



Actively enhancing life



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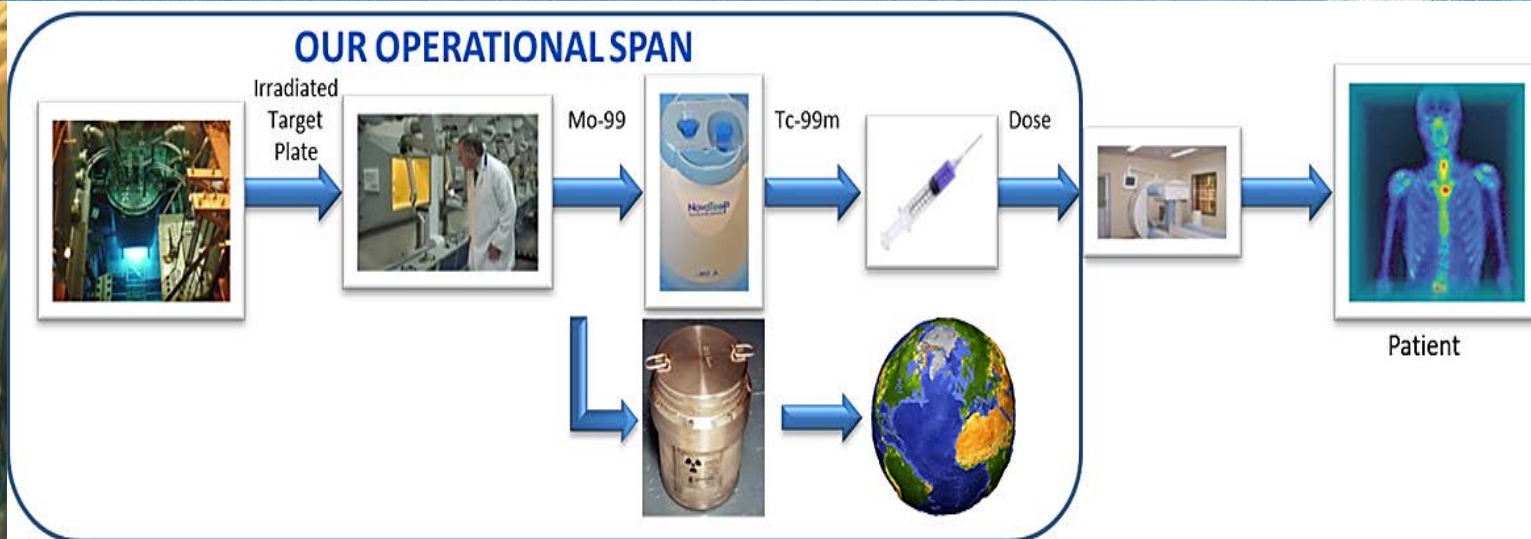
REFLECTIONS ON CONVERSION EXPERIENCE PIONEERS OF CHANGE

Gavin Ball – Group Executive: Operations, NTP RADIOISOTOPES SOC Ltd
Mo-99 Topical Meeting, St Louis, Missouri, 2016

- Introduction
- Time line
- Current status
- Consequences
- Reflections



OUR FIELD OF PLAY



RADIOCHEMICALS & API'S

Mo-99; I-131; Lu-177n.c.a

RADIOACTIVE SOURCES (NDT)

Ir-192; Cs-137; Co-60

RADIOPHARMACEUTICALS

Novatec-P Tc-99m generator;
MIBG; I-131 capsules; FDG;
cold kits

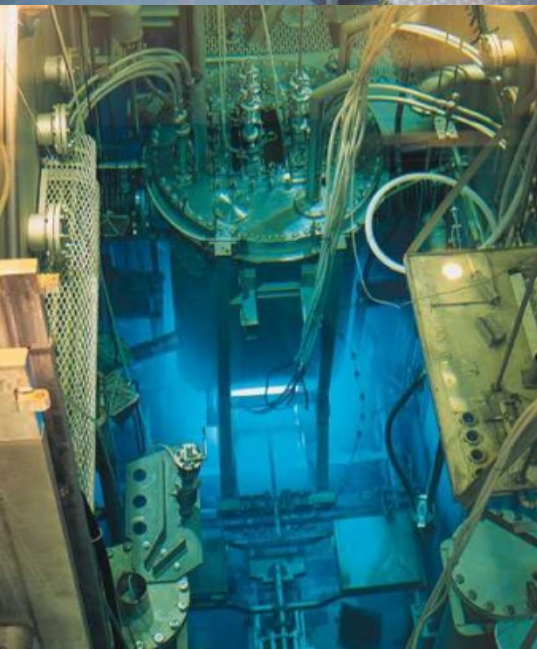
IRRADIATION SERVICES

NTD silicon; target irradiations

AND IT'S ALL ABOUT THE PATIENT



HEU TO LEU TIME LINE

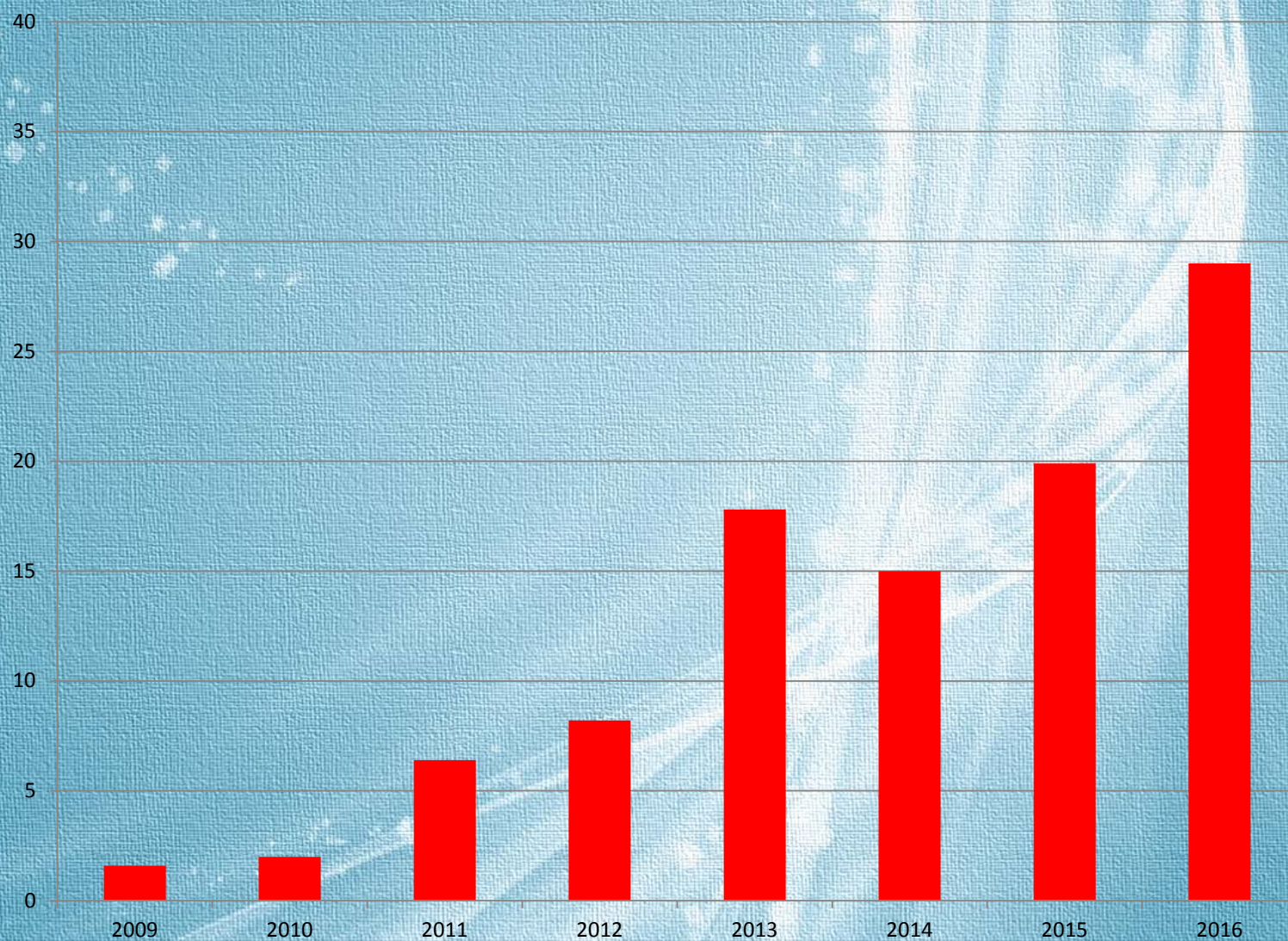


Year	Event
2007/8	Theoretical feasibility studies & cold experiments
2009	NNR approval received for test stage and first hot runs commence
2010	Hot runs, process validation, regulatory approval
Sep 2010	US FDA approves LEU ⁹⁹ Mo for a customer in the US
Dec 2010	First large scale commercial FDA approved batch of LEU ⁹⁹ Mo produced and shipped to US for patient use
Jun 2011	Routine commercial supply of LEU ⁹⁹ Mo commenced
Sep 2011	Commencement of investment in plant modifications for increased LEU residue storage requirements
Jan 2014	Hot commissioning of new LEU specific production line
Dec 2014	Commencement of project to manufacture & install 2 nd LEU design dissolver cell
Sep 2016	Hot Commissioning of new uranium residue facility

PROGRESS WITH MO-99 CONVERSION



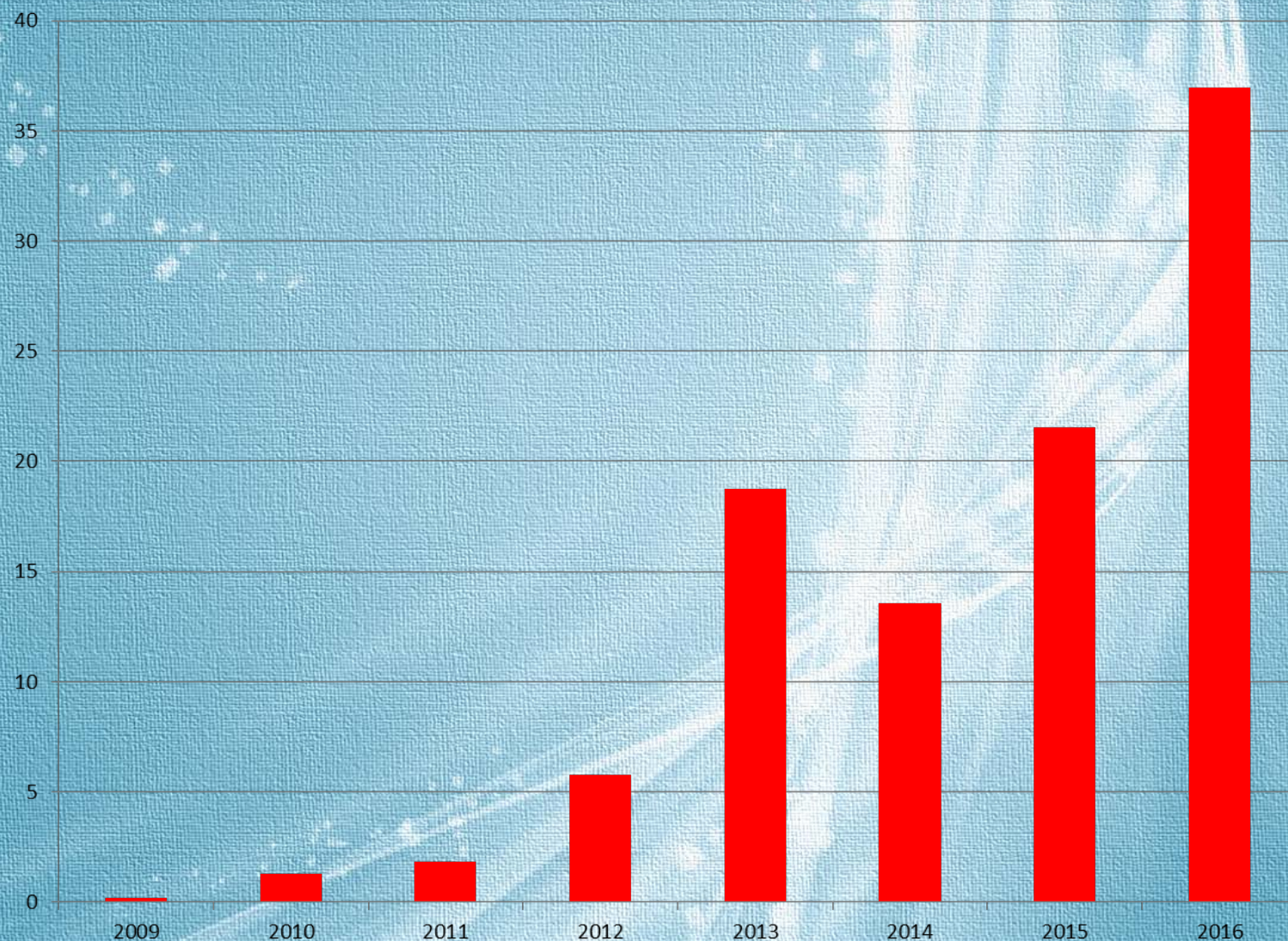
% LEU Distribution relative to all LEU runs



PROGRESS WITH I-131 CONVERSION



% LEU Distribution relative to all LEU runs



ACTUAL CONVERSION PROGRESS



Mo-99

Year	% Conversion
2014	38
2015	47
2016 (2 Quarters)	77

I-131

Year	% Conversion
2014	39
2015	46
2016(2 Quarters)	63

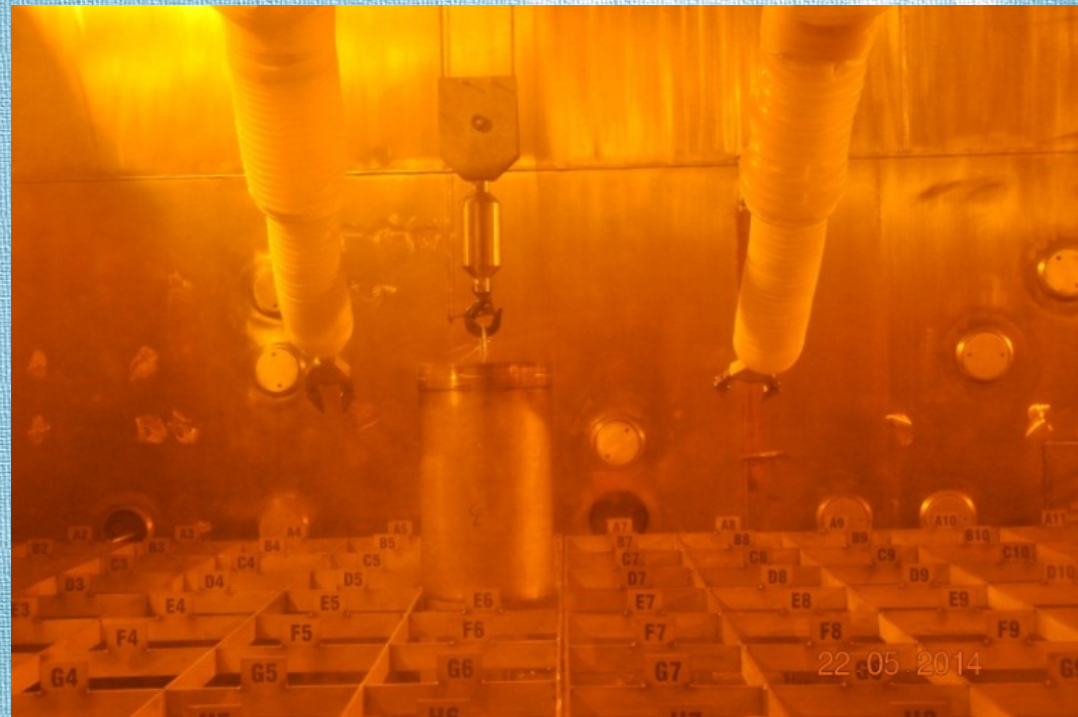
NEW DISSOLVER CELL PRODUCTION LINE

COMMISSIONED AND OPERATING WELL



NEW URANIUM RESIDUE FACILITY

COLD COMMISSIONED
HOT COMMISSIONING COMMENCED



COMPLIANCE LESSONS FROM THE FRONT LINE

- HEU TO LEU -

IT' ALL ABOUT CONSEQUENCES:

THE GOOD, THE BAD & THE UGLY



**PIONEERS IN
CONVERSION
TECHNOLOGY**

A WORLD FIRST

**EXCEED FULL
COMPLIANCE**



**MASSIVE CAPITAL
INVESTMENT**

**HIGHER REACTOR
OPERATIONAL COSTS
AND LOWER FLUXES**

**LOWER MO-99
PRODUCTION CAPACITY**

**HIGHER WASTE VOLUME
AND COST**



**NO NOTICEABLE
BENEFITS TO PATIENT**

**THE PATIENT SHOULD PAY
MORE**

WHERE ARE WE NOW

MUCH ACHIEVED

PUSH TO COMPLETION

Proven
fully LEU
capability

Operated
new LEU
dissolver
cell for 32
months

Upgraded
waste
infrastructure

2nd LEU
design
dissolver
cell
commenced



INTO THE FUTURE

LET'S LEARN

FROM THE LESSONS OF THE PAST

Technology
and scale-
up
challenges
are to be
expected

Developing
non-HEU
production
methods
takes
longer
than
expected.

It costs
more than
initially
budgeted

It is more a
'technology
push' than
a 'market
pull'
situation



IN CONCLUSION

REFLECTIONS....

Technically feasible

Full cost recovery not
implemented

More challenging
production operations

Sustainability of the
industry questionable



IT'S TIME FOR WISE ACTION
- no *reactions* required -

THANK YOU

