EXPLORE SCIENCE

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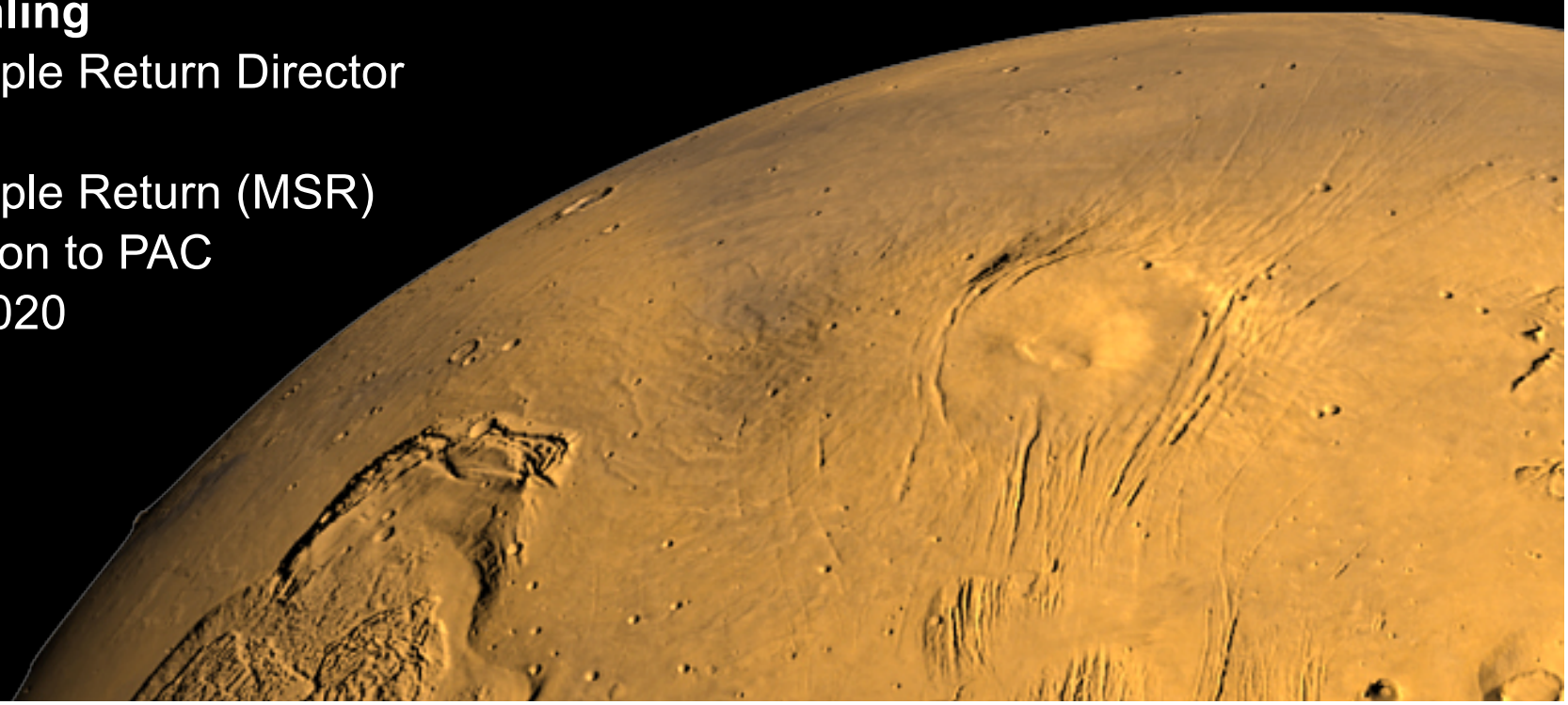
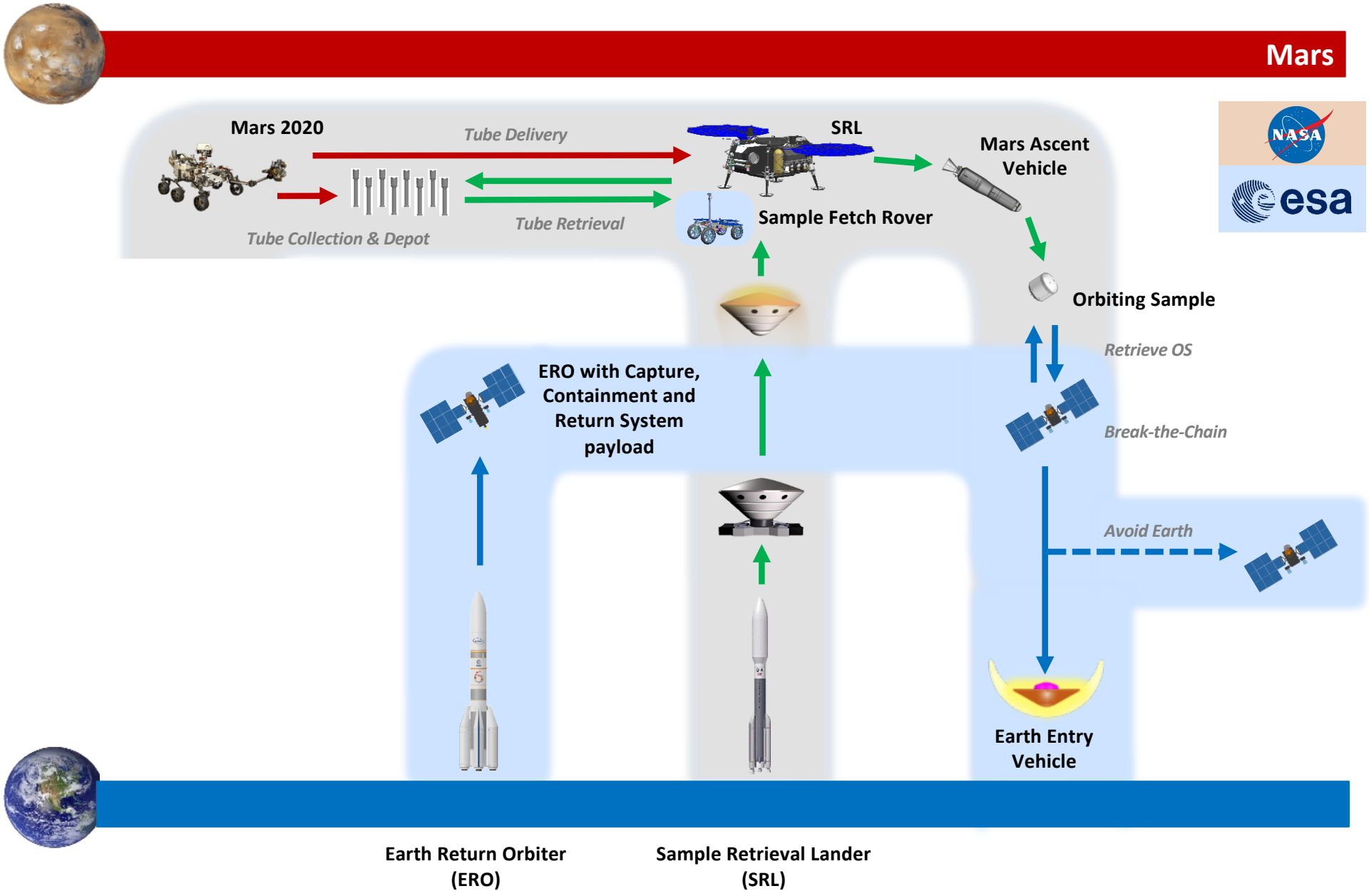
Mars Sample Return Director

Mars Sample Return (MSR)
Presentation to PAC
Aug 16, 2020



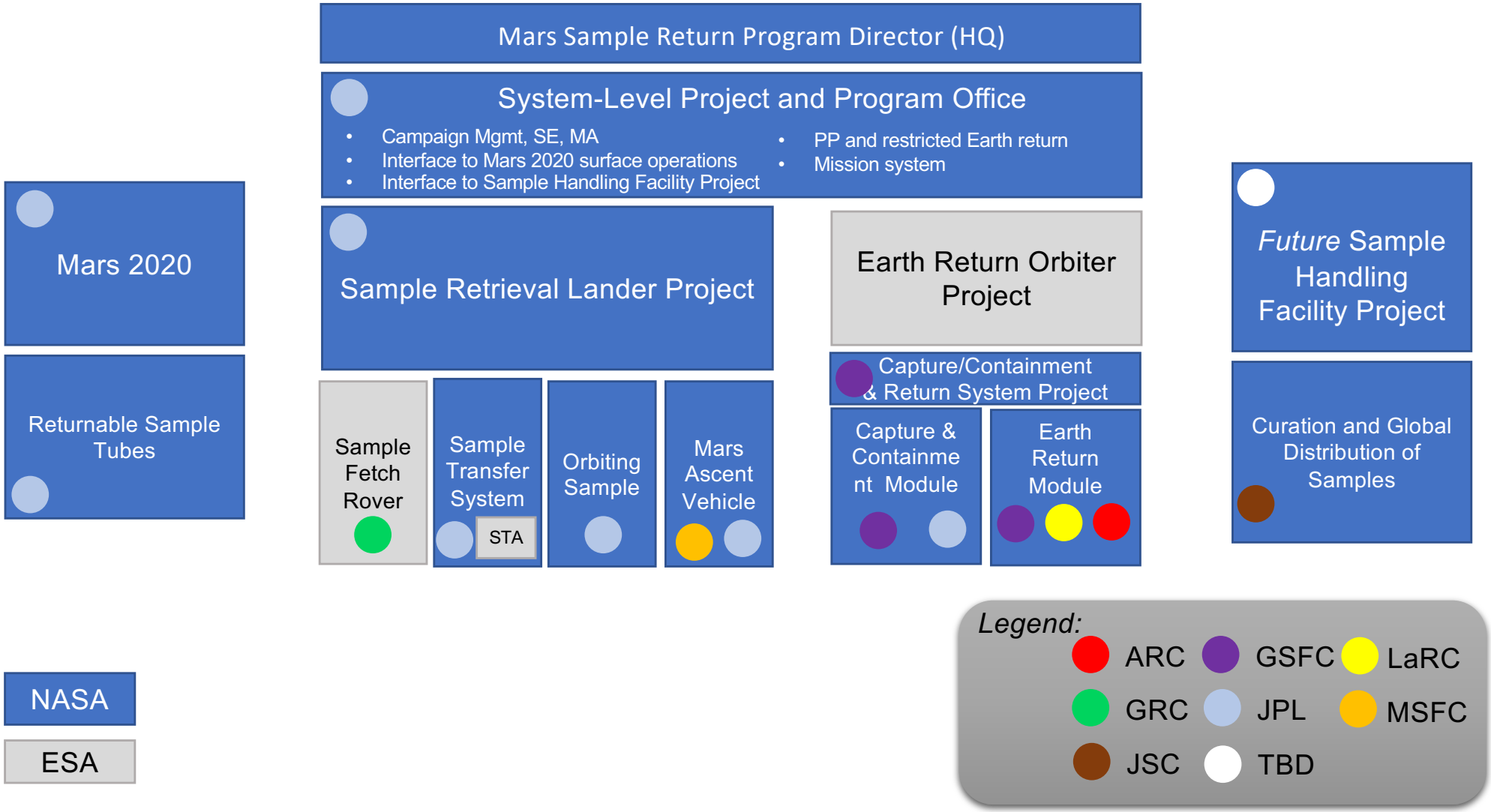
MSR Architectural Overview



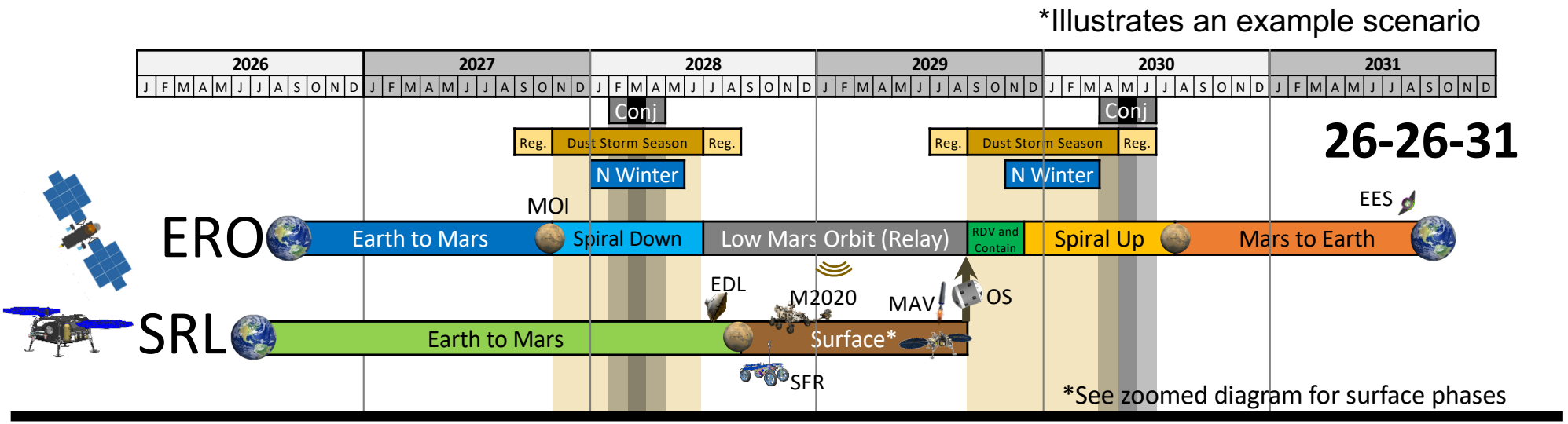
Progress to Date

- NASA conducted an Acquisition Strategy Meeting (ASM) in July 2019 and made Center roles/responsibilities assignments
- ESA obtained approval for MSR at Nov 2019 Ministerial Council
- Campaign Reference Architecture Stakeholders Peer Review (CRASPR) in January 2020 brought all implementing organizations together
- MSR was included in President's FY2021 budget request and has been called out in FY21 House CJS report language
- ESA selected Earth Return Orbiter (ERO) contractor in March 2020
- ESA selected Sample Fetch Rover (SFR) contractor in June 2020

MSR Architecture Elements



Campaign Timeline Overview



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SRL Launches in 2026

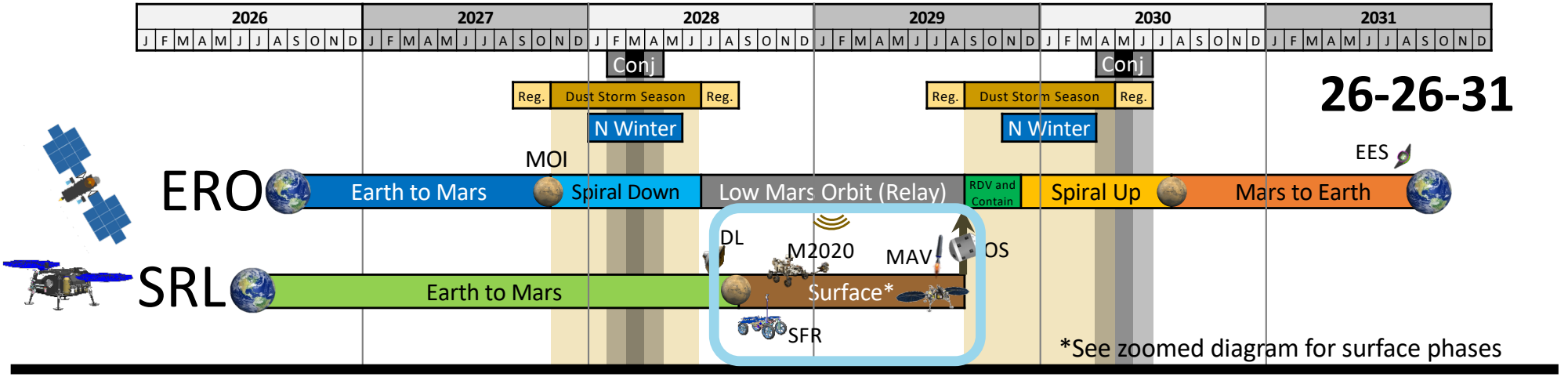
ERO launches in 2026

Samples are returned in 2031

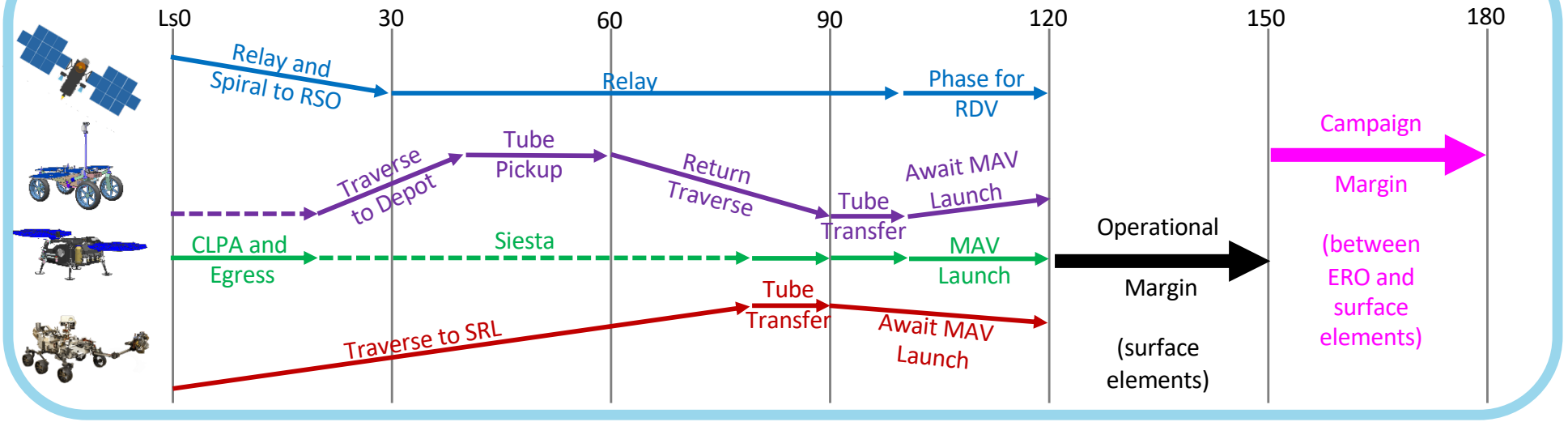
- Sample Retrieval Lander (SRL) avoids winter and global dust storm season, enabling all-solar SRL/SFR
- SRL EDL occurs in a favorable season, maximizing landed mass
- ERO can provide all relay services needed for MSR (SRL, SFR, M2020, Mars Ascent Vehicle (MAV))
- SRL and ERO fit on available launch vehicles and trajectories are feasible

Campaign Timeline Overview

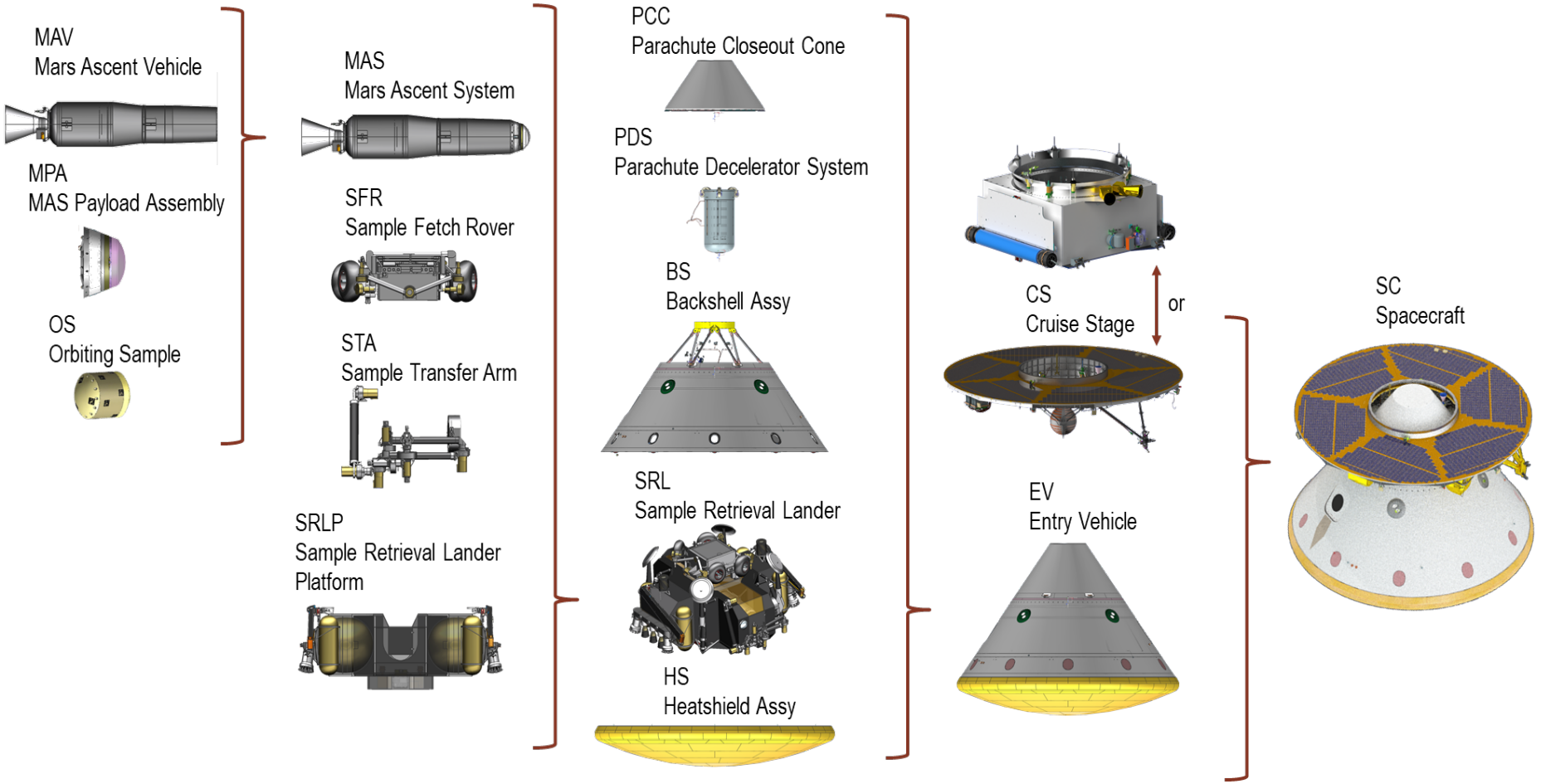
*Illustrates an example scenario



SRL Surface Activities (~13 months)



Sample Retrieval Lander Components

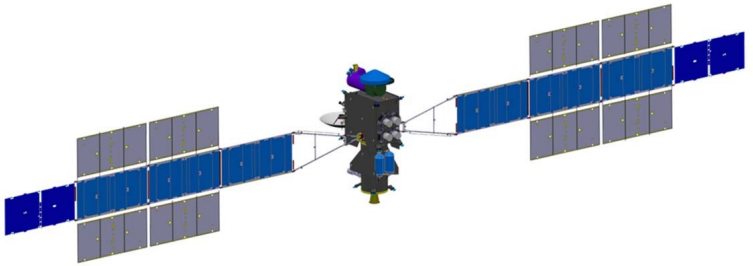


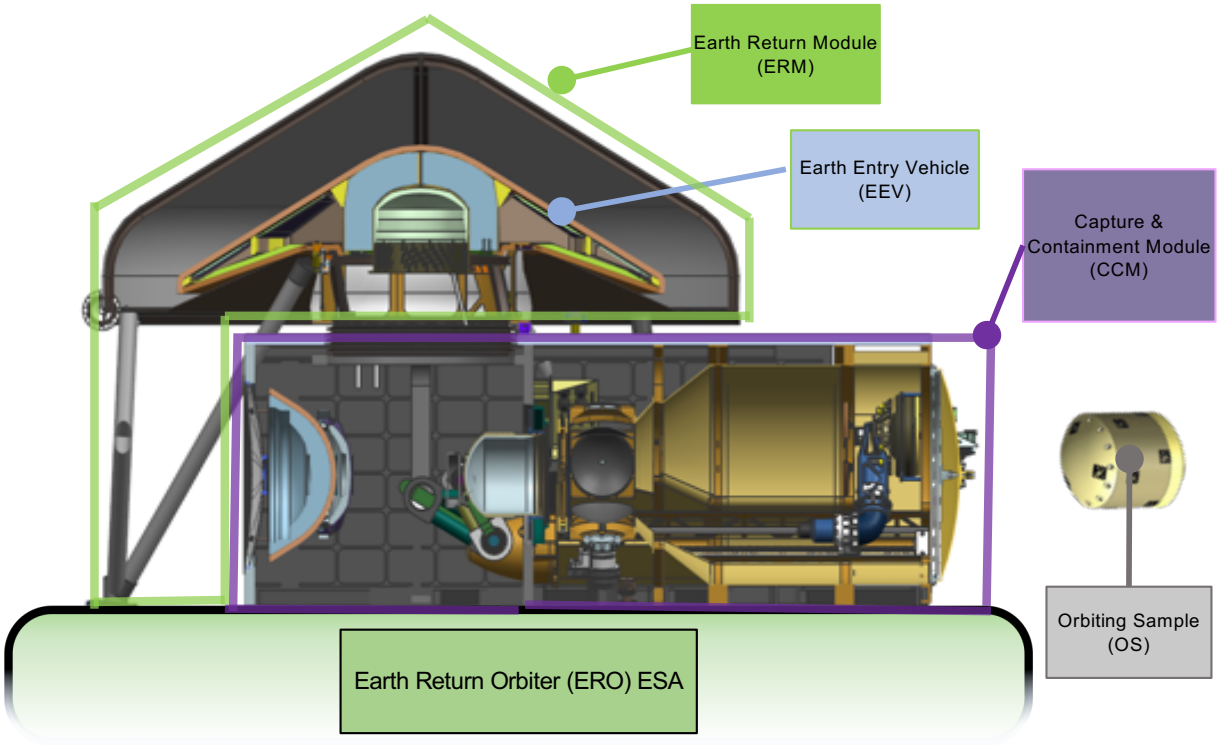
SRL Comparison to Mars 2020/Perseverance

- No science payloads
- Precision landing (from M2020) simplifies landing site requirements
- Stationary (SFR is contributed)
- Simpler operations activities (more similar to InSight)

Capture, Containment and Return System (CCRS) Overview

- CCRS is the payload on the ESA provided ERO
- Key functionalities:
  - Rendezvous and capture Orbiting Sample (OS)
  - In-flight robotic assembly of Earth Entry System (EES), including Break-the-Chain (BTC) and Containment Assurance activities
  - EES delivery to Utah Test and Training Range (UTTR) while meeting biosignature preservation potential (BPP) requirements (w/ ESA/ERO)
- CCRS elements and their functions:
  - Capture and Containment Module (CCM)
  - Earth Return Module (ERM)

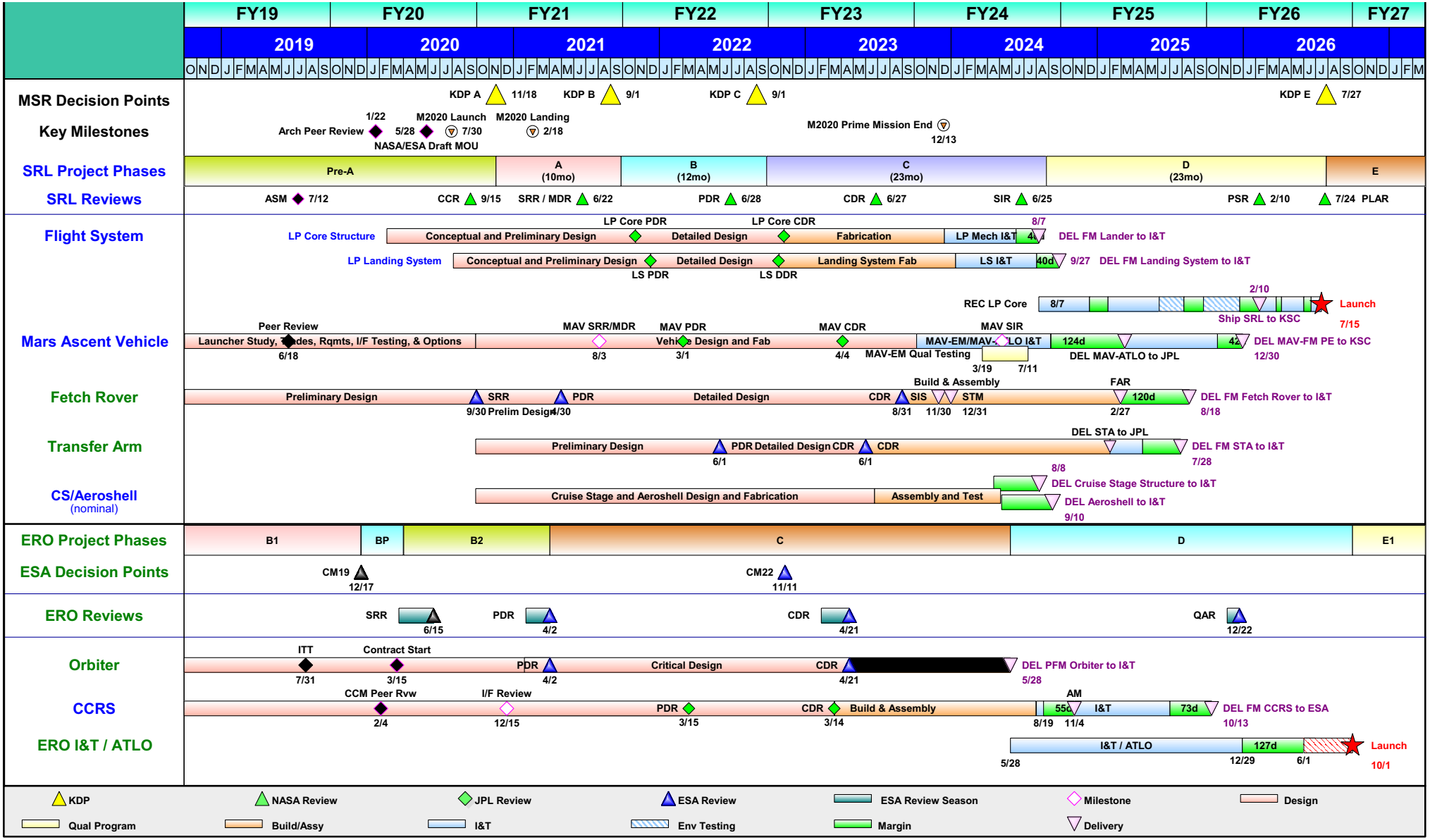




Mars Sample Return
Mission Summary Schedule

BLUE: Work Performed by NASA
GREEN: Work Performed by ESA

Status Date: 7/16/20



Near-Term Plan

- NASA-ESA MOU in final signature (signatures expected by end of Aug)
- SMD-chartered Independent Review Board to be conducted prior to KDP-A
  - Eight week activity planned to start 8/17/20
- Mission Concept Review (MCR)
  - Independent cost and schedule reviews commissioned in advance of KDP-A
  - Standing-up Standing Review Board (SRB)
  - Formulation Authorization Document (FAD) and Formulation Agreement (FA) in work
  - Conduct MCR in mid-October
- KDP-A expected mid-November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