

**Summary**  
**NOAA Commercial Weather Data Pilot Round 2 Industry Day**  
**19 June 2017**  
**Silver Spring, MD**

**Attachments:**

- Opening presentation, Dr. Karen St. Germain, Director, NOAA/NESDIS Office of System Architecture and Advanced Planning
- Summary of NOAA responses to public comments on Commercial Weather Data Pilot (CWDP) Round 2 draft RFP, Dr. Karen St. Germain
- Description of changes to RFP based on public comments received, Sarah Waugh, Contracting Officer, NOAA/AGO Satellite and Information Acquisition Division



# Overview of NOAA's Commercial Weather Data Pilot

*Dr. Karen St. Germain*

*Director*

*NOAA/NESDIS*

*Office of System Architecture and Advanced Planning (OSAAP)*

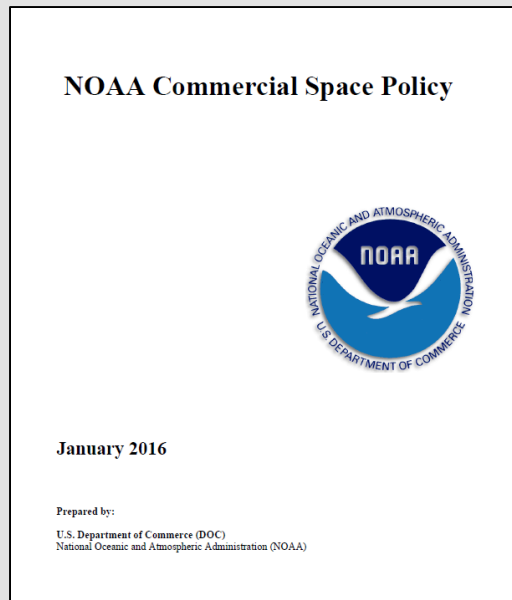
CWDP Round 2 Industry Day

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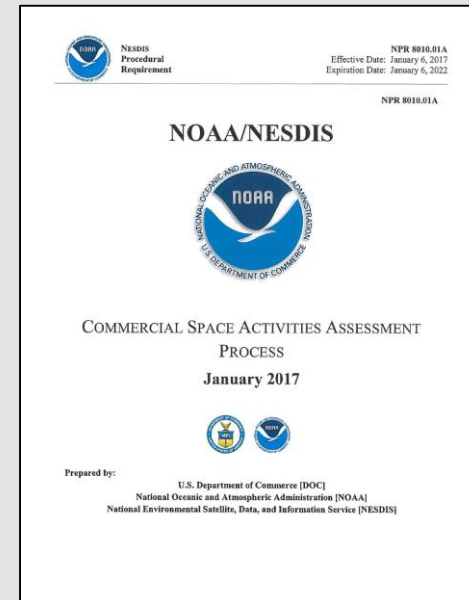
NOAA Satellite and Information Service



# NOAA Policy Framework



“NOAA will explore and, where appropriate, **pursue demonstration projects** to validate the viability of assimilating commercially provided environmental data and data products into NOAA meteorological models and add value to the forecast.”



“NESDIS will issue one or more solicitations...for NOAA to **acquire and evaluate on-orbit observations from commercial sources**, where industry has or will establish on-orbit capabilities that were identified by NOAA as promising option(s)...”

# CWDP Round 1 Evaluation

- CWDP initiated with \$3M in FY 2016
- NOAA identified radio occultation as initial data set for evaluation
- Roles:
  - NCAR/UCAR performing data processing and initial quality evaluation
  - Joint Center for Satellite Data Assimilation performing data validation and NWP model impact assessment
- Requirements set to enable maximum participation:
  - Requested 3-6 months of data in specified format
  - No minimum requirement for occultations per day, distribution of occultations around the globe, or secure real time data delivery
- Round 1 activities addressed processes for contract writing and initial evaluation
  - Round 1 does not address NESDIS processes for IT security, data rights and distribution, real time data ingest





# CWDP Round 1 Lessons Learned

While Round 1 is still underway, NOAA is already incorporating lessons learned into planning for Round 2 and beyond.

- Having data in advance is critical to prepare for data processing
- Vendors must be able to state risks to their proposal
- Need verification and validation of requirements being met
- More work is needed on communication between vendors and NOAA/NOAA's CWDP partners during data delivery and analysis
- NOAA must be able to state specific requirements
- Parts of the commercial sector would prefer that NOAA purchase processed data products rather than lower level data



# CWDP Round 2 Overview

## Overview:

CWDP Round 2 seeks to extend the purchase of weather data from commercial vendors, to perform a more comprehensive assessment of the value of commercial weather data, and develop NOAA systems readiness to prepare for any future purchases of operational weather data from commercial sources.

This progress toward an operational data purchase is seen in three aspects of Round 2:

- Comprehensiveness of data requested and performance of seasonal impact assessment
- Increased emphasis on vendor validation approaches, a key enabler for level 2+ data purchase
- Operational features of data requested such as security, timeliness, and availability



# Round 1/Round 2 Comparison

Requirement	Round #1	Round #2
Data latency	Minimum monthly deliveries required.	Minimum weekly deliveries required; options for vendors to demonstrate low-latency downlink and processing.
Data Rights and Sharing	Only within entities performing specific CWDP analysis.	Rights for non-operational analysis and retention, and sharing with U.S. agencies and international partners.
Radio Occultation data	No minimum amount required. Specific periods of consecutive data, open loop required.	$\geq 500$ RO per 24 hrs, up to 6 months total consecutive data. $\geq 1$ RO covering $\geq 90\%$ of all 500km <sup>2</sup> surface areas, repeated every 15 days.
Ionospheric data	Not requested.	POD data able to derive Total Electron Content (TEC); options for electron density, S4 and $\sigma\Phi$ derived product files.
Concurrent RO/POD/Attitude data	Attitude data required, and closed-loop POD corresponding to RO dataset.	POD and attitude data concurrent with RO data required; minimum 50% POD duty-cycle and 60 minute arcs required.
GNSS Tracking data	No requirement on tracking data quality. Dual-frequency required.	Requires 4 GNSS satellites in Field of View during POD, 95% of the time.
Derived bending angles and profiles	Not requested.	Requested as an option. Onboard clock steering information required, to ensure accurate angle/profile derivation.





Thank you





## Summary of NOAA responses to public comments on CWDP Round 2 draft RFP, released 26 May, 2017

The below summary includes responses to comments received during the public comment period and at Industry Day.

- NOAA appreciates the thoughtfulness and completeness of the comments received on the draft RFP. Thank you to those who took time to respond. We've also put effort into considering the comments received and being responsive.
- Below are the major themes NOAA noted in the comments received, and our responses.
  - Clarifications: Several comments require only clarifications; these are noted in the attached AGO presentation. We appreciate these comments so we can make this RFP as clear as possible.
  - Communication between vendors and NOAA/CWDP partners: Commenters noted that communication between vendors and those processing and assessing the data is important for successful evaluation of the data.
    - Response:
      - This is one of our Round 1 lessons learned. NOAA will hold a kickoff meeting following contract award so lines of communication are clear.
      - NOAA appreciates the need for vendors to talk to UCAR as the processor of CWDP data. NOAA will be present in all conversations and facilitate those conversations.
  - Amount of data needed for the Pilot: Several comments stated that NOAA does not need a full six months of data for the Pilot, and/or that NOAA gains value from systems that provide fewer than 500 occultations daily.
    - Response:
      - NOAA will be using Round 2 RO data to complete an evaluation of the data's impact on NOAA's numerical weather prediction models.
      - NOAA would not ingest any new products, no matter the source, into our forecast models without thoroughly understanding and validating the data going into those products. Spot checks of products are not sufficient to systematically understanding the errors and biases of the

data.

- In order to conduct a statistically significant evaluation that can support an operational purchase decision, NOAA requires 500 occultations per day over six months. The Joint Center for Satellite Data Assimilation (JCSDA) will conduct this impact assessment for NOAA.
- o Specify performance goals rather than implementation: Several comments noted that specifications seem to be prescriptive rather than performance-based, and encouraged NOAA to specify the performance goal it wishes to achieve rather than the means by which that goal is to be accomplished, as this may reduce the cost to the government and allow the broadest level of competition.
  - Response:
    - NOAA appreciates that we are in the early stages of the complex process of incorporating commercial space-based data streams into our forecast models.
    - For RO data, as our starting point we are using the established and validated data quality assessment and processing approach that NOAA has used to date for COSMIC.
    - This validated approach necessitates certain requirements in the RFP so that the data can be processed and evaluated. However, we have scrubbed the RFP to limit such requirements to the extent possible.
    - We understand going forward that development of new processing techniques, ways for the government to validate companies' processing chains, and ways to assess and continually monitor level 2 products may be needed to enable a broader range of options in the future. We are taking incremental steps toward such capabilities.
- o Data sharing input: NOAA appreciates the inputs on data sharing constructs and will consider them in future Pilot activities.
- o More flexibility in the data collection window: This comment came in several forms such as allowing 3 months for launch slips, in general extending the window, and having a continuously open window.

- Response: NOAA must offer an equal playing field for all participants, so we must have a clear delivery construct. We have included base and contingent options in the RFP. Base proposals should address existing capabilities, while contingent proposals should address capabilities that depend on future events such as launches.
- If a company cannot deliver data as proposed in a contingent proposal due to a launch delay, NOAA will not pursue contract termination.
- NOAA must be able to plan labor to evaluate data and satisfy CWDP reporting requirements, and doing so for data delivered on unspecified timelines would not be possible. This construct is not indicative of a future operational contract. In a potential future operational data purchase, an IDIQ contract may be an option. It is not feasible for the Pilot.

#### Open Q&A

Q: Is there an availability requirement less than 100% for delivering 500 occultations per day?

As the RFP is currently written, if a system has an issue and fails to deliver 500 occultations for one day, the vendor is non-compliant. I know of no system that can meet such a 100% requirement.

A: Agreed, as written, 500 occultations per day are required 100% of the time. We will take this comment under advisement. Note: NOAA will change this to a requirement that 500 occultations be delivered 95% of days each month.

\*NOTE\* NOAA reserves the right to continue to revise the required specifications prior to posting the final RFP. Interested vendors are encouraged to review the final RFP specifications carefully at that time, as there may be changes.



# Commercial Weather Data Pilot Draft Request for Proposals

*Sarah Waugh*  
*Contracting Officer*  
*NOAA/AGO*

*Satellite and Information Acquisition Division (SIAD)*

CWDP Round 2 Industry Day  
19 June 2017





# Request for Proposal Statement of Need

- Attachment 2 to the RFP includes the Statement of Need
- Section III prescribes the minimum data specifications:

NOAA requires at least two periods of at least three consecutive months of on-orbit RO and Precise Orbit Determination (POD), a within a nine-month data collection timeframe. Data delivered shall meet the following minimum requirements, for no less than 95% of deliveries over a 28-day period:
- Anticipated change from draft RFP:
  - Provides a 5% margin of error on data delivery for all specifications included in the contract



# Section III-Minimum Specifications

- a. Space-borne Radio Occultation Data
  1. All RO soundings shall provide dual frequency open-loop measurements at a 50Hz or 100 Hz data rate
  2. RO soundings shall be delivered in a compatible opnGns format (TBD)
  3. No RO data shall be collected without concurrent POD data
  4. RO soundings shall be acquired such that at least one RO sounding is collected over at least 90% of adjacent, non-overlapping 500km x 500km areas covering the Earth's surface, with this coverage repeated every 15 days.
  5. A minimum of 500 soundings per any 24-hour period.
- Changes:
  - Removed III(a)(1)(i) Signals tracked shall include GSP L1 C/A and/or P(Y) and/or P(Y), GLONASS L1C/A and/or P, GLONASS L2 C/A and/or P
  - Removed III(a)(5) At least one RO sounding shall be acquired every orbit per satellite for 95% of orbits





# Section III-Minimum Specifications

## b. Precise Orbit Determination tracking data

1. All POD data shall include pseudorange, carrier phase, signal-to-noise ratio (SNR), and S4 amplitude scintillation index (computed over 10 second interval).
  - i. The unit for SNR values shall be indicated in the RINEX header record.
  - ii. A conversion factor of the SNR from db-Hz to Volts/Volts or vice versa shall be provided, if applicable.
2. All POD data shall provide dual frequency measurements from a minimum of four GNSS satellites simultaneously.
3. All POD data shall be recorded at a 1Hz rate.
4. All POD data shall be suitable to derive total electron content.
5. Every other orbit revolution shall be continuously covered by POD data, no less than 50% duty cycle with minimum arc length of 50 minutes per cycle.
6. Navigation solutions calculated onboard the spacecraft shall be provided, including at a minimum: receiver clock offsets, and time-tagged Earth-Centered-Earth-Fixed position and velocity.
  - i. Navigation solutions shall be provided in SP3 format, as per the latest standard published by the NOAA National Geodetic Survey.
7. All POD data shall be in RINEX 2.20 or above format.

## • Changes:

- Removed “at any given time” from III(b)(2).
- Removed III(b)(2)(i) Signals tracked shall include GSP L1 C/A and/or P(Y) and/or P(Y), GLONASS L1C/A and/or P, GLONASS L2 C/A and/or P
- Edited (b)(5) from a minimum of 6 orbit revolutions continuously covered by POD data per satellite per day to no less than 50% duty cycle with minimum arc length of 50 minutes per cycle



# Section III-Minimum Specifications

## c. On Board Receiver Clock Specifications

1. A description of the onboard receiver clock steering methods shall be provided so NOAA and its CWDP partners can accommodate any needed processing adjustments on the ground.
2. The Allan deviation of the onboard oscillator for timescales ranging from 0.005 sec to 30 sec shall be provided.
3. If the POD and RO receiver clock is not the same, a description of how to align them for single difference RO data processing shall be provided.

## d. Satellite Attitude Quaternion Data Specifications

1. Attitude quaternion data shall be collected concurrently with all POD and RO data.
2. Attitude quaternion data shall be expressed in a format **conforming to the COSMIC, GRACE or CHAMP attitude telemetry formats expected by the Bernese software tool at the COSMIC Data Analysis and Archive Center (CDAAC). The provided attitude data shall allow satellite attitude to be calculated in the inertial J2000 reference frame with respect to the satellite body-fixed reference frame.**
3. Attitude quaternion data shall be provided every 30 seconds or less.

- Changes:

- Requirement in (III)(d)(2) changed to CHAMP format



# Section IV-Desired Specifications

- Specifications listed in Section IV exceed or supplement the minimum requirements
- Any proposed specifications in this section will be incorporated into the contract at award, and will be the standard for successful delivery
- The list is not all-inclusive and offerors are encouraged to provide additional specifications or features that would increase the data quality and value to the Government
- Examples:
  - a. Latency from data acquisition to receipt at ground station  $\leq$  90 minutes, for at least 80% of satellite orbits.
  - b. Level 1a data delivery to NOAA within 20 minutes of each Ground Station pass Loss of Signal (LOS), and the Level 2+ files of atmospheric profiles and ionospheric indices derived from that data (if offered) delivered to NOAA within a further 20 minutes.
  - c. Atmospheric profiles, in WMO FM-94 v.2.4.1 BUFR file format, derived from Level 1a RO instrument and associated metadata.
  - d. Derived ionospheric data, specifically total electron content, electron density profiles, sigma-phi and S4 indices, with the following file formats preferred:
    - i. podTec for total electron content
    - ii. ionPrf for ionospheric profiles of electron density
    - iii. scnLv1 for derived S4 scintillation index
  - e. POD data continuously covering six consecutive orbit revolutions per satellite per day.



# Section V-Data Delivery Requirements

- Coordination begins at least 30 days before on-orbit initial delivery
- Data shall be delivered at least weekly, but shorter timeframes are permitted
- Changes:
  - Modified (V)(e) Data files shall be delivered to NOAA grouped into one or more compressed TAR files; each individual TAR file shall ~~contain data from a specific satellite and~~ include concurrent POD, RO, ionospheric and all related satellite data, batched per ~~downlink~~ pass with file names correlating file types for each downlink.
  - Removed (V)(g)(2): Each data delivery submission shall adhere to the Consultative Committee on Space Data Systems (CCSDS) or equivalent standard



# Section X-Data Rights

- Revised language:

NOAA will retain all data purchased under this contract for non-operational use, including, but not limited to, analysis related to the CWDP or weather research and modeling. The Contractor shall grant NOAA a Limited License, allowing it to provide free access to data upon delivery to NOAA, not for further dissemination for commercial purposes, to U.S. Government agencies, National Meteorological and Hydrological Services, WMO-designated Regional Specialized Meteorological Centers, and members of the Coordination Group for Meteorological Satellites.

- Clarifications:

- Limited License granted to NOAA immediately upon delivery
- No sharing with commercial entities or for commercial purposes



# Section XI-Non-Conformance

- New Section added

This contract is subject to FAR 52.212-4, Contract Terms and Conditions, Commercial Items, including the Government's right to terminate for cause or convenience. Failure to meet the delivery requirements or applicable minimum specifications may result in a partial or complete termination of the contract. The following exception applies: for Contingent-independent offers, based on a future scheduled launch, delays or inability to deliver based on a launch delay will result in a no-fault partial or full cancellation of the contract.

- Purpose

- Restate the Government's rights for termination
- Emphasize the significance of proposing specifications that are attainable
- Forgives schedule slip for contingent offers
  - Cancellation
  - No extensions





# Attachment 3-Instructions and Evaluations

## FAR 52.212-1(B)(2)(c)

- Base Proposal
  - For on-orbit, current (at time of proposal) capabilities only
  - Narrative shall include detailed explanation of capabilities
- Contingent Proposal
  - Anticipated future capabilities
  - Narrative shall include detailed explanation of expected capabilities and all scheduled activities affecting successful data delivery and anticipated completion dates
  - Can be added to Base Proposal as Option, contingent upon successfully reach proposed requirements and the Government's right to exercise
- All proposal specifications will be incorporated into award



# Attachment 4-Instructions and Evaluations

- Separate pricing for Base Offer; Contingent Offer-Option; Contingent Offer-Independent

Quantity	Firm Fixed Price	Earliest Delivery Date
Base offer		
Contingent Offer-Option		
Contingent Offer-Independent		

- All offers must be firm-fixed price for two sets of three months of consecutive on-orbit RO data, based on individual proposals
- Government reserves the right to award combination of contracts or contract options based on availability of funds and program requirements
  - Include alternate pricing for non-consecutive or consecutive months



Questions?

