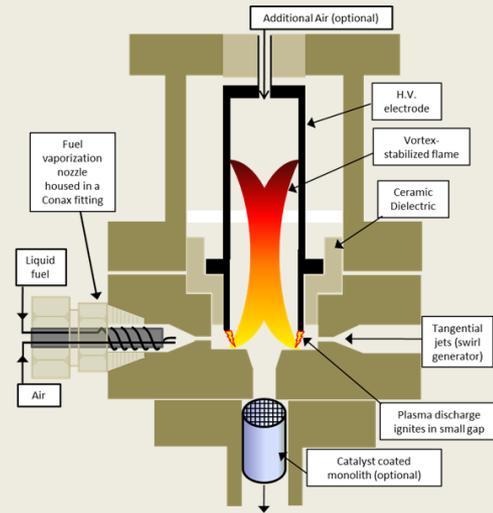
Heavy Water: non-nuclear uses

Application: Semiconductor, drugs, enhance fiber optic transmission

- Since 1996, there has been no U.S. production capability for heavy water
- All non-nuclear needs—about 75 MT annually-- are being satisfied by foreign (mainly Canada and India) suppliers
 - The Canadian Government has indicated that Canadian users, mainly their CANDU reactors, will be given first preference for remaining inventory
 - Isowater, a Canadian company, is trying to establish a market presence with limited success thus far
 - India supplies, but pricing has been erratic
 - Restrictions on material use by these vendors
- GAO and DOE/IG concerns on diminishing U.S.-origin heavy water

New U.S. Production Proposal

- IP awarded R&D funding for new heavy water production methodologies
- Successful peer review
- Office of Fossil Energy/National Energy Technology Laboratory (NETL) proposal
 - Methane steam reforming process
 - Two-year effort began January 2018



He-3

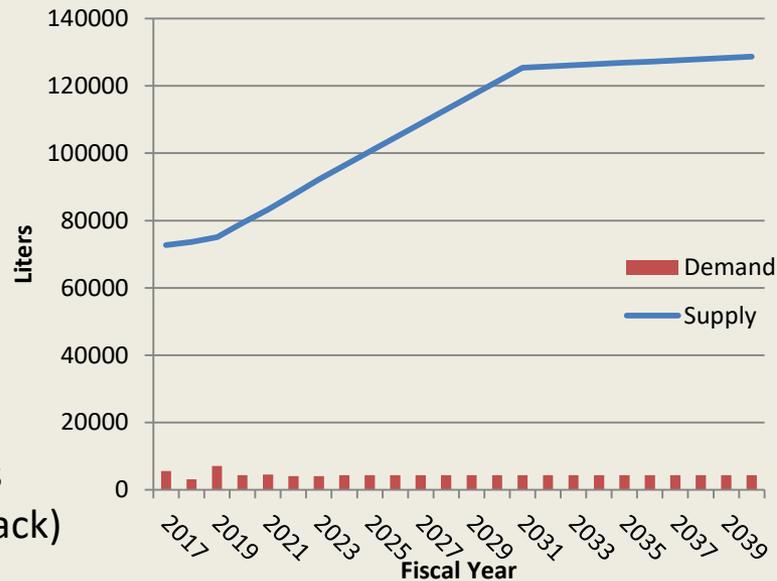
Applications: Medical imaging, oil and gas exploration, nuclear detection, ultra-low temperature (20 mK), road construction

- He-3 is a tritium decay product with main suppliers being Russia and the U.S.
- Russia has on occasion stopped exporting their gas (most recently in 2009) with resultant spot shortages
- Since earlier supply disruptions, NNSA/DP and IP have strengthened communications
- White House-led interagency team ensures that supply is exceeding demand

White House-led interagency team ensures that supply and demand remain favorable, but...

- Near term outlook is favorable
- Longer term needs may increase above projections
- IP looking at production enhancements and possible commercial production
- Still encouraging alternatives
- DHS testing alternative detector materials for small monitoring units (vehicle, backpack)
 - info sharing with DOE and DOD

- Where are the gotchas?
- Again, input from the community on longer term needs would be helpful



PAWS FOR EFFECT



Heavy Water in IP Inventory

- Received 32 MT of Iranian heavy water in summer 2016
- 26 MT sold to private industry and to Spallation Neutron Source in FY2017
- MIT heavy water reactor FY2018 purchase of two MT, delayed until FY2019
- Industry sale of most of the remainder (almost 4MT)
- IP will retain three drums (150 kg) for IAEA-related and research use

