



Medical Isotope Supply Review: $^{99}\text{Mo}/^{99\text{m}}\text{Tc}$ Market Demand and Production Capacity Projection 2018-2023

2018 ^{99}Mo Topical Meeting, Knoxville 23-26 September 2018

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The Nuclear Energy Agency (NEA)

- The NEA is a specialist agency of the Organisation for Economic Co-operation Development (OECD), the NEA is an intergovernmental organisation of 33 industrialised countries based in Paris
- The NEA MISSION - To assist its member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal basis required for a safe, environmentally friendly and economical use of nuclear energy for peaceful purpose

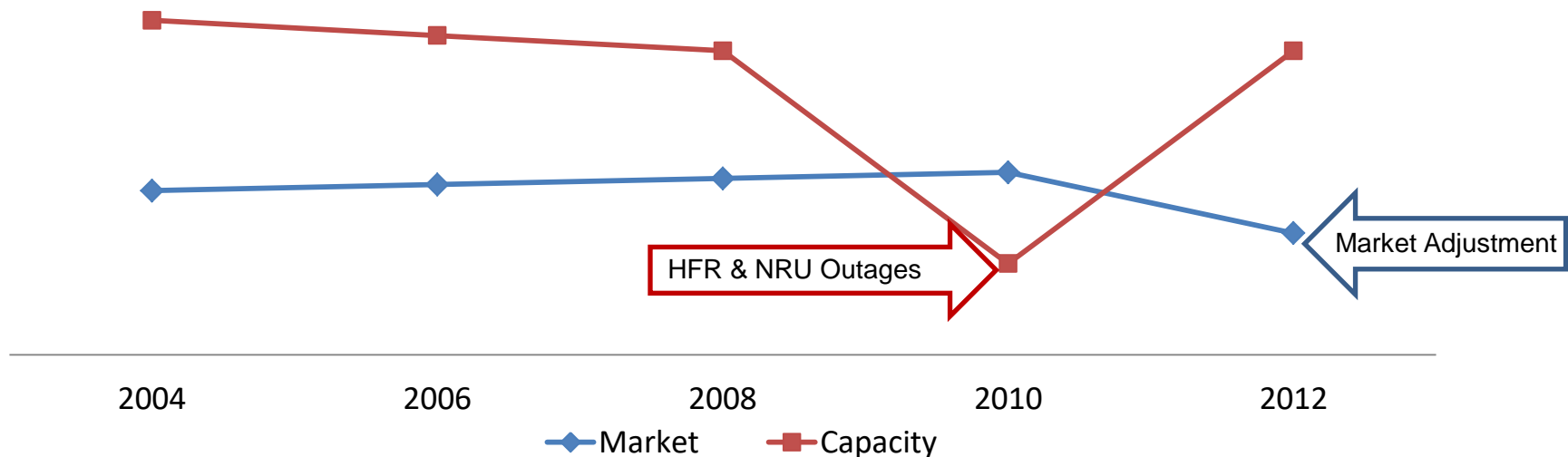
Medical radioisotopes

- The medical radioisotopes market is global and secure economically sustainable supply is essential
 - they are utilised in a wide range of diagnostic procedures, heart, brain, kidney, bone and in cancer: between 30-40M patient doses/year
 - medical radioisotopes with their short half-lives ^{99}Mo (66 hours) and $^{99\text{m}}\text{Tc}$ (6 hour) can not be stored
 - they must be produced near continuously and are the original “Just-In-Time” (JIT) products, pre-dating the JIT concept
 - any disruption to the supply chain can cause immediate disruption to patient services leading to sub-optimal care

HLG-MR

- The High-Level Group on the Security of Supply of Medical Radioisotopes (HLG-MR) was established at the request of NEA member countries, following global supply shortages of $^{99}\text{Mo}/^{99\text{m}}\text{Tc}$ in 2009-2010 that resulted from simultaneous unplanned outages of ageing research reactors in Canada and the Netherlands and processing problems in Belgium

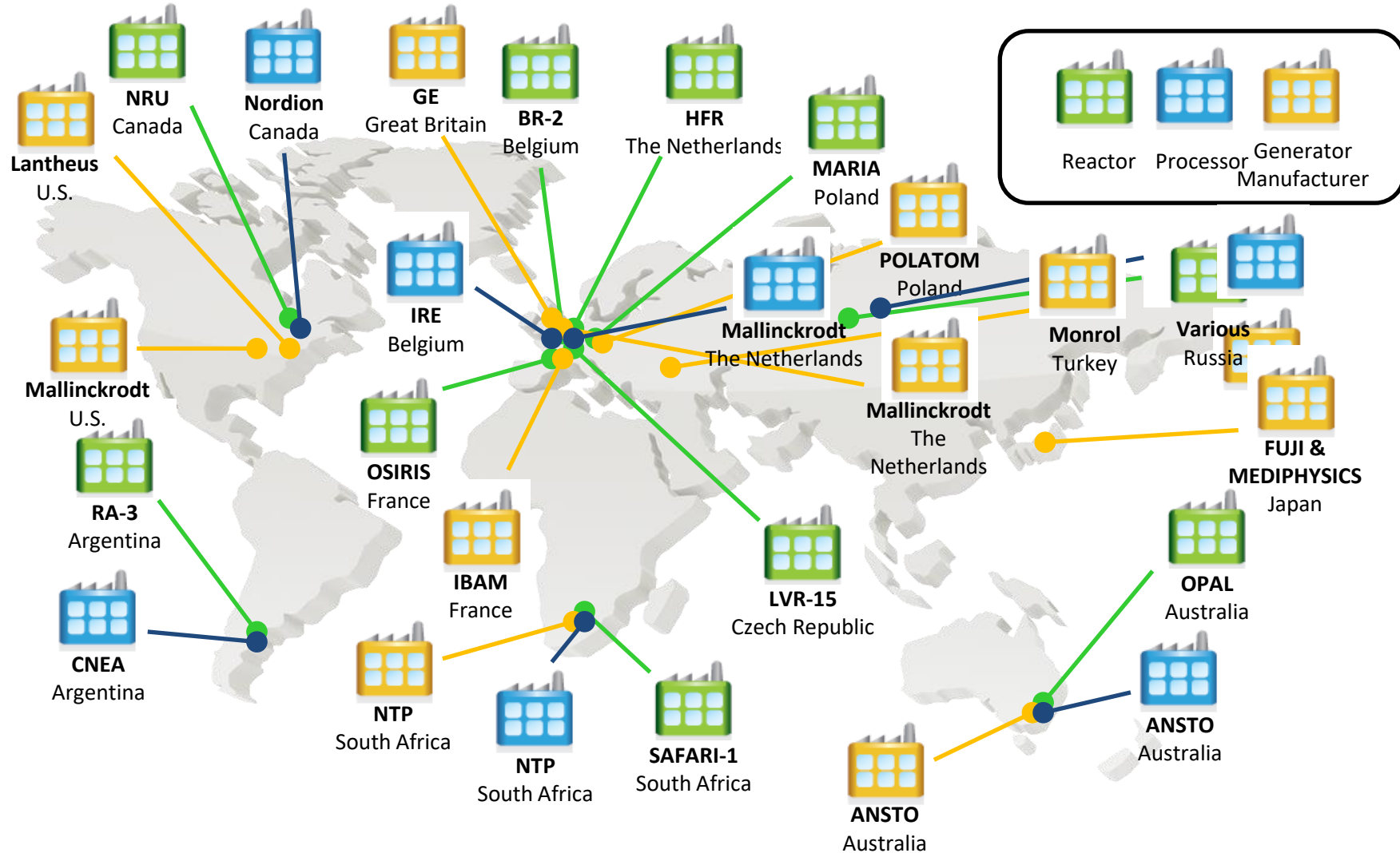
Demand and Capacity Trends



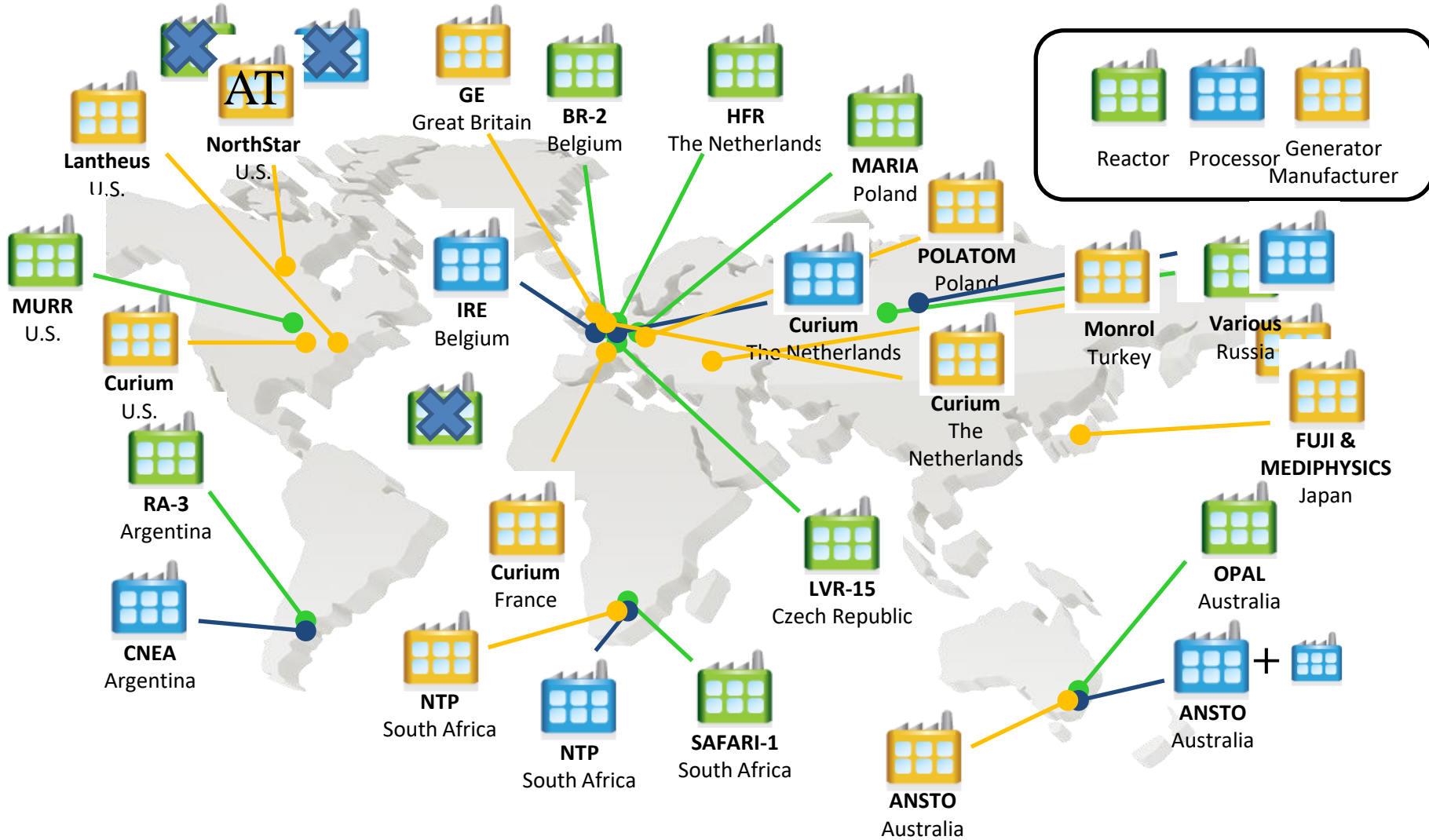
Demand and Capacity Review 2018-2023

- The 2018 Medical Isotope Supply Review: $^{99}\text{Mo}/^{99\text{m}}\text{Tc}$ Market Demand and Production Capacity Projection, 2018-2023 the latest in a series of reports has recently been published:-
 - Positive News
 - Curium conversion to **100% LEU targets**
 - positive FDA decision for NorthStar RadioGenix project (**non-HEU**)
 - Negative news
 - multiple NTP problems led to **“chronic” shortage** situation in some markets for $^{99}\text{Mo}/^{99\text{m}}\text{Tc}$ and some shortages of ^{131}I
 - Nordion/GA/MURR project **terminated** on economic grounds
 - some reported **reductions in reactor irradiation capacity from LEU conversion**
 - more **project delays**

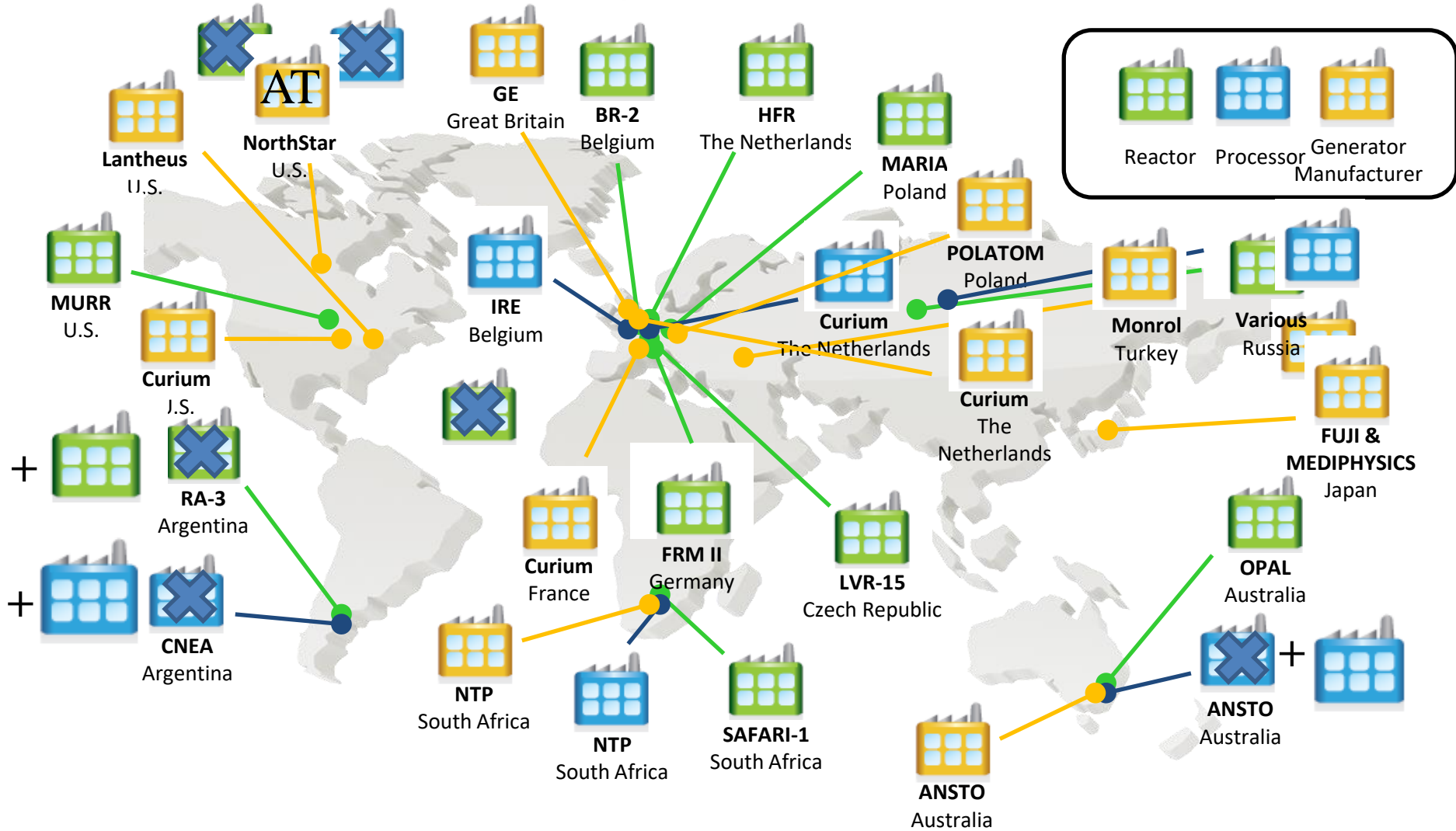
Global Supply Chain – around 2014



Global Supply Chain – around 2018



Global Supply Chain – around 2022



Global Supply Chain – around 2022

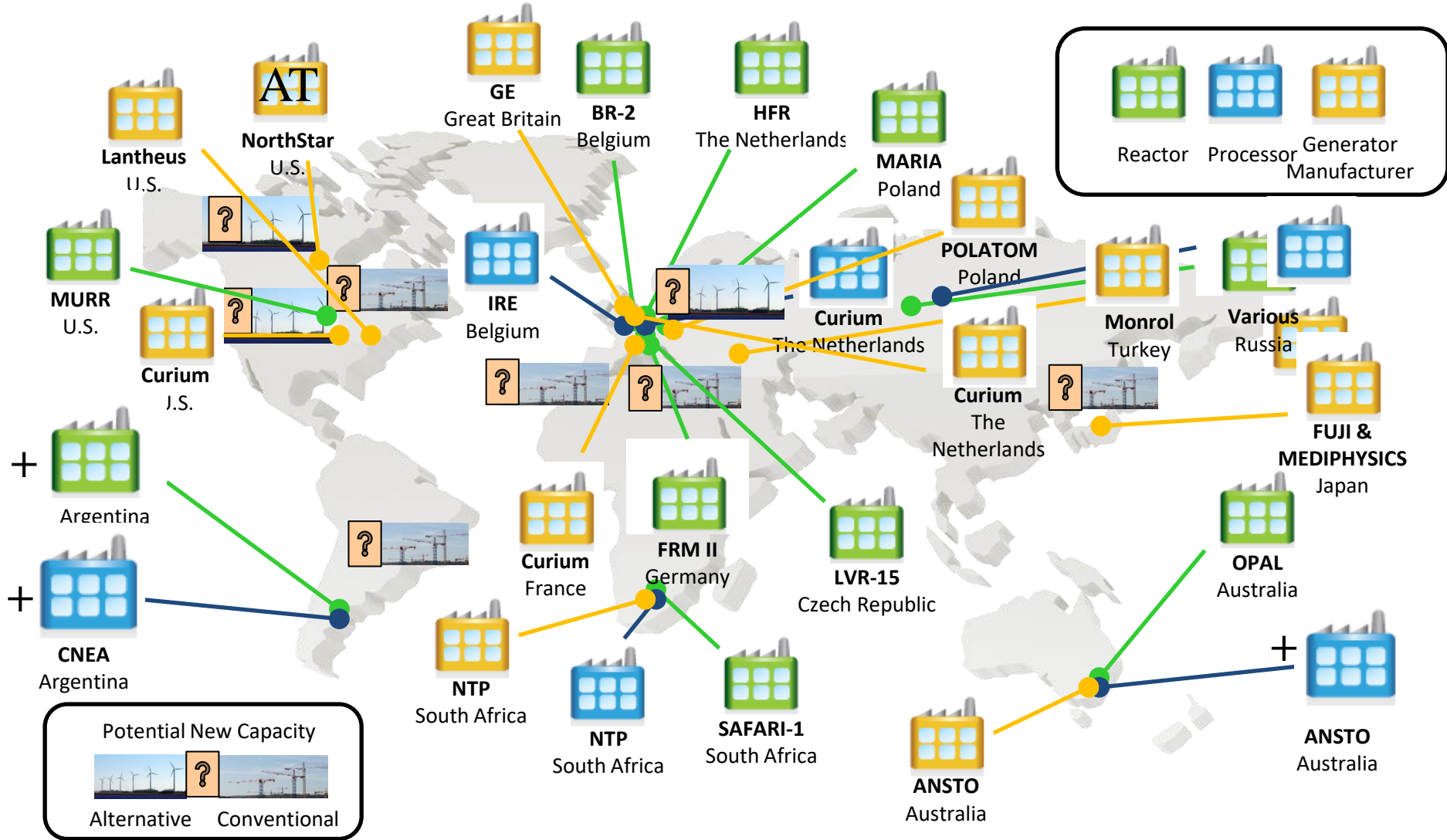


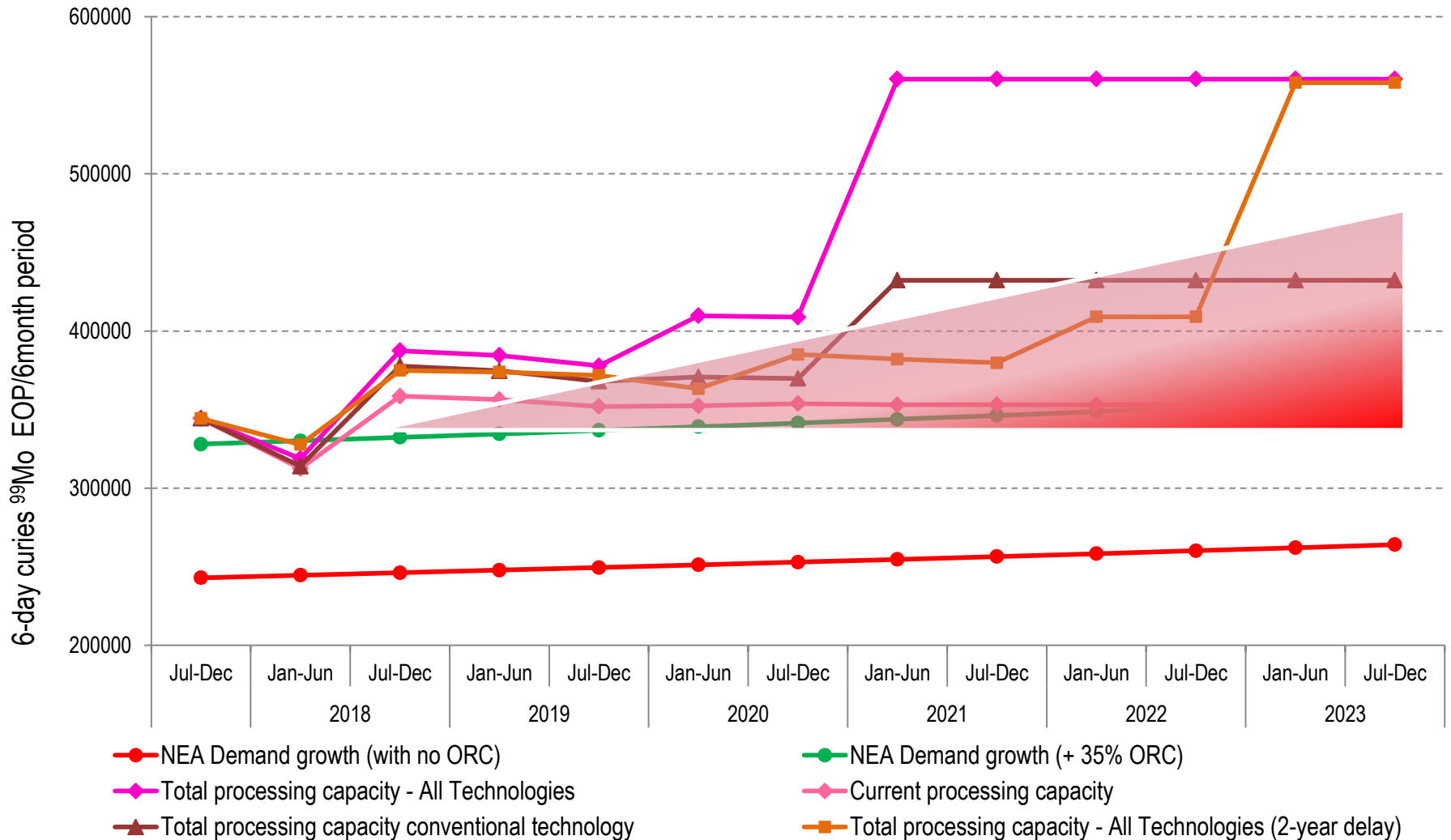
TABLE 4 – ~~January 2018~~ (Revised April 2018)

Processor	Targets ⁵	Anticipated Mo-99 production weeks/year	Expected available capacity per week (6-day Ci) by 2023 ⁶	Expected available capacity per year (6-day Ci ⁹⁹ Mo) by 2023 ⁶	Estimated first full year of production	Project status (January 2018)
MURR/NorthStar	Natural Mo target	52	750	39 000	2019 ↓	FDA approval Feb 2018 ↑
MURR/NorthStar ¹	Enriched Mo target	52	+2 250	+117 000	2020 ↓	In production scale up
NorthStar	Non-fissile	52	3 000	156 000	2021 ↓	Accelerator vendor selected, initiating scale up
Nordion	LEU-SGE	52	3 200	166 400	2020 ↓	Phase 2 underway PROJECT CANCELLED
SHINE	LEU solution	50	4 000	200 000	2021	Construction Permit Granted
CNEA	LEU	48	2 500	120 000	2021	Building start by end 2018
Korea ²	LEU	43	400	17 200	2023+ ↓	Construction permit in review by regulatory body
MARIA: Mo-99 2010 ³	LEU	40	300	12 000	2023+ ↓	Financing – not yet agreed
Brazil MR	LEU	41	1 000	41 400	2023+ ↓	Detailed design still to be contracted. Construction depends on budget
China Advanced RR ⁴	LEU	34	1 000	34 000	2023+ ↓	Financing decision after 2017 tests

2018-2023 Demand and Demand +35% ORC

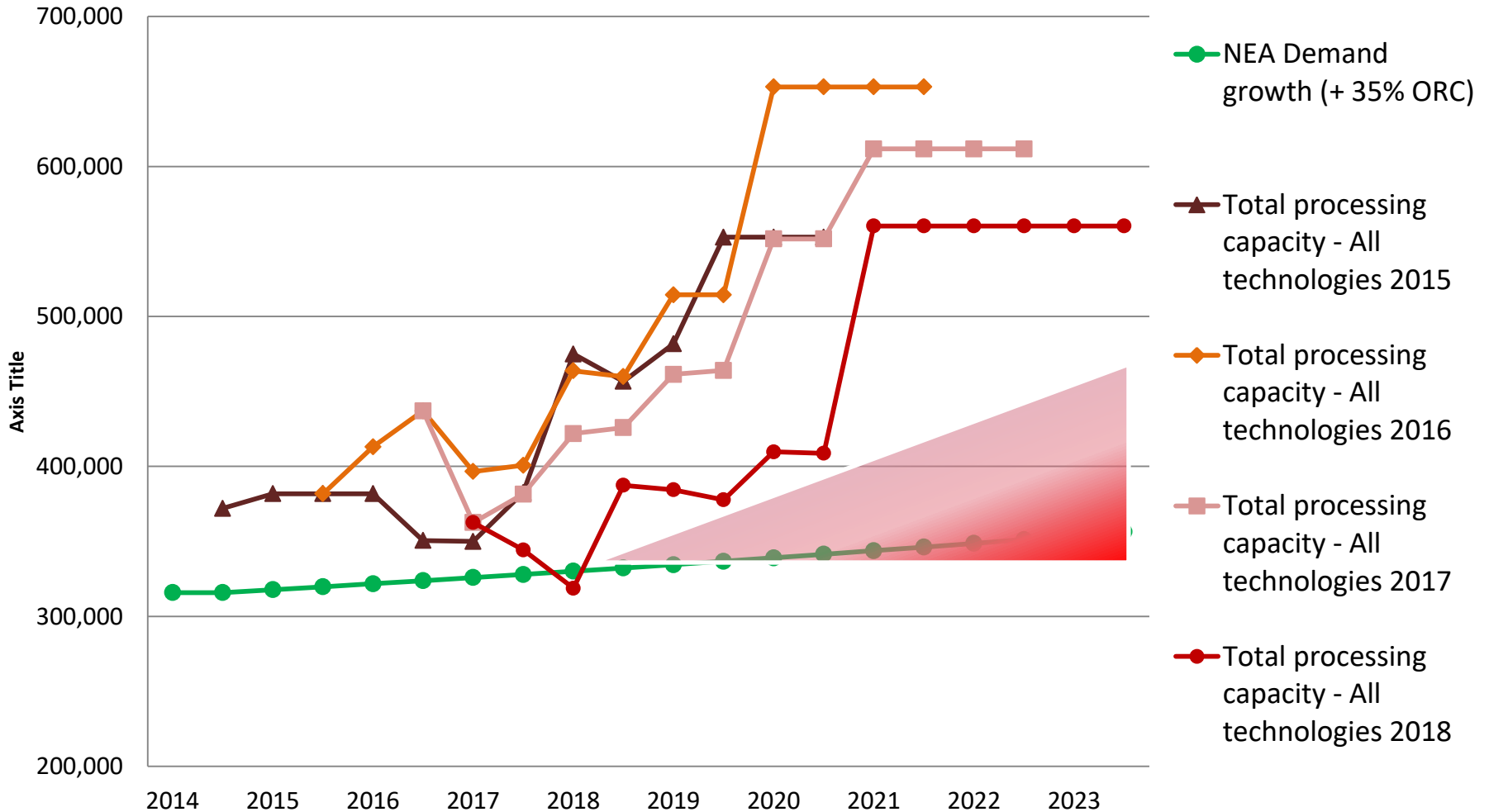


2018-2023 Processing Capacity (Fig. 6.2 Projections)



The Effect of Multiple Project Delays

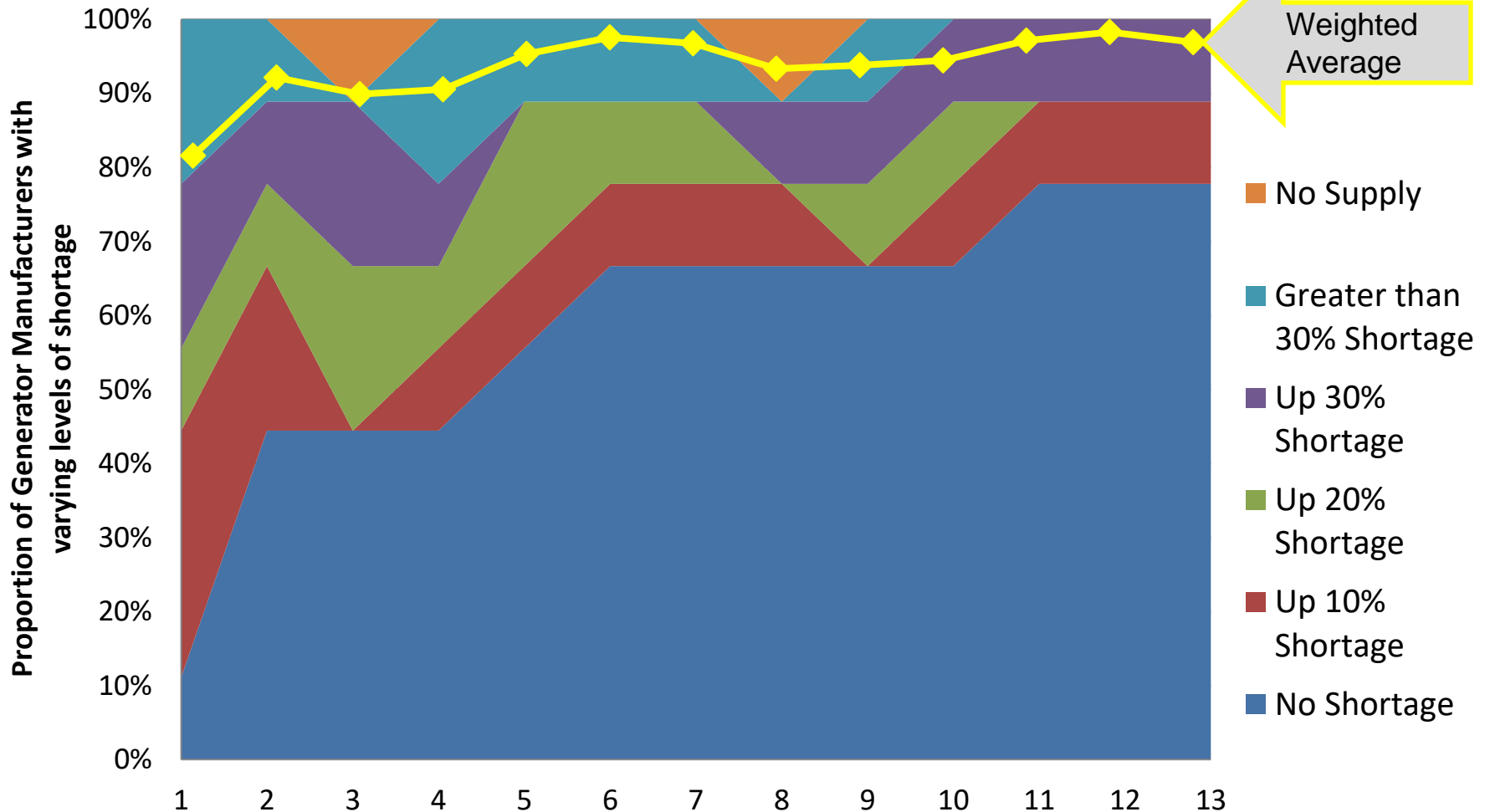
Scenario B - "Technological Challenges" Projection Creep with Time



HLG-MR Status Summary

- Many **technical problems** have been **solved** and a range of alternative production technologies demonstrated
 - the **first alternative technology** is being introduced into the US market
- **Supply stabilised** as a result of the actions of existing supply chain participants and the co-ordination activities of the Association of Isotope Producers and Equipment Suppliers (**AIPES**), but **challenges remain**
 - **supply** has been **stressed** since mid-November 2017 due to an unplanned outages at NTP (South Africa) and disruptions at other facilities
 - the AIPES Emergency Response Team (ERT) convening weekly
 - supply shortages of **up to 15% of world demand** in some weeks

Supply Performance to Gen Manufacturers 1Q 2018



HLG-MR Status Summary

- Conversion to **LEU targets** (a market externality determined by governments) has **technical challenges**; it is **less efficient**, produces **more waste** and has a **higher unit cost**
 - **>70% market conversion** to LEU recently achieved
- 3rd Self-Assessment 6-policy principles - **slow implementation**
 - **FCR** pricing levels have **not yet achieved**
 - paid **ORC** remains **under utilised** by the supply chain
 - **reimbursement levels** remain **unchanged** in many markets
- The market remains economically unsustainable
 - **risk to secure supply** remains
 - **some risk of delay or cancellation** of new investment
- Further work needed to reform healthcare economics

Co-operation with OECD Health Division

- At the 5th meeting of the 4th mandate (February 2018) of the HLG-MR, the OECD Health Division (HD) joined a review session on work programme proposals and the HLG-MR delegates agreed to support the proposal
 - final project amendments were agreed with a smaller HLG-MR working group
 - sufficient Voluntary Contribution pledges have been received to allow HD to perform the work
 - work started – early April 2018
 - interim update – mid June 2018
 - closed presentation to HLG-MR – 9 October 2018
 - open presentation - EANM 2018, Düsseldorf – 17 October 2018
 - final report – late 2018

EANM 2018 Special Session

Wednesday, October 17, 2018, 08:00-09:30 Hall 6

Session Title: High-level Group of the Security of Supply of Medical Radioisotopes (HLG-MR) - Open Briefing Session for Participants and Stakeholders

Summary of the content

The Organisation for Economic Co-operation and Development - Health Division (OECD-HD) and the Nuclear Energy Agency (NEA) will present on the findings of recent joint work performed for the HLG-MR on health economics aspects of the medical isotopes supply chain (in particular $^{99}\text{Mo}/^{99\text{m}}\text{Tc}$) that are important in ensuring a long term economically sustainable market model. The NEA will also provide a short briefing on proposed future activities to support the security of supply of medical isotopes.

www.oecd-nea.org

Thank you for your attention