



Update from the EIC Project Management

Jim Yeck

EIC Project Director

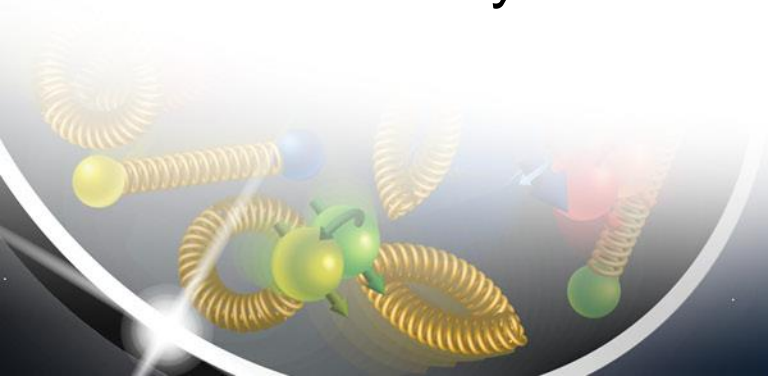
EIC User Group Meeting

July 25, 2023

Electron-Ion Collider

Outline

- EIC Requirements
- Management and Organization
- Funding and Schedule Plans
- CD-3A and CD-2 Planning Perspective
- Accomplishments
- Opportunities and Challenges
- Summary



Project Requirements

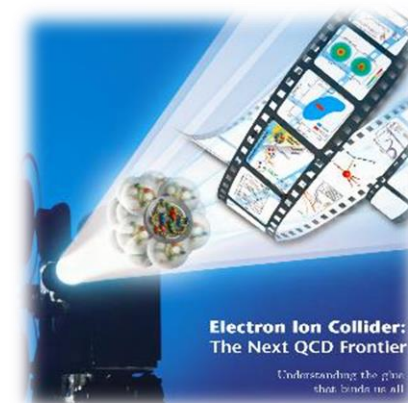
Project Design Goals

- High Luminosity: $L = 10^{33} - 10^{34} \text{cm}^{-2}\text{sec}^{-1}$, 10 – 100 fb⁻¹/year
- Highly Polarized Beams: 70%
- Large Center of Mass Energy Range: $E_{\text{cm}} = 20 - 140 \text{ GeV}$
- Large Ion Species Range: protons – Uranium
- Large Detector Acceptance and Good Background Conditions
- Accommodate a Second Interaction Region (IR)

Conceptual design scope and expected performance meets or exceed NSAC Long Range Plan (2015) and the EIC White Paper requirements endorsed by NAS (2018).

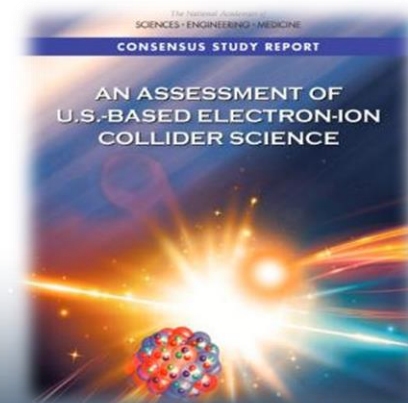


The 2015
LONG RANGE PLAN
for NUCLEAR SCIENCE



Electron Ion Collider:
The Next QCD Frontier

Understanding the glue
that binds us all

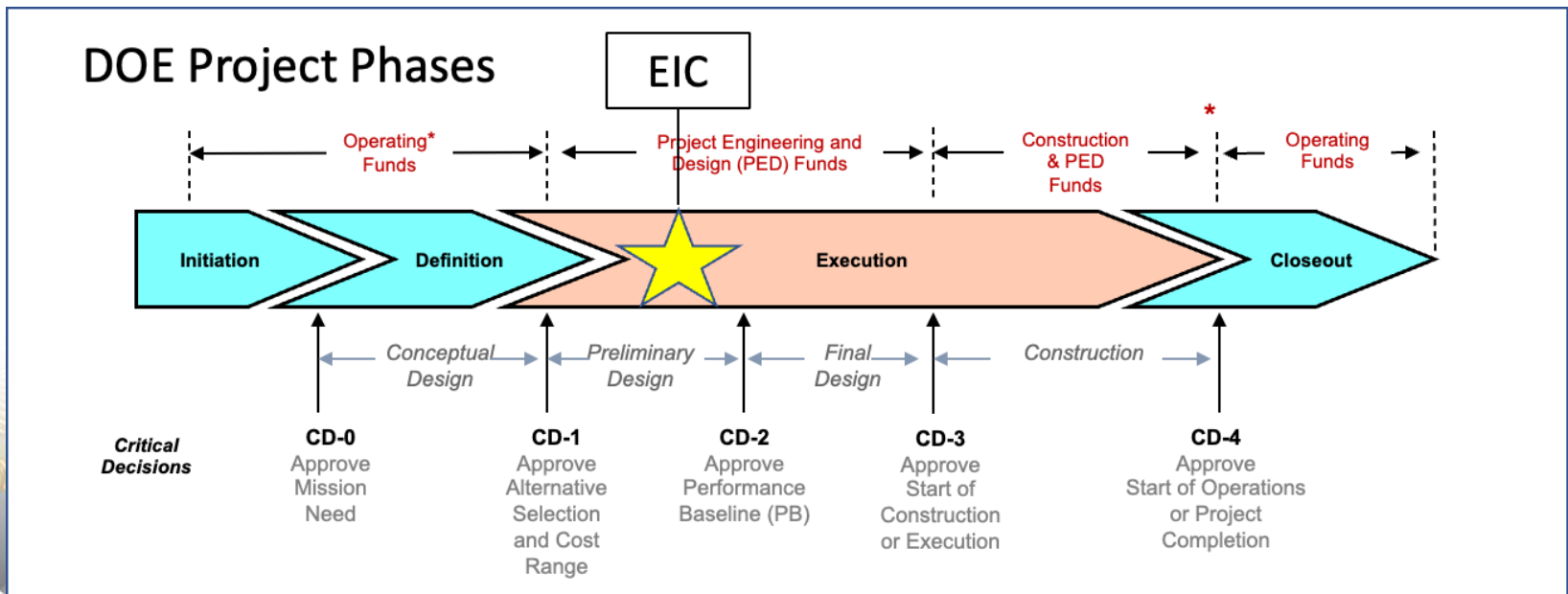


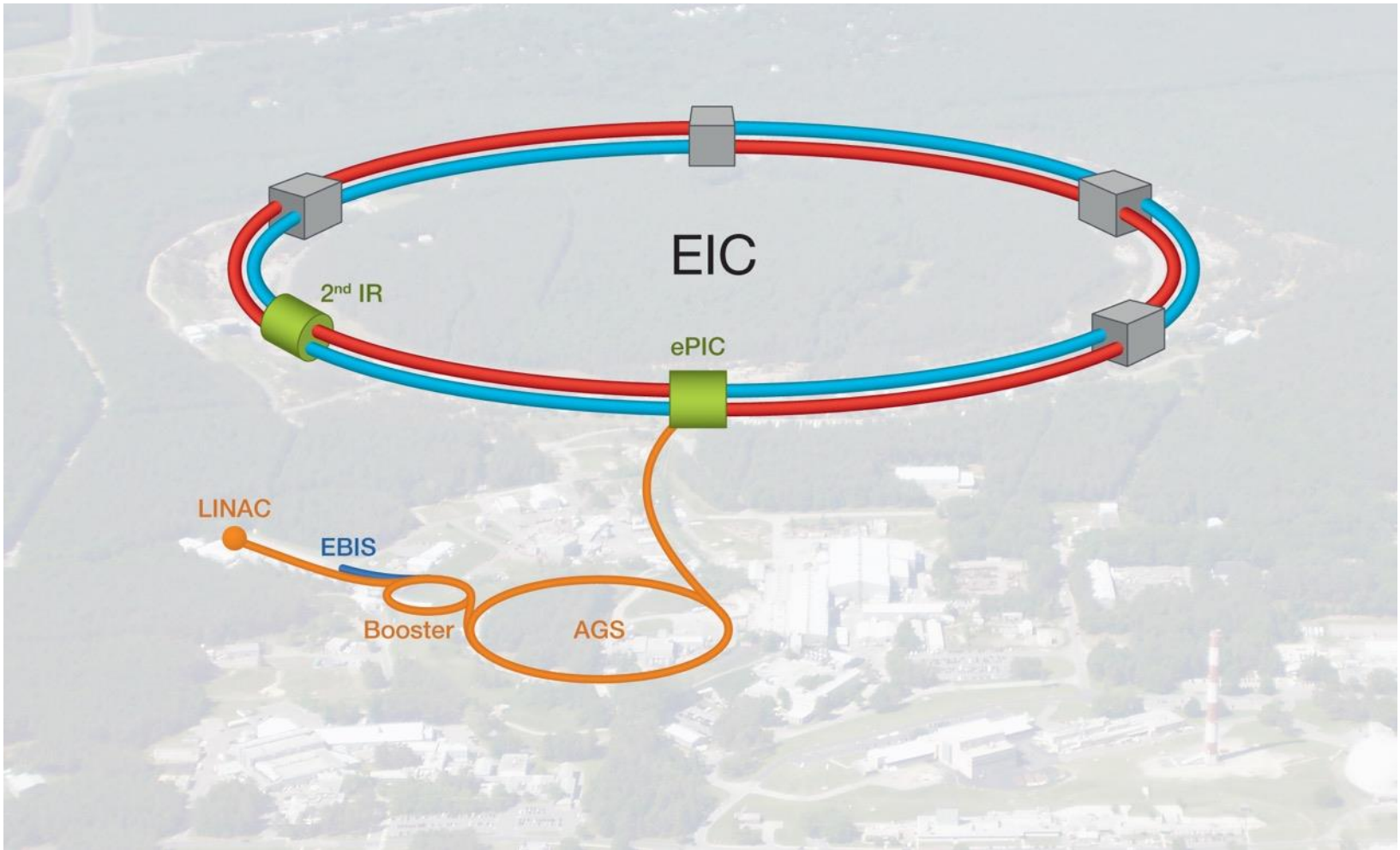
CONSENSUS STUDY REPORT

AN ASSESSMENT OF
U.S.-BASED ELECTRON-ION
COLLIDER SCIENCE

EIC Project History and Plans

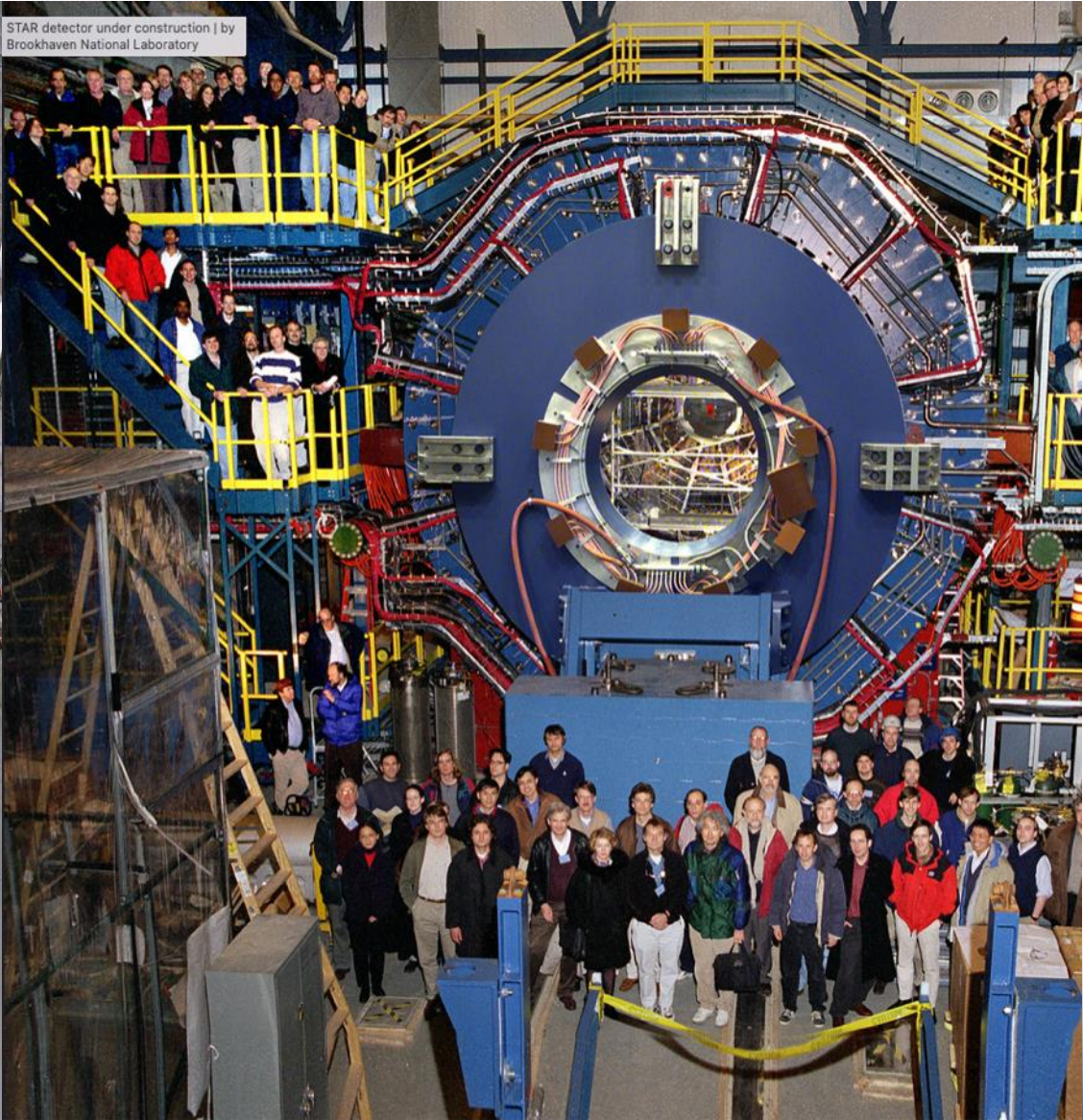
CD-0, Mission Need Approved	December 2019
DOE Site Selection Announced	January 2020
CD-1, Alternative Selection and Cost Range, Approved	June 2021
CD-3A, Long Lead Procurement	January 2024
CD-2/3, Performance Baseline/Construction Start	April 2025
RHIC Shut Down	June 2025

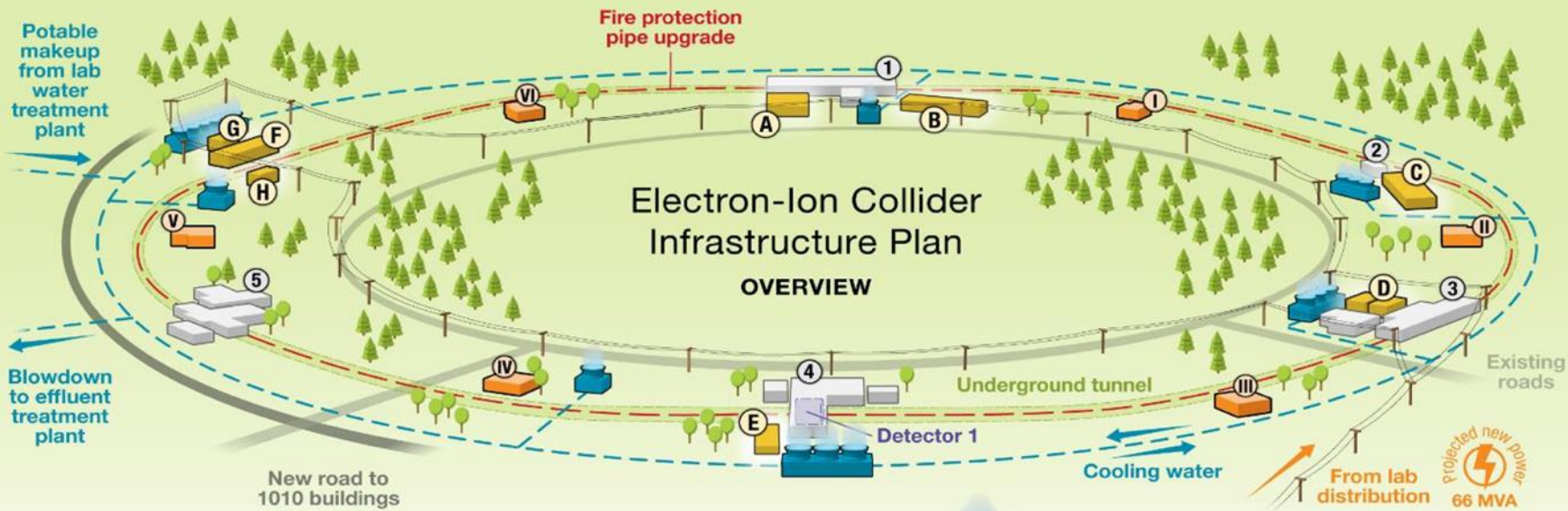




**EIC Double Ring Design
Based on Existing RHIC Facility
RHIC Operations Concludes in 2025**

RHIC Infrastructure





APPROVED NEW BUILDINGS				POWER SUPPLY BLDGS.		COOLING SYSTEM								
		sq. ft.	MVA		sq. ft.	MVA								
(A)	1012C	Kicker Power Supply	11,061	1.25	(I)	1001A	4,284	1.19	12	2	4	6	7	
(B)	1012D	400 MeV Linac	9,812	1.16	(II)	1003A	4,284	1.16	Heat load (MW)	0.1	10	6	7	1
(C)	1002H	Injection Linac	17,948	4.10	(III)	1005T	6,405	1.73	Flow rate (gal/min)	94	6,612	4,221	4,778	1,028
(D)	1004G	Cooling / Kicker	4,421	0.41	(IV)	1007A	9,034	12.6	Blowdown (gal/min)	0.2	18	11	13	3
(E)	1006J	Cryo Building	4,738	2.85	(V)	1009A	4,284	1.18	Makeup (gal/min)	1	88	56	63	14
(F)	1010C	RF Power Amplifier	40,844	28.2	(VI)	1011A	4,284	1.16						
(G)	1010D	DI Pumphouse	5,037	0.99										
(H)	1010E	Cryo Facility	5,325	1.10										

EXISTING BUILDINGS	① 1012 & 1012A	Interaction Region & Cryo/Polarimeter Service Building	② 1002	Interaction Region	③ 1004 & 1004A	RHIC RF Supply Building
	④ 1006 Complex	Detector 1 Experimental Hall & Service Buildings	⑤ 1008 Complex	Detector 2 Experimental Hall & Service Buildings		

New York State will provide new EIC support buildings (\$100M).

BNL/TJNAF Special Partnership



- BNL/JLab partnership established in early 2020
- Integrated management and scope
- Serve together as hosts for the EIC experimental program



BROOKHAVEN NATIONAL LABORATORY
 D. Gibbs
 Laboratory Director
 R. Tribble Deputy Director for Science & Technology
 J. Anderson Deputy Director for Operations

EIC BOARDS
EIC Advisory Board
 S. Henderson, TJ Director, Chair
EIC Resource Review Board
 H. Gao, BNL Associate Lab Director for Nuclear & Particle Physics
 D. Dean, TJ Deputy Director for Science
 TBD Co-Chair, International Funding Agency

ELECTRON-ION COLLIDER PROJECT
 J. Yeck (BNL), Project Director
 F. Willeke (BNL), Deputy Project Director and Technical Director
 K. Smith (BNL), Deputy Technical Director
 R. Ent (TJ), Co-Associate Director for the Experimental Program
 A. Lung (TJ), Deputy Project Director for TJNAF Partnership
 E. Aschenauer (BNL), Co Associate Director for the Experimental Program
 A. Seryi (TJ), Associate Director for Accelerator Systems & International Partnership
 Technical Integration
 L. Lari (BNL), Project Manager

EIC COMMITTEES
Project Advisory Committee
 T. Glasmacher, Chair
Machine Advisory Committee
 T. Raubenheimer, Chair
Detector Advisory Committee
 E. Kinney, Chair
Infrastructure Construction Advisory Committee
 M. Fallier, Chair

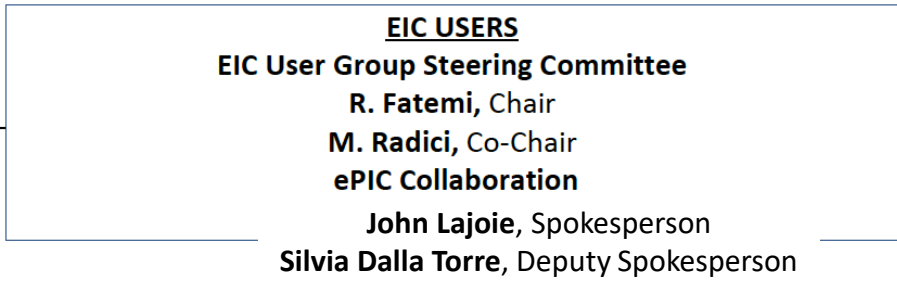
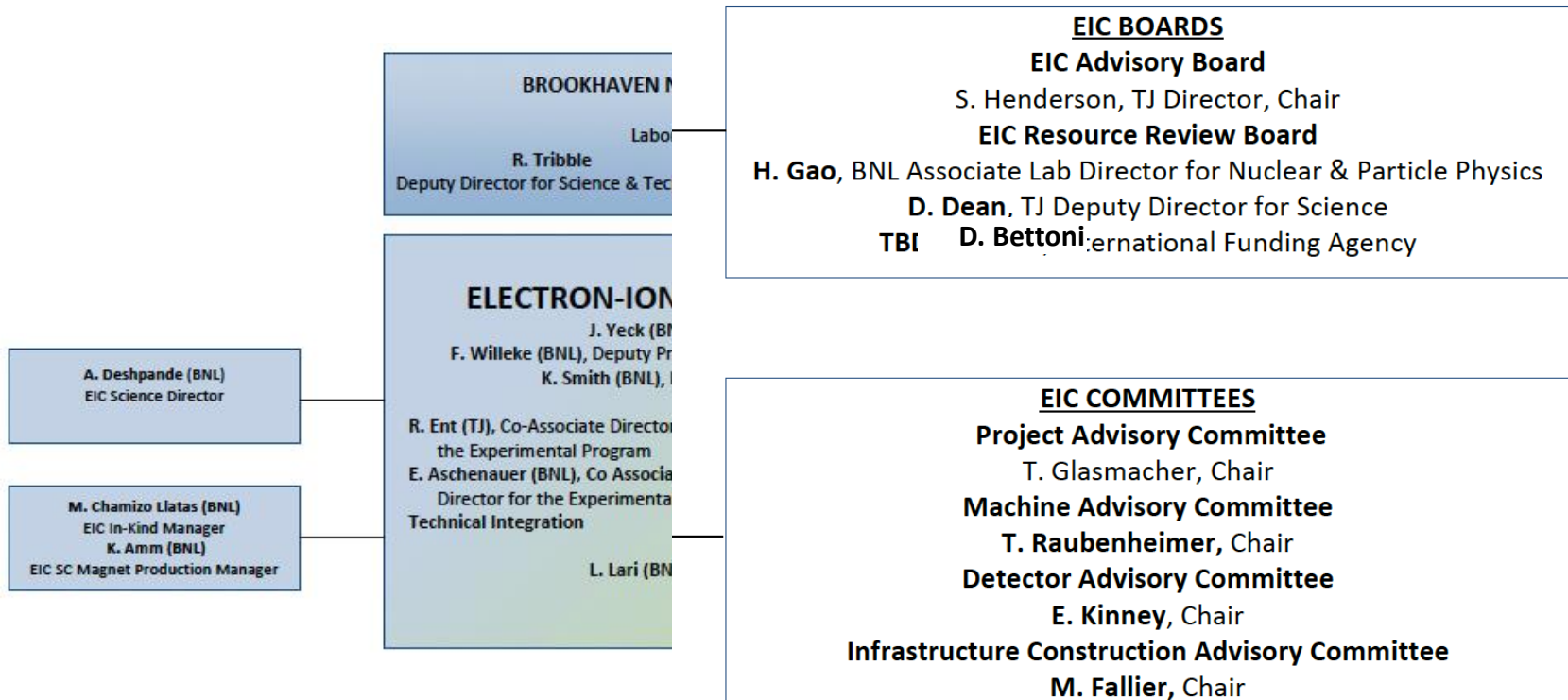
A. Deshpande (BNL)
 EIC Science Director

M. Chamizo Llatas (BNL)
 EIC In-Kind Manager
K. Amm (BNL)
 EIC SC Magnet Production Manager

EIC USERS
 EIC User Group Steering Committee
 R. Fatemi, Chair
 M. Radici, Co-Chair
 ePIC Collaboration
 TBD – Spokesperson



Boards and Advisory Committees



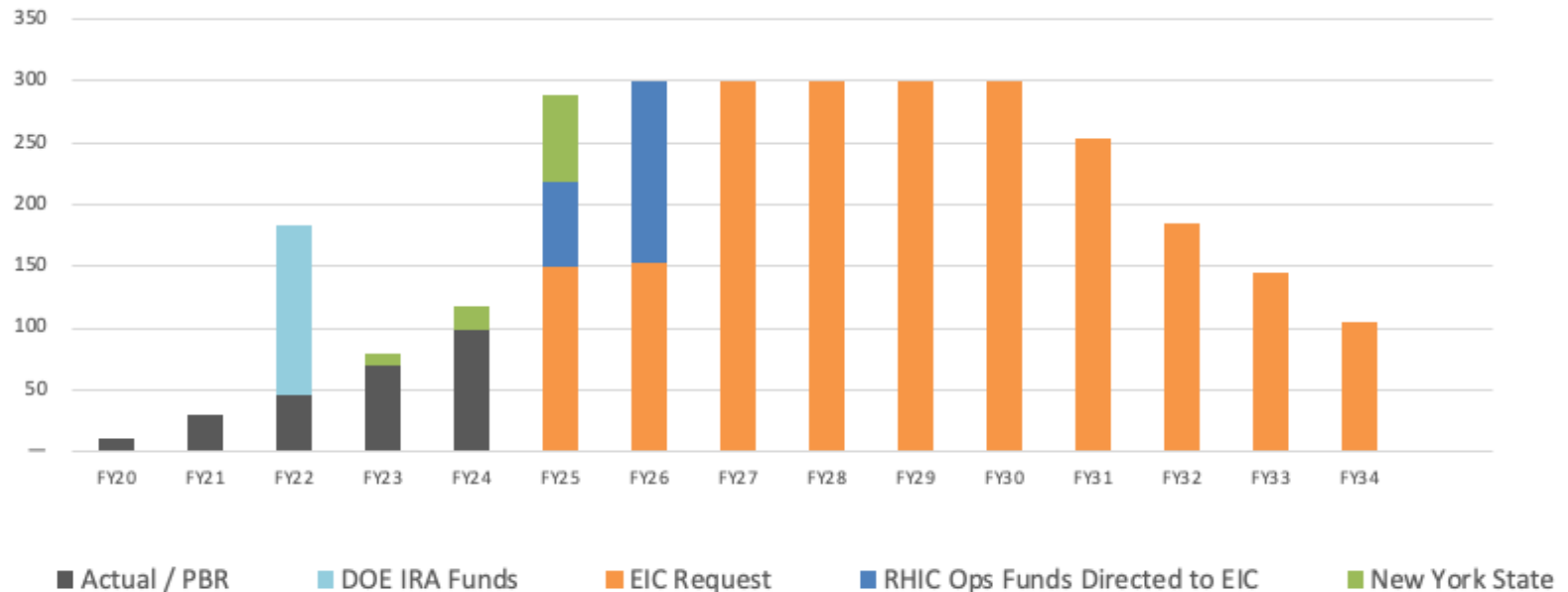
- DOE, BNL, and JLab envision an EIC facility
- International EIC Advisory Board provides advice on the accelerator: ANL, BNL, France, STFC - UK, INFN - Italy.
- International EIC Resource Review Board meets in 2023. Delegates from Africa, Asia, Europe, and Latin America.
- International EIC Project Advisory Committee provides advice on the successful delivery of the DOE Project including management, scope, schedule, cost, and performance.

EIC Advisory Board

- Directors of labs participating in the EIC accelerator design and construction, chaired by JLab Director
- Meets 3-4 times per year, last meeting on June 29, 2023
- June meeting approved charter and provided recommendations:
 1. BNL: Expeditiously move forward with a design contract with Saclay for the solenoid spin rotator magnets.
 2. JLAB: Evaluate the benefit/risk to the project of the PERLE cryomodule proposal.
 3. BNL/JLab: Establish an accelerator collaboration with the proper structure and regular meetings.
 4. EIC Project and Partners: Finalize scope with partners.
 5. EIC Project: Define high-level risks and milestones at the appropriate level to be monitored by the EIC Advisory Board.

DOE Reference Funding Plan

EIC Reference Funding Profile v4 FY24 - \$98M,
FY25 \$150



- DOE Inflation Reduction Act funding of \$138M allocated in September 2022. Actual FY2023 funding is \$70M. DOE request for FY2024 is \$98M.
- RHIC shut down planned for June 2025. Significant RHIC Operations funding will be redirected to EIC construction starting in FY2025 and reaching ~\$150M/year in FY2026.
- Current funding supports DOE CD-3A, Long Lead Procurement Approval, in January 2024. Long lead procurement mitigate risks: technical, supply chain, inflation, and schedule.

Funding and DOE Critical Decisions

- Inflation Reduction Act (IRA) funding of \$138M provided at the end of 2022 supports CD-3A, Long Lead Procurement Approval, plans
- FY2024 funding is expected to be \$98M
- Substantial redirection of funding from RHIC operations into EIC construction starting in 2025
- FY2025 funding will be critical to achieving the CD-2/3 approval schedule
 - Priority is securing CD-2 prior to planned conclusion of RHIC ops in 2025 and the efficient transition from RHIC ops into EIC construction

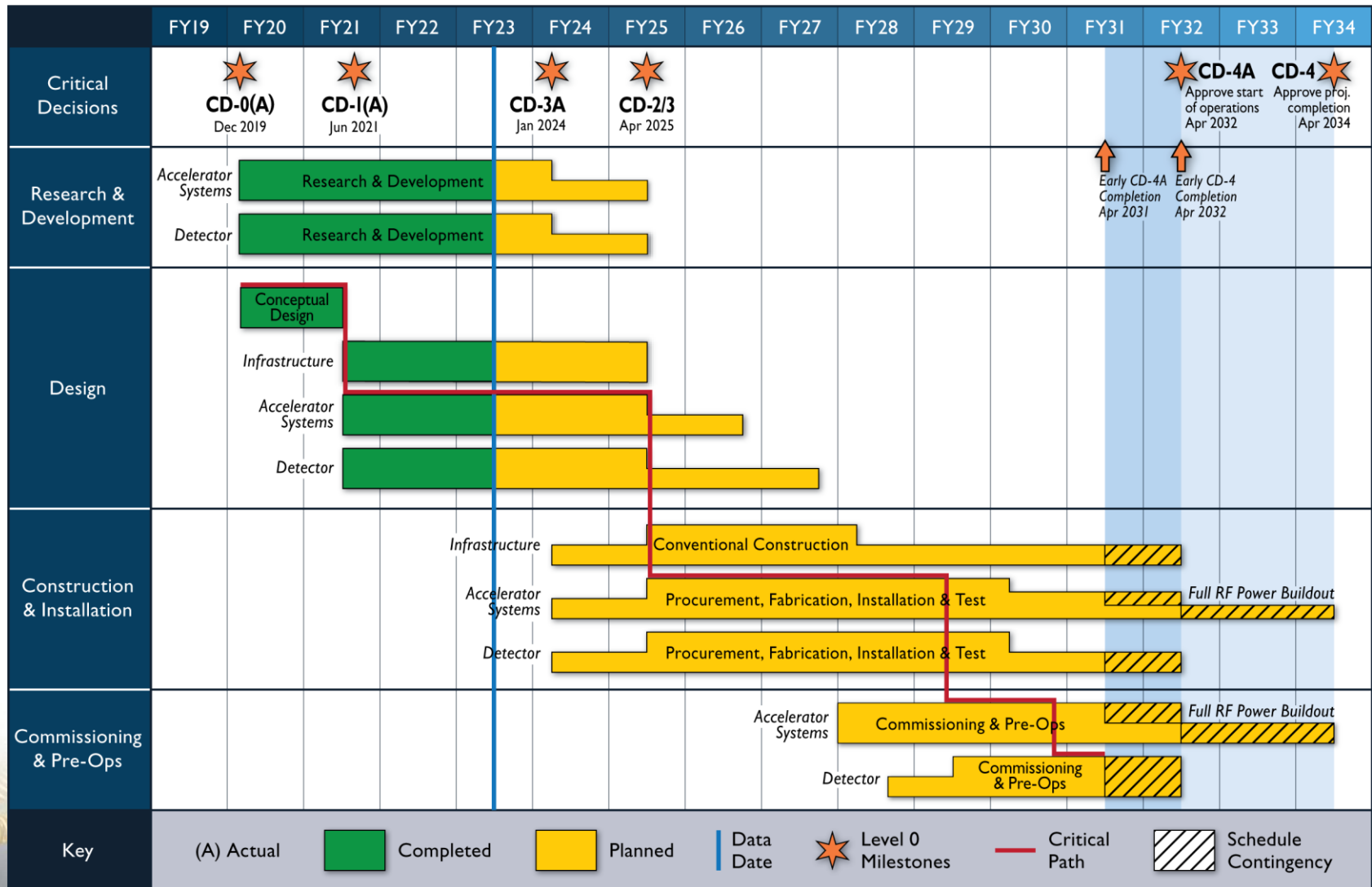
EIC Project & Design Reviews

Event	Date
Office of Project Assessment Status Review	October 19-21, 2021
Fundamental Power Coupler Design Review (PDR)	June 18, 2021
Federal Project Director Status Update	June 28-30, 2021
EIC ESR Vacuum Systems and Impedance (CDR)	November 8, 2021
IR Design & MDI Review (CDR)	April 6, 2022
EIC Source and 400 MeV Pre-Injector Linac Systems Review (PDR)	July 14, 2022
Electronics/Computing Subsystem Status Review (CDR)	August 29, 2023
DET - Magnet Subsystem Design (PDR)	October 18, 2022
ESR Single Cell Cavity Review (PDR)	October 27, 2022
Crab Cavity R&D Prototype (PDR)	November 2, 2022
Cryogenics Satellite Plant and 2K & 4k Distribution (PDR-1)	November 15, 2022
Hadronic Calorimetry Subsystem Status Review (PDR-1)	December 6, 2022

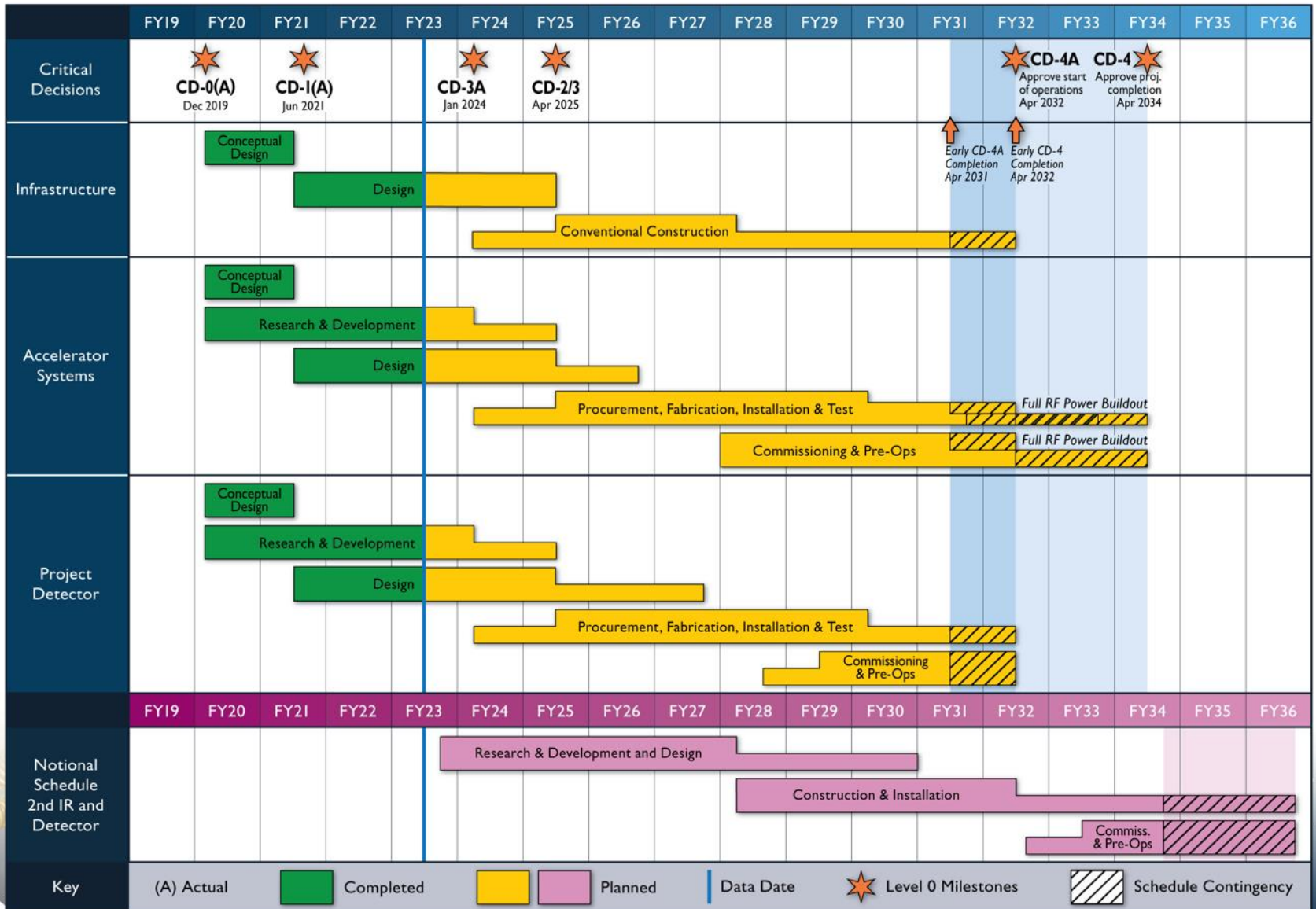
EIC Project & Design Reviews (cont.)

Event	Date
Polarimetry & Luminosity Detector Status Review (PDR-1)	January 17, 2023
Office of Project Assessment Status Review	January 31-February 2, 2023
591 MHz First Article Single Cell Cavity String Components (PDR)	April 20, 2023
EIC High Power FPC (FDR-1)	April 28, 2023
591 MHz HP-SSA Engineering Demonstration Units (FDR)	May 16, 2021
RCS Arc Vacuum Chambers (PDR)	June 9, 2023
SC Magnet Wire Specification (FDR)	June 15, 2023
HSR BPM Cryo Buttons & Cryo Cables (PDR)	June 20, 2023
400 MeV Linac System (FDR)	June 23, 2023
Long-Lead Procurement Cost Review	June 26-29, 2023
SC Magnet Schedule Review	June 26-29, 2023
Secondary Unit Substations (FDR)	July 24, 2023

Schedule



Reference Schedule for 2nd IR and Detector



Recent Accomplishments

- Contract for Architecture / Engineering Services for **Infrastructure** signed in June. Construction Management / General Contractor acquisition plans prepared. New York State funding buildings. Team clarifying requirements and sustainability goals.
- Increased **Accelerator** staffing and collaboration with US labs and international partners. Overall design and lattice stabilized to serve as the basis of engineering design.
- **Detector** technology choices and design prepared by the ePIC collaboration with support from the project. Resource Review Board established to engage funding agencies in planning.
- CD-3A case and viability established. Performance measurement baseline in preparation (CD-3A & CD-2) by the **Project Management** team (L1, L2, L3, L4, ...).
- International partners participating in the development of the **Governance** model. Working to prepare a facility that is international in character.

Challenges

- **Affordability** – The cost range for the EIC project is higher than can be accommodated by current DOE ONP funding levels. The EIC construction phase requires an increase in the annual funding for ONP/EIC followed by the substantial redirection of funding from RHIC operations. The reference funding plan provides \$300M/year starting in FY2026.
- **DOE M&O Contractor SOP vs Project Needs** – Successful large science projects require modifying many of the host Laboratory's operational functions to facilitate the project's construction. The EIC project team is working with the host labs and the EIC Project Advisory Committee (PAC) to position the EIC project for success (recent PAC report).
- **In-kind Schedules** – Schedule of in-kind contributions are often a challenge given the timing of funding agency decisions. A proactive approach is taken to ensure issues are resolved.

Summary

- EIC is a unique, high-energy, high-luminosity, polarized beam collider that will be one of the most challenging and exciting accelerator complexes ever built -- only collider in next decade(s).
- EIC project scope includes the complete infrastructure, accelerators, and detector required to meet the performance and science requirements.
- Strong support for the EIC with increasing international engagement.
 - ePIC Collaboration formed
 - 1st Resource Review Board meeting in April 2023 and 2nd meeting planned for December 2023
- We are successfully building the collaborations and project team, establishing partnerships, preparing for DOE CD-3A, and making the maximum technical progress with the funding available.

Questions?

