Since June GA Meeting

- **June** General Assembly :
  - Dedicated meeting of interested funding agencies on Nov 3 after many consultations also with the Nuclear Division DOE, Chair, Tim Hallman
  - Strategy towards alignment of international agencies developed with T. Hallman

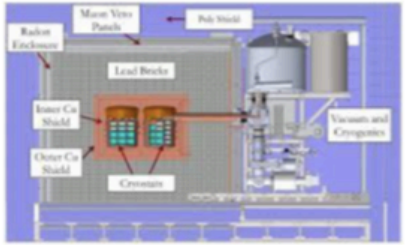
Snowmass process

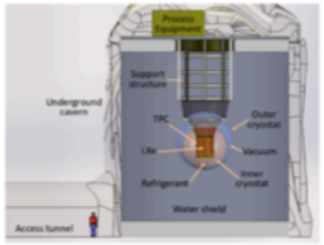
Recommendation 2: ton-scale neutrinoless double beta decay experiment

NLDBD of great interest to particle physics community (NF05); stewarded by NP within DOE and supported by NSF in the US

Current Status of Ton-Scale 0νββ

- Within DOE, Office of Science, NP is the steward of neutrinoless double beta decay and the ton-scale experiment
- Critical Decision – 0, Mission Need, approved in November 2018
- TEC construction start for a ton-scale 0νββ experiment requested in the FY2020 President's Budget Request. TEC Funding of $1.44M Requested. R&D funding is continuing
- Met on the margins of IUPAP WG9 Meeting in London (8/2019) to discuss possible international collaboration
- Processes for technology down-select and site selection for a 1 ton experiment are under discussion:
  - Three front runner candidate experiments, LEGEND-1000 (Ge-76), CUPID (Mo-100), nEXO (Xe-136).
  - Three current candidate site locations: Gran Sasso (Italy), SNOLAB (Canada) and SURF (U.S)





- progress by ongoing experiments and R&D for next-generation
- progress in theory
- anticipated "down-select" still under discussion (site, technology)

- Snowmass ongoing (Berrie's update in the newsletter)
- Chair's update: https://indico.fnal.gov/event/46713/

T. Hallman, October 2019 NSAC meeting

Some questions

- What is the best way to pursue large multi-purpose (DM, $0\nu\beta\beta$, neutrino experiments)?

-Desire expressed for underground facilities to coordinate with the physics community and among the labs, to facilitate multiple scales experiments, and to support full realisation of US-based facility at SURF and additional sites at SURF and SNOLAB

Summary of strategic vision towards a global investment on neutrinoless double beta decay

1) Neutrinoless double beta decay is recognized in the European and North American scientific communities as fundamental for the exploration of the nature of the neutrino mass and of lepton number violatio (APPEC Roadmap, Double Beta Decay APPEC Committee Report arXiv:1910.04688, 2015 Long Range Plan For Nuclear Science)

2) To ensure timely validation and ultimately the success of $0\nu\beta\beta$ research, the funding agencies accept the conclusion of the scientific community that there **must be at least two ton-scale experiment**s capable of exploring the **10-15 meV region**, on the time-scale of a decade or less after construction is completed

3) **Three isotopes, ^{100}Mo, ^{76}Ge and ^{136}Xe have potential to address the 10-20 meV** mass scale of the lightest neutrino and fully explore the **inverted ordering region** of the neutrino mass pattern with energy resolution better than ~0.2% at $Q_{\beta\beta}$ and background at the level of 10^{-4} counts keV^{-1} kg^{-1} yr^{-1}.

4) In view of the technological and logistical challenges identified and by the scientific community, the interested funding agencies in Europe and the North America agree that a **global approach to supporting this phase of $0\nu\beta\beta$ research** will be optimal to ensure efforts are f**ully coordinated on ton-scale research**, enabling it to be successful and impactful. Coordinatio between North America and Europe is necessary.

5) If 2 experiments are to be pursued, the funding agencies accept the wisdom of the scientific community that they should be based on **complementary technologies**, having different, well **controlled systematics and directly comparable results.**

6) The funding agencies view that the above consideration do not prevent other smaller scale “targets of opportunity” from being pursued as interest and resources permit and that it is the view of the scientific community that R&D funding to develop G4 technology for experiments capable of exploring the region of the normal hierarchy must be continued.

Proposed joint strategic plan of agencies

- A joint preparatory meeting of **APPEC interested agencies and DOE** to happen virtually after the GA by **mid January with following aims:**
  - agreeing on the preparation of the **2021** $0\nu\beta\beta$ **European-North American Summit** to achieve collectively **a global investment strategy for the achievement of at least 2 projects for the 10-20 meV reach;**

  - Defining the the **Steering board** composition for the preparation of this meeting
    - A Chair and vice - Chair
    - 2 science experts
    - 3 unbiased experts on three techniques
    - 3 lab directors (LNGS, SNOLAB, Canfranc)
- Fixing the date of Symposium ideally **by end of May 2021**, while location at **LNGS/virtually is viable.**

-The Steering board defines the **Big Questions** that the Symposium Summit should address (consideration on sites and background levels, infrastructures, risks, costs, availability of detailed TDR,…) and consequently the **Scientific Program** and consults eventually panels and experts in North America by **mid February 2021**.

-Agencies produce in **a joint resolution document** signed by Funding Agencies.