IceCube Upgrade
3 Season Workplan

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Upgrade Logistics Review
November 3-5, 2021

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2019-2020 Upgrade Field Season Review:

- Inspected and evaluated all components of the Enhanced Hot Water Drill (EHWD) at South Pole Station
- Completed scheduled inventory, repairs and testing
- Returned with thorough documentation on condition of EHWD that informed plans for replacements, repairs and upgrades in following seasons
- A total of 13 Drillers spent time at the station during the season, core population of about 6 for duration of season Nov 18 to Jan 30

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After the successful 2019-2020 Season….

- 2020-21 and 2021-22 Field Seasons Cancelled
- Work at UW Physical Sciences Lab continues
- Upgrade still needs 3 field seasons to complete the project

Upgrade storage on new berm 2020

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Why 3 Seasons:

- **Each Season Will Build on Prior Season's Progress**

- **Programmatic Considerations**
  - Cargo Movement, Bed Space, Fuel Supply, Duration of Season

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Field Season #1 - EHWD Refit - 8 Drillers

- Complete the repairs and upgrades identified in 19-20 field season
- Perform efficiency, pressure and fitness testing of 4 Main Heating Plants and Pre-Heat System
- Assemble entire EHWD in drilling configuration at Seasonal Equipment Site
- Evaluate system as a whole, including interconnects and fuel system
- Deliver and integrate 2 of 3 Generators

Model 75 Heaters in MHP#2

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Field Season #1 - Workflow

1- Opening team of 5 arrives first to set up work site, 3 additional team members arrive a week later

2- Excavate Drill Components from Winter Storage/Berms

3- Set-up MECC and SHOP outside Cryo Facility as in 2019-20 season

4- Bring in MDSs, Reels sequentially for testing, repairs, upgrades beginning with Main Heating Plants and Pre-Heat System

5- Move MDSs from Cryo site across the skiway into position on SES pad

6- Assemble entire EHWD at SES, including interconnects

7- Winterize, stow cargo for winter

Upgrade Cryo work site 2019-2020

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Field Season #2 - Pre-Drill Activities - 14 Drillers

- Full drill systems integration and testing
- Firn Drill 9 Holes – 7 for Deep Holes, 1 for Rodwell, 1 for Condensate Disposal
- Full system Wet Test
- Begin Rodwell development
- Complete remaining Generator work and fully integrate all 3 Gens
- Install new drill hose and heating system on Drill Supply Hose Reel, prepare for winter-over heating with TOS1 and TOS2.

SES setup during IceCube Gen 1

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Field Season #2 - Workflow

1- Opening team of 6 arrives, followed by 4 drillers each of the next 2 weeks

2- Excavate SES, open up camp, warm MDSs and Generators

3- Finish SES build-out and subsystem integration from prior season

4- Integrate larger systems including ARA Drill and WISSARD HPU

5- Commission Firn Drill and drill 9 firn holes

6- TOS and Tower setup and Reels testing, commission motor drives and control system

7- Receive seed water from station for snow melt operations and initiate water flow in system

8- Exercise high pressure pumps and circulation pumps, fire heaters

9- Spool drill hose onto Drill Supply Hose Reel (DSHR)

10- Perform full system wet test, circulating flow through SES, supply and return hose reels

11- Prepare DHSR winter-over heating and monitoring system, stage with TOS1 and TOS2 for winter heating

11- De-water EHWD, winterize and stow cargo for winter

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Field Season #3 - Drilling and Installation - 28 Drillers

- Drill 7 deep holes
- Install instrumentation/7 strings
- Decommission and disassemble EHWD, storage and retrograde components

Drilling operation with IceCube Lab in background

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Field Season #3 - Workflow

- Opening team of 6 arrives, followed by 8 the following week, then 14 the next
- Excavate SES, open up camp, warm MDSs and Generators
- Receive seed water from station for snow melt operations and initiate water flow in system
- Perform pre-drill testing and safety checks
- Drill 7 deep holes
- Install instrumentation/7 strings
- Decommission, winterize and disassemble EHWD
- Begin retrograde and store remaining cargo for winter

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