A National Space Weather Strategy

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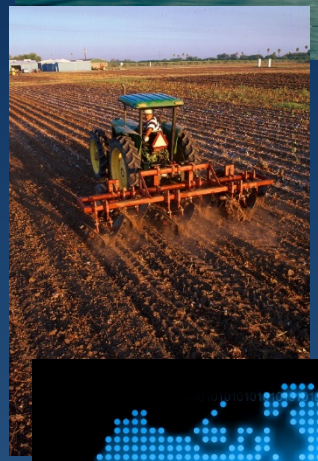
Tamara L. Dickinson, Ph.D.
Principal Assistant Director for Environment & Energy
White House Office of Science and Technology Policy

Louis W. Uccellini, Ph.D.
Assistant Administrator, National Oceanic and Atmospheric Administration
Director, National Weather Service

Severe Space Weather – Societal and Economic Impacts



Space Weather Awareness

Multiple efforts underway across government agencies, nationally and internationally

- Congress – Critical Infrastructure Protection Act, H.R. 3410, Dec 2014; NASA Authorization Act of 2010
- U.S. Regulatory Action – FERC reliability standards
- Space weather in Strategic National Risk Assessment
- FEMA Federal Interagency Response Plan – Will include a Long-Term Power Outage Annex
- International – UN WMO Inter-Programme Coordination Team on Space Weather; FAA and UN International Civil Aviation Organization; NATO space weather teams

The Executive Office of the President

- OSTP Space Weather Interagency Working Group
- 2013: Presidential Policy Directive 21 Critical Infrastructure Security and Resilience
- 2014: Space Weather Observing Systems: Current Capabilities and requirements for the Next Decade
- 2014: President and UK PM discuss space weather

POTUS 2014 visit to DHS Cyber Security Center

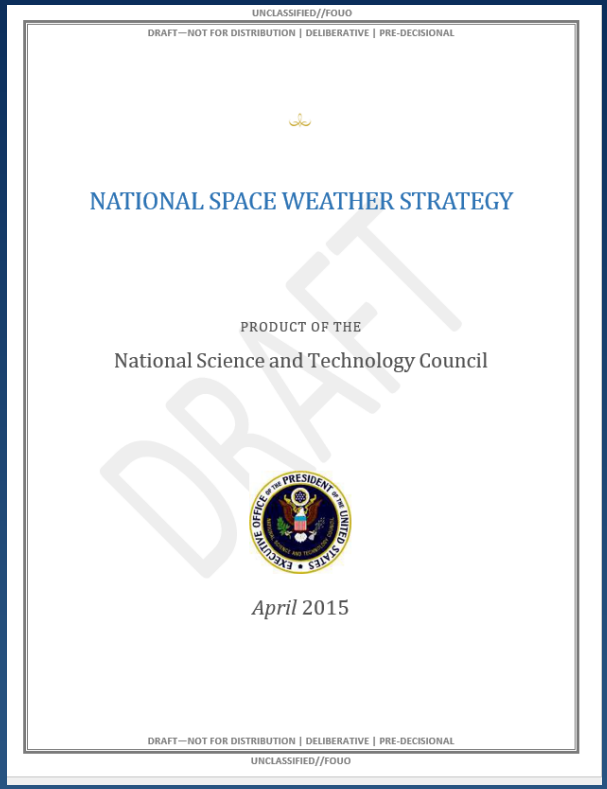
SWPC Webpage in background!

National Space Weather Strategy

Nov 2014 – Space Weather Operations, Research, and Mitigation (SWORM) Task Force is established

Tasked to develop:

- National Space Weather Strategy
- Space Weather Action Plan



Space Weather Operations, Research, and Mitigation (SWORM) Task Force

- Over 20 Departments and Agencies
- Three Co-chairs:
  - Tammy Dickinson, Principal Assistant Director for Environment and Energy , OSTP
  - Louis Uccellini, Assistant Administrator, National Weather Service, NOAA
  - Caitlin Durkovich, Assistant Secretary for Infrastructure Protection, DHS
- ~50 Principals and Subject Matter Experts
- Six Goal Teams

SWORM Task Force Leadership

Co-Chairs:

Tammy Dickinson, Office of Science and Technology Policy
Louis Uccellini, National Weather Service
Caitlin Durkovich, Department of Homeland Security (DHS)

Goal Team Leads

Seth Jonas, Science and Technology Policy Institute
Andrew Sabata, Federal Emergency Management Agency
Sarah Ellis Peed/Jacob Anderson, DHS
Tom Berger, Space Weather Prediction Center
Genene Fisher, National Weather Service
Chris Cannizzaro, Department of State

Bill Murtagh, Office of Science and Technology Policy

National Space Weather Strategy – Structure

Strategy articulates six high-level goals.

1. Establish Benchmarks for Space Weather Events
2. Enhance Response and Recovery Capabilities
3. Improve Protection and Mitigation Efforts
4. Improve Assessment, Modeling, and Prediction of Impacts on Critical Infrastructure
5. Improve Space Weather Services through Advancing Understanding and Forecasting (*R2O/O2R, Observations*)
6. Increase International Cooperation

1. Establish Benchmarks for Space Weather Events:

Multiple benchmarks will be created to address:

- The different types of space weather events; for example, radio blackouts induced by solar flares and geomagnetic disturbances induced by CMEs
- Multiple physical parameters that will ensure the functionality of the benchmarks; for example, magnitude and duration
- A range of event magnitudes and associated recurrence intervals; for example, multiple event scenarios may inform different vulnerability thresholds, and an understanding of the “worst case” scenario may be instructive

2. Enhance Response and Recovery Capabilities:

- Complete an all-hazards power outage response and recovery plan
- Support Federal, State, Local, Tribal and Territorial (SLTT) government, and private sector planning for and managing of an extreme space weather event
- Provide guidance on contingency planning for extreme space weather impacts on the continuation of critical government and industry services
- Ensure communications systems capability and interoperability during extreme space weather events

2. Enhance Response and Recovery Capabilities… cont

- Encourage the owners and operators of critical assets to coordinate the development of realistic power restoration priorities and expectations
- Develop and conduct exercises to improve and test Federal, State, regional, local, and industry-related space weather response and recovery plans
- Increase the Nation's restoration capability through continued investments, unique solutions, and strong public-private partnerships

3. Improve Protection and Mitigation Efforts:

- Assess the relevant legal mechanisms, authorities, and incentives that can be used to protect critical systems
- Encourage the development of hazard-mitigation plans that reduce vulnerabilities to, manage risks from, and assist with response to impacts associated with space weather
- In concert with industry partners, achieve long-term vulnerability reduction to space weather events by implementing appropriate measures at critical locations most susceptible to space weather
- Strengthen public/private partnerships that support private action to reduce public vulnerability to space weather

4. Improve Assessment, Modeling, and Prediction of Critical Infrastructure Impacts:

- Develop a national capability for real-time assessment of space weather impacts on critical systems
- Develop or refine operational space weather impact/ systems models
- Improve operational impact forecasting and communications protocols
- Support basic and applied research into space weather impact on industries, operational environments, and infrastructure sectors

5. Improve Space Weather Services through Advancing Understanding and Forecasting:

- Improve understanding of user needs for space weather forecasting and use these data to establish lead-time and accuracy goals
- Ensure products are intelligible and actionable to inform critical decision-making
- Define a baseline operational space weather observation capability
- Improve forecasting accuracy and lead-time

5. Improve Space Weather Services through Advancing Understanding and Forecasting…cont

- Enhance fundamental understanding of space weather and its drivers to develop and continually improve predictive models
- Improve effectiveness and timeliness of research to operations transition process
- Assess and develop observational strategies for the study and prediction of space weather events

6. Enable Increased International Cooperation:

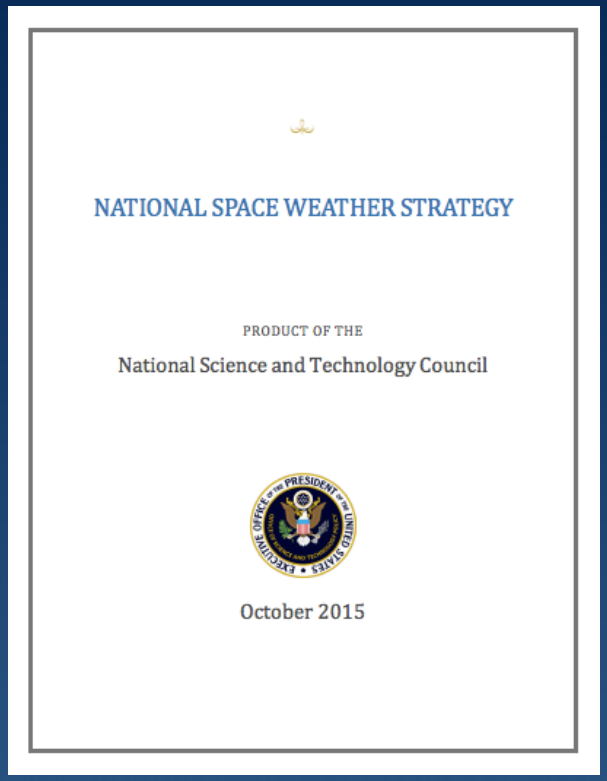
- Build international support at the policy level for space weather as a global challenge
- Promote a collaborative international approach to protect against, mitigate, respond to, and recover from extreme space weather events
- Increase engagement with the international community on scientific research, observation infrastructure, and modeling

6. Enable Increased International Cooperation:

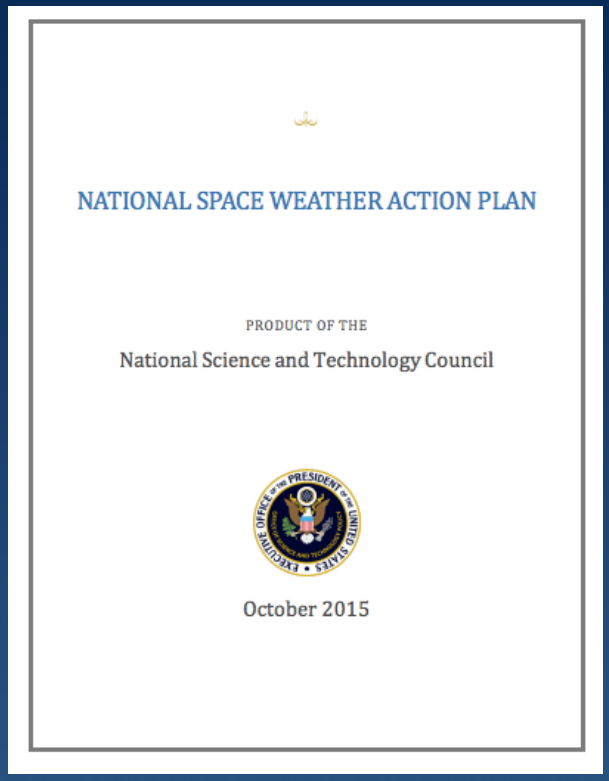
- Improve international data sharing
- Strengthen international coordination and cooperation on space weather products and services
- Develop coherent international communication strategies

Documents now available

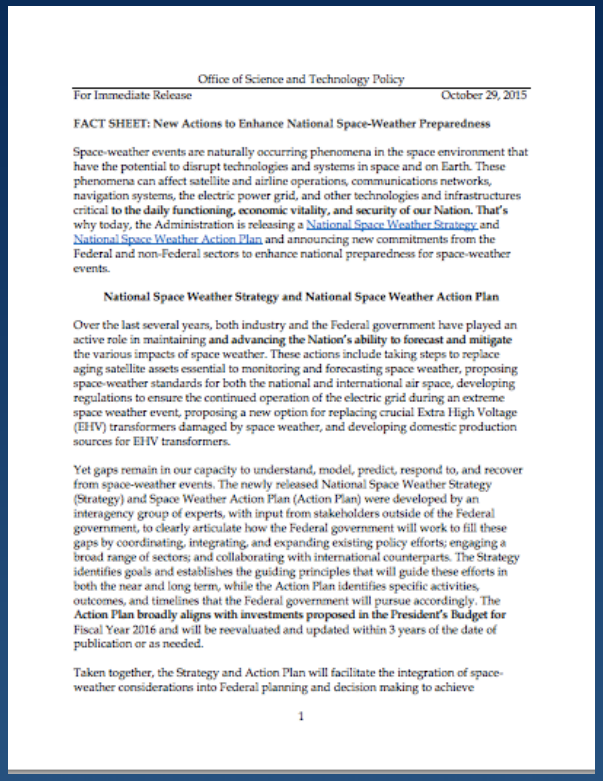
https://www.whitehouse.gov/blog/2015/10/28/enhancing-national-preparedness-space-weather-events



Strategy



Action Plan



Office of Science and Technology Policy

For Immediate Release — October 29, 2015

FACT SHEET: New Actions to Enhance National Space-Weather Preparedness

Space-weather events are naturally occurring phenomena in the space environment that have the potential to disrupt technologies and systems in space and on Earth. These phenomena can affect satellite and airline operations, communications networks, navigation systems, the electric power grid, and other technologies and infrastructures critical **to the daily functioning, economic vitality, and security of our Nation. That's** why today, the Administration is releasing a National Space Weather Strategy and National Space Weather Action Plan and announcing new commitments from the Federal and non-Federal sectors to enhance national preparedness for space-weather events.

National Space Weather Strategy and National Space Weather Action Plan

Over the last several years, both industry and the Federal government have played an active role in maintaining **and advancing the Nation's ability to forecast and mitigate** the various impacts of space weather. These actions include taking steps to replace aging satellite assets essential to monitoring and forecasting space weather, proposing space-weather standards for both the national and international air space, developing regulations to ensure the continued operation of the electric grid during an extreme space weather event, proposing a new option for replacing crucial Extra High Voltage (EHV) transformers damaged by space weather, and developing domestic production sources for EHV transformers.

Yet gaps remain in our capacity to understand, model, predict, respond to, and recover from space-weather events. The newly released National Space Weather Strategy (Strategy) and Space Weather Action Plan (Action Plan) were developed by an interagency group of experts, with input from stakeholders outside of the Federal government, to clearly articulate how the Federal government will work to fill these gaps by coordinating, integrating, and expanding existing policy efforts; engaging a broad range of sectors; and collaborating with international counterparts. The Strategy identifies goals and establishes the guiding principles that will guide these efforts in both the near and long term, while the Action Plan identifies specific activities, outcomes, and timelines that the Federal government will pursue accordingly. The **Action Plan broadly aligns with investments proposed in the President's Budget for** Fiscal Year 2016 and will be reevaluated and updated within 3 years of the date of publication or as needed.

Taken together, the Strategy and Action Plan will facilitate the integration of space-weather considerations into Federal planning and decision making to achieve

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Fact Sheet

Actions Relevant to GNSS community

Goal 4: Improve Assessment, Modeling, and Predictions of Impacts on Critical Infrastructure

- 4.2 Develop real-time infrastructure assessment and reporting capability
  - 4.2.6 DOC, in coordination with NSF and DOI, and commercial communication and PNT system stakeholders, will define requirements for real-time monitoring systems to assess atmospheric conditions that could affect these systems during ionospheric disturbances and geomagnetic storms. *Within 1 year of publication of Action Plan*
  - 4.2.7 DOC, DOD, and DHS, in coordination with government and commercial communications and PNT systems users, will define the scope and observational requirements for a system that provides near real-time situational awareness of the space environment for communications and PNT systems. *Within 1 year of publication of Action Plan*

Assessment

Reporting

Actions Relevant to GNSS community

Goal 4: Improve Assessment, Modeling, and Predictions of Impacts on Critical Infrastructure

- 4.2 Develop real-time infrastructure assessment and reporting capability
  - 4.2.8 DOC and DOD will create and support a satellite anomaly database in a secure format at DOC. *Within 1 year of publication of Action Plan*

Reporting

Some highlights for NOAA

- 4.2.5 Transition aviation radiation model to operations
- 4.3.3 Validate and/or Develop infrastructure impact models
  - Related: 4.4.2 Develop operational impacts forecasting capability
- 5.3.2 Develop "Space Weather Follow-On" mission to replace SOHO coronagraph at L1 (and other solar wind instruments).
- 5.3.7 Enable and sustain the acquisition and delivery of satellite-based GNSS radio occultation data for space weather models.
- 5.3.8 Develop options to sustain or enhance the worldwide ground-based neutron monitoring network.

THANK YOU!

Space Weather Operations, Research, and Mitigation Task Force

Co-chairs: Caitlin Durkovich, Assistant Secretary for Infrastructure Protection, DHS
Louis Uccellini, Assistant Administrator, National Weather Service, NOAA
Tammy Dickinson, Principal Assistant Director for Environment and Energy , OSTP

Additional Slides

National Science and Technology Council

- Environment, Natural Resources, and Sustainability (CENRS)
  - SDR: Disaster Reduction (Subcommittee)

- Homeland and National Security (CHNS)
- Science (CoS)
- Science, Technology, Engineering, and Math Education (CoSTEM)
- Technology (CoT)