

ENVIRONMENTAL ASSESSMENT FOR Electron Ion Collider

**Brookhaven National Laboratory
Community Advisory Council Presentation**

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BROOKHAVEN
NATIONAL LABORATORY



The NEPA Process

- Project conceived
 - Detail must be sufficient enough to describe what is going to be done.
- Environmental Evaluation and Notification Form
 - Checklist of all potential impacts associated with project
 - Determination
 - Categorical Exclusion (CX) – project proceeds or
 - Environmental Assessment
- Environmental Assessment prepared
 - Finding of No Significant Impact – project proceeds or
 - Determination of need for an Environmental Impact Statement

Environmental Assessment (EA)

- **Purpose**

The purpose of the EIC project is to deliver a fully functional Electron-Ion Collider including the accelerator complex and one or more detectors. The EIC is necessary to understand the basic properties or building blocks of the nuclei; and how quarks and gluons, the particles that make up neutrons and protons are held together and interact. This will allow advancement of our understanding of nature; further fundamental science and technological innovations; and advance the energy, economic, and national security of the United States.

Environmental Assessment (EA)

- **Need**

To build an Electron Ion Collider which meets the full range of the Nuclear Science Advisory Committee (NSAC) 2015 Long Range Plan

- Luminosity up to $\sim 1 \times 10^{34} / \text{cm}^2 / \text{s}$
- Center-of-Mass Energy up to 140 GeV
- One Interaction Region with the ability to add a second
- One Detector with the ability to add a second
- Complete the construction project in 10-15 years
- Deliver the facility within a cost range of \$1.6B-\$2.6B
- Consider the ability to collide polarized particles
- Maintain and operate the facility with routine improvements for the foreseeable future

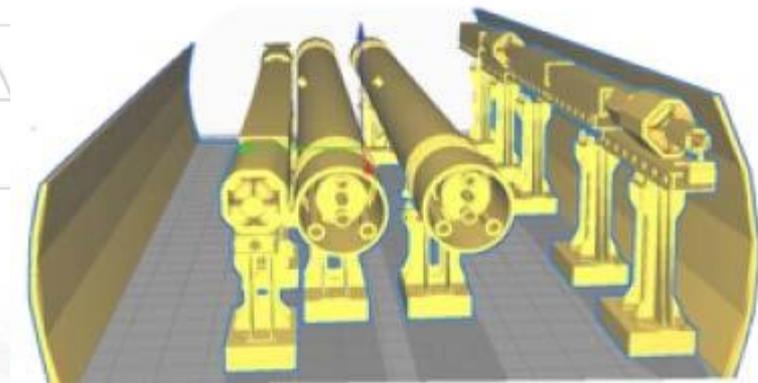
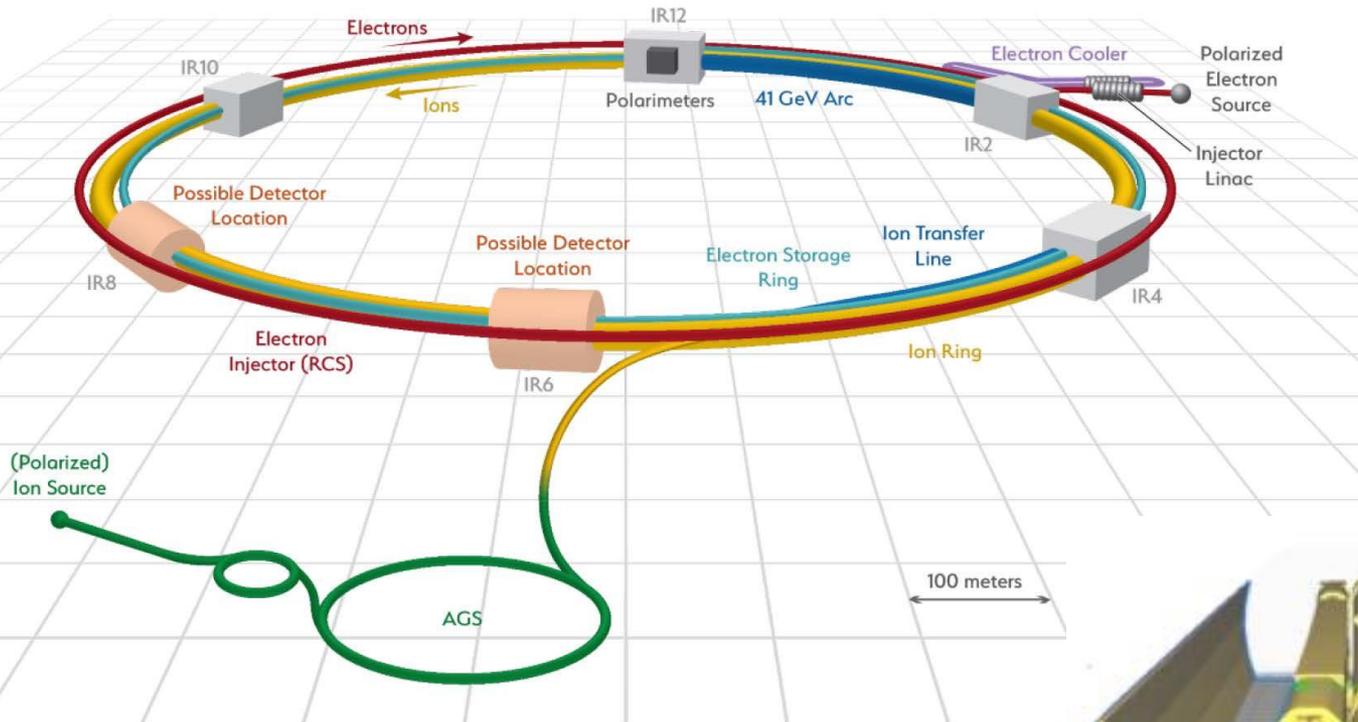
Alternatives Evaluated

- **Construct an Electron Ion Collider (EIC)**

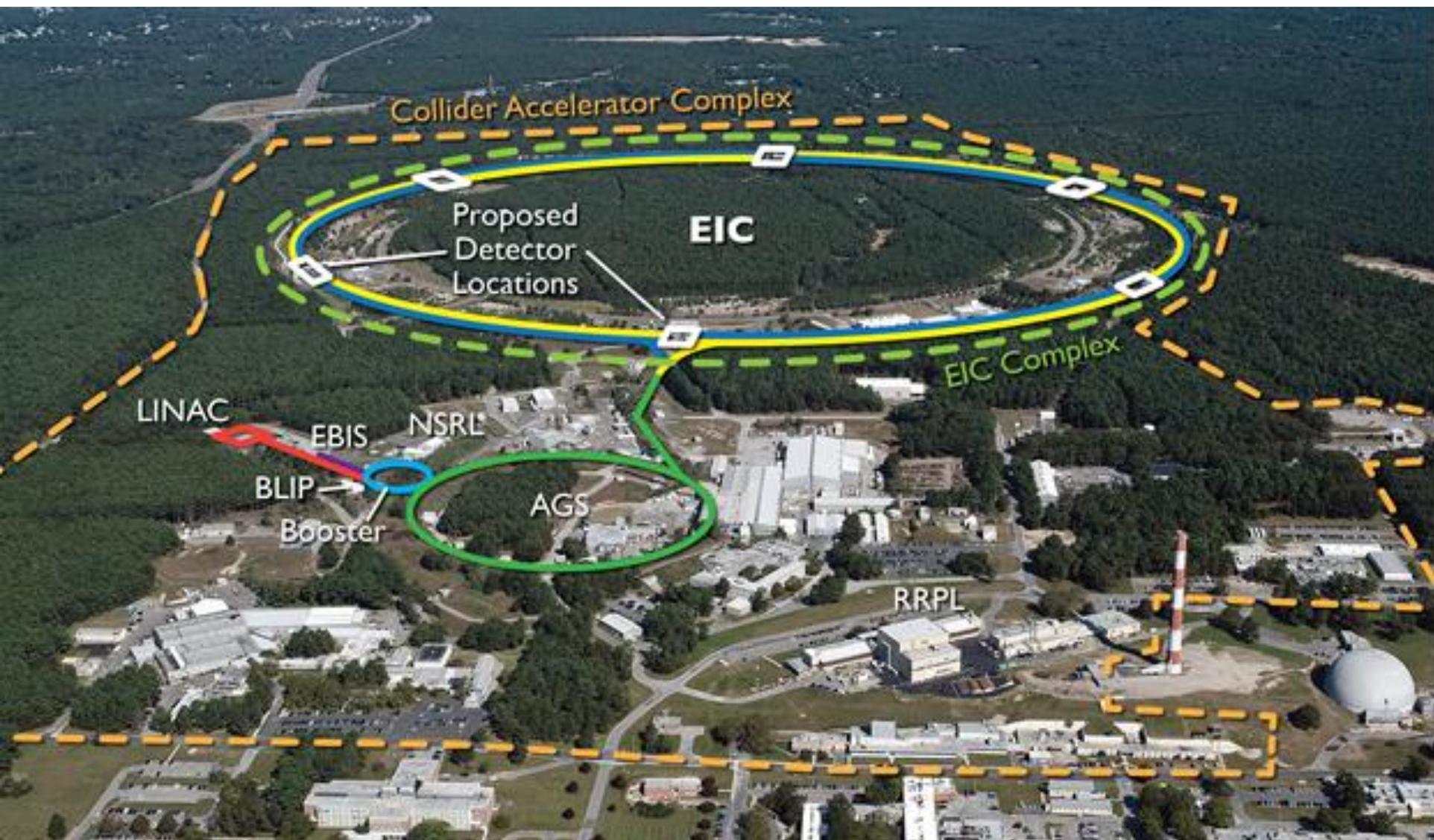
The conventional facilities required for the EIC will include:

- the buildings and structures that will house the scientific equipment and utility systems
 - the utility services (electric, water, sanitary, com/data) required to power, cool, occupy and communicate among the science facilities
 - the site infrastructure modifications needed to provide access roads, parking and proper drainage for the EIC site and its facilities
- **No Action – continue operations of the Relativistic Heavy Ion Collider (RHIC)**
 - Continued development of sPHENIX
 - Routine maintenance and necessary upgrades to meet current mission

EIC conceptual



RHIC/EIC Area



Conventional construction reviewed under EA

Buildings

Building Designations	Proposed GSQFT	Remarks
Alcove Buildings: ALC-01, -03, -05 and -11	8,000	4 @ 2,000SF each
Main Alcove Buildings ALC-07 and -09	10,000	2 @ 5,000 each
Cryo Facility 1006	1,200	
Kicker Power Supply 1004	9000	Two stories
Cryo Facility 1002	2,400	
Electron Source Building 1002	21,000	Two Stories ^a
Cryo Facility 1010	7,200	
RF Building 1010	70,800	Two Stories
Kicker Power Supply 1012	15,200	Two Stories
Total	144,800	Gross SQFT

Conventional construction

- ~8,000 ft. of new roads
- ~3,600 ft. of potable water lines
- ~10,000 ft. of sanitary lines
- ~3,500 ft. of storm drainage
- Clearing estimates range from 5 – 10 acres, mostly for roads and at 1002 and 1010
 - Much of area is previously disturbed
 - Acreage may change depending on placement of roads and buildings

Utilities

- Water

- EIC will have significant cooling needs – options under consideration
 - Conventional cooling w/cooling towers
 - Chillers
 - Geothermal

- Electricity

- Increased need for additional power requirement depending on configuration (one or two detectors)
- Additional infrastructure needed

Assessment

Topics Addressed in EA

- Ecology
 - Vegetation
 - Invasive Species
 - Threatened and Endangered Species
 - Migratory Birds
 - Mammals
 - Reptiles & Amphibians
 - Fish
 - Water
 - Surface water – wetlands, scenic river
 - Groundwater
 - Land Use, Demography, Social Justice
 - Socioeconomic
 - Transportation
- Cultural Resources
 - Air Quality
 - Climate
 - Visual Quality
 - Noise
 - Industrial Safety & Occupational Health
 - Radiation Exposure
 - Natural Hazards
 - Destructive Acts
 - Utilities
 - Waste Management/Pollution Prevention
 - Commitment of Resources
 - Decommissioning & Restoration

Water Resources – all alternatives

- Cooling water
 - Accelerators cooled with closed-loop water systems – water becomes activated
 - Cooling towers used to cool water using heat exchangers (blow down discharged to recharge basins or released to sanitary)



Water Resources

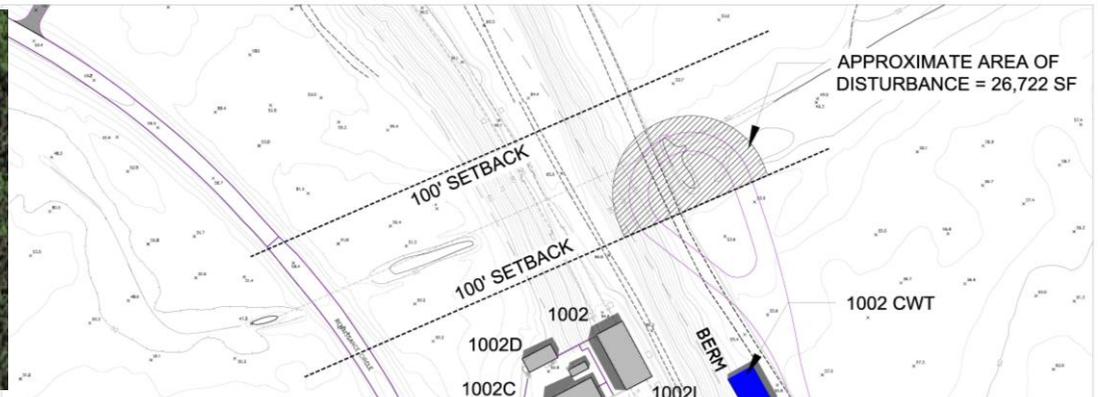
- Monitoring and protection of water resources
 - Accelerator Safety Subject Area used for continual improvement and to drive process reviews – all alternatives
 - Surface waters – all alternatives
 - Leak prevention program to prevent tritiated water going to discharge points (basins)
 - Cooling tower discharges monitored under SPDES permit
 - increased concern under preferred alternative, for exceedances due to corrosion control chemicals for cooling towers
 - concern greatly reduced/eliminated with chillers or geothermal cooling

Water Resources

- Monitoring and protection of water resources - (continued)
 - Groundwater – all alternatives
 - Surveillance program – multiple monitoring wells
 - Leak prevention program
 - Caps and impermeable barriers
 - Groundwater – preferred alternative
 - Potential SPDES permit excursions (sanitary) from cooling tower corrosion control chemicals
 - Pumping (production wells) and recharge (cooling tower blowdown)
 - Geothermal [extraction well(s), heat exchange for cooling, injection wells(s)]

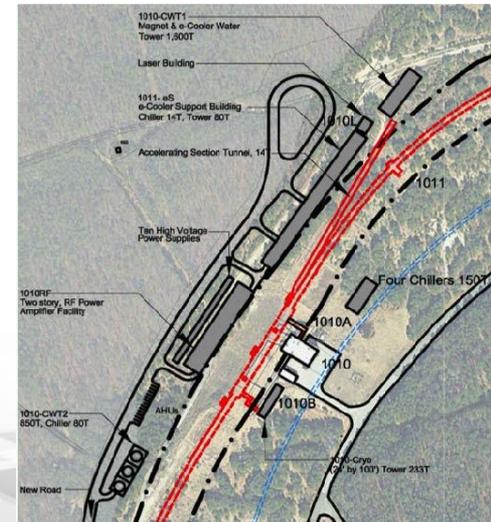
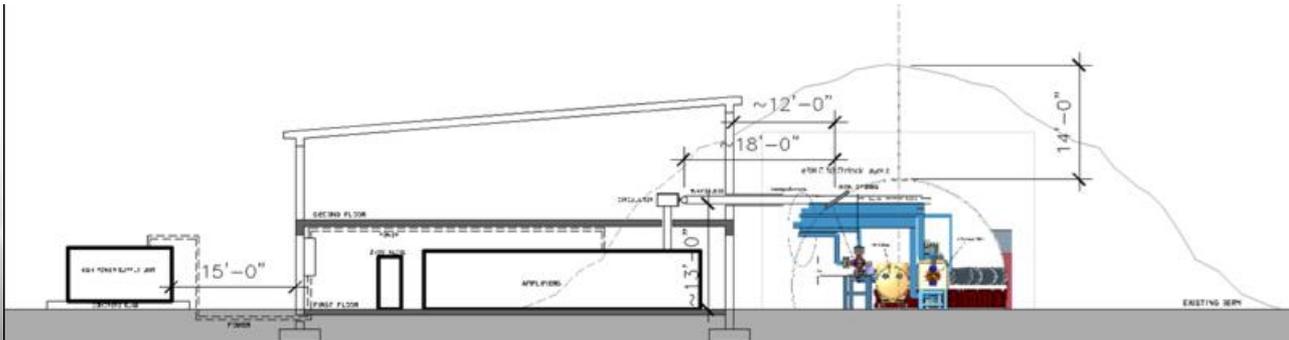
Water Resources

- Wetlands – preferred alternative
 - Construction at two and ten o'clock in proximity to Peconic River – roads either near or over river.
 - Permits will be required (wetland/scenic river)



Visual – preferred alternative

- Construction at two and ten o'clock areas
 - Proposed buildings visible from river corridor
 - Visibility from offsite locations unlikely due to density of trees
- Construction in other areas less likely to be visible from Peconic due to trees

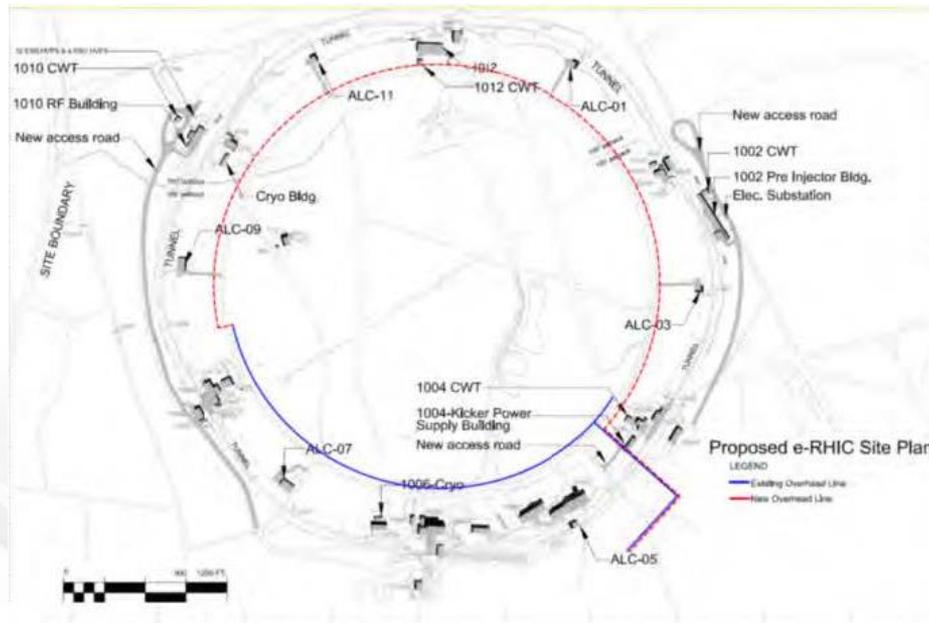


Radiation –

- No Action alternative – no change
- Preferred alternative
 - Hadron beam intensity will be at upper limit of RHIC
 - Effects continue to be analyzed
 - Shielding is adequate but additional shielding will be added where required
 - Interlocking radiation monitoring is required, allows for automatic shutdown
 - Current RHIC environmental monitoring data are comparable to offsite data.

Utilities

- No Action – no change
- Preferred alternative
 - Electric use increases, increased renewable energy credit purchases, new above ground distribution through previously disturbed areas
 - Potential need for additional electric feeder into Lab



Waste Management/Pollution Prevention

- No Action Alternative – continued routine waste shipments
- Preferred Alternative
 - Increased waste shipments for any decommissioning work needed to prepare facility for construction
 - Construction would look for opportunities for sustainability, recycling, re-use of materials, energy efficiency

Next Steps

- Complete Draft EA – end of September to early October
- Distribute for internal comment
 - Address comments and edits
 - Prepare Draft Final EA – mid-October
- Draft Final distributed to NY State
- Address any comments from NY State
- Department of Energy prepares determination
 - Either Finding of No Significant Impact
 - Need to prepare Environmental Impact Statement
- Publish Determination and Final EA – target end of November 2020

Questions?

