



TRIUMF Five-Year Implementation Plan - Context, Budget and Scenarios

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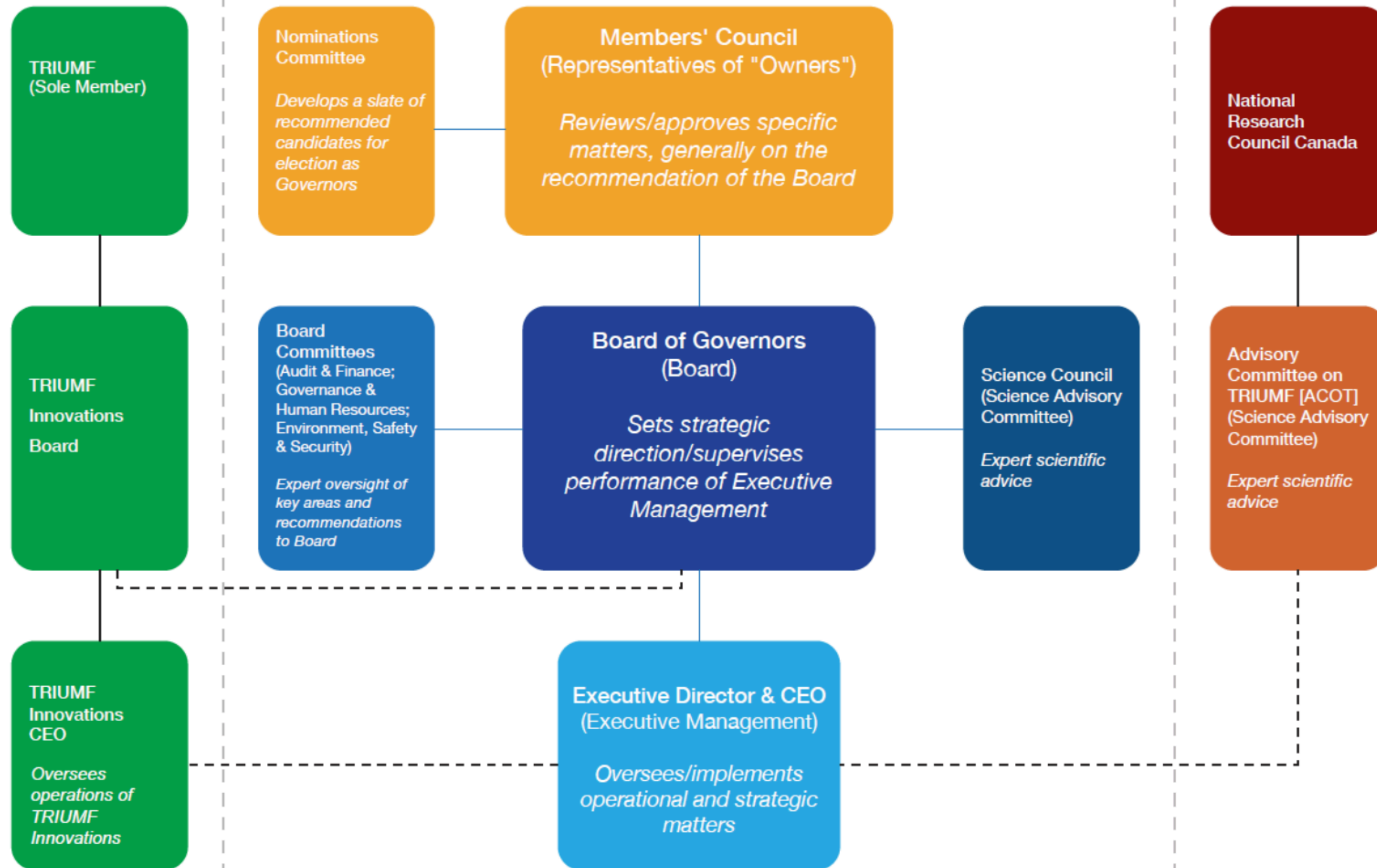
Discovery,
accelerated

TRIUMF Context & Operational Environment Changes

Governance changes

- During June 2021, TRIUMF **incorporated** as a not-for-profit, bringing in a new governance structure, and ultimately disbanded the Joint Venture and amalgamated TRIUMF Accelerators Inc. and TRIUMF Inc.
 - Top level **Members' Council** for the owners (initially 14, now grown back to 21 after working with the 7 previous associate members)
 - MC appoints a skills-based smaller Board of 11, including external members
 - A **Science Council** of researchers from each university member
- New potential members under discussion (and relationship building with existing members)
- This has had more impact than potentially envisaged as the Board has been very engaged, and has had major influence in our work and objectives (eg WAG/QA report)
- We also now have effectively two governance structures, the university-based one, and the NRC-based one including ACOT and a (rather stringent!) Contribution Agreement
 - The governance stakeholders are working on simplification, likely around any new funding model

Governance changes



Leadership changes

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- During 2022, the **leadership structure** was reworked with a leaner and flatter team structure to support strategic planning and delivery
- Focus on Divisional structure, with a leadership team clearly defined as Divisional leads, supporting clearer lines of accountability and responsibility
 - Science leads fully embedded in the leadership team
 - New Operational excellence Divisional structure
- Over last few months the **Senior Management Group** has been redefined as the Departmental leads, supporting programme delivery and engagement
 - Will play a major role in **Weft & Warp**

Strategic Planning

- In Fall 2022, our first **20-year vision** was released after 18 months of engagement and discussion with our various communities
 - This sets our aspirations and direction for the lab over the next two decades, assuming funding can be delivered
- The **NCR quinquennial evaluation** was successfully completed during 2023
 - This included a very fulsome **international peer review** demonstrating the great impact and world-class science being delivered by TRIUMF
- TRIUMF is a trusted member in discussions on the future developments of large-scale science in Canada
 - The **Major Research Facility** framework is developing as a consequence of the broad community discussions (eg Bouchard report)



Funding

- Construction and submission of our five-year **Request for Support**
- Provincial support of \$11M for **IAMI phase-II** secured after 18 months of discussion with JEDI and Health
- Collaboration including TRIUMF Innovations successfully secured \$35M for the **Canadian Medical Isotope Ecosystem SIF**
- **Research grants** continue to be successfully secured, currently valued at >\$82M from tri-council and CFI in this five-year plan
- **Strong relationships** have been built with government and funding agencies (first ministerial visit for many years by Champagne, Premier Eby talked directly to Minister Freeland during budget discussions)

Emergent Crises

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- 2021 and 2022 impacted dramatically by **COVID** and our response
 - Remote working protocols established (many of which continue today)
 - Impact of COVID still being felt, emotionally and practically
- **Research and cyber security** are new areas of greater focus from governments including use of research funds and protection of IP
 - IP and security policies released in 2021/2022
 - Reacting to release of Sensitive Technology Research and Affiliations of Concern (**STRAC**) policy - new processes in evolution

Regulatory approvals

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- A **10-year license renewal** secured during summer 2022, although clear direction from the commission to CNSC staff to ensure substantial oversight on TRIUMF
 - Interim approvals secured from CNSC for actinium production in 2022 to secure medical isotope chain (requiring additional protocols)
- New **License Conditions Handbook** (plus revisions) in place following Herculean effort from many in the lab to rewrite documentation and processes
- New **EGBC requirements** implemented on TRIUMF as an engineering 'firm'. Changes implemented in engineering practices, impact continues to be evaluated and mitigated

2024 Budget Outcome

Budget 2024 Outcome - Process

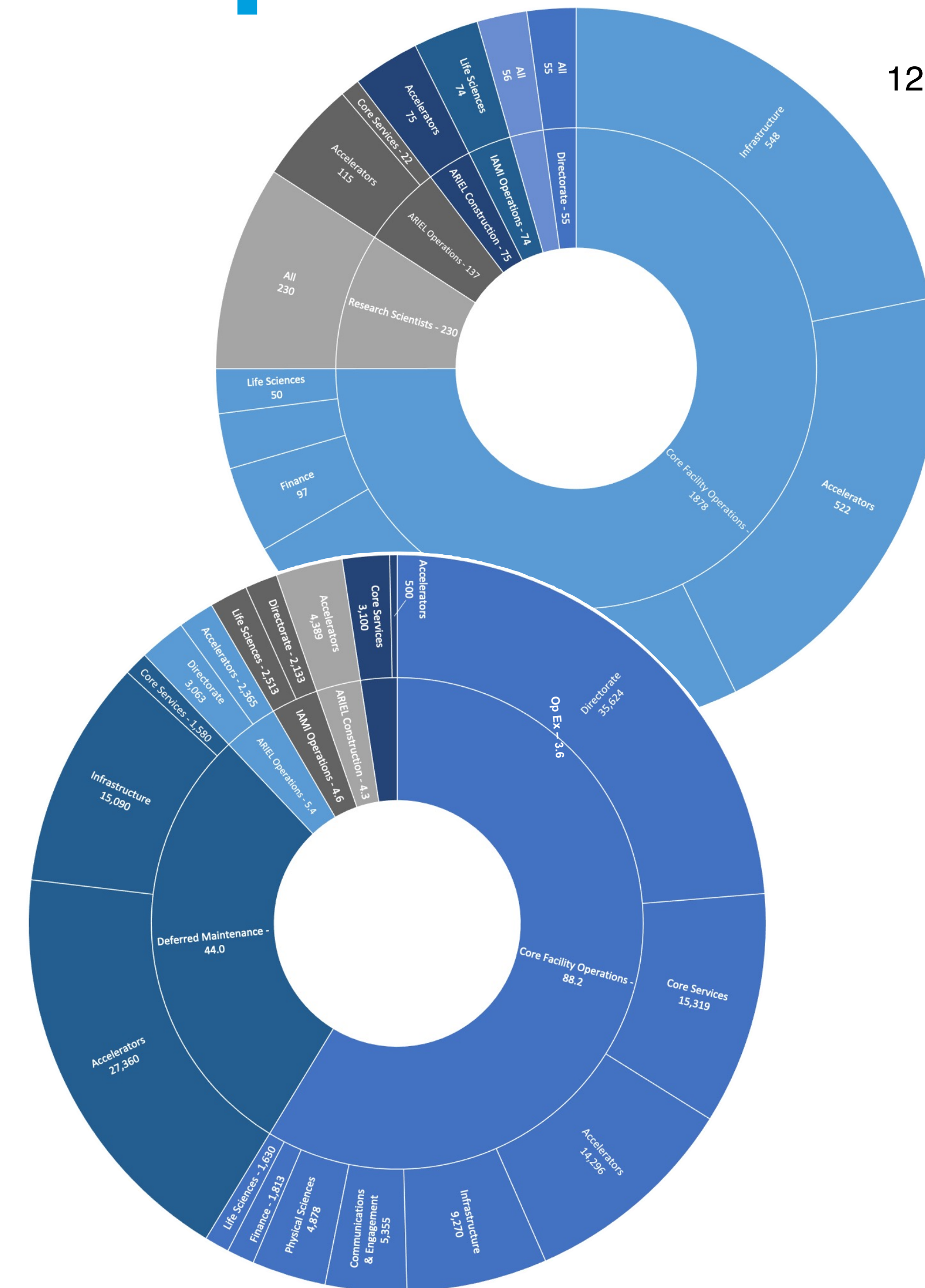
- The Minister of Finance usually announces the budget around 16:00 or so
- Prior to that, stakeholders are invited to a “lock-up” where they have a preview of the budget, and can ask clarification questions of Finance staff
- The budget is obviously embargoed at this point - all cell-phones, smart watches, etc. are secured in sealed envelopes, with security folk wandering around
- Lock-up lasts three hours...
- A brutal way to find out the funding commitment for the next five years!



Budget 2024 Outcome - Request

TRIUMF requested \$450M in operational funding for period from 2025 – 2030.

- Separating operations, capacity for research and research costs: buy-in from NRC on this approach
- Full investment in TRIUMF capitalizes on a window of opportunity around international facility shutdowns (ISOLDE@CERN) and actinium.
- The requested level of support is necessary to sustain core operations and capacity for research to realize TRIUMF’s full potential for Canada; the added socioeconomic benefits that the laboratory delivers through many of its programs (i.e., medical isotopes, new technologies, spin-off companies, etc.) are not possible without strong and stable facility operations.
- Now is the time for Canada to lead in big science research and assert its place in the international landscape amidst surging competition.



Budget 2024 Outcome - Request

- TRIUMF is at a critical moment in its life cycle as a major research facility; the lab faces a critical inflection point as it balances the demands of aging legacy infrastructure while seeking to complete and operate new world-class facilities.

Five core themes of the request:

1. Delivering new infrastructure for science impact
2. Ensuring operational excellence
3. Training the diverse talent of tomorrow
4. Refurbishing legacy facilities
5. Evolving TRIUMF's program towards the future

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

Heat map visualizing various funding-level scenarios, including those of reduced funding from the \$450M request

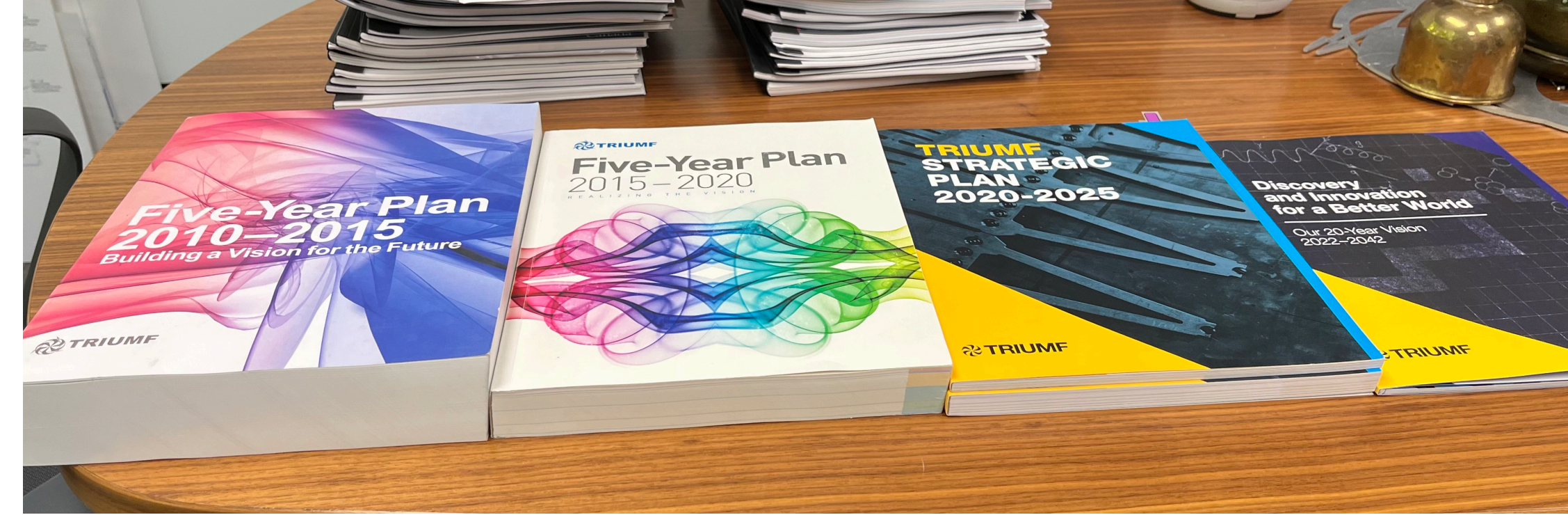
Budget 2024 Outcome - Result

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- “To advance the next generation of cutting-edge research, Budget 2024 proposes major research and science infrastructure investments, including: **\$399.8 million over five years**, starting in 2025-26, to support TRIUMF, Canada’s sub-atomic physics research laboratory, located on the University of British Columbia’s Vancouver campus. This investment will upgrade infrastructure at the world’s largest cyclotron particle accelerator, positioning TRIUMF, and the partnering Canadian research universities, at the forefront of physics research and enabling new medical breakthroughs and treatments, from drug development to cancer therapy.”
- There is no ring fencing on these funds (cf \$25M projects), other than alignment to the five-year plan, and there is some flexibility in terms of profiling across the award. We will work with NRC on profiling.
- We have been communicating to the team how great this result is (a 50% increase in baseline operations during times of incredible fiscal pressure), yet have been trying to dampen expectations as we didn’t get the full request - this will have implications on our programme

Previous Support Levels

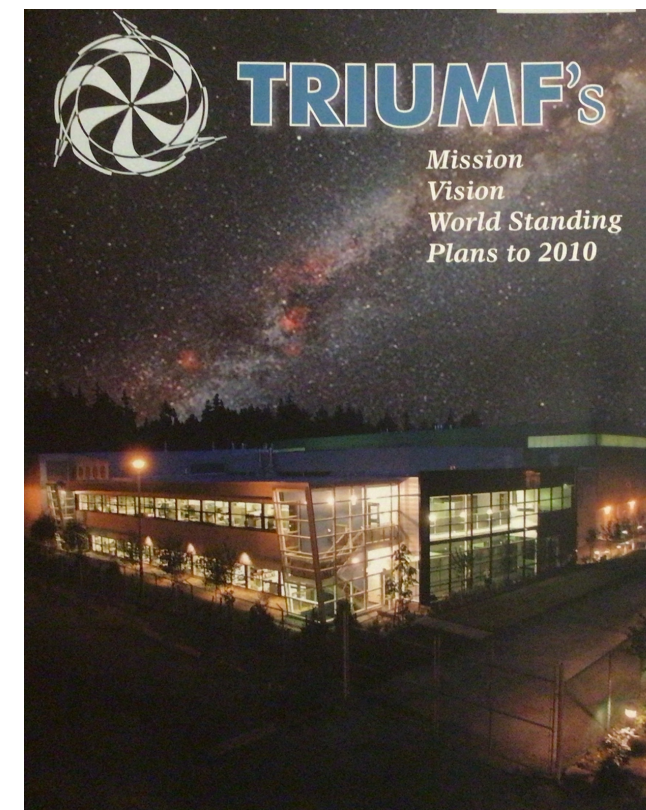
Previous requests followed NRC-led process
Requests delivered flat-flat support, with additional funds from ad-hoc engagement



5-Year Plan 2005 – 2010:

- Targeted funding: \$276.9M
- Funding received: \$222.3M

\$346M@2025



5-Year Plan 2010 – 2015:

- Targeted funding: \$328M*
- Funding received: \$222.3M

\$318M@2025



5-Year Plan 2015 – 2020:

- Targeted funding: \$290M
- Funding received: \$267.3M**

\$350M@2025



5-Year Plan 2020 – 2025:

- Targeted funding: \$320M
- Funding received: \$292.7M***

\$357M@2025



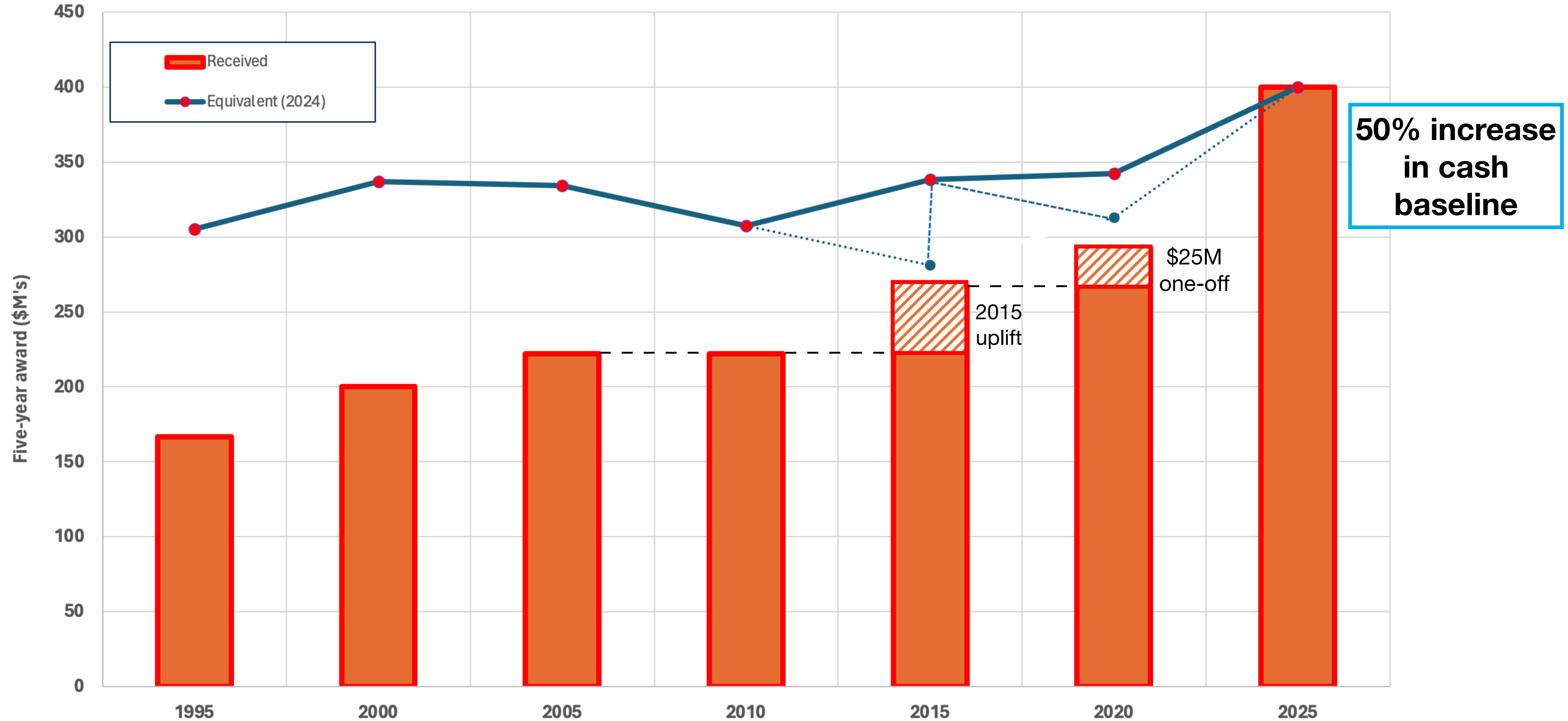
* This request included funding for several projects that would later be supported through the CFI Innovation Fund, including ARIEL and the ATLAS Tier-1

** This funding was allocated in two tranches beginning with an initial \$222.3M commitment in 2014, followed by a \$45M supplement in 2015

*** Finance Canada arrived at this value by starting with the flat-flat amount of \$267.3M and adding a one-time increase of ~\$25M for critical capital projects and deferred maintenance

Budget 2024 Outcome - Context

TRIUMF Funding levels (5-year awards)



Budget 2024 Outcomes

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- Overall, I view this outcome as one that will allow us to stabilise TRIUMF and consolidate on the currently planned operations, infrastructure and programme
- We still have one year to run on the current five-year plan, and will be guiding the organisation to the new plan over the next year
 - This means things will remain very tight over this year, but we have the confidence that the next five years have increased operational support
- Over the next few years, we will have the ability to seize opportunities that may arise, yet need to ensure TRIUMF is operating at maximum efficiency and efficacy
- *Basically, this budget secures the future of TRIUMF operations at its current scale*

Budget 2024 Outcome - MRF

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- There is no specific text around the Major Research Facility framework in the Budget 2024, however many of the components are clearly being lined up
 - Additional support to MRF to get them to the 2029/30 timeframe
 - Capstone organisation to help advance *internationally collaborative, mission driven and multidisciplinary research*
 - Strategic advisory bodies
- We will continue to engage with ISED and CFI as the MRF process unfolds. There may be additional detail in the Fall Economic Statement, or in the Budget Act itself
 - TRIUMF remains a trusted stakeholder in this process

Five-Year Implementation Plan - Scenarios

Stakeholder & Ecosystem Engagement - Reminder

		Leads	Engaged	Outcome	Completed?
Community Requirements	20YV: Community Topical Groups	Divisions	TRIUMF Divisions Community	Vision frameworks Topical group outputs	Yes
	20YV: Vision Framework	DDR	Steering Committee Community	Vision frameworks	Yes
	20-year Vision	DDR/ED	Board of Governors	TRIUMF 20-year vision	Yes
Framework	NRC OAE Evaluation	NRC	TRIUMF Divisions Community	Evaluation report	Yes*
	Community alignment to Long Range Plan, strategic plans for stakeholder groups	Leadership Team	Community Science Week	Alignment to 20-year Vision	Yes
	MRF Framework discussions	ED/CoS	ISED/NRC	Understanding of scope and framework	Yes*/ Ongoing
Contents and Scenarios	Staff compensation model	ED/HR	Consultants	Compensation model	Yes
	Long term objective setting	Leadership Team	TRIUMF Divisions	Resource spreadsheet	Yes
	Resource requirement setting based on objectives	Leadership Team	TRIUMF Divisions	Resource spreadsheet	Yes
	Scenario planning	ED	Leadership Team	Priorities and scenario planning	Yes
5-year Request for Support	"Two-page" brief document	ED	Leadership Team	Brief	Yes (evolves with input)
	Pre-budget submission document	ED	Leadership Team	PBS	Yes
	Proposal construction	ED	Leadership Team	5-year request for support	Yes
	Proposal dissemination	ED/CoS	Leadership Team / community	Socialisation of request in government	Yes*/ Ongoing
	Proposal submission	NRC (ACT)	ED	Submission to government	Yes*/ Ongoing
After award					
5-year Plan	Comparison to proposal	Divisions	TRIUMF Divisions	Framework document	No
	5-year Plan Construction	ED	TRIUMF Divisions Community	5-year Strategic Plan	No
	5-year Plan Approval	ED/CoS	Board of Governors	5-year Strategic Plan	No

- Community requirements developed through 20-year Vision
- Framework defined through Canada's subatomic physics long-range plan, domestic and international plans, etc.
- Scope and framework refined through the NRC Evaluation (including the Peer Review Committee feedback)
- Scenario planning based on these inputs developed through internal and community processes
- Documentation created for government engagement, pre-budget submissions, request for support
- TRIUMF 5-year plan will be created with community input once funding levels have been determined, to provide accountability to the community

Five-year Plan Scenarios

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- We have given the government some indication of what we can achieve at this level within the request in terms of infrastructure completion, HQP training, international and national science leadership, etc.
- Within the Request for Support, the \$400M scenario was framed as (in comparison to the \$450M request) a “Loss of Opportunity”:
 - ARIEL construction is slowed and operations of ARIEL and IAMI are delayed, resulting in the loss of first-mover advantage against international competition in key research and technology areas
 - Increased risk of infrastructure failure due to reduced investment in deferred maintenance
 - Decreased science output with internal resources and staff reorganised to fill operational requirements
- Now we know the budget outcome we will need to look at potential options at this level, balancing communication government, the requirements of the lab, and the desires of our stakeholders
- Process will lead to a funded five-year plan that TRIUMF can be judged against - this is going to be critical for the transition to a new funding structure to ensure TRIUMF is a credible leader in that group

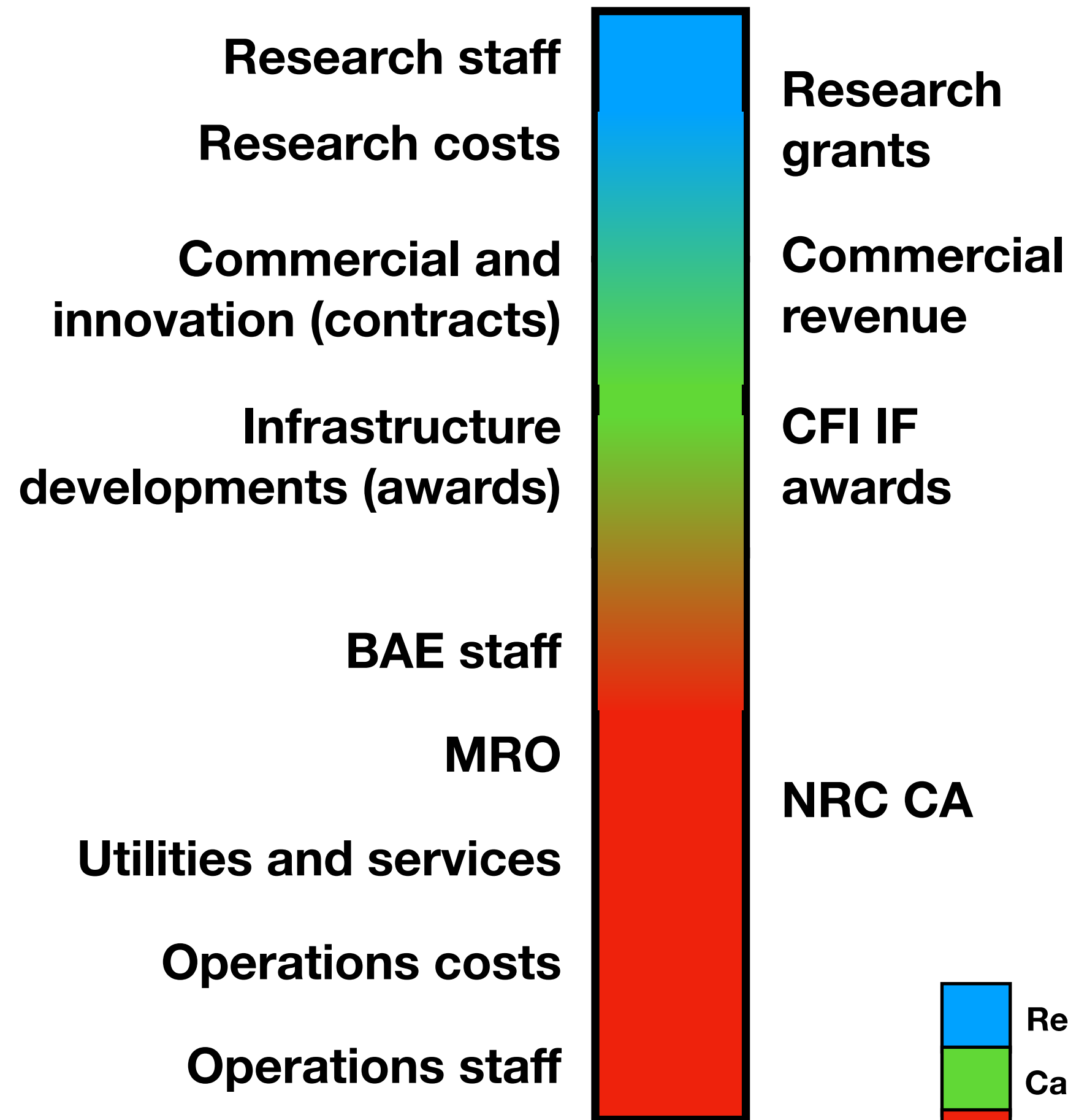
Five-year Plan Requirements

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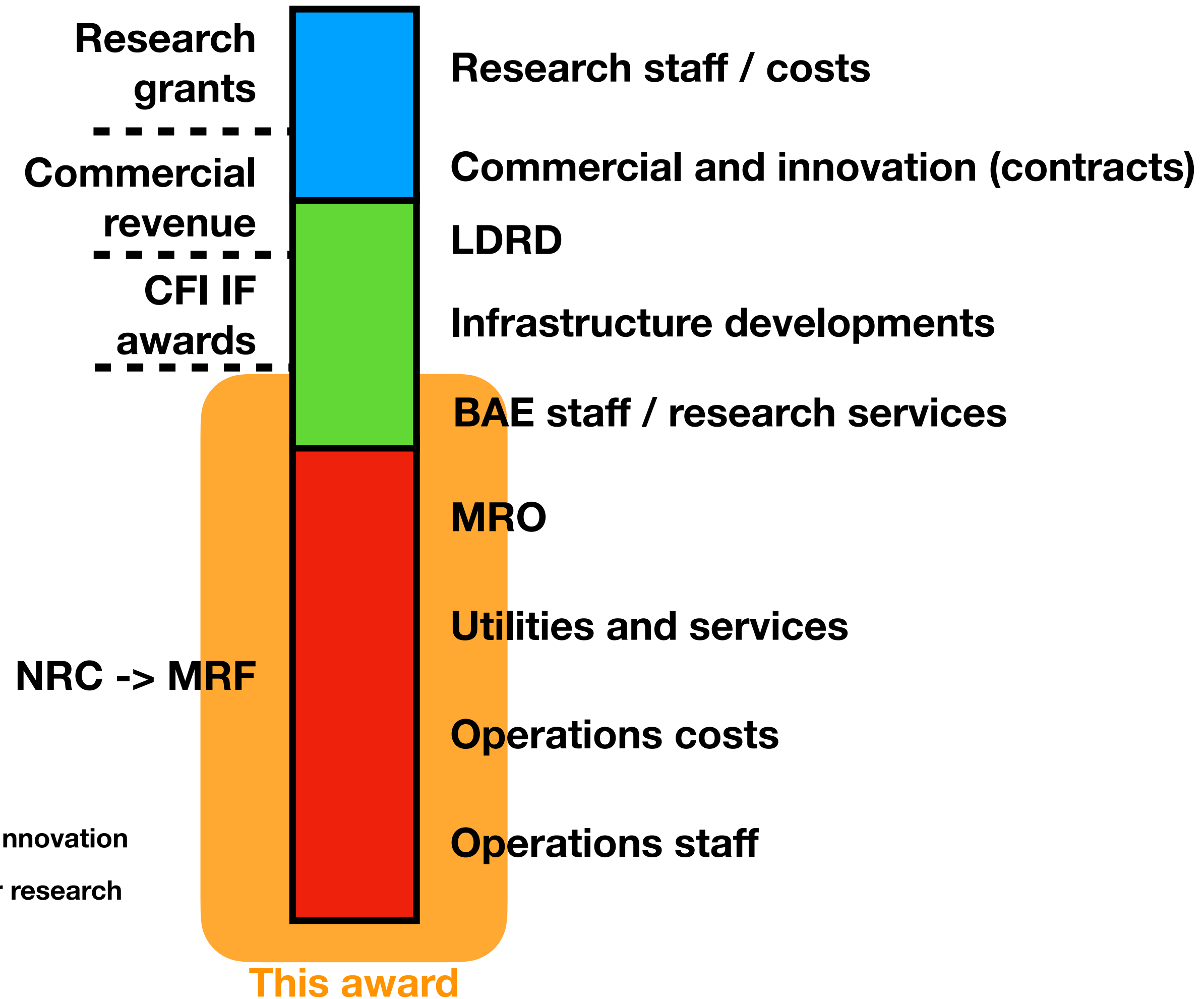
- Some of the areas that we have viewed as essential components of the next five-year planning (the “rocks”) have been discussed with the Board, and we view them as Board expectations
- **Compensation plans:** we aim to deliver the market median as a target salary for all staff by the end of the next five-year plan, with evaluations of market every three years.
- **Deferred maintenance:** an essential component of the request and discussions with government. We have an aging core infrastructure and need to invest heavily in securing future operations
 - Looking to use CFI IF process (there is a new “core facilities” stream) to augment budget
- **Operational Excellence** is a cornerstone of the request. Funding Weft and Warp as a response to CNSC/WAG, developing research security, safety, programme management, ...
- These components form the basis of the award, as re-affirmed in the budget language and by statements from the PM. So we need to deliver on these...

Budgetary Model

Current model



Future model



NRC CA

NRC -> MRF

This award

5-year plan scenarios

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- The TRIUMF Leadership Team has discussed ways to develop the five-year programme to deliver the core requirements for TRIUMF within the available budget and constraints
 - ARIEL and IAMI completion re-affirmed as primary objective of the next five-year plan
 - Endorsed by ACOT as a “vital deliverable” from the international perspective (and ASSC)
- Three scenarios have been identified which are currently under evaluated:
 1. Returning to an eight-month operational cycle for ISAC, delaying operations of IAMI into the next five-year period and effectively deferring ARIEL construction and operations well beyond existing five-year plan
 2. A single extended shutdown of the main accelerator for a year in 2026 to complete ARIEL construction as defined by the CFI criteria. This allows focus on ARIEL during that period without distraction (and will require rigour), yet obviously impacts ISAC and CMMS, and medical isotope production
 3. The status quo of longer shutdowns over the next four/five years to provide some spare capacity for ARIEL construction. This implies continued six month shutdowns, which impacts science and medical isotope production - this is actually closer to the scenario put to government
 - (Fourth scenario of securing an additional \$50M operation funds viewed as unrealistic)
- Note that in all scenarios upgrading Beamline 1A is required, which takes that beam line down for 6-9 months

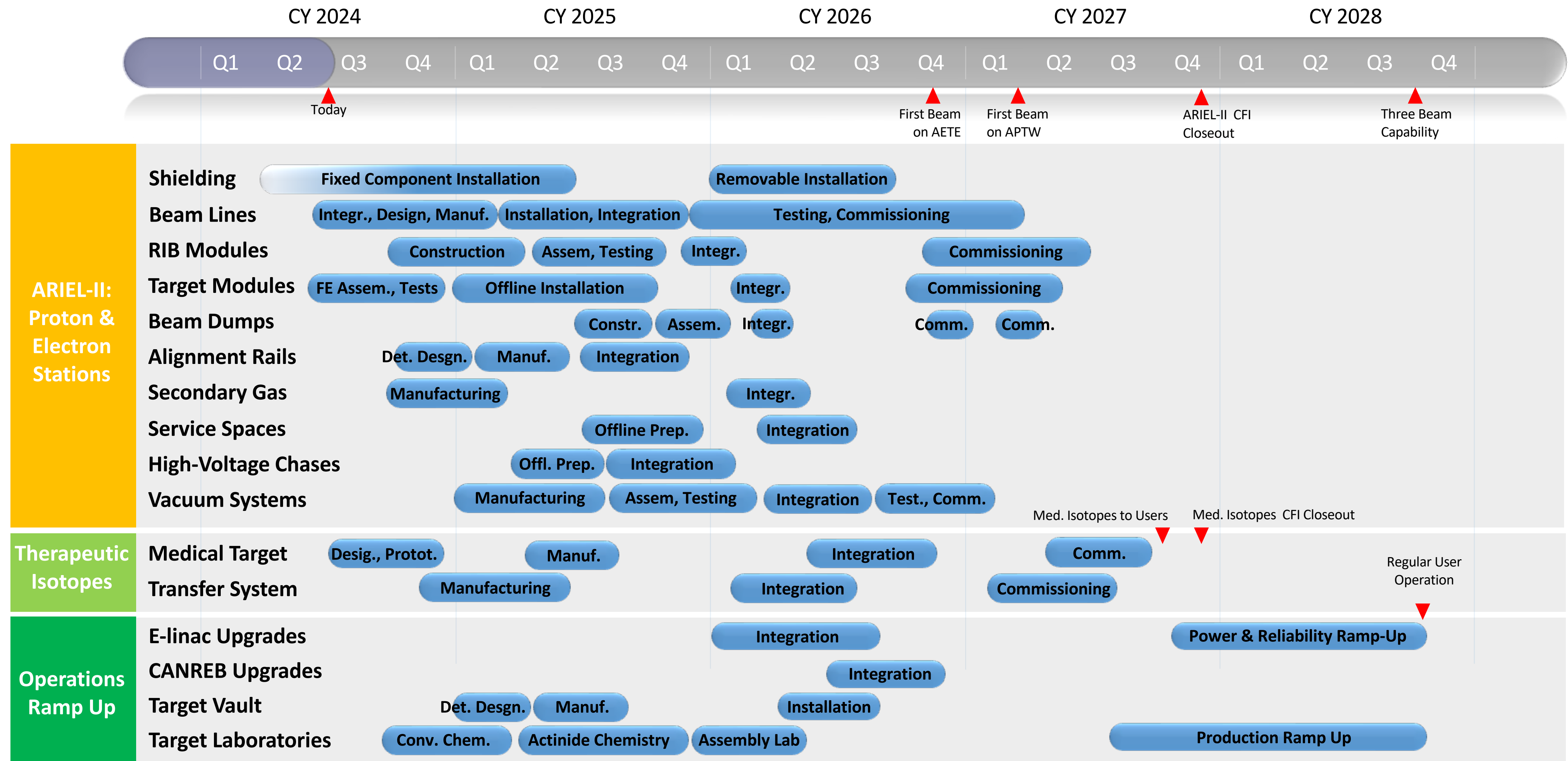
5-year plan scenario considerations

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- From the 20-year vision, the following additional considerations were developed:
- Ensure positioning for next 5YP funding request
- Maintain scientific excellence in our domestic research programme
- Maintain scientific excellence in our international research programme
- Talent development (ie impact on student and postdoc projects)
- Complete and operate ARIEL
- Complete and operate IAMI
- Complete refurbishment of Beamline 1A (major deferred maintenance objective)
- Medical isotope production
- Manage reputation with users
- Maintain reputation with international collaborators
- Manage reputation with government
- Manage reputation with business partners

Input taken from project teams

- ARIEL timeline acceleration from current planning - block planning



5-year plan scenario considerations

- Fulsome discussion of pro/con analysis of scenarios at leadership team

	Scenario 1 - 8/4	Scenario 2 - extended SAS	Scenario 3 - 6/6
Issue	Pro/Con	Pro/Con	Pro/Con
Position TRIUMF for next 5YP	Pro: Science output maintained (domestic); Con: No major infrastructure completed; No credibility that we will ever finish ARIEL (with government and CFI)	Pro: ARIEL and IAMI completed and operating; More science from the five year period; Con: Reputational damage (especially if we fail)	Pro: Less science output, but some Con: No major infrastructure operational at point of the discussions
Maintain domestic scientific userbase / excellence	Pro: Short term benefit to domestic users over 5 years; Reduction of backlog in ISAC Con: Long term stress for domestic users due to lack of ARIEL	Pro: Long term benefit if we succeed; more beam time overall, more varied science programme with ARIEL Con: Short term stress, increased risk of long term credibility if we fail	Pro: Less science output, but some Con: Constant stress (fewer beam hours), jam tomorrow
Maintain international scientific userbase / excellence	Pro: As above Con: As above	Pro: Attracting ISOLDE users + as above Con: As above	Pro: As above Con: As above
Talent Development	Pro: Non-disruptive HQP development Con: Similar research programmes	Pro: Overall greatest HQP development; new research threads can be developed (both Con: Disruptive development and management of fellowships	Pro: Non-disruptive, HQP development Con: Least overall development
Complete and operate ARIEL	Pro: None Con: ARIEL is not completed, nor operating	Pro: Completion and operation of ARIEL Con: Increased risk of failing (as we're actually trying); increased regulatory load	Pro: Completion of ARIEL Con: No operations of ARIEL
Complete and operate IAMI	Pro: IAMI completed; BC Ops possible Con: IAMI TRIUMF operations delayed to 2028	Pro: IAMI completed; BC Ops possible; TRIUMF Operations immediately Con: Potential impact on other LS programmes; increased regulatory load	Pro: IAMI completed; BC Ops possible Con: IAMI TRIUMF operations delayed to 2028; Potential impact on other LS programmes
Complete (primarily triplet) BL1A	Pro: Planning of resource usage Con: Will require a longer shut down compared to the four months planned	Pro: Potential alignment to year-long shutdown Con: Competing resources against ARIEL	Pro: Shortest potential additional loss Con: Longer shutdown possible, beyond six-month; Resource conflict with ARIEL during SAS
Medical isotope production on IPE	Pro: Least-disruptive irradiation (BL1A/IPF down); increased production yield of other scenarios;	Pro: Production possible on ARIEL and TR-24 capacity, providing future benefit and greater production capacity; Mitigation against	Pro: Less-disruptive irradiation (BL1A down), reduced yield; Reduction in supply at critical

5-year plan scenario considerations

More +ve	
Less +ve	
Less -ve	
More -ve	

Scenarios		
1 (Defer ARIEL/IAMI; 8-month cycle)	2 (Extended Shutdown)	3 (Delay ARIEL/IAMI; 6-month cycle)

Non-negotiable elements			
Compensation	✓	✓	✓
Deferred Maintenance	✓	✓	✓
Operational Excellence	✓	✓	✓
Considerations			
Position TRIUMF for next 5YP			
Maintain domestic scientific userbase / excellence			
Maintain international scientific userbase / excellence			
Talent Development (also 'compensation' above)			
Complete and operate ARIEL			
Complete and operate IAMI			
Complete BL1A Refurbishment			
Financially secure - operations & capacity			
Medical isotope production			
Manage reputation with users			
Maintain reputation with international collaborators			
Manage reputation with government			
Manage reputation with business partners			

TRIUMF Preferred Scenario

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- Evaluating the three scenarios the TRIUMF Leadership Team is viewing scenario 2 (extended shutdown) as the preferred and working option
 - Only viable pathway to completing ARIEL and IAMI in this five-year period
 - An operating ARIEL facilitates much more science (including new projects proposed)
 - Off-ramps possible if ‘show-stoppers’ are discovered during detailed planning and preparation, but we need to start now to be able to deliver in 2026
- Risks and requirements recognised
 - Need to deliver - requires full laboratory focus, and discipline on resource and project management
 - There will be impact over a short time on other projects and resources at TRIUMF, but the longer term benefits are clear
 - TRIUMF operates well in challenging times - I have confidence we can pull together to coalesce around this pathway, we have already delivered major outcomes for the lab and community

TRIUMF Preferred Scenario - Feedback

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- Community feedback still important on this preference
 - Have we missed any considerations?
 - Does the community agree that this is the best option given our situation?
 - How can we make this a success for all?
 - What experiments are planned for 2025 operations? (EECs)
 - What steps needed to ensure HQP not severely impacted? (PIs)
 - How do we support commercial partners through six month gap in production? (T.I. and Leadership)

Governance and Oversight

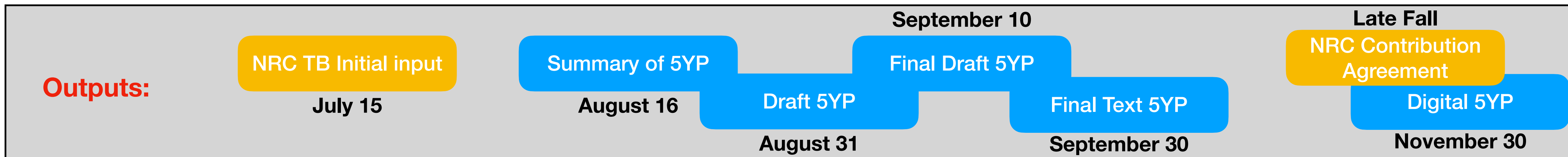
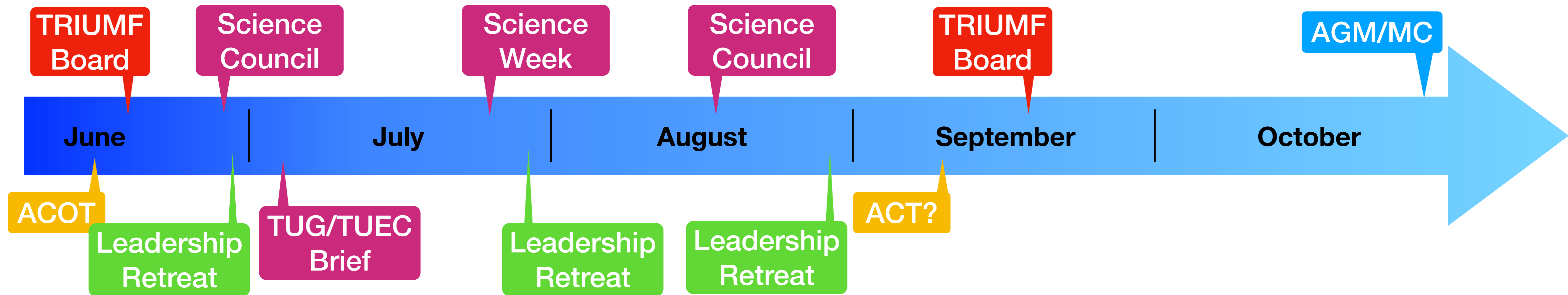
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- The delivery of ARIEL through an extended shutdown will become the highest priority for required (and appropriate) resources within TRIUMF
 - Additional capacity targeted through QRPP etc. to other projects and requirements
- Project governance structure in development, but will follow the successful model of the CNSC Licence Conditions Handbook work over last 2 years
 - Leadership Team -> acts as a Tiger Team with overall accountability (NJTS as overall project sponsor)
 - Senior Management Group act as resource managers and tactical delivery
 - ARIEL Project leads (Alex, Peter) have responsibility for ensuring project is on track through PM resources
 - “Über-SAS” technical team will coordinate and execute work (thanks Doug!)

5-year plan process timeline

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- Three streams of input and process we need to coordinate and manage:
 - Governance chains: Board of Governors, Science Council, Members' Council (AGM)
 - Government: NRC Contribution agreement discussions, ACOT
 - Community: Science Council, Science Week, TUEC/TUG meetings
- Scenarios articulated in June, input over July/August, finalised by September for approval in October
- Budgets for FY25 and 5YP being 'refined'
 - Board has added additional constraints on 'colour' of money
- NRC cash flow and documentation needs to be with TB imminently



Meeting details

- Leadership Team Retreat (Plan Development) – May 13
- Leadership Team Retreat (Plan Development)– May 31
- NRC – Advisory Committee on TRIUMF – June 10-12
- Board of Governors Meeting – June 18
- Science Council Meeting – June 27
- Leadership Team Retreat (Plan Development) – June 28
- TRIUMF User Group Pre-Science Week Briefing – July 5
- TRIUMF Science Week - July 22-26
- Science Council Meeting [**ACTION:** Review 5YP summary and secure endorsement] – Mid August (TBC)
- *Tentative* Agency Committee on TRIUMF – August/September (TBC)
- Board of Governors Meeting [**ACTION:** Recommend 5YP approval] – September 17
- Members’ Council Annual General Meeting [**ACTION:** 5YP approval] – October 28 & 29



Questions?

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