

Memo

Date: January 21, 2018
To: CBETA Advisory Committee
From: Berndt Mueller, Chair of the CBETA Oversight Board
Subject: Charge for the Advisory Committee meeting on February 22-23, 2018

The CBETA project is in contract with NYSERDA to build a four-pass Energy Recovery Linac. The Advisory Committee is asked to report to the CBETA Oversight Board on whether the project will be able to deliver the parameters listed in Table 1, on a schedule with the high level technical milestones shown in Table 2, and to offer advice on ways that the probability of technical success can be improved.

In particular, please evaluate and advise on:

1. **Main Linac Cryomodule:** issues and solutions identified and addressed in the testing that has already been performed with and without beam, including microphonics and the need to reliably accelerate or decelerate the beam by 36 MeV on each pass.
2. **Halbach magnets and girders:** magnet quality, arc production, integration and installation, consistent with technical milestones 7 and 8 (“Girder production run complete” and “Final assembly and pre-beam commissioning complete”).
3. **Commissioning strategy:** milestones 9, 10 and 11, which outline a beam commissioning path that meets the key performance parameters. Alternative commissioning strategies under consideration could be more efficient, and could be implemented after the Fractional Arc Test in early 2018.
4. **Beam tests and studies:** results of beam tests made during “Injector CryoModule”, “Main Linac Cryomodule” and other running periods. Please also evaluate and advise on low and high current beam dynamics studies and simulations designed to inform component design (eg Halbach magnets, instrumentation, impedances) and to prepare for beam commissioning (eg closed orbit correction).
5. **International collaboration:** opportunities for cost-neutral collaboration especially during the NYSERDA CBETA construction phase. Potential later phases might extend the BNL-CU collaboration, and might include additional institutions.

Please make a closeout presentation available to the CBETA Oversight Board at the end of the review, and a written report by March 15.

cc: E. Giannelis, G. Hoffstaetter, R. Michnoff, R. Patterson, S. Peggs, T. Roser, K. Smolenski, J. Thom-Levy, D. Trbojevic.

Table 1: Key Performance Parameters and ultimate design parameters.

Parameter	Unit	KPP	Design
Electron beam energy	MeV		150
Electron bunch charge	pC		123
Electron source current	mA	1	40
Bunch repetition rate (source)	MHz		325
RF frequency	MHz	1300	1300
Injector energy	MeV		6
RF operation mode			CW
Number of ERL passes		1	4
Energy aperture of arc		2	4

Table 2: High level technical milestones.

#	NYSERDA milestone	Baseline	Actual	Forecast
	NYSERDA funding start date		31-Oct-16	
1	Engineering design documentation complete	31-Jan-17	31-Jan-17	31-Jan-17
2	Prototype girder assembled	30-Apr-17	30-Apr-17	30-Apr-17
3	Magnet production approved	30-Jun-17	23-Jun-17	30-Jun-17
4	Beam through Main Linac Cryomodule	31-Aug-17	16-Jun-17	31-Aug-17
5	First production hybrid magnet tested	31-Dec-17	21-Dec-17	31-Dec-17
6	Fractional Arc Test: beam through MLC & girder	30-Apr-18		30-Apr-18
7	Girder production run complete	30-Nov-18		30-Nov-18
8	Final assembly & pre-beam commissioning complete	28-Feb-19		28-Feb-19
9	Single pass beam with factor of 2 energy scan	30-Jun-19		30-Jun-19
10	Single pass beam with energy recovery	31-Oct-19		31-Oct-19
11	Four pass beam with energy recovery (low current)	31-Dec-19		31-Dec-19
12	Project complete	30-Apr-20		30-Apr-20