

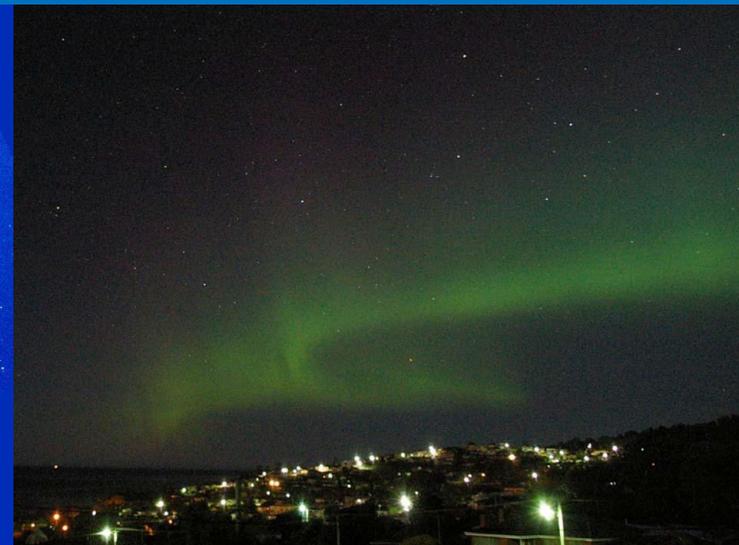
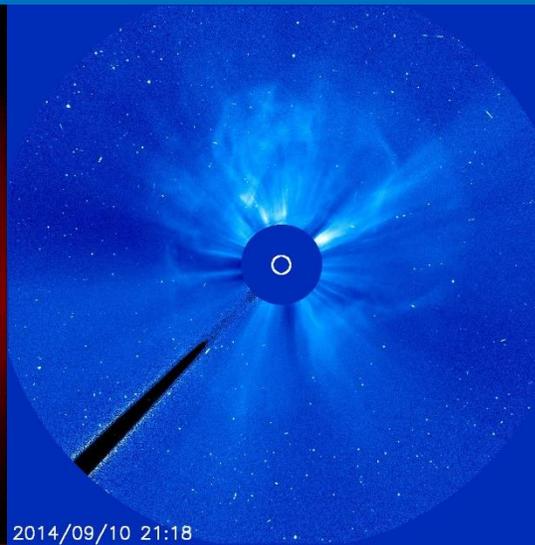
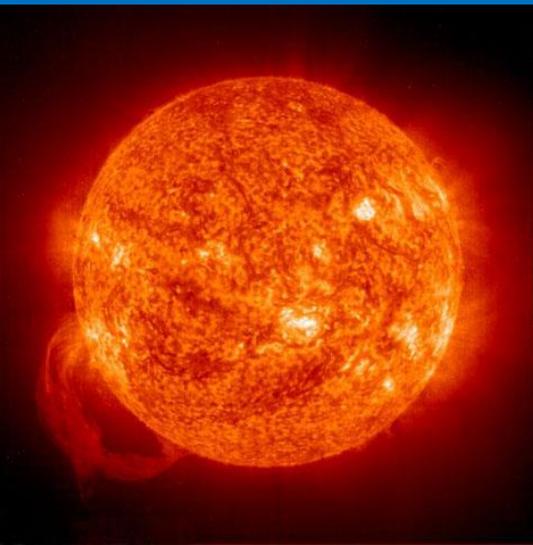


NOAA

Space Weather Overview & Space Weather Program Introduction

Dr. Elsayed Talaat

Director, Office of Projects, Planning, and
Analysis



2014/09/10 21:18



Agenda

- **Bottomline up front**
- **Background**
- **SWX program Overview**
- **Notional SWFO to SWX Timeline**
- **SWX program formulation plans**
- **Summary**





Bottomline upfront

- SWFO – L1 will continue to provide operational service into late 2020's
 - Continuing to evolve data products based on user input
- Space Weather Program (SWX) planning was initiated in May 2020
 - New program is the third pillar in the NESDIS Observing Systems
 - Mission will encompass all space weather observational needs including LEO, GEO, HEO and extended orbits
- SWX program planning has started
- Currently formulation studies underway:
 - User needs assessments
 - Observational value assessments
 - Requirements development
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 - Partnership development
 - Commercial data buy research
- MS1/KSP0: Phase A notionally planned for 3Q FY21
- Program initiation following MS2/KDP 1 decision gate notionally for 3Q FY22

Achieving the NESDIS Vision in Space Weather



NESDIS Vision:

A truly integrated digital understanding of our earth environment that can evolve quickly to meet changing user expectations by leveraging NOAA's own capabilities and partnerships.

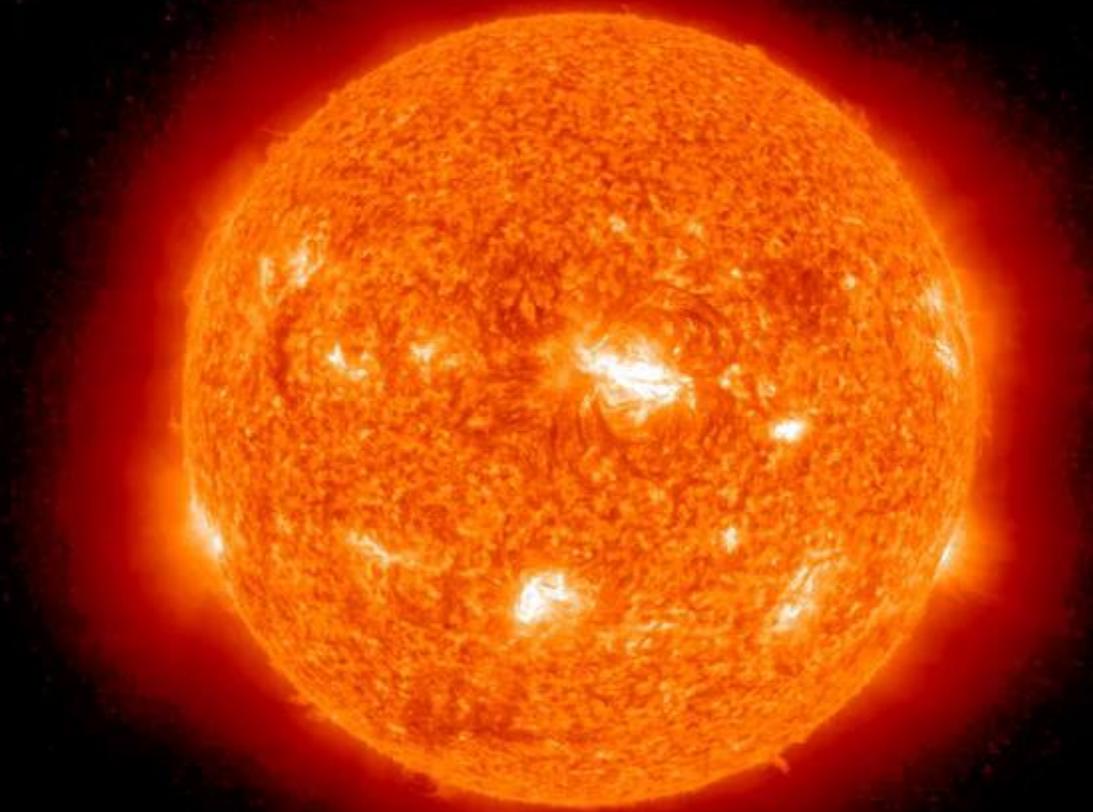
Space Weather Strategic Objective:

Advance Space Weather observational leadership in LEO, GEO, and extended orbits consistent with the agency's responsibilities within the National Space Weather Strategy and Action Plan.

Space Weather Roles:

- Maintain and extend space weather observations from LEO, GEO, HEO and extended orbits (Lagrange 1 and beyond)
- Improve and expand our product suite
- Collaborate with partners to collect, process, and deliver relevant data to our users
- Interpret and provide data in a manner that users can readily access and understand





STEREO AHEAD EUV

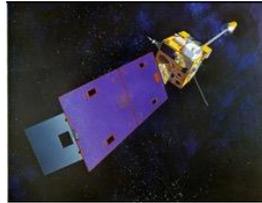
Space-Based Space Weather at NOAA and Partners



NASA SMS
GOES 1-3



GOES 4-7



GOES 8-12



GOES-NOP



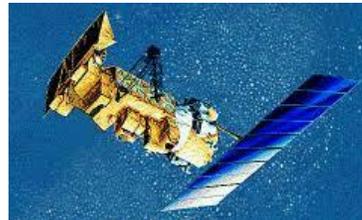
NASA SDO



GOES-R Series



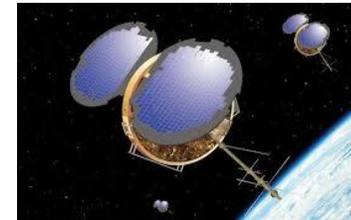
TIROS-N



POES



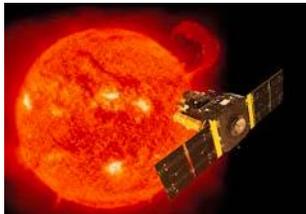
EUMETSAT Metop



COSMIC-1



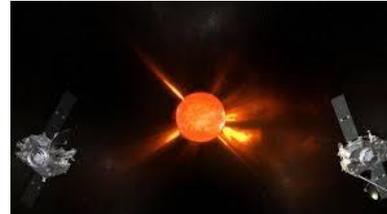
COSMIC-2



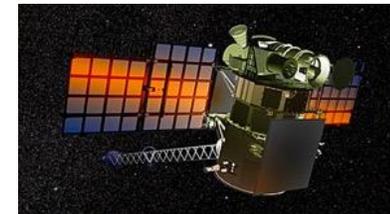
ESA/NASA SOHO



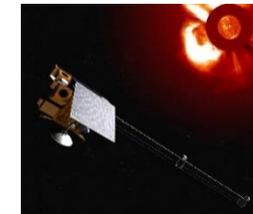
NASA ACE



NASA STEREO



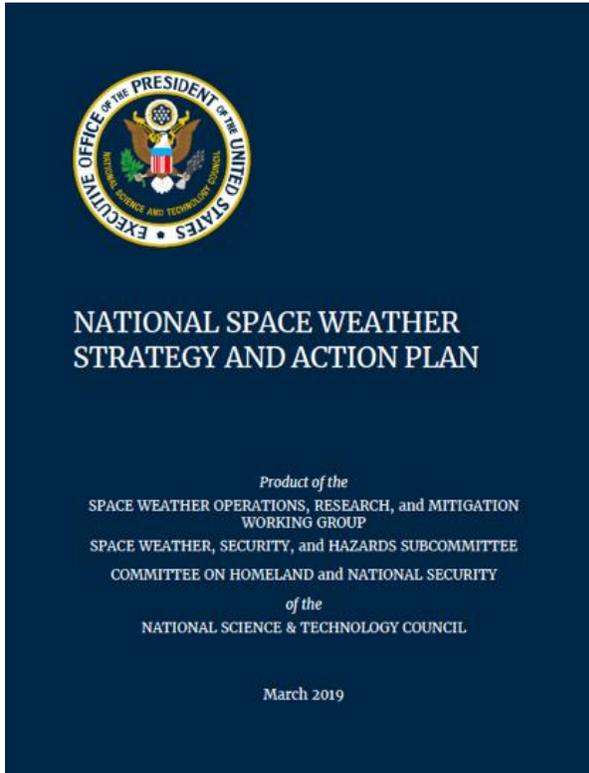
DSCOVR



SWFO-L1

Legend:
Historical
Operational
In development

Space Weather as a National Priority



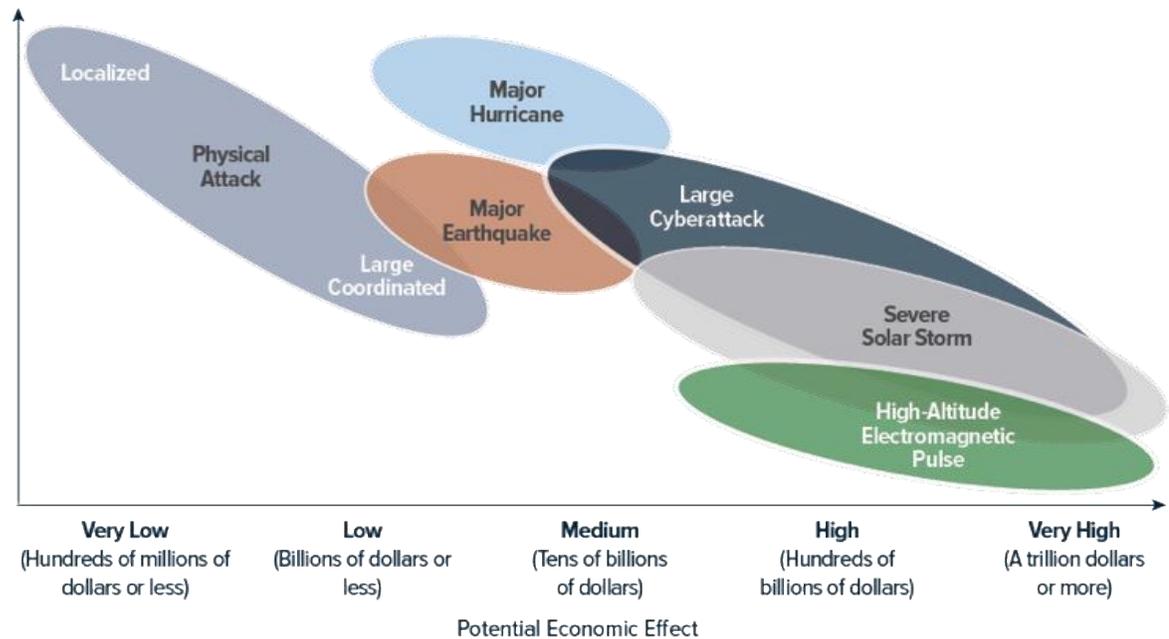
2020 Enhancing the Security of the North American Electric Grid

Congressional Budget Office

2019 Space Weather Strategy and Action Plan

Space Weather Operations, Research, Mitigation Working Group, National Science & Technology Council

- Likelihood**
(Expected average occurrence)
- High**
(Averaging about one every 10 years)
 - Medium**
(Averaging about one every 50 years)
 - Low**
(Averaging about one every 100 years)
 - Very Low**
(Averaging about one every 150 years or more)



Uses of Space Weather Products



Electric Power Grid

- Adjust/reduce system load
- Disconnect components
- Postpone maintenance

Airlines

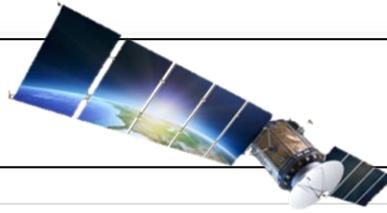
- Divert polar flights
- Change altitude

GPS/Navigation

- Postpone activities
 - Redo survey
- Use backup systems

Space Operations

- Postpone launch of satellite
- Turn off/safe instruments and/or spacecraft in orbit



Solar Flares Interfered With Radio Network's Ability to Warn People About Hurricane Irma



General: Recent solar storm interfered with Air Force satellite



Huge Solar Flare Delays Private Rocket Launch to Space Station until Thursday

by Tariq Malik, Managing Editor | January 08, 2014 08:10am ET

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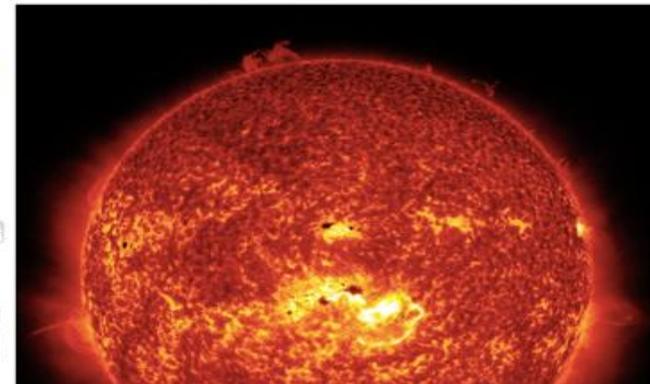
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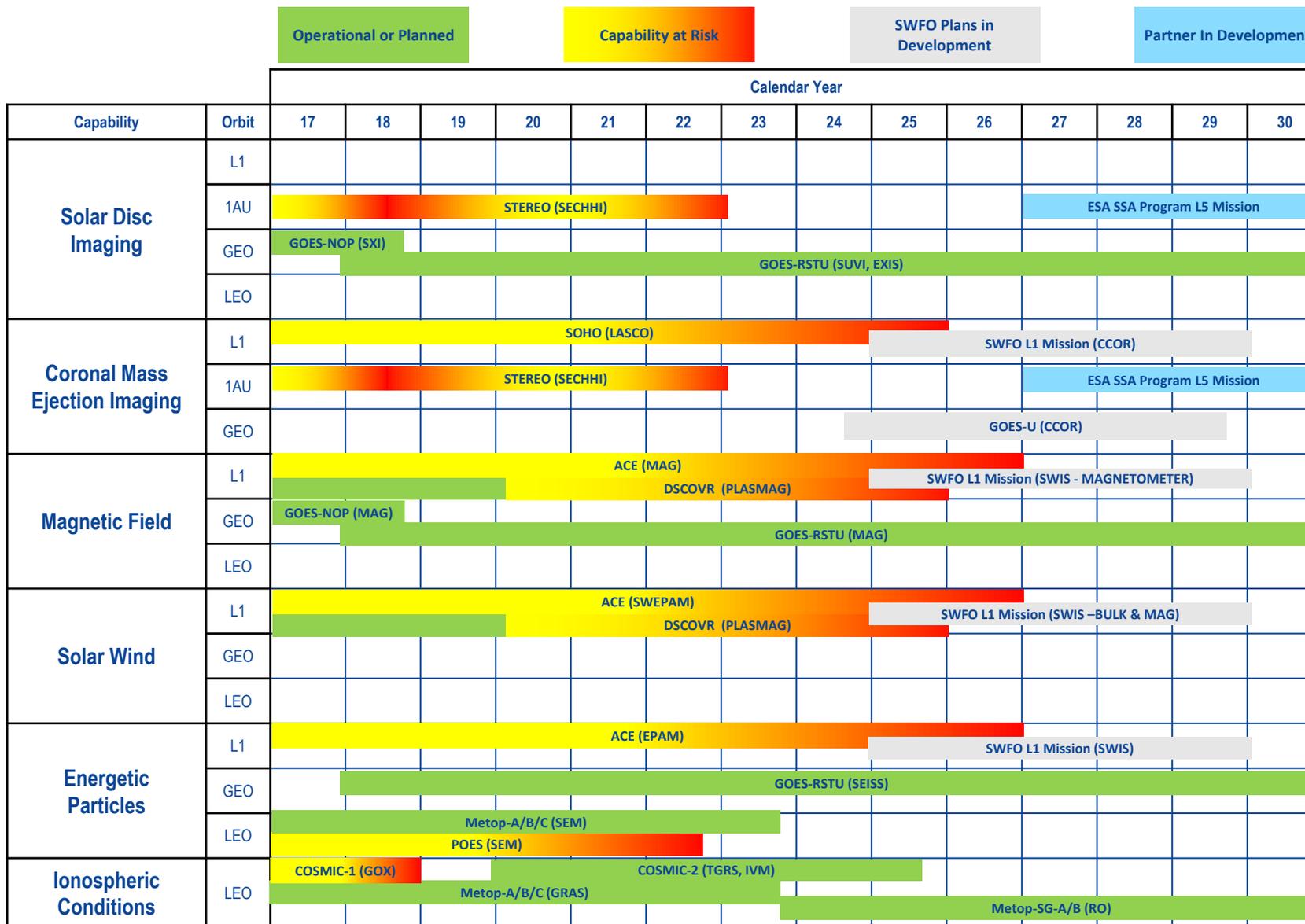
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Reddit

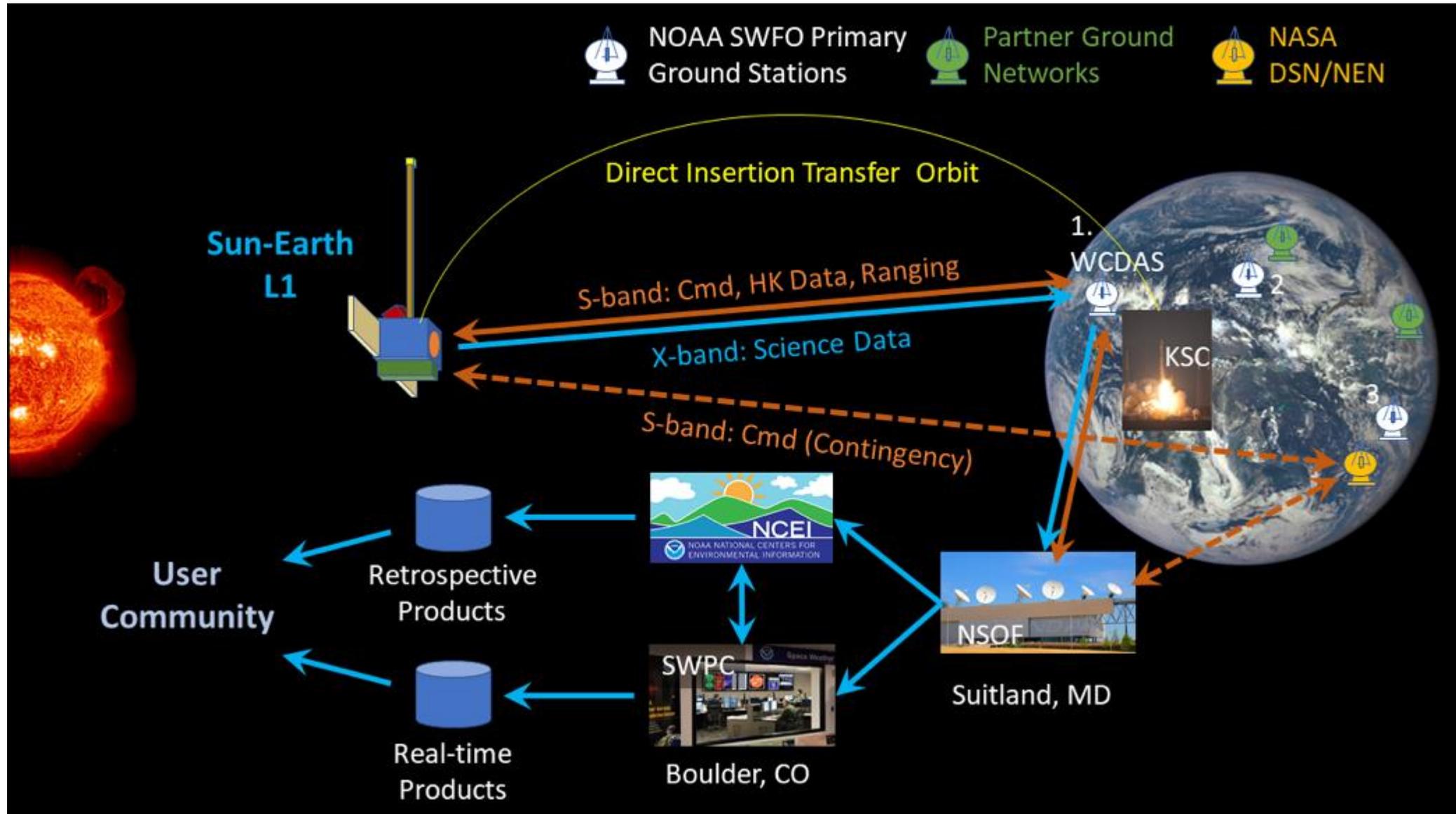
More



Space Weather is Inherently Disaggregated



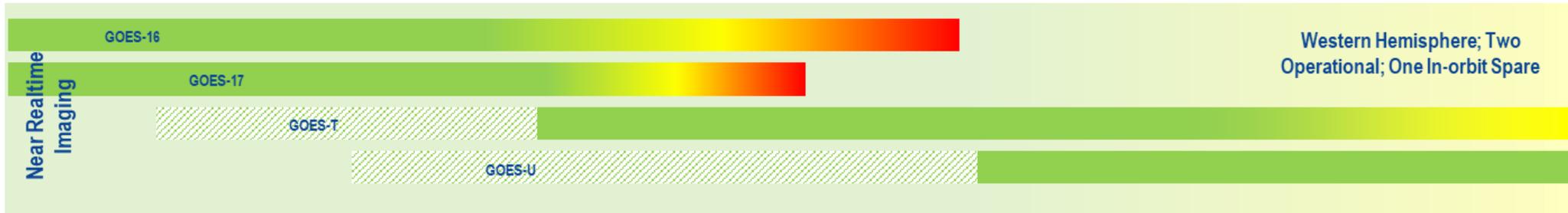
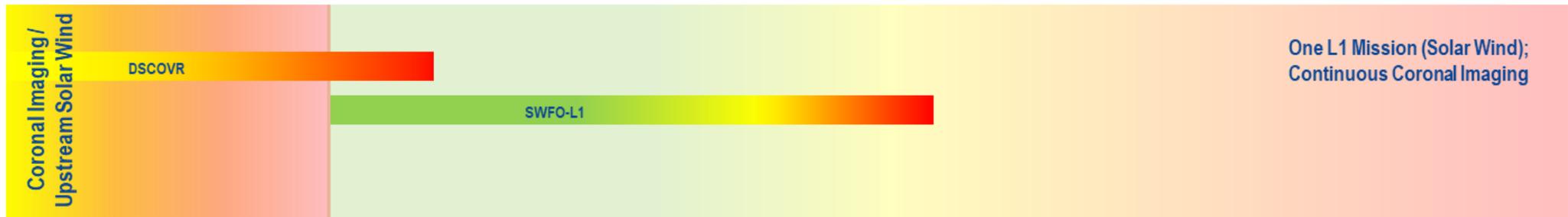
SWFO Mission Architecture



Constellation Risk for Key NESDIS Observations (Programs of Record)



2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
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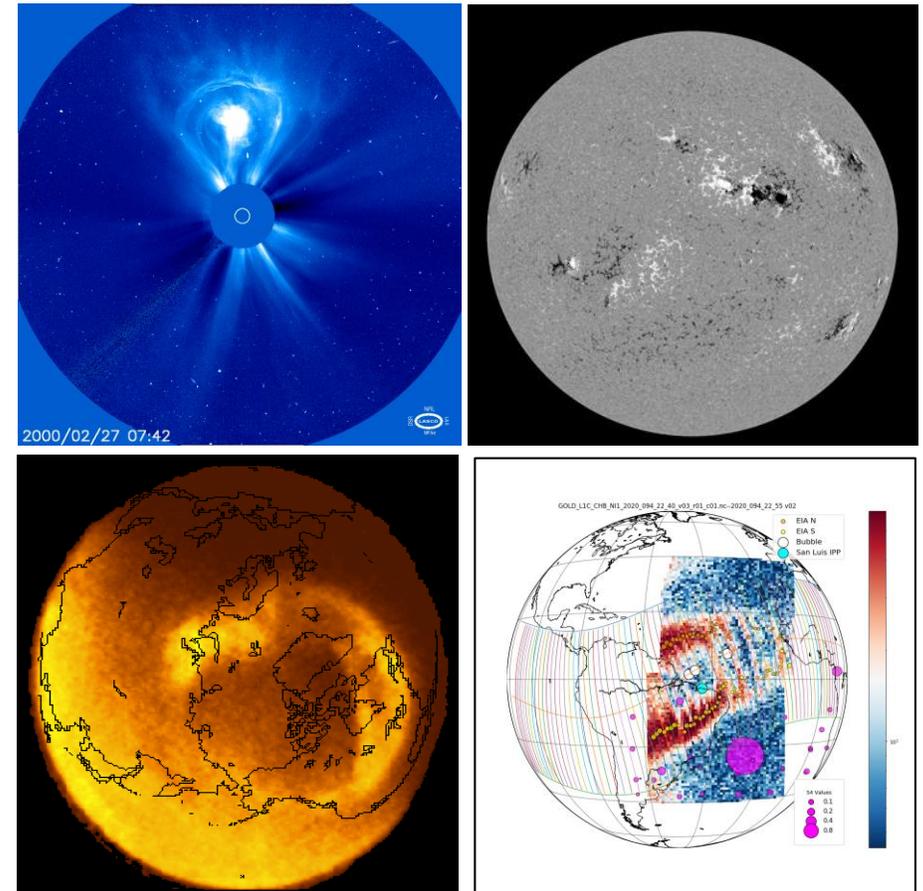




Space Weather Program Overview

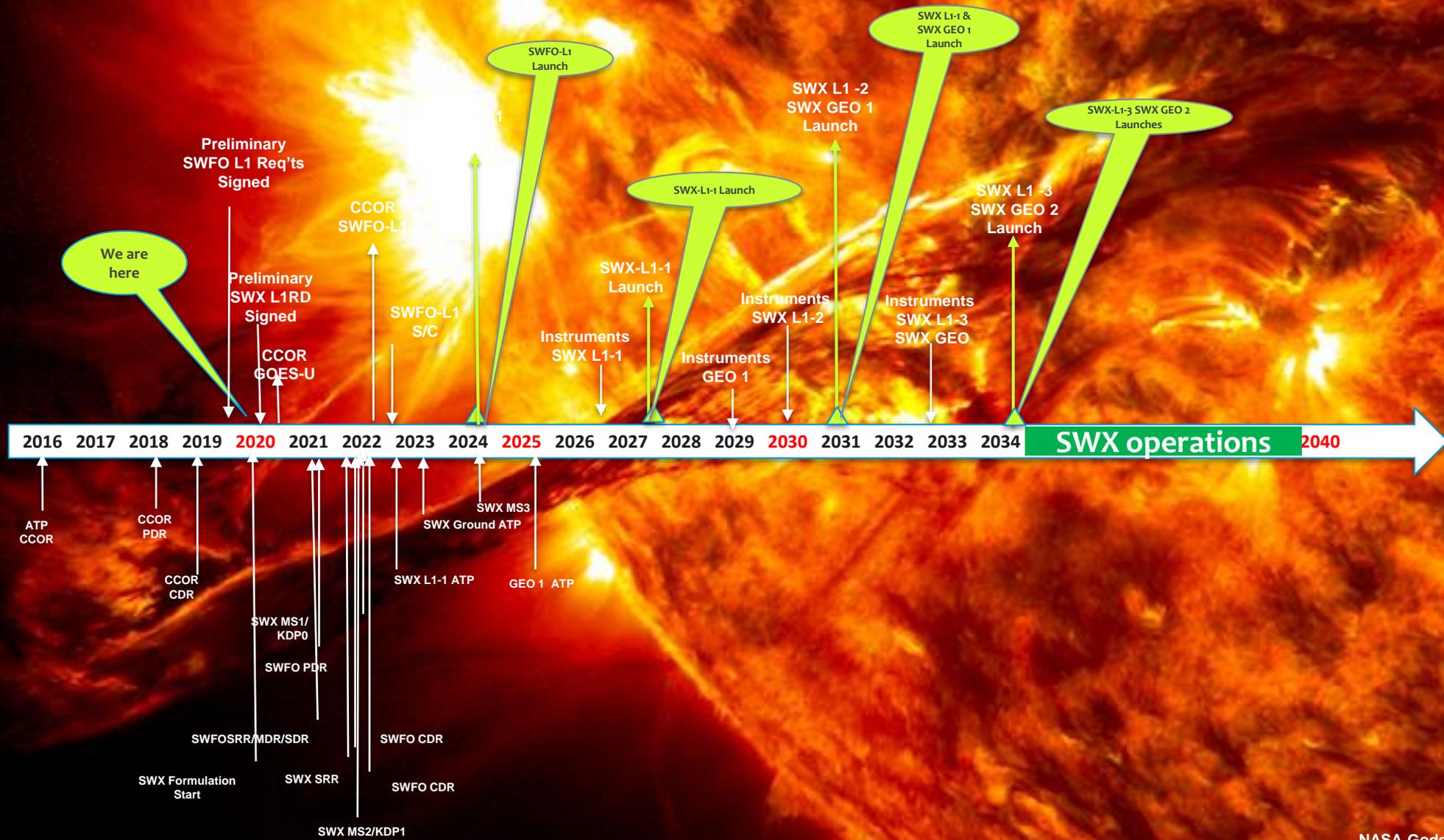
- **SWX = Space Weather Program**
 - The mission to subsume the Space Weather Follow-on program and provides continuity for hosted space weather instruments on GOES-R, COSMIC-2 and other LEO satellites.
 - Includes continuity for L1 observations, off-Sun Earth Line (L5)
 - Considering expanding to include observations from “Tundra” to Lagrange points and beyond L1
 - Ground services for Space Weather mission
- **SWX considering all space weather-observing assets deployed at LEO, GEO, HEO and extended orbits:**
 - Government spacecraft
 - Instruments or payloads hosted on commercial/partner spacecraft
 - Potential use of commercial services and observational data
 - Potential partnerships, interagency and international
- **Operational in the 2024 -2040 timeframe**
 - Currently in pre-formulation:
 - Instrument and constellation studies underway
 - User needs assessment underway
 - Requirements definition underway
 - Notional Program Schedule
 - System Requirements Review, 3Q FY21
 - Milestone 1, 3Q FY21
 - System Definition Review 2Q FY22
 - Milestone 2, 3Q FY22
 - SWFO-L1 launch 1Q FY25
 - SWX L1-1 launch, 2Q FY28

Data Continuity and Potential New Observations



Clockwise from top left:
a) Coronal imagery (LASCO),
b) Magnetograph imagery (HMI),
c) Thermospheric imagery (GOLD),
d) aurora (POLAR).

Notional SWFO to SWX Timeline



NASA Goddard SFC

Notional SWX Formulation thru 2 Qtr. FY21



SWX Pre-Formulation Event/Activity	Timeframe	Status
Initial trade Studies (SWPC, NCEI, GSFC, MITRE, Aerospace, ASTRA)	4Q FY20	Completed
User Needs Studies (NASA, SWPC, MITRE, GEO-XO,)	4Q FY20	Underway; ECD 2Q FY21
Initial AOA (NASA, SWPC, NCEI, GSFC, MITRE, AEROSPACE, ASTRA)	4Q FY20	Underway; ECD 1Q FY21
Requirements Working Group	2Q FY20	Work Underway
GEO Broad Agency Announcement Study Contracts	3Q FY20	Awarded; ECD 2Q FY21
Interagency and International Partnership development	1Q FY21	Underway; ECD 3Q FY21
Requirements Definition Plan then briefed to NOSC	2Q FY21	Underway; ECD 2Q FY21
Formulation Authorization Document	1Q FY21	ECD 2Q FY21
NOAA-NASA Inter-Agency Agreement	3Q FY21	Planned
User Needs Workshops	2Qt FY21	3Q FY21
Program Level 1 Requirements	1Q FY21	Drafted; ECD 3Q FY21
System Requirements Review	3Q FY21	ECD 3Q FY21
MS1/KDPo	3Q FY21	ECD 3Q FY21



Notional SWX Formulation thru 2 Qtr. FY21 MS2



SWX Pre-Formulation Event/Activity	Timeframe	Status
Detailed concept studies, instruments, S/C, architecture	2Q FY20	ECD 2Q 2021
Detailed AOA	2Q FY21	ECD 2Q FY22
Requirements Societal and Economic Benefits	2Q FY21	ECD 3Q 2021
Continuing Interagency and International Partnership development	1Q FY20	ECD 2Q 2022
Formulation Agreement	1Q FY21	ECD 2Q FY22
NOAA-NASA Inter-Agency Agreement completion	2Q FY21	ECD 2Q FY21
Independent Review	2Q FY21	ECD 2Q FY21
System Definition Review	2Q FY22	ECD 2Q FY22
MS2/KDP1 Review	3Q FY 22	ECD 3Q FY22



SWX Summary

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