REFLECTIONS ON CONVERSION EXPERIENCE
PIONEERS OF CHANGE
OUR FIELD OF PLAY

OUR OPERATIONAL SPAN

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

Patient
AND IT’S ALL ABOUT THE PATIENT
<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007/8</td>
<td>Theoretical feasibility studies &amp; cold experiments</td>
</tr>
<tr>
<td>2009</td>
<td>NNR approval received for test stage and first hot runs commence</td>
</tr>
<tr>
<td>2010</td>
<td>Hot runs, process validation, regulatory approval</td>
</tr>
<tr>
<td>Sep 2010</td>
<td>US FDA approves LEU $^{99}$Mo for a customer in the US</td>
</tr>
<tr>
<td>Dec 2010</td>
<td>First large scale commercial FDA approved batch of LEU $^{99}$Mo</td>
</tr>
<tr>
<td>Jun 2011</td>
<td>Routine commercial supply of LEU $^{99}$Mo commenced</td>
</tr>
<tr>
<td>Sep 2011</td>
<td>Commencement of investment in plant modifications for increased</td>
</tr>
<tr>
<td></td>
<td>LEU residue storage requirements</td>
</tr>
<tr>
<td>Jan 2014</td>
<td>Hot commissioning of new LEU specific production line</td>
</tr>
<tr>
<td>Dec 2014</td>
<td>Commencement of project to manufacture &amp; install 2$^{nd}$ LEU design</td>
</tr>
<tr>
<td></td>
<td>dissolver cell</td>
</tr>
<tr>
<td>Sep 2016</td>
<td>Hot Commissioning of new uranium residue facility</td>
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</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Year</th>
<th>% Conversion</th>
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</thead>
<tbody>
<tr>
<td>2014</td>
<td>38</td>
</tr>
<tr>
<td>2015</td>
<td>47</td>
</tr>
<tr>
<td>2016 (2 Quarters)</td>
<td>77</td>
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#### I-131

<table>
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<th>Year</th>
<th>% Conversion</th>
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<tr>
<td>2014</td>
<td>39</td>
</tr>
<tr>
<td>2015</td>
<td>46</td>
</tr>
<tr>
<td>2016 (2 Quarters)</td>
<td>63</td>
</tr>
</tbody>
</table>
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
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