Section 4 Targets and Performance Summary

DOC Objective 15: Improve weather, water, and climate reporting and forecasting

Measure 15i - Geomagnetic Storm Forecast Accuracy (%)

Measure Description	This performance measures tracks the ability of forecasters at NOAA's Space Weather Prediction (SWPC) to accurately predict geomagnetic storms which potentially disrupt power systems, spacecraft operations, and navigation systems. The NOAA geomagnetic storm scale (G-scale) ranges from the G1 or minor level where weak power grid fluctuations can occur to the G5 or extreme level. During a G5 event, where aurora may be visible over most of the United States, the power grid can experience equipment damage causing system collapse or blackout; significant satellite damage can occur; and global positioning systems may be inaccurate or temporarily unavailable. Geomagnetic Storm Forecast Accuracy is the percentage of times that the 24 hour geomagnetic storm forecast is correct for the 60 most recent geomagnetic storms. The 24 hour geomagnetic storm forecast is considered accurate if a G1 or greater storm event was predicted. This calculation also includes geomagnetic storms which were not forecast. This measure is verified based on ground-based magnetometer observations. Due to the nature of the approximately 11-year solar cycle and variability of geomagnetic storm occurrence, this metric is assessed over the 60 most recent geomagnetic storms to maintain statistical significance.

Target and Performance Table

	FY2010 Actual	FY2011 Actual	FY2012 Actual	FY2013 Target	FY 2014 Target	FY 2015 Target
Accuracy (%)	33	42	47	49	51	53
Comments on Changes to Targets	In order to be responsive to stakeholder needs, NOAA transitioned to forecasting the G scale in FY 2012. Previously, NOAA had forecast the A scale, which is not as useful to stakeholders such as electric power grid managers. In FY 2011 forecasters' use of Wang Sheeley Arge Enlil (WSA-Enlil) solar wind experimental model guidance resulted in significant performance improvement over FY 2010 results. WSA-Enlil became fully operational on NWS' Weather and Climate Operational Supercomputing System in FY 2012. Improvements in WSA-Enlil model physics and improved applications in geomagnetic storm forecasting are anticipated to result in an upward performance trend in FY 2014 and beyond. Coronagraph data currently provided by NASA's Solar and Heliospheric Observatory (SOHO) enables maintenance of current operational geomagnetic storm forecast accuracy and achievement of out-year improvement targets. The SOHO coronagraph began providing data in 1996 and has exceeded design lifetime. An operational follow-on will be critical to maintaining and improving performance.					

	Supplementary observations from the L5 Lagrangian point, a side-on view of the Sun-Earth region, can also provide for more accurate input to the WSA-Enlil model and has the potential to improve forecast. ** Note: Actuals from 2010 to 2012 establish a baseline for past performance. Consideration of past performance trends and anticipated science and technology enhancements are used to determine future targets.
Impact of Recovery Act Funds	N/A

Relevant Program Changes	Program Changes	Title of Program Change				Exhibit 13 Page Number
N/A	N/A					
Validation & Verification Information	**Data Source**	**Reporting Frequency**	**Data Storage**	**Internal Control Procedures**	**Data Limitations**	**Actions to be Taken**
	Observational Data from the SOHO coronagraph used in the forecast process is available from NASA. Verifying data is available from USGS and worldwide magnetic observatory partners. NOAA's NWS SWPC delivers forecast information.	Running average values for this annual measure are reported on a monthly basis.	NWS SWPC stores all data and forecast information. NESDIS National Geophysical Data Center archives all relevant geomagnetic storm data.	In order to minimize the influence of solar variability this metric is averaged over the 60 most recent storms. Additionally, SWPC focuses on minimizing the False Alarm Ratio (FAR) which is tracked internally on a monthly basis. FAR is % of times a forecast is issued and no occurrence was verified.	Number of geomagnetic storms varies from year to year during the approximate 11-year solar cycle. During solar maximum, significant geomagnetic storming will occur with greater frequency. During solar minimum, long time periods will occur with little to no geomagnetic storming. For this reason, yearly changes in this measure may not be as significant as longer term trend measurements that span the natural solar	Methods to improve performance for FY 2013-17: WSA-Enlil Solar Wind Model enhancements; forecaster training on improved Model interpretation and application; WSA-Enlil Solar Wind Model continuing validation and improvement; implementation of ensemble modeling techniques; interpretation and application of NASA Solar Terrestrial Relations Observatory (STEREO) observations. Note STEREO has a finite mission lifetime due to nature of its orbit.

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