

\$400M 5Yr Plan Scenarios (with SRK "prelim" commentary)

#1: \$400M put to government ("loss of opportunity") ... details provided next slide

- Delay of ARIEL construction for two years, to the end of the five-year period.
- Deferral of IAMI operations for two years
- Deferral of (some of?) beamline 1A refurbishment by two years, halving the cost in this plan by extending cash flow into the next funding cycle.
- MRO costs remain the same, assuming all legacy and existing systems are operated at the same level of science capacity.
- Commercial revenue is assumed to be similar to the full request
- BL1A - triplet exchanged at the end of the 5Y period unless CFI funding awarded (why? can be installed in any normal long shut down after quad delivery)

	Funding Level			
	≤ 300	350	400	450
Operational excellence	Orange	Green	Green	Green
IAMI	Orange	Green	Green	Green
Facility utilization	Orange	Yellow	Green	Green
Domestic research ecosystem	Orange	Yellow	Green	Green
Site maintenance	Red	Orange	Yellow	Green
Talent and training	Red	Orange	Yellow	Green
Major deferred maintenance (BL1A/substation)	Red	Orange	Yellow	Green
Innovation & commercialization	Red	Orange	Yellow	Green
International research ecosystem	Red	Orange	Yellow	Green
ARIEL completion	Red	Orange	Yellow	Green
ARIEL operations	Red	Orange	Yellow	Green

#2: Shutdown for a year to finish ARIEL construction and get projects done

- Shutdown in 2026 (Dec 2025-April 2027) (what about IAMI?)
 - BL1A triplet exchanged during the year-long shutdown
- nb. - Getting a new set of rad-hard triplets in this time frame is not a "slam-dunk". The currently available technologies are not well known / common-place at TRIUMF.
- What about commercial revenue issues i.e. loss of \$\$; contractual issues ?
 - What happens after April 2027 if ARIEL is not completed?
 - If BL1A is funded (with a successful CFI MSI) when does that work get done?



and hence questions asked

#3: Business as usual (as this year)

- 6 months shutdown – 6 months beam (Dec - May shutdown) (for every yr?)
- ARIEL finished in 2028 (what about IAMI?)
- BL1A triplet exchanged (during which long shutdown ... or asap after triplet delivery?)

- Transformer replacement in all scenarios
- No new NRC positions in any scenario ... (\$400M/Town Hall says a small/no reduction?)
- There appears to be consensus among the divisions that finishing ARIEL is a very high priority.

Note: slide is adapted from Petr's DH presentation.



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Scenario#1 as presented/accepted by NRC

Scenario #1: the \$400M as put to government (“i.e. loss of opportunity” ... and framed as a “poison” pill?)

The objective in this scenario is to maintain existing science and innovation programs, including medical isotope production for commercial partners, although some impact will be required as staff are re-tasked to other areas. Components delayed are the operations of ARIEL and IAMI, which represents a major loss of opportunity on the international stage, as well as the loss of potential science. Risk is also escalated by deferring the beamline 1A refurbishment by two years, the failure of which would significantly impact materials and quantum science, green technology, and isotope production.

Changes from the requested funding level (i.e., \$450M) and capabilities are primarily:

- **Delay of ARIEL construction for two years, to the end of the five-year period.** No operations of ARIEL during the five-year period, just commissioning. This defers the operation of ARIEL beyond the CERN long shutdown, missing an opportunity for Canada to provide global leadership in ISOL based discovery while a primary competing facility, ISOLDE at CERN, is shutdown.
- **Deferral of IAMI operations for two years.** Such a delay will impact the ability of IAMI to develop new life saving drugs and risks the reliability of production of medical isotopes. This will also impact potential future commercial revenue as it will naturally defer clinical trials of new drugs.
- **Deferral of beamline 1A refurbishment by two years,** halving the cost in this plan by extending the cost into the next funding cycle. This significantly increases the risk to the material science, quantum, and irradiation science programs should a major failure occur. It also increases the risk of production of actinium and commensurate potential impact on reputation and commercial revenues.
- Reduction in request by 57 staff to **444 staff average, just below the contemporary staffing plan.** This reduction is a combination of reduced staff due to deferred implementation of the major infrastructure projects and a reorganisation to support operational excellence, with a commensurate loss of capability for the broader research ecosystem in science and engineering. This impacts our ability to fully support domestic and international projects with commensurate loss of impact and reputation.
- **MRO costs remain the same,** assuming all legacy and existing systems are operated at the same level of science capacity.
- **Commercial revenue is assumed to be similar to the full request,** contributing \$20M to operational support over the 5-year period.



SRK's General Observations

- S#3 is (or may be sold as) an "ARIEL accelerated" version of S#1 and distinguishing between them seems overly "detail orientated" given the overall uncertainties involved. If ARIEL completes in 2018, can 2019 be 8-months beam?
- By funding TRIUMF at the \$400M level, NRC has already tacitly accepted S#1. Does TRIUMF risk losing its "credibility" by trying to significantly change (by adopting S#2) its stance on how it plans to proceed with operating the lab during the 5 yrs in question? i.e. will NRC accept the \$400M amount as the only "given"? Understanding this ahead of time will make life easier.
- An advantage of S#3 (6-month shutdowns) over S#2 is that if things don't go as planned S#3 allows the additional longer shutdowns to design and implement the needed fixes. In S#2, come April 2027 if things are not as expected/hoped for (e.g. there will have been no beams available for potentially relevant testing), the time/effort building the "defects" will have been irrevocably lost.

Thus, one can argue that the more incremental S#3 approach, with its time distributed relevant quality control & testing measures, never lets one go too far down a (usually unanticipated*) rabbit hole. This more measured course of action can be considered the prudent approach when dealing with actually implementing and then operating "technically innovative" facilities.

*recall: The beam contamination reality in ISAC II and local heating/arcng issues when high RF power densities (e.g. in CMMS RF- μ SR experiments) are "naively" deployed.



CMMS
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CMMS Scenario #2 Negative Impacts

- Throttling M9H after its birth:
 - New, world unique, experimental facilities are scheduled to come on-line in 2025 and the uSR world community has long been hungry for its experimental capabilities. Killing it for a year after its initiation would be an extraordinarily heavy burden on any longer-term experimental program that will seek to initiate use in its maiden 2025 operating year.
 - Furthermore, in addition to this beamline's unique quantum-materials capabilities, it will be the central pillar to the CMMS's sustainability/energy related research scope. To firmly secure and evolve this TRIUMF vision into a body of results/publications within the 5Yrs requires that the groundwork be established early, i.e. in 2024-25. A year of operational delay in 2016 could (might I say would?) derail the timely unfolding of this effort.
- User Community Research Disruption:
 - External groups (Canadian and international) are the majority of the CMMS user community and beam time recipients. They can utilize μ SR either as the major component of their research program, or as a supporting characterization technique. For the former (mostly Canadian but some international) the disruption to their research programs and HQP timelines will be dire. For the latter, less heavily reliant on μ SR, one can only hope that they will return after pruning their research scope to exclude TRIUMF.



Thank you
Merci

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