ENVIRONMENTAL ASSESSMENT
FOR
Alternating Gradient Synchrotron Complex, Upgrades for Continued Operation

Brookhaven National Laboratory

Community Advisory Council Presentation

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Environmental Protection Division

BROOKHAVEN NATIONAL LABORATORY

a passion for discovery

Office of Science
U.S. DEPARTMENT OF ENERGY

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
  - Finding of No Significant Impact – project proceeds or
  - Determination of need for an Environmental Impact Statement

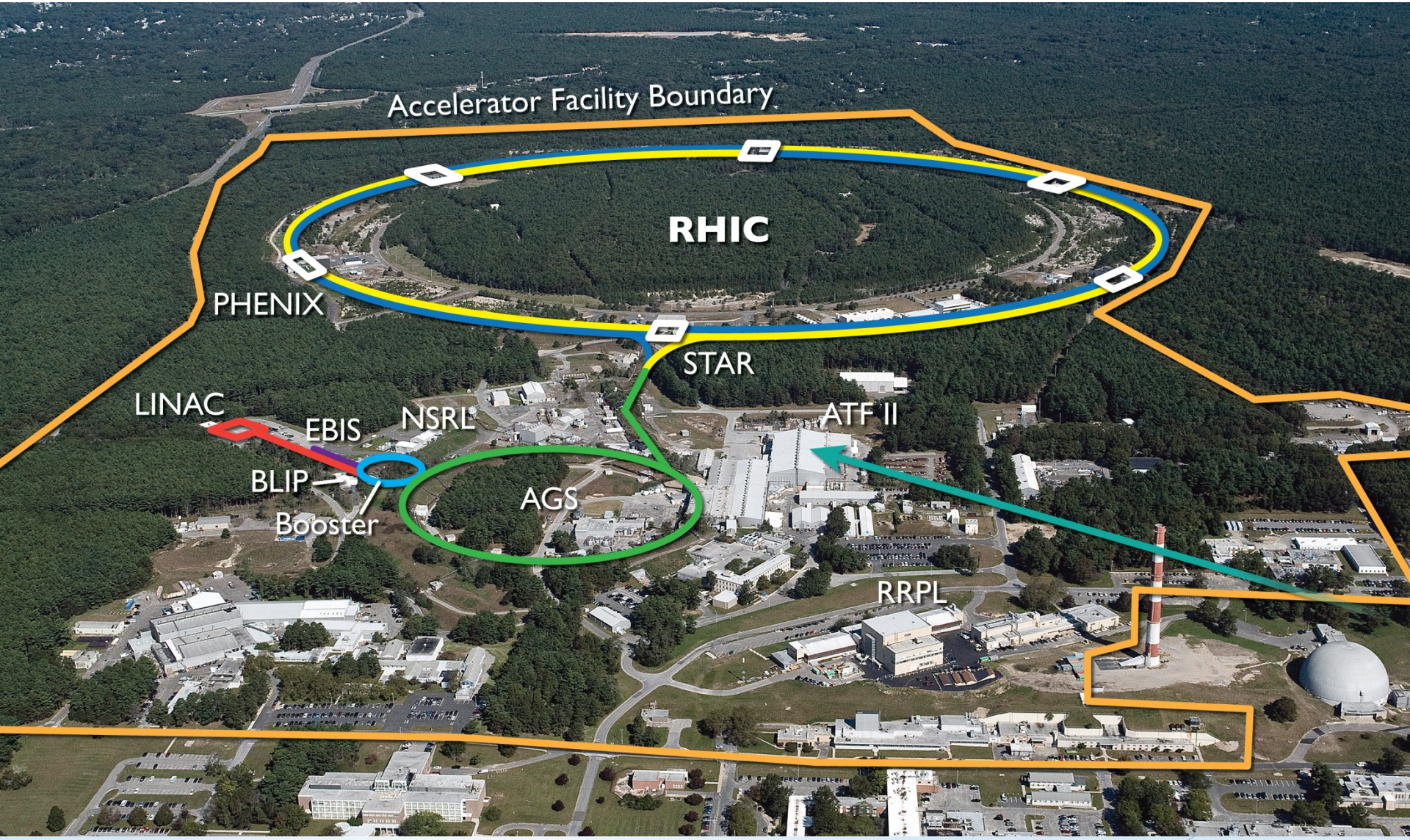
Environmental Assessment (EA)

- **Purpose and Need (for the project)**
  - Increase capability of the Accelerator Test Facility (ATF), increased production of radiopharmaceuticals, and improve and maintain facilities for High Energy Physics research.
  - Need for an upgraded facility that could perform electron accelerator research, increased intensity of the Linac, improved radiochemistry facilities and activities, and continue nuclear physics research with heavy ions and polarized protons
- **EA will evaluate three alternatives**
  - ATF-II upgrade alternative with other proposed changes to the rest of the AGS Complex (preferred)
  - ATF-II upgrade alternative with no changes to the rest of the AGS Complex
  - No Action - continue operation as is with no modifications to the AGS or ATF

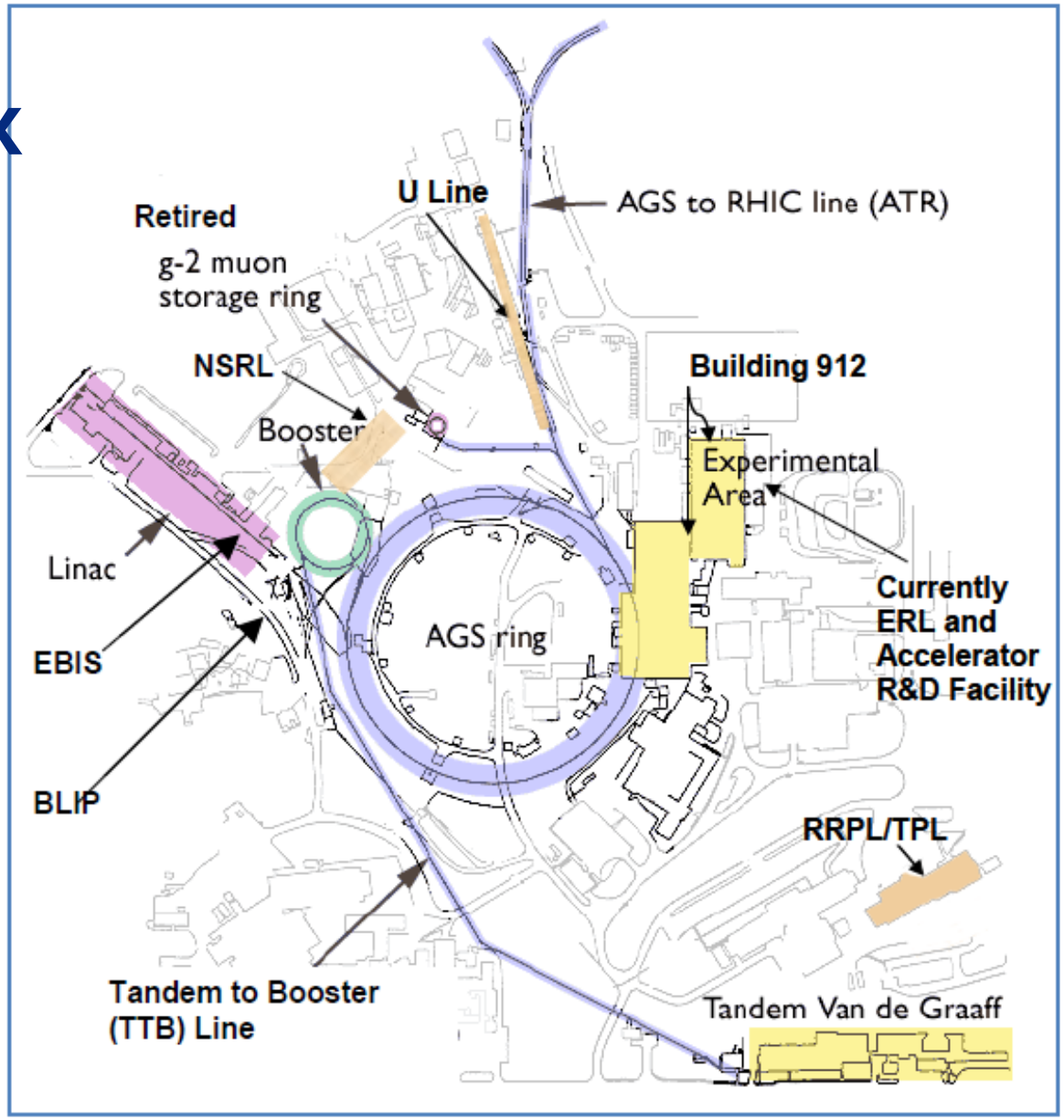
Alternatives Evaluated

- ATF-II Upgrade with other proposed changes to AGS complex (Preferred Alternative)
  - ATF to ATF-II upgrades for improved capabilities
    - Energy upgrade (more than 100x increase in energy)
    - Synchronized CO2 laser, higher power upgrade
    - State-of-the-art photocathode electron gun
    - Experimental halls designed for high energy electron beam
  - Intensity upgrade to Linac (increased current for BLIP)
  - Increased radiochemistry (active pharmaceutical ingredients) production (BLIP and Bldg. 801), improved lab space
  - Addition of an electrostatic proton ring within AGS tunnel
  - All foreseeable and routine upgrades and maintenance
- ATF-II upgrade no modifications to AGS Complex
  - Upgrades to ATF – same as preferred alternative
  - Continued operations as is: routine maintenance, individual project reviews
- No Action – continue operations as is; routine maintenance, individual project reviews

Collider Accelerator Area



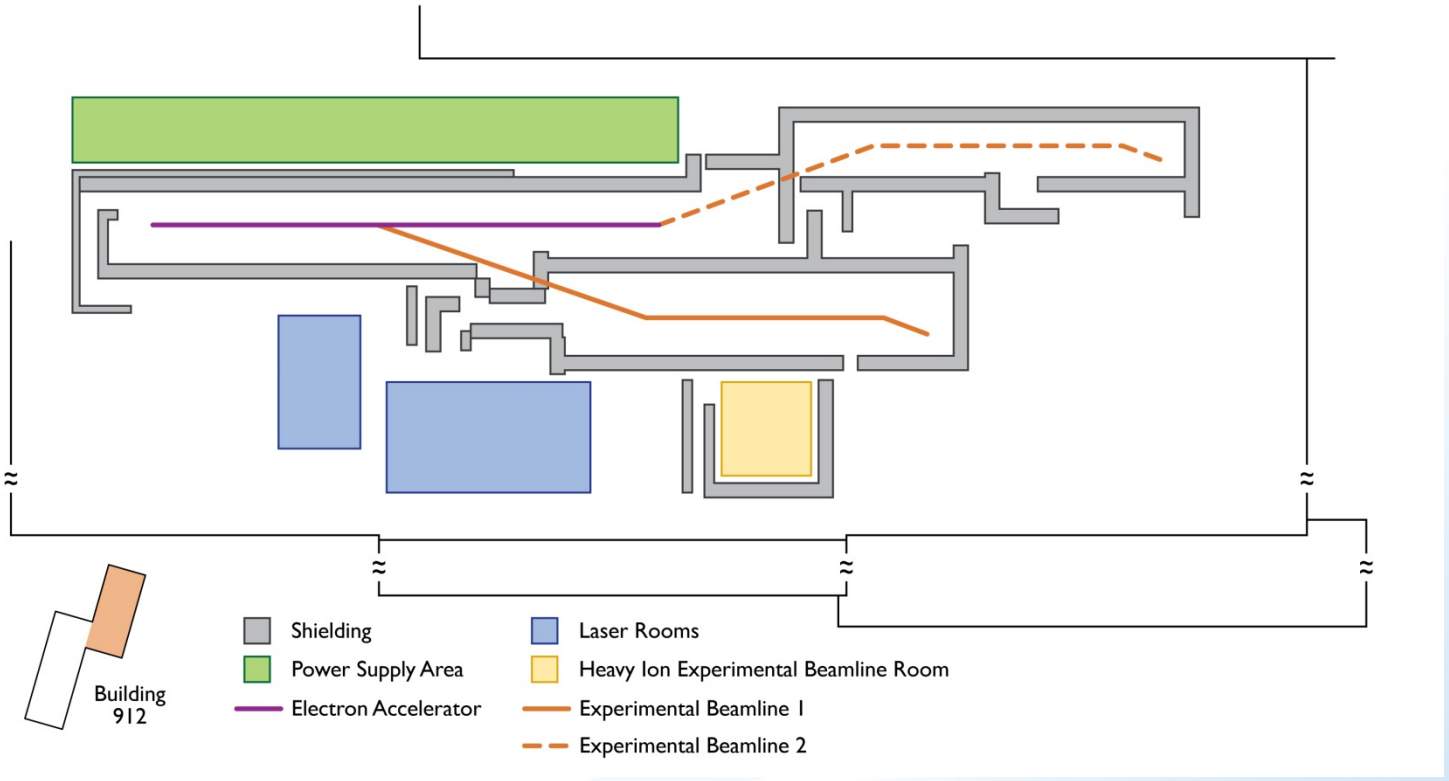
AGS Complex


U Line
AGS to RHIC line (ATR)
Retired
g-2 muon
storage ring
NSRL
Booster
Building 912
Experimental
Area
Linac
EBIS
BLIP
AGS ring
Currently
ERL and
Accelerator
R&D Facility
RRPL/TPL
Tandem to Booster
(TTB) Line
Tandem Van de Graaff

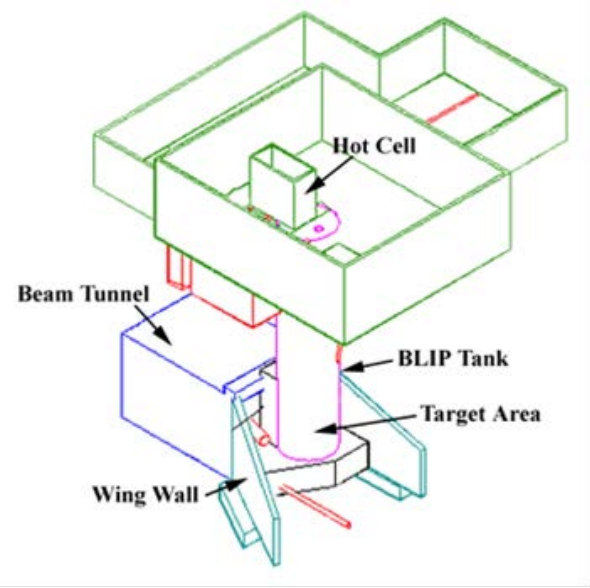
Key Facilities reviewed under EA

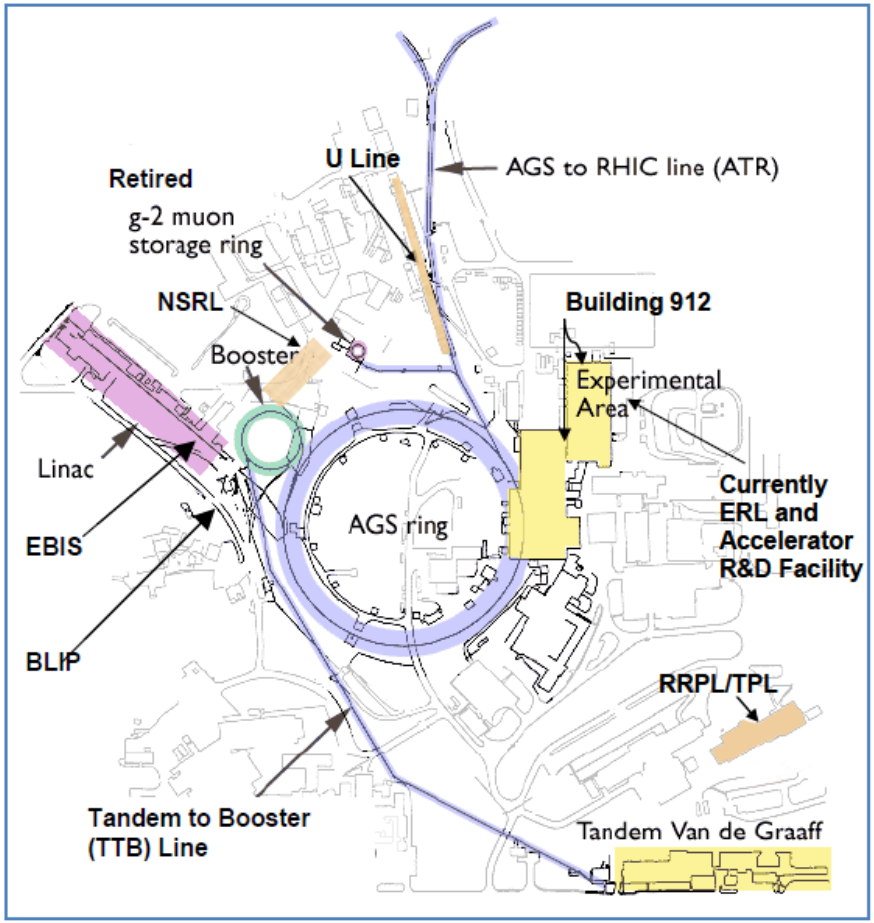
- Accelerator Test Facility (ATF) – To be located in Bldg. 912 (100,000 sq. ft.)
  - Moved from Bldg. 820 (~20,000 sq. ft.)
- Upgrade to ATF-II – in part driving EA
  - Upgraded to higher energy
  - Incorporate CO_2 laser
  - Incorporate experimental halls and beamlines
  - State-of-the-art- photocathode electron gun

ATF to ATF-II


Building
912
Shielding
Power Supply Area
Electron Accelerator
Laser Rooms
Heavy Ion Experimental Beamline Room
Experimental Beamline 1
Experimental Beamline 2

AGS Complex





Linac

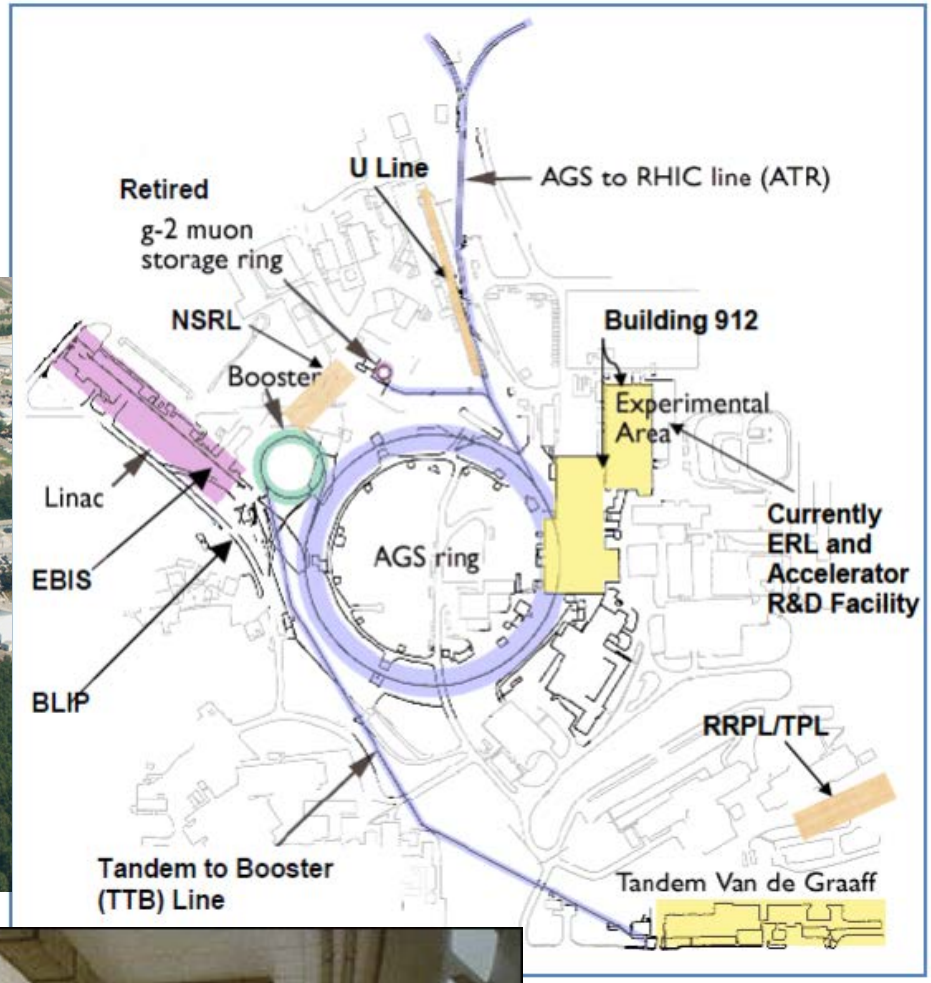
Key Facilities (cont.)

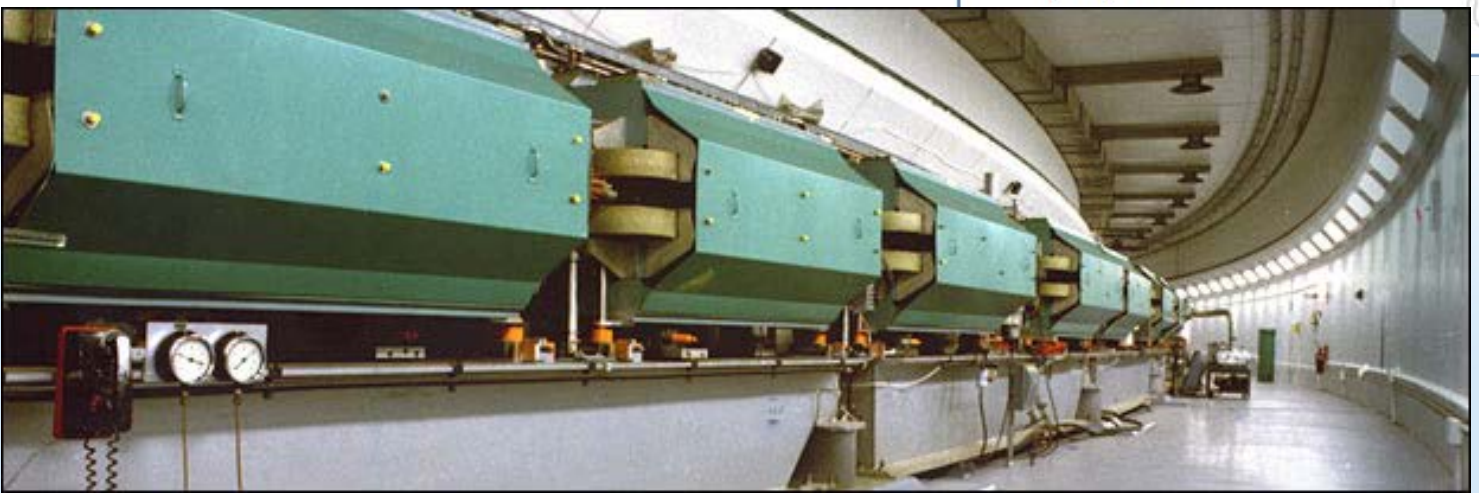
- Linear Accelerator (Linac)
  - Produces high intensity protons
  - Used by BLIP, Booster, NSRL, and RHIC
  - Increase average current to meet production demand at BLIP
- Brookhaven Linac Isotope Producer
  - Radiochemistry target irradiation facility
  - Provides irradiated targets for processing at Bldg. 801
  - Creation of Strontium-82 (Sr-82) and Actinium-225 (Ac-225) (proposed)

Key Facilities (cont.)

- Bldg. 801
  - Radioisotope Research Production Lab (RRPL) – facility receives targets from BLIP, BNL cyclotrons, and occasionally from off-site
    - Research into new accelerator-produced radionuclides
    - Design, develop, and evaluate radiopharmaceutical ingredients
    - Distribution of radiopharmaceuticals for nuclear medicine
  - Target Processing Lab (TPL) – processes targets from BLIP
    - Produces Sr-82 used to generate Rubidium-82 (Rb-82) used in cardiac procedures
    - Proposed – Production and processing of Ac-225

AGS





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Key Facilities (cont.)

- Alternating Gradient Synchrotron (AGS)
  - Receives ions from the AGS-Booster
  - Accelerates ions for injection into RHIC
  - Proposed addition of a second accelerator ring within AGS tunnel (construction 2019 to 2021)
    - Study and measurement of electric dipole moment of the proton
    - Create 233 MeV polarized protons
    - Electrostatic ring results in two counter rotating proton beams
    - Results in protons with spin rotation out of horizontal plane which can be measured with a proton-carbon polarimeter

Remaining AGS Facilities

- NEPA coverage for continued operation and maintenance
  - Allow routine upgrades and maintenance of AGS complex for continued support of RHIC, NSRL
  - Office upgrades
  - Replacement of magnets, controls, computer systems, etc. for efficiency
  - Building maintenance
  - Reuse of accelerator components
  - Environmental, Health and Safety upgrades
    - Shielding, caps, beam stops, beam dumps, target stations, cooling
    - Safety modifications
    - Energy saving modifications

Assessment

Topics Addressed in EA

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

Water Resources – all alternatives

- Cooling water
  - Targets at BLIP become hot, cooled by continuous circulating water – water becomes activated
  - 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)
  - Beam stop/ beam loss areas – soil activation (potential impact to GW)

Water Resources

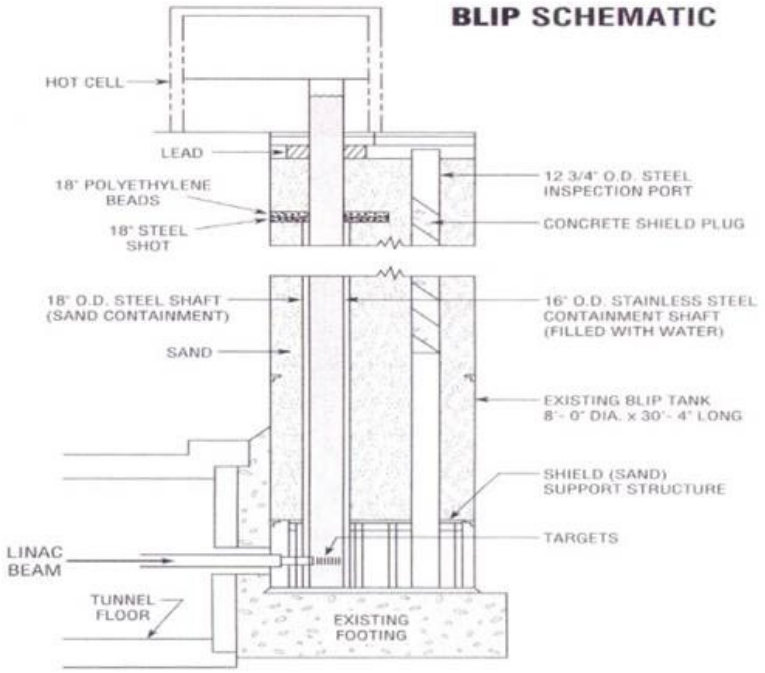
- Monitoring and protection of water resources - All Alternatives
  - Accelerator Safety Subject Area used for continual improvement and to drive process reviews
  - Surface waters –
    - No significant changes over current processes
    - Leak prevention program
    - E-ALARA to prevent excessive tritiation of cooling waters
    - Discharge points monitored under SPDES permit
  - Groundwater –
    - Surveillance program
    - Leak prevention program
    - Caps and impermeable barriers

Air Quality – preferred alternative

- Increased BLIP operations – increased rad-air emissions
  - 10 meter stack
  - Continuous monitoring
  - Oxygen-15 (122 second half-life) and Carbon-11 (20.4 minute half-life)
  - NESHAPS evaluation underway – for increased air emissions

Airborne Radionuclide Releases from BLIP 2014.

Nuclide	Half-Life	Ci Released
Carbon-11	20.4 minutes	2.51E+03
Oxygen-15	122 seconds	5.02E+03
Tritium	12.3 years	3.25E-02
Total		7.534E+03
Notes:		
Ci = 3.7E+10 Bq		



Air Quality – preferred alternative

- Target processing (bldg. 801)
  - Use of HEPA and charcoal filtration on chemical extraction process
  - Filter monitoring and NESHAPS evaluation will determine need for additional monitoring

Waste Management/Pollution Prevention

- Increased BLIP/TPL operations
  - Increased target processing = increased waste handling
  - No change to waste handling processing
  - Shipments follow all applicable DOT\DOE\EPA regulations
- ATF-II and future upgrades component re-use
  - Accelerator components from other facilities including NSLS and other offsite facilities
  - Re-use of magnets
  - Re-use of vacuum tubes, etc.
  - Result is overall cost savings and less scrap

Next Steps

- Complete Draft EA – end of January 2016
- Distribute for internal comment
  - Address comments and edits
  - Prepare Draft Final EA – Mid-February
- 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

Questions?