U.S. DEPARTMENT OF ENERGY | Office of Science

High Energy Physics Project Status

HEPAP Meeting
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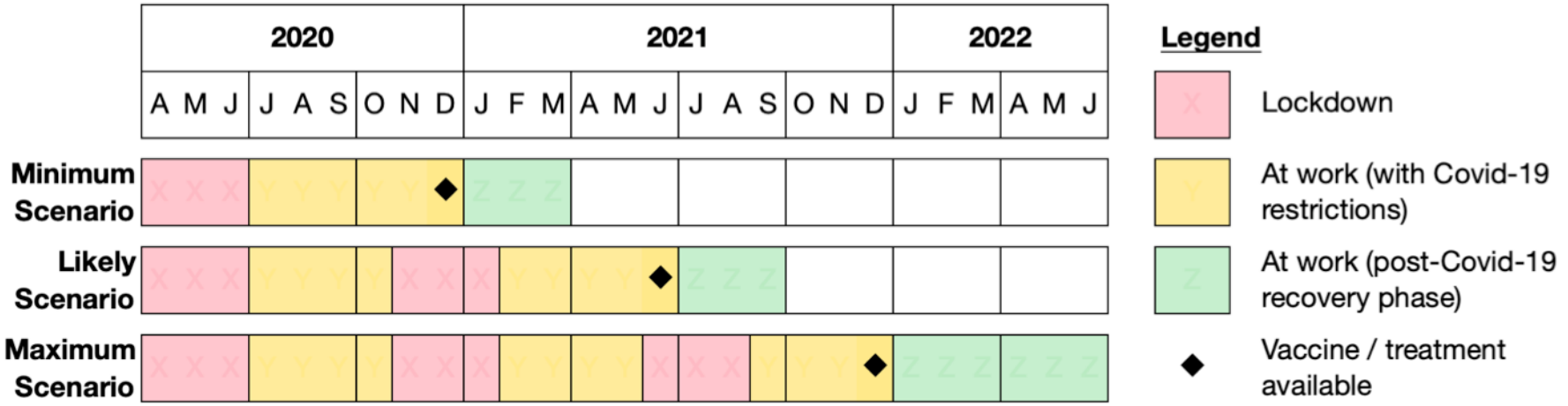
HEP COVID 19 scenarios

- We do not now know how pandemic will evolve
  - We continue to monitor guidance from the public health authorities
- Fermilab has proposed a framework to analyze the risk
  - Assume different possible courses for the pandemic
  - Apply different efficiencies for work under different situations
    - Tailor the efficiencies based on experience to get the best analysis
    - The data on efficiencies is just now coming in
  - Analyze the scenarios in P6 (project schedule and cost tool)
- HEP is using this framework on all projects
- OPA has asked for three levels of impact
  - OPA did not specify that projects should use the Fermilab model

Fermilab COVID-19 Scenarios



- Each schedule is divided into phases:
  1. **Lockdown** with teleworking from home where possible
  2. **At work (with Covid-19 restrictions)**, e.g. Covid-19-safe working procedures
  3. **At work (post-Covid-19 recovery phase)**
- The milestones indicate the assumed date in each scenario at which an effective COVID-19 vaccine or treatment has been made widely available
- The durations and timings of the lockdown(s) will be refined as we learn more about the effectiveness of the current lockdowns in the USA and other countries

HEP Projects past CD-3

- ATLAS and CMS (Initial) Phase-1 Upgrades received CD-4
  - Installation activities are through the LHC Ops program, done during the present LHC long-shutdown
  - CERN has modified LHC long-shutdown schedule for Run 3 to begin in early-2022 (versus the original 2021 plan) to allow completion of upgrade activities
- DESI received CD-4 on May 11, 2020
- FACET II is nearly complete
  - ✓ Will finish without a rebaseline
- LZ project is nearly complete
  - ✓ Can finish without a rebaseline
- LSSTcam project is also close to completion
  - Funding has been finished
  - Close the project out soon and complete the initial assembly on ops
  - Will need additional ops funding of $5.5 million

Mu2e

- Mu2e project has seen delays due to magnet procurement
  - Funding has been finished
  - COVID-19 will clearly push the project past CD-4 and over the approved TPC
  - There are adequate funds to wait until we know more before rebaselining
  - The project needs to see General Atomics complete more coils before they can confidently project a CD-4 date

Mu2e Cost and Schedule Impacts

Mu2e Impacts	Low	Medium	High
Cost Impact	$3.6M	$4.7M	$6.6M
Schedule Impact	3.5 mo.	7.5 mo.	12 mo.
Delay to CD-4	1.5 mo.	5.5 mo.	10 mo.

- The cost impacts of GA delays have not yet been fully evaluated
- A preliminary estimate would add about $3 million
- The House science infrastructure bill has $9 million for Mu2e

SuperCDMS

- SuperCDMS project has seen delays due to cryostat procurement
  - Funding has been finished
  - COVID-19 has also pushed the project over the TPC
  - The project has enough funds to last into Q2FY21 before rebaselining
  - HEP is discussing with NSF how to complete this project
  - We are waiting to see costs for the redesigned cryostat before rebaselining

Cost impacts (k$)			Schedule impact	TPC limit hit
NSF	DOE	Total	CD-4 forecast	
$ 601	$ 1,589	$ 2,190	Dec-21	Mar-21

Well within CD-1 cost range;
Pre-COVID CD-4 forecast was Mar-21

HL-LHC Accelerator Upgrade Project

- HL-LHC Accelerator Upgrade Project
  - Project has CD-2/3B approved February 2020
  - Magnets are in production at BNL, FNAL, and LBNL
    - All three labs had a multi-month shelter-in-place that stopped production work
    - Estimated impacts as of 6/19/2020

HL-LHC Impacts	Low	Medium	High
Cost Impact	$9-13M	$18-23M	$25-30M
Schedule Impact	6 mo.	11 mo.	15 mo.

- The project will need to rebaselined, funding is sufficient to wait until we know more

HL-LHC Detector Upgrade Projects

Cost Impact all estimated based on baseline costs in current schedule:

ATLAS	Low	Medium	High	CMS	Low	Medium	High
Cost Impact	$11M	$18.1M	$27.6M	Cost Impact	$3.9M	$8.5M	$13.9M
Schedule Impact	4 mo.	8 mo.	12 mo.	Schedule Impact	3 mo.	6.2 mo.	9.6 mo.

- The difference between ATLAS and CMS reflects a number of factors:
  - They are both **not baselined** and at different stages of design and/or incipient production
  - ATLAS has a higher fraction of **lab-based work**, and all the labs have been shutdown and in the event of further lockdowns, they would still be hard hit
  - **ATLAS** has used more conservative lower **efficiencies** for returning to normal work mode, mostly reflecting the cautious reopening of labs
  - **CMS efficiencies** are just an average of very preliminary estimates and these are being refined, as data from the working sites is effectively collected
  - Both projects do not include any **potential international schedule delays** due to COVID yet

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