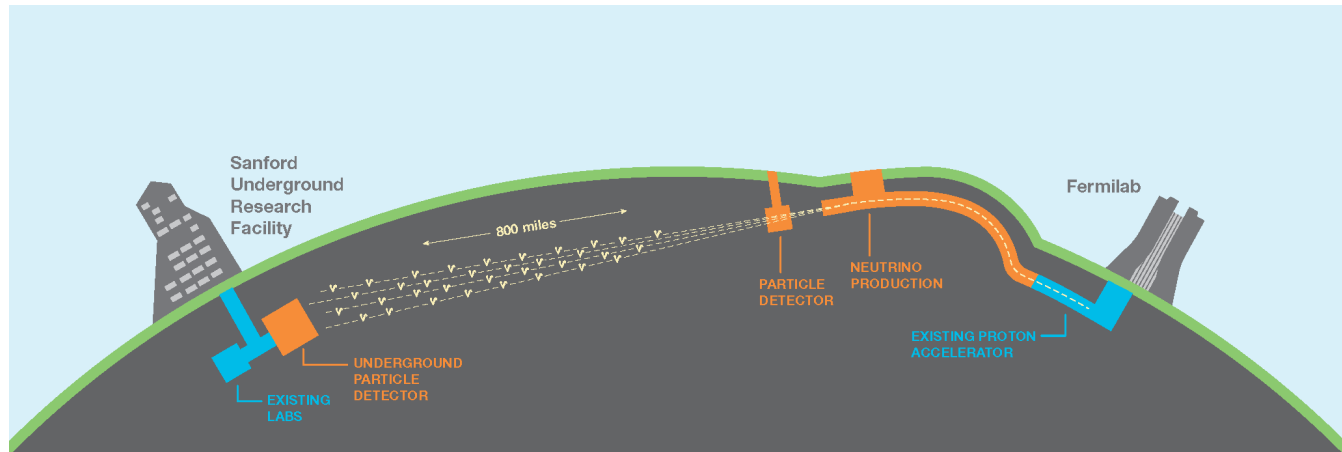




State of DUNE and Update to DUNE CD-2 Strategy

Mark Thomson

LBNC Meeting

CERN, 22nd June 2017

DUNE

- **Will cover**

- 1. Collaboration Status and news
 - 2. DUNE Today
 - 3. Overview of Plans for 2017
 - 4. Strategic View of ProtoDUNEs
 - 5. Far Detector Strategy
 - 6. Near Detector Strategy
 - 7. Recommendations and Milestones
 - 8. Summary
- } Past
- } Present
- } Next up

1. Collaboration Status & News

2. DUNE Collab. Status & News



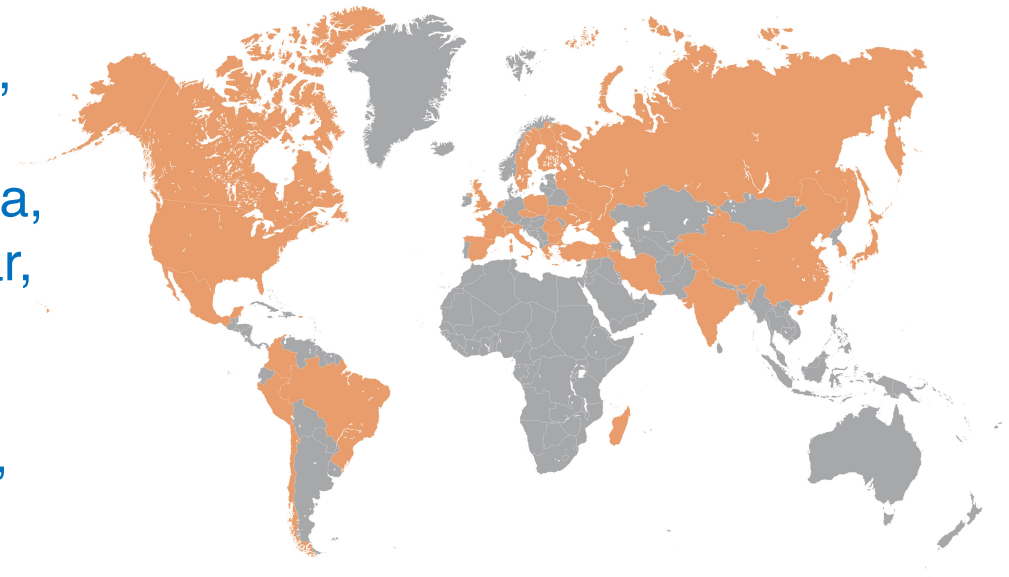
The DUNE Collaboration

As of today:

60 % non-US

970 collaborators from 164 institutions in 30 nations

Armenia, Brazil, Bulgaria,
Canada, CERN, Chile, China,
Colombia, Czech Republic,
Finland, France, Greece, India,
Iran, Italy, Japan, Madagascar,
Mexico, Netherlands, Peru,
Poland, Romania, Russia,
South Korea, Spain, Sweden,
Switzerland, Turkey, UK,
Ukraine, USA



DUNE is still growing – anticipate next growth spurt soon

The DUNE Collaboration

As of today:

970 collaborators from 164 institutions
60 % non-US

Armenia, Brazil, Bulgaria,
Canada, CERN, Chile
Colombia, Czech
Finland, France
Iran, Italy
Japan
Korea
Russia
South Korea
Sweden
Switzerland
Taiwan
Ukraine

Increasing levels of engagement

- Last Collaboration Meeting
- 201+ in person attendees
- >190 presentations!

DUNE is growing – anticipate next growth spurt soon

International growth

- **DUNE** (4xFD & ND): aim for ~75 % non-DOE resource
- **Continue to reaching out to international community, e.g.**
 - **Europe:**
 - Ongoing discussions in Czech Republic, Spain, Italy and Germany
 - **Latin Americas:**
 - New institutes joined (Brazil, Columbia) + interest elsewhere (e.g. Mexico)
 - Brazilian (FAPESP) DUNE/SBN meeting June 1st 2017 – over 100 attendees !
 - Paraguay in process of joining (UNA)
 - **Asia:**
 - Already have many collaborators from India – but resources...
 - Annex 2 is critical (but there are positive indications)
 - Some involvement from China, Japan & South Korea, working to build on this
 - **Near Detector:**
 - New involvement in Near Det: workshops at FNAL in March & June 2017
 - Participation from Italy, Germany, Russia
 - Next ND workshop at CERN in November

1.1 Organization Updates

- **Organization refreshes:**
 - April: Co-Spokespersons, Executive Committee
 - September: Coordinators, Working Group conveners

Changes since last March LBNC

- **Executive Committee**

- Elected: Co-spokes (**Ed Blucher**, Mark Thomson)
- Appointed: TC (Eric James) & RC (Ami Dave)
- Elected: IB chair (Bob Wilson)
- Elected: Kate Scholberg, Stefan Söldner-Rembold,
Chang Kee Jung, Mary Bishai
- Appointed: Dario Autiero, Marta Losada

- **Near Detector Coordination**

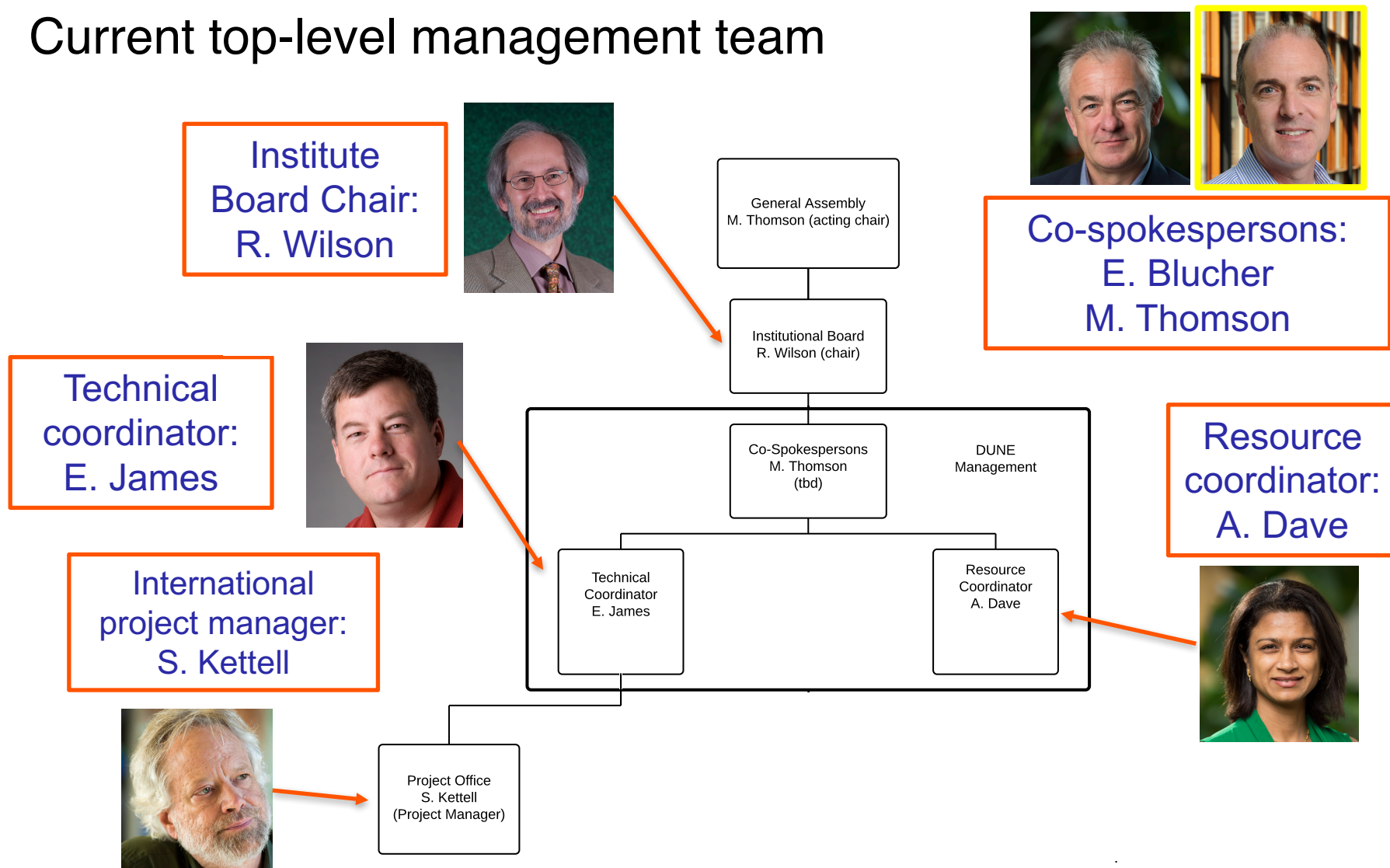
- Appointed: Kam-Biu Luk, Alfons Weber

- **Physics TDR Editors**

- Appointed: Jon Urheim, Albert de Roeck
 - Get started as early as possible

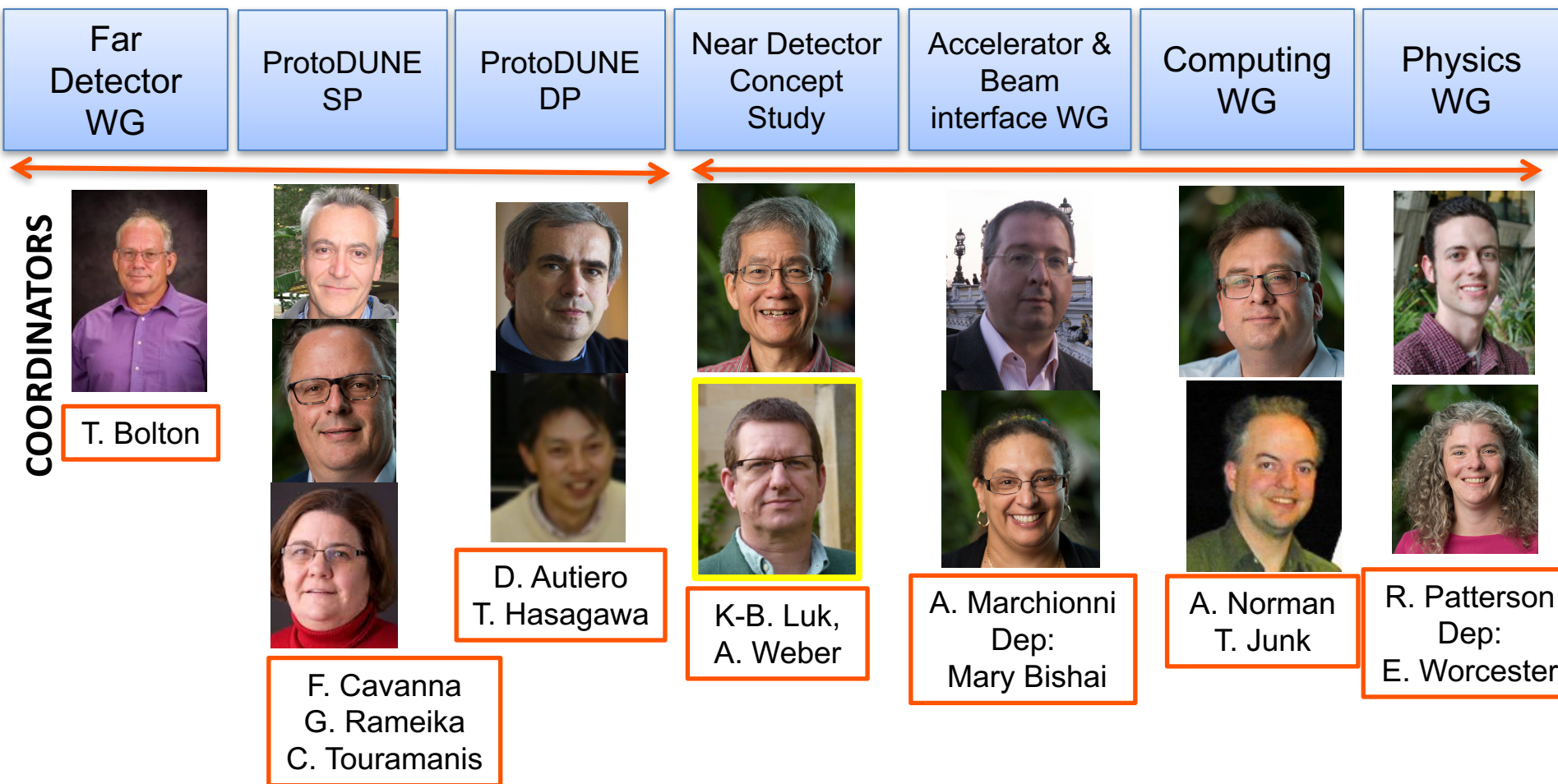
DUNE Management Team

Current top-level management team



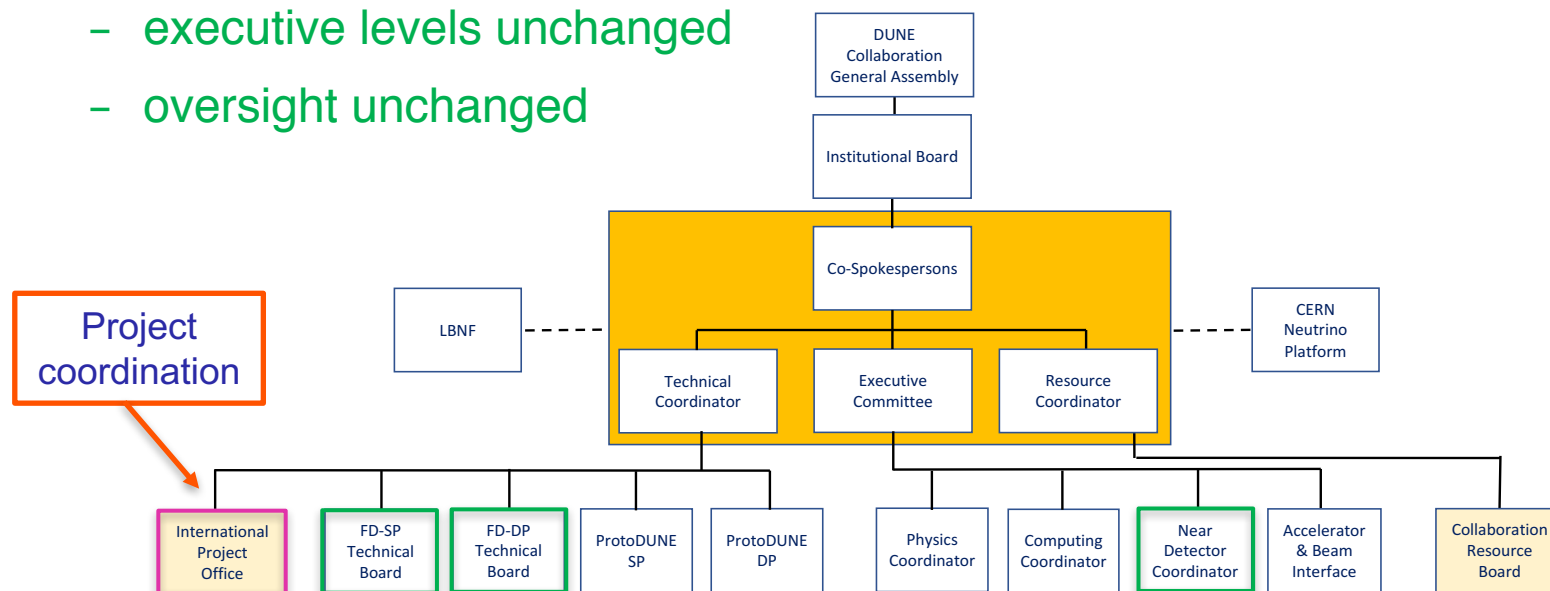
DUNE Coordination Team

- Very strong team in place – all working effectively



Management Structure: Aug 2017

- Moving to **modified DUNE organizational structure** to implement our strategy for **CD-2: FD WGs** → **Construction Consortia**
 - in addition, removed a layer of management to clarify reporting lines
 - executive levels unchanged
 - oversight unchanged



- **Project management**

- Shift towards distributed project organization, coordinated by **IPO**
- Deliverables managed by **international contributors** within consortia

2. DUNE Today

Where are we now?

- **DUNE is in very good shape**
 - **CD-3A** in September was an important milestone
 - **\$50M** for LBNF/DUNE in US FY17 budget & **\$55M** in FY18 PBR
 - **ProtoDUNE-SP** is now in a strong position
 - We are in the **construction phase** !
 - Largely keeping to the schedule – impressive work from many people
 - **Dual-Phase 3x1x1 m³ demonstrator**
 - Has been ready for a while, but some issues with cryostat
 - First cosmic-ray track yesterday !
 - Ready move seamlessly into construction of **protoDUNE-DP**
- **Overall, excellent progress**
 - Now planning for construction phase

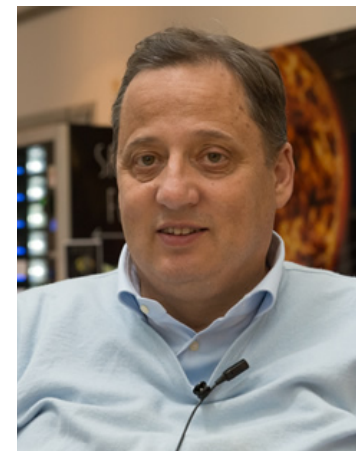
Impressive progress at CERN

- **ProtoDUNE construction at CERN charging ahead**
 - **EHN1 at time of May collaboration meeting**



Impressive progress at CERN

- ProtoDUNE construction at CERN charging ahead
 - EHN1 yesterday



Thank you!

Looking ahead: Strategic Goals

- **DUNE is committed to delivering:**
 - Two large-scale engineering prototype detectors (**protoDUNE-SP** and **protoDUNE-DP**) operational at CERN in **2018**
 - DUNE TDR for the CD and LBNC Reviews in **2019**
 - **Technical Proposal in 2018**
 - 20-kt (fiducial mass) Far Detector ready for beam in **2026**
 - **Two 10-kt detector modules (not necessarily the same design)**
 - Full 40-kt (fiducial mass) Far Detector shortly afterwards
 - Near detector system(s) operational in time for first beam
- **The detailed implementation strategy for 2016 – 2019 described in dune-doc-1050 - being updated by EC**

To meet our goals...

- **Expected timeline for DUNE (and LBNF) reviews**

- Mid-2018: **Technical Proposal for FD** (+costs, responsibilities)
- End-2018: **Decision on** (at least) **first two FD modules**
- Jan/Feb 2019: **RRB** for to provide funding status
- July 2019: **LBNC** review of TDRs

Review of **international** DUNE construction project

- Sept 2019: **RRB** to confirm **funding** status for construction
validation of **international** funding model
- October 2019: **DOE CD-2** Review of LBNF (Far) and DUNE-US:
far site and two far detector modules
- August 2020: **DOE CD-2** for near facilities and DUNE-US ND

- **In just over two years**

- Need **FD technical designs** and understanding of **funding model**

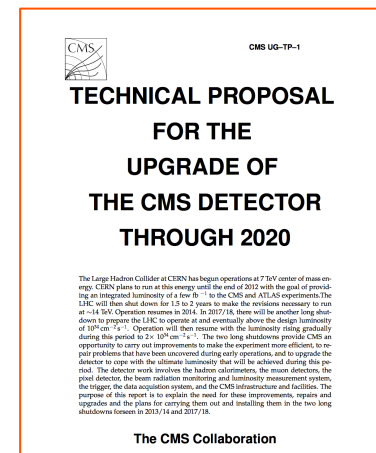
2.1 DUNE FD Technical Proposal

- **Previously**

- Considering a FD Preliminary Design Report in mid/late 2018:
 - Step towards the TDR
 - Intermediate milestone for the Far Detector Consortia

- **Thinking has evolved**

- FD Technical Proposal(s) in mid-2018
 - Prompted by LBNC/RRB discussions
 - Step towards TDR – **first major task of consortia**
 - Detailed scope still to be defined
 - Overview of timeline, physics
 - Overview of major systems, maybe ~30 pages per system
 - Common infrastructure
 - Planned responsibilities & **Cost**
 - x2 : Single-Phase and Dual-Phase



CMS: ~300 pages

2.1 DUNE FD Technical Proposal

- **Previously**

- Considering a FD Preliminary Design Report in mid/late 2020
 - Step towards the TDR
 - Intermediate milestone for the Far Detector C

- **Thinking has evolved**

- FD Technical Proposal(s) in the form of a **Task of consortia**
 - Prompted by LBNC
 - Step towards TDR
 - Detailed design of the detector

Major milestone for FD consortia
Details and timeline need to be agreed with LBNC

- **Detector systems, physics**
 - Major systems, maybe ~30 pages per system
- **Detector infrastructure**
 - Planned responsibilities & **Cost**
- **×2 : Single-Phase and Dual-Phase**



CMS-UG-TP-1

TECHNICAL PROPOSAL FOR THE UPGRADE OF THE CMS DETECTOR THROUGH 2020

The Large Hadron Collider at CERN has begun operations at 7 TeV centre of mass energy. CERN plans to run at this energy until the end of 2012 with the goal of providing an integrated luminosity of a few fb^{-1} to the CMS and ATLAS experiments. The LHC will then shut down for 1.5 to 2 years to make the revisions necessary to run at 14 TeV. Operation resumes in 2014. In 2017/18, there will be another long shutdown to prepare the LHC to operate at and eventually above the design luminosity of $10^{34} \text{ cm}^{-2} \text{ s}^{-1}$. Operation will then resume with the luminosity rising gradually during this period to $2 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$. The two long shutdowns provide CMS an opportunity to carry out improvements to make the experiment more efficient, to repair problems that have been uncovered during early operations, and to upgrade the detector to cope with the ultimate luminosity that will be achieved during this period. The detector work involves the hadron calorimeters, the muon detectors, the pixel detector, the beam radiation monitoring and luminosity measurement system, the triggers, the data acquisition system, and the CMS infrastructure and facilities. The purpose of this report is to explain the need for these improvements, repairs and upgrades and the plans for carrying them out and installing them in the two long shutdowns between 2013/14 and 2017/18.

The CMS Collaboration

CMS: ~300 pages

3. 2017

3. 2017 – a critical year for DUNE

- **Looking ahead**

- FD Technical Proposal in 2018
- Two years to be ready for various reviews in 2019
- Much of the groundwork needs to be complete by end of 2017
- Major steps need to be taken in 2017:
 - Understand possible contributions to far detector construction
 - Decision on the near detector concept & some understanding the likely contributors
 - Preparations for TDRs must have started, TP is a good step
 - Need a better understanding of financial contributions from the different agencies
- **Progress will have to be very rapid**
 - Need to map out timeline with respect to LBNC and RRB

DUNE in 2017

- **Major (non-protoDUNE) milestones in 2017**

- **Jan** Launch Eol process for FD-SP ✓
- **March** First ND Concept Study workshop ✓
- **April** Physics TDR editors appointed ✓
- **May** Task force reports finalized/reviewed ✓
- **May** FD_SP consortia discussions at collab. mtg. ✓
- **June** Second ND Concept Study workshop ✓
- **June** **FD-DP consortia discussions: CERN 26/27 June**
- **June** FD “proto-consortia” defined
- **July** **Consortia leadership elected**
- **Aug** First formal meetings of FD construction consortia
- **Sept** Rotation of coordinator/convener roles
- **Nov** **Consortia plans presented to RRB**
- **Dec** **Far Detector TDR editors appointed**
- **Dec** **Decision-making process for first two FD modules agreed**
- **Dec(ish)** **Concept for DUNE ND agreed** (Jan collab mtg.)

Focus: FD construction consortia and ND Concept

Strategy and Implementation

4. Strategic view of protoDUNE

4. Strategic View of protoDUNE

- **Status of protoDUNE**

- **Generally going very well**

- **This is a major effort**

- The two largest LAr-TPC modules ever constructed

- **Plans (beyond 2018)**

- **Formally communicated our plans to CERN management (RD, SPSC chair, RB chair):**

- Aim for test beam operation in 2018, before LHC LS2

- Recognize the challenges/risks:

- Construction schedule (but actually doing well here)
 - Cryostat/cryogenics
 - Beam

- Wish to keep open the option of post-LS2 test beam

- Regardless, wish to run with cosmics in 2019 and (ideally) 2020

- Test long-term stability

4.1 Role of protoDUNEs

- **Large-scale prototyping/calibration**
 - **Production (delivery of the detector components to CERN):**
 - **stress testing of the production and quality assurance processes** of detector components
 - mitigate the associated risks for the far detector.
 - **Installation:**
 - **test of the interfaces** between the detector elements
 - mitigate the associated risks for the far detector.
 - **Operation (cosmic-ray data):**
 - **validation** of the detector designs and performance
 - **Test beam (data analysis):**
 - **essential measurements** of physics response of detector
 - not necessary for the finalization of the FD design

4.1 Role of protoDUNE

- **Large-scale prototyping/calibration**

- **Production (delivery of the detector components to CERN):**
 - **stress testing of the production and quality assurance processes** of detector components
 - mitigate the associated risks for the far detector.
- **Installation:**
 - **test of the interfaces** between the detector elements
 - mitigate the associated risks for the far detector.
- **Operation (cosmic-ray data):**
 - **validation** of the detector designs and performance
- **Test beam (data analysis):**
 - **essential measurements** of physics response of detector
 - not necessary for the finalization of the FD design

Risk mitigation and understanding of costs for CD-2

Detector validation for LBNC & CD-2

Physics calibration for oscillation analyses

4.1 Role of protoDUNE

- **Large-scale prototyping/calibration**

- **Production (delivery of the detector components to CERN):**

- stress testing of the production and quality assurance processes of detector components
 - mitigate the associated risks for the detector

- **Installation:**

- test of the interfaces between elements
 - mitigate the risks for the detector

- **Operation:**

- test of the detector designs and

- **Physics analysis:**

- initial measurements of physics response of detector

- not necessary for the finalization of the FD design

ProtoDUNE construction validates detector design and informs the DUNE FD cost model

Validation and understanding of costs for CD-2

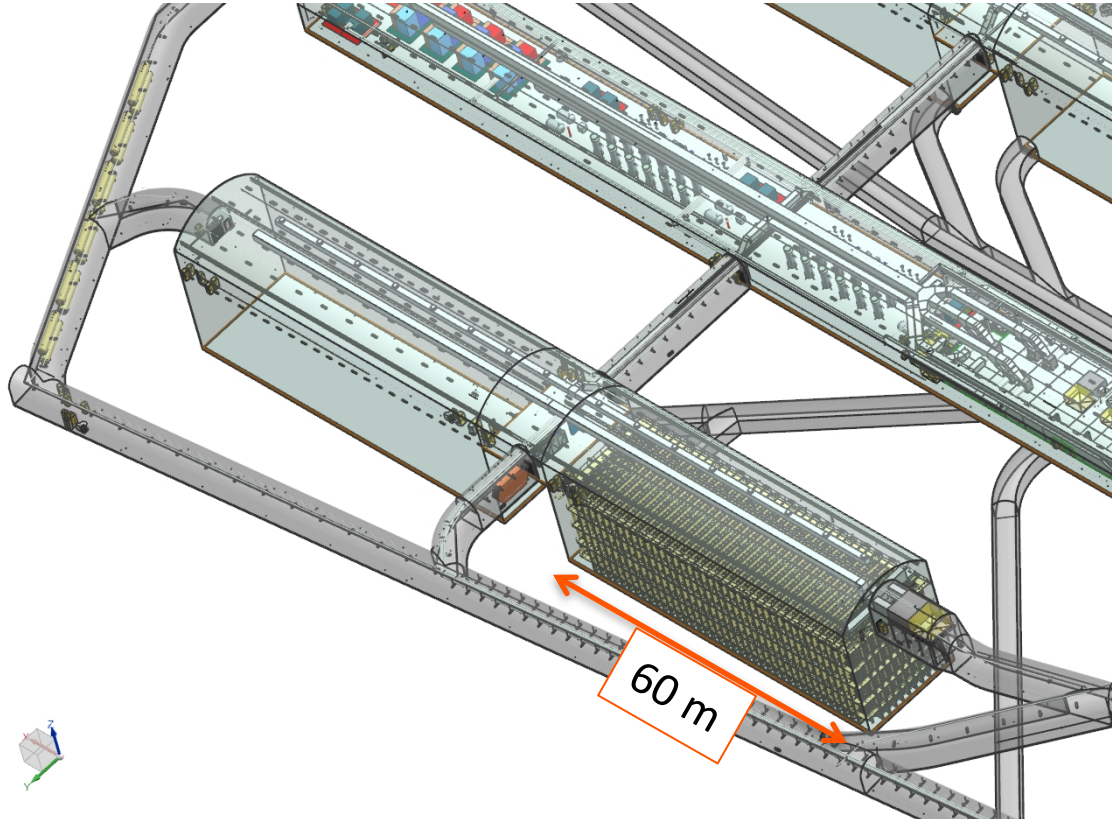
Detector validation for LBNC & CD-2

Physics calibration for oscillation analyses

5. Far Detector Strategy

Far Detector Staging Strategy

- Four chambers hosting four independent 10-kt FD modules
 - Flexibility for staging & evolution of LAr-TPC technology design
 - Assume four **identical** cryostats: 15.1 (W) x 14.0 (H) x 62 (L) m³
 - Assume the four 10-kt modules will be similar but **not identical**



Far Detector Staging Strategy

- **Four chambers hosting four independent 10-kt FD modules**
 - Flexibility for staging & evolution of LAr-TPC technology design
 - Assume four **identical** cryostats: 15.1 (W) x 14.0 (H) x 62 (L) m³
 - Assume the four 10-kt modules will be similar but **not identical**
- **Two LAr readout technologies on the table**
 - **Single-Phase** (Ionization read out in the Liquid Ar)
 - Demonstrated by ICARUS & MicroBooNE
 - **Dual-Phase** (Ionization amplified and read out in Gas Ar)
 - Pioneered by WA105 (protoDUNE-DP)
- **Soon need to agree a concrete plan for the first two far detector modules**
 - With a funding model agreed by the FAs
 - Major decision for the collaboration

Planning Strategy and Decisions

★ Need Resource matrix for (at least) first two FD modules by 2019

★ Planning Strategy is to keep options open:

- Could be two modules of same type
- Could be 1 + 1 (plan for first SP, second DP)
- Identify full scope (4 FD modules) as early as possible

★ Decision on (at least) first two FD modules at end 2018

★ Decision process will be defined in 2017, non-trivial parameter space:

- Detector performance, Cost, Risk, Opportunity
- **Resources** and interest from collaboration

Updated FD Planning Strategy

- Discussed in EC – converged
- Assumes success of both protoDUNE detectors
 - Success is defined in dune-doc-2765
- At this stage wish to keep options open
- For planning purposes:
 - “we are assuming that the first far detector module will be single-phase and the second will be dual-phase”
 - “This planning strategy is not intended to prejudice the actual technology decision in late 2018/early 2019, which will be based on the full knowledge at that time and the availability of funding.”
 - i.e. plan so that all options can be on the table

5.1 Far Detector Consortia

- **Motivation:**

- By 2019, need to understand contributions to first two FD modules & funding
- **To succeed, have to start this process now**

- **Strategy:**

- Build collaboration detector activities around “**consortia of institutions**” responsible for detector sub-systems
- August 2017: will replace existing FD WG organization with sub-detector consortia
 - Evolution towards LHC GPD organization structure
- Use the consortia to facilitate the process whereby **institutions take on responsibility** for concrete tasks
 - **Funding Agency engagement is essential**

Far Detector Consortia

- **Consortia operate within the DUNE collaboration**
 - Each consortium is self-organizing, working within collaboration rules:
 - Elected Consortium Leader (faculty scientist or equivalent)
 - Select a Technical Lead – acts as project manager
 - Consortium Board with a representative from each institution
 - Internal Project Management Board (PMB) with representatives from each contributing national project
 - ...

Far Detector Consortia

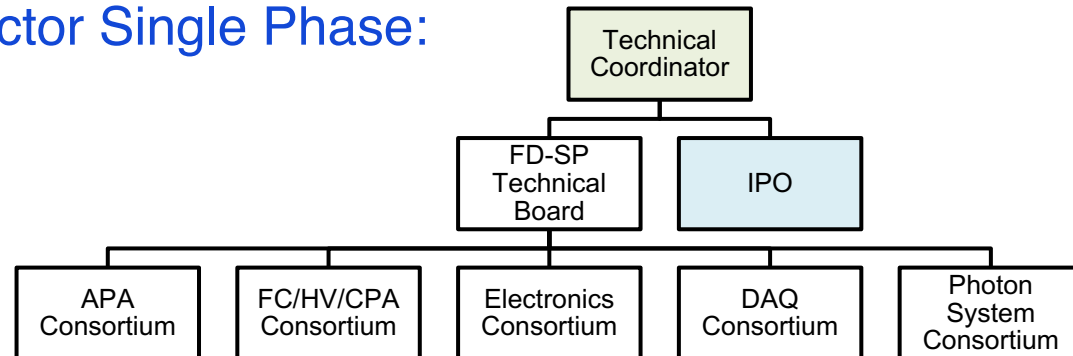
- **Consortia operate within the DUNE collaboration**
 - Each consortium is self-organizing, working within collaboration rules:
 - Elected Consortium Leader (faculty scientist or equivalent)
 - Select a Technical Lead – acts as project manager
 - Consortium Board with a representative from each institution
 - Internal Project Management Board (PMB) with representatives from each contributing national project
 - ...

**Details are defined in the
DUNE management plan**

Deep Underground Neutrino Experiment
Management Plan – v1.0
dune-doc-2145
April 17, 2017

Far Detector Consortia

- **Consortia operate within the DUNE collaboration**
 - Each consortium is self-organizing, working within collaboration rules:
 - Elected Consortium Leader (faculty scientist or equivalent)
 - Select a Technical Lead – acts as project manager
 - Consortium Board with a representative from each institution
 - Internal Project Management Board (PMB) with representatives from each contributing national project
 - ...
- **Consortia come together under a technical board**
 - e.g. Far Detector Single Phase:



Far Detector Consortia

- **Consortia operate within the DUNE collaboration**

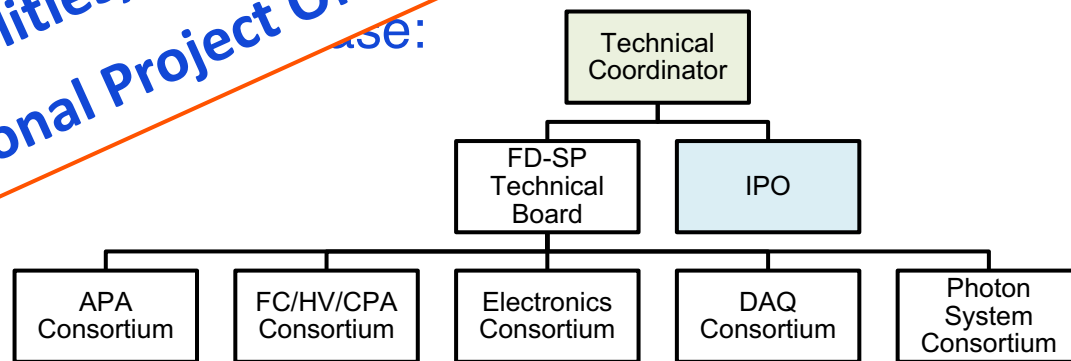
- Each consortium is self-organizing, working within collaboration rules:

- Elected Consortium Leader (faculty scientist or postdoc)
- Select a Technical Lead – acts as project manager
- Consortium Board with a representative from each contributing nation
- Internal Project Manager
- ...

- **Consortia responsibilities/management lie with collaborating institutes**

International Project Office (IPO) coordinates these activities

or a technical board



5.2 Boot-strapping

- **Consortium Membership**

- Define consortium membership by end of June
 - Will mark end of “Eol” process
 - Process organized by Technical Coordinator
 - Phone meetings to identify list of deliverables (hardware, scientific support)
 - IB representatives then contact TC to formally join initial consortium, including a description of possible role and potential funding source(s)
 - Also possible for institutions to join consortia at a later date

- **Consortium Leader**

- These are important positions, e.g. they will steer the Tech. Proposal
- Election of Consortium Leader in early July
 - Process will be steered by DUNE Co-spokespersons
 - Consortium Board members nominate candidates for CL to Co-spokes
 - Co-spokes will talk to potential candidates
 - EC recommends a slate of candidates for election
 - CB representatives vote (1 vote per institution)

5.3 Consortia Status

- **Single-Phase Consortia**

- First meetings at May collaboration meeting
 - Socialize concept and discuss consortium-specific issues
 - Discuss process of forming consortia and electing leadership
- Second and Third meetings in June
 - Discuss and define responsibilities and deliverables (and interfaces)
- Overall progressing extremely well
 - Strong engagement and interest
 - FD discussions start to feel very real
 - Ready to launch call for initial consortia membership – next week

- **Dual-Phase Consortia**

- Aim to converge in parallel with single-phase with a similar model
- Process is lagging somewhat
- Next week face-to-face meetings at CERN to advance discussion

6. Near Detector Strategy

Near Detector Concept Study

- **CD-1-R Conceptual Design**

- NOMAD-inspired Fine-Grained Tracker (FGT)
- Developed in the context of **LBNE** as a U.S. – India collaboration
- Generally felt to be a good concept (and could be the right one)
- But not the only option, and funding model is very unclear...

- **Moving to a DUNE Near Detector Concept**

- A number of Options: FGT, HP-TPC, LAr-TPC or a **hybrid system**
- Before formation of ND-consortium/consortia need to converge on an agreed DUNE collaboration concept for the ND
 - Will depend on interests of collaborators and funding opportunities
 - Major opportunity to bring in new collaborators/nations/resources
- Aim to agree the DUNE ND concept by end of 2017
- New “Near Detector Concept Study” to provide the focus to this process is up and running

Near Detector Concept Study

- **Charge:**

- Develop a proposal for a DUNE collaboration near detector concept by the end of 2017.

- **Study should:**

- Ensure that the proposed near detector concept meets the requirements of the primary scientific goals of DUNE.
- Assume a single near detector hall of a similar to the CD-1-R design, located at a distance of between 360 m and 575 m from the target.
- Present a plausible funding model for the proposed concept, based on the interests and likely contributions to the detector construction from the international collaboration
- Focus solely on the design of the Near Detector; the scope of the study does not extend to the design of the LBNF near site facility

Near Detector Timeline

- **Timeline**

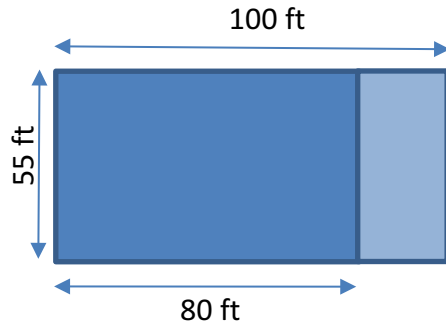
- Jan 2017: 1-day workshop to start discussions ✓
- Feb 2017: EoI-light for interests in ND ✓
 - **Form broad “DUNE ND Concept Study Team”**
- Mar 2017: 3-day DUNE ND Workshop 27th-29th March at FNAL ✓
 - “new” participation: Germany, Italy, Russia, ...
- May 2017: agree on 2 [or 3] options to pursue ✓
- Jun 2017: 2-day DUNE ND Workshop ✓ to review and document pros/cons of each option and assumed funding model
- Aug 2017: presentation of options at collab. mtg, possible down select
- Nov 2017: 2-day DUNE ND Workshop at CERN
- Jan 2018: concept agreed by collaboration + EoI process
- Early 2019: ND CDR (which could be an updated FGT CDR)
- Early 2020: ND TDR for review in August

Conventional Facilities

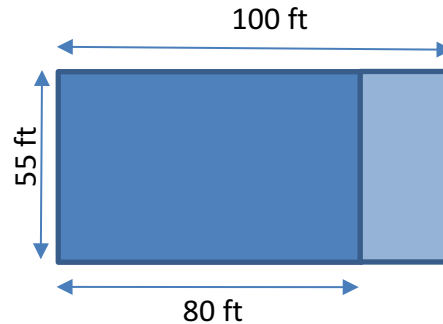
- **Needless to say... CF are a major cost driver in any large-scale construction project**
 - At last ND workshop, built into the discussions
 - Aim to keep process on the real axis
- **DUNE management asked LBNF for cost estimates of a number of potential options:**
 - dune-doc-3866 : alternative ND hall sizes
 - dune-doc-3914 : alternative location
- **LBNF provided estimates of increase in LBNF DOE TPC**
 - Includes escalation and contingency

Conventional Facilities (ND Hall)

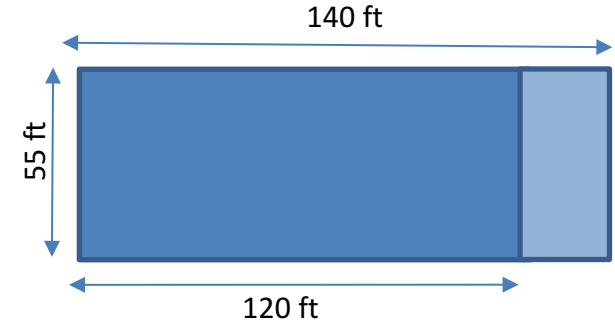
Current @ 575m



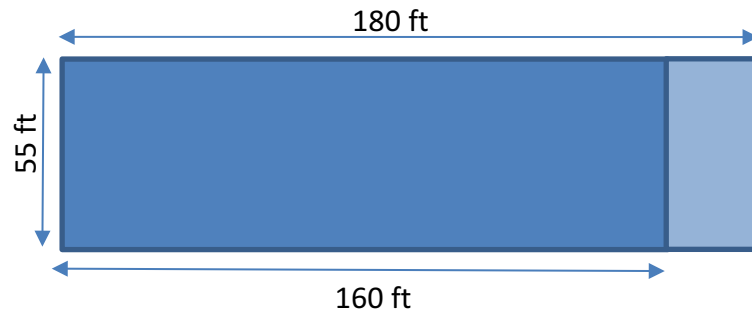
Option A: current @ 365m



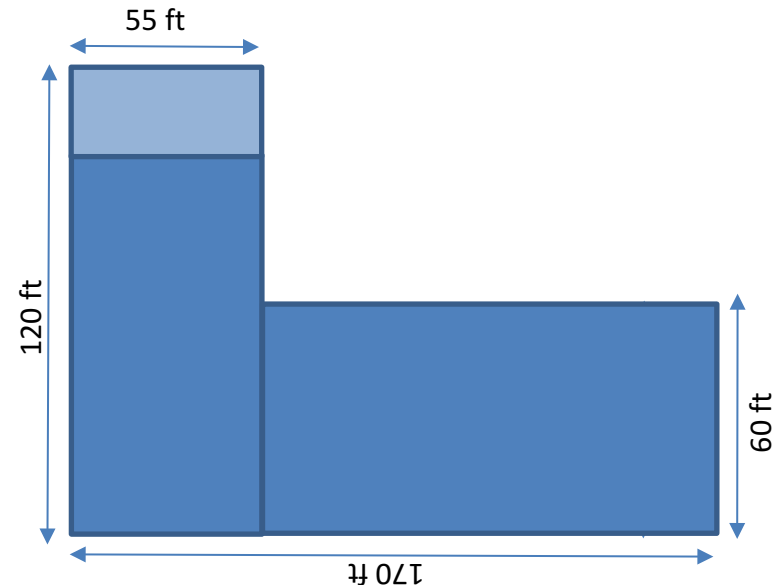
Option B: Existing + 50%



Option C: Existing + 100%

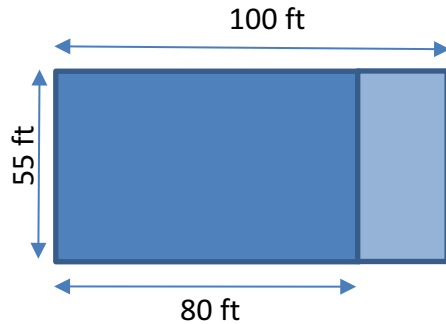


Option D: "DUNE Prism"

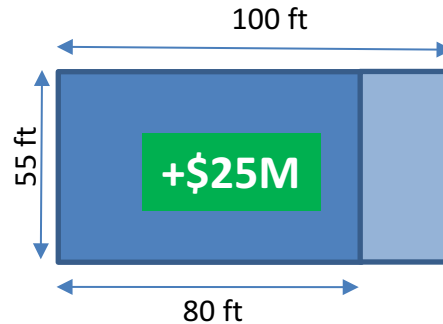


Conventional Facilities (ND Hall)

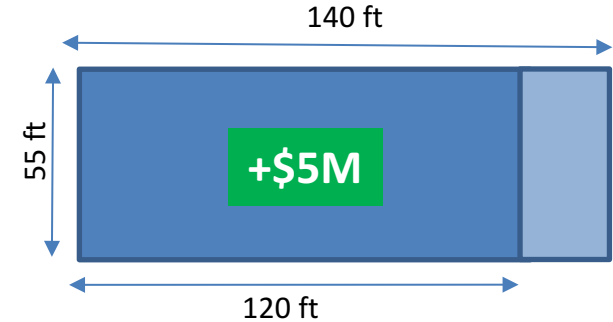
Current @ 575m



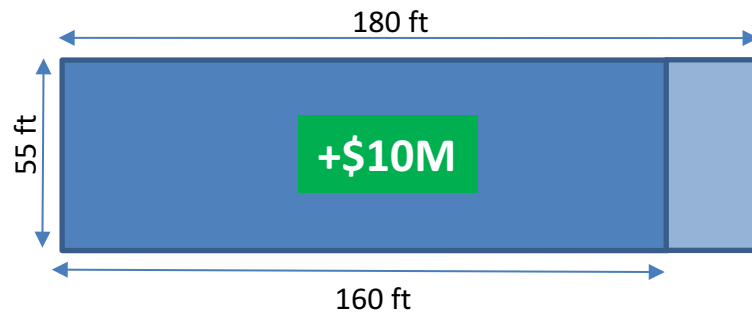
Option A: current @ 365m



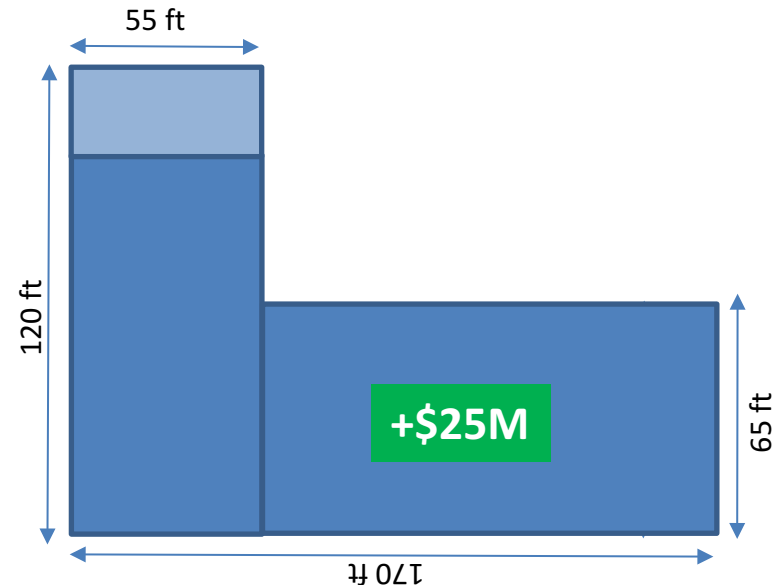
Option B: Existing + 50%



Option C: Existing + 100%



Option D: "DUNE Prism"



ND Status

see talk from
Alfons Weber

- **Agreed direction**

- Non-magnetized LAr-TPC & magnetized “Multi-purpose tracker”
- Likely to require ~50% larger ND hall
- Remain at current location (575m), unless LBNF believes there are cost benefits for moving closer
- Movable “DUNE-Prism” option not favored

- **Issues**

- Magnet (and who pays): Solenoid vs. Dipole
- Costs of conventional facilities
 - Cryogenics and cryostat for LAr-TPC
 - Helium deliver for SC solenoid
 - Increased size of access shaft for SC solenoid/cryostat
- Resource matrix...

7. Recommendations and Major Milestones

7.1 LBNC Recommendations

- **DUNE is tracking LBNC recommendations**
 - Moved to a more transparent procedure (google doc + docdb)
- **Current status of LBNC recommendations:**
 - 97 closed
 - 11 in progress
- **Open recommendations:**
 - 3 management
 - 2 protoDUNE-SP
 - 2 protoDUNE-DP
 - 1 physics
 - 1 cold electronics
 - 2 LBNF (cryogenics and engineering for optimised beam)

“Management” Recommendations

- **Open management recommendations:**
 - “Work with the LBNC to better define the deliverables needed for a full review of the TDR and the detector sub-system proposals in a meaningful way to meet the needs of the RRB and the INC”
 - Discussions are on-going. From DUNE side we have developed an extended list of key milestones in the process. High-level path through LBNC, RRB for TDR and Technical Proposal have been defined.
 - “It would be useful for DUNE and LBNF to develop a 6-month look ahead mechanism to anticipate important developments or activities that would benefit from interaction with the LBNC.”
 - Being developed. Six-month look head will appear in plenary talks.
Developing an overall milestone list.
 - “DUNE should develop and document a process for evaluating and providing feedback to consortium proposals”
 - After formation of the consortia is complete (July 2017), evaluation of proposed contributions from each institution will be the responsibility of the consortia leadership, in consultation with DUNE management..

7.2 Six-month look ahead (management)

- **Moving to more systematic tracking of high-level milestones**
 - Work in progress...

Target date	Milestone	Type ▼	Tier ▼	Original date
Jun-17	Launch of expressions of interest in DUNE FD-DP	FD	2	May-17
Jun-17	Review of TF reports	TF	2	Jun-17
Jun-17	Initial membership of consortia finalized	FD	2	Jun-17
Jun-17	ND Concept Study workshop	ND	2	Jul-17
Jun-17	LBNC Meeting	LBNC	4	Jun-17
Jul-18	Consortium leaders in place	Management	2	Jul-17
Aug-17	Update of strategy document	Management	2	May-17
Aug-17	Initial consortia for the construction of the far detector systems in place	FD	1	Aug-17
Aug-17	First formal meetings of FD consortia	FD	1	Aug-17
Aug-17	Eighth DUNE Collaboration Meeting (FNAL)	Meeting	3	Sep-17
Sep-17	Rotation of Leadership of WGs etc.	Management	3	Sep-17
Oct-17	LBNC Meeting	LBNC	4	Oct-17
Nov-17	ND Concept Study workshop (CERN)	ND	2	Nov-17
Nov-17	Presentation of consortia plans at RRB	RRB	1	Nov-17
Nov-17	RRB Meeting	RRB	4	Nov-17
Dec-17	All components of protoDUNE-SP at CERN	PD-SP	2	Dec-17
Dec-17	All components of protoDUNE-DP at CERN	PD-DP	2	Dec-17
Dec-17	FD TDR editors appointed	TDR	2	Dec-17
Dec-17	Definition of the decision-making process for the first two FD modules	FD	2	Dec-17

8. Summary

Summary

★ DUNE is going ahead

- CD-3a & US FY17/FY18 funding are major steps
- International commitments come next

★ DUNE has a strong and focused team

- There are many challenges, but we are working effectively together to realize our goal

★ Great progress in the last year

★ 2017 is an incredibly important year for DUNE

- Same will be true for 2018, 2019, ...

Thank you. Questions?

