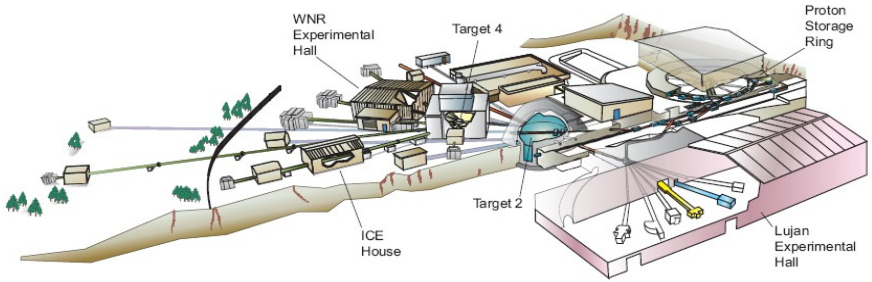
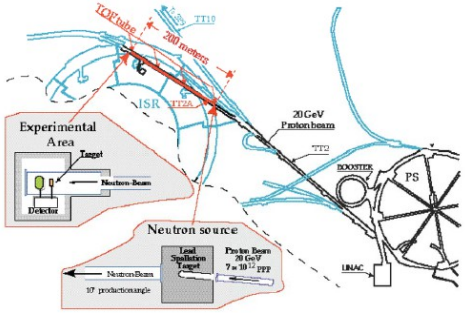
# Existing Facilities With Nuclear Astrophysics Research

**GELINA, Geel Electron LINear Accelerator (Belgium).**
***Ee* = 150 MeV.**
**12 simultaneous experiments**
**10 – 400 m.**
**4x C6D6 for (*n*,g).**
**Ion chamber for (*n,z*).**
**6Li-glass detectors for st.**
**Modest flux, very high resolution.**

**LANSCE, Los Alamos Neutron Science CEnter (**
***Ep* = 800 MeV.**
**20 m.**
**4p BaF2 (DANCE) for (*n*,g).**
**LSDS for (*n,z*).**
**High flux, modest *En* resolution.**




**n_TOF, neutron Time Of Flight (Switzerland).**
***Ep* = 20 GeV.**
**185 m.**
**4p BaF2, or 2x C6D6 for (*n*,g).**
**Diamond for (*n,z*) (in development).**
**Modest flux, high peak flux, high resolution.**



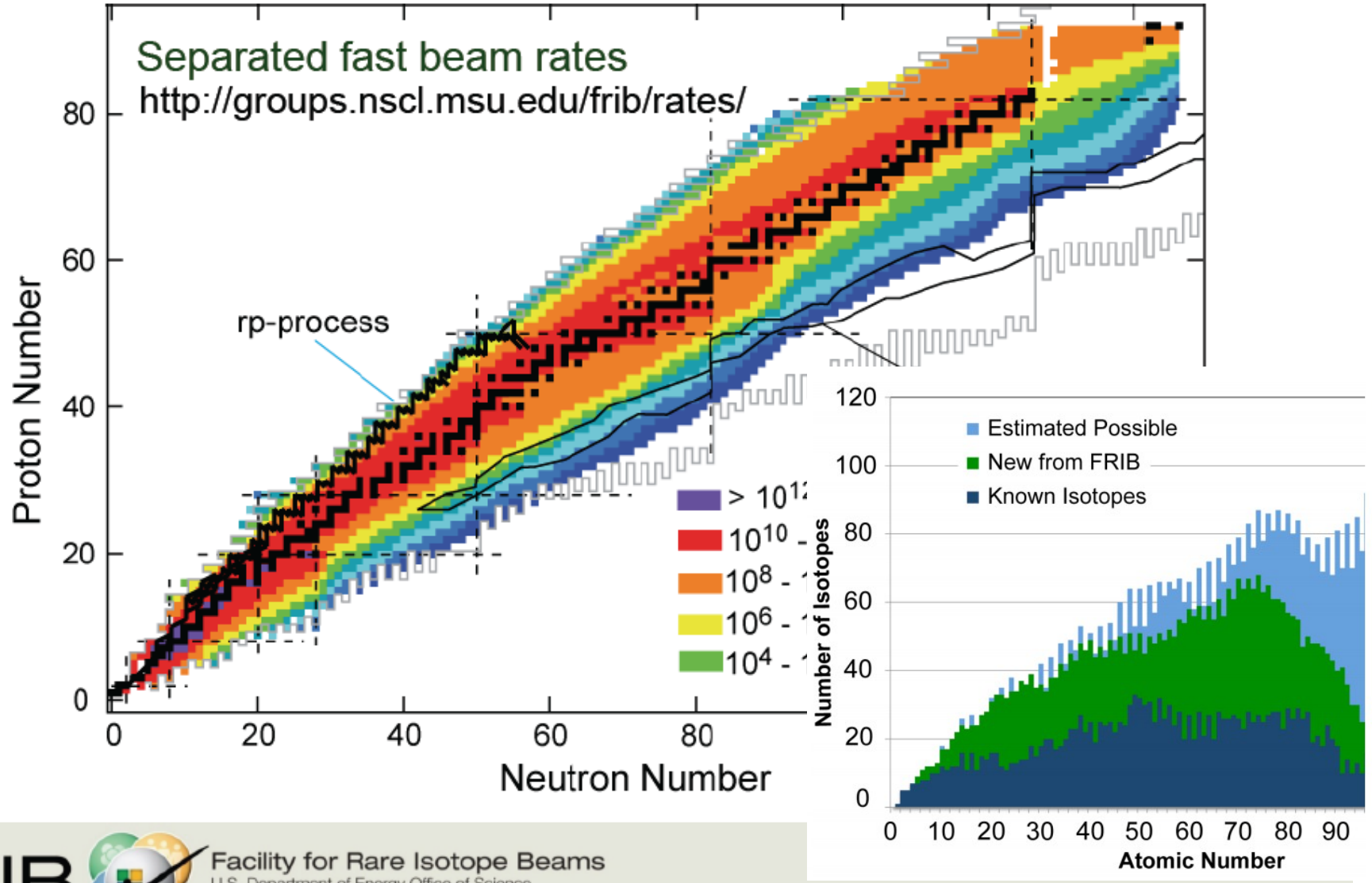
# Future Neutron Nuclear Astrophysics Facilities
## (Alphabetical Order)

- **FRANZ, Frankfurt neutron source at the Stern-Gerlach-Zentrum, Germany**
- **J-PARC, Japan Proton Accelerator Research Complex (Japan).**
- **LANSCE pulse stacking (USA).**
- **NIF, National Ignition Facility, USA (Dennis McNabb @ 1400).**
- **n_TOF EAR-2 (Switzerland).**
- **SARAF, Soreq Applied Research Accelerator Facility (Israel).**

# Exisiting RIB Facilities

- Wide range of complementary facilities operational or coming online
  - stopped / re-accelerated / fast beams
  - complementary production methods available [in-flight/ fission / ISOL (p,e)]
  - Broad range of beams and intensities explored, but still needed
  - Development Needs:
    - High intensity beams
    - More exotic beams with sufficient intensity and purity
- Experimental set-ups with ever increasing sensitivity, precision, and efficiency are available or being developed
  - Direct /  indirect reaction studies
  - Ground state properties

# The Reach of FRIB



# Proposed statement to the NSAC Long Range Plan Implementation Subcommittee on behalf of participants in the 2012 Nuclear Astrophysics Town Meeting

Expeditious construction of the Facility for Rare Isotope Beams (FRIB) is the highest nuclear physics priority for the nuclear astrophysics community.

Rare isotope data obtained with the unique and unprecedented capabilities of FRIB will be key to the understanding of the origin of the elements, stellar explosions, and the nature of neutron stars. FRIB ensures that the US scientific community remains at the forefront of interdisciplinary efforts that connect and advance the development of ground- and space-based astronomical observatories, nuclear and accelerator physics and high-performance computing.

The urgency of these motivations was reiterated in the 2012 Decadal Study of the National Research Council “Exploring the Heart of Matter”. We endorse the urgency for constructing FRIB expressed in the report in the strongest possible terms.