



Meeting Minutes
AMS Commission on Weather, Water, and Climate Enterprise
Steering Committee
11 January 2020
Boston, MA

Members Present	Guests & CWWCE SC Candidates
Pam Emch, Commissioner	Yvette Richardson, Commissioner, Planning
Bill Mahoney, Past Commissioner	Rick Rosen, AMS
Doug Hilderbrand, Future Commissioner	Bill Hooke, AMS
Heidi Centola, Chair, BEED	Mary Glackin, AMS President-Elect
Jonathan Porter, Chair, BEC	Elizabeth Sanabia, US Naval Academy
Tanja Fransen, Chair, BEST	Sue Haupt, Next Future Commissioner
Stephanie Herring, Chair, BGS	Bruce Telfeyan, Past Commissioner, STAC
Paul Higgins, AMS Policy	Jennifer Sprague-Hilderbrand, Incoming Chair, BEED
Louis Uccellini, Dir, NOAA/NWS	Jerry Brotzge, Future Chair, BEC
Tim Hall, ACM	Rob Cifelli, Incoming Chair, WRC
Jennifer Mahoney, NOAA/ESRL	Jordan Gerth, Chair, CRFA
Michael Farrar, AF Wx Ops & Next AMS President-Elect	David Lubar, CRFA Member
Kevin Petty, The Wx Co, IBM (call-in)	Renee Leduc, CRFA Member
Rich Spaulding, Earth Networks	Branko Kosovic, Chair, CWFWTR
Ron Sznajder, DTN	Shawn Miller, BEED Member
Deanna Hence, U. of Illinois	
Julie Campbell, Campbell Marketing Group	Don Berchhoff, Chair, COEIS
Mohammed Ombadi, UC Irvine (Student)	Alexandra Keclik, NOAA/NWS
Maureen McCann, Commissioner, Professional Affairs	Claudia Gorski, AMS
Gene Fisher, Commissioner, STAC	Anne McDonough, AMS
Keith Seitter, Exec Dir, AMS	
Jenni Evans, AMS President	

The AMS Commission on Weather, Water, and Climate Enterprise’s Steering Committee met on 11 January 2020 from 3:00 to 6:00 PM in conjunction with AMS Annual Meeting in Boston, MA.

Agenda

The meeting followed the agenda below.

3:00 PM	Welcome and Self Introductions (Commissioner, Pam Emch)
3:10	AMS President Remarks (Jenni Evans)
3:20	CWWCE Organizational Update (Commissioner, Pam Emch)
3:30	Board on Enterprise Communication (Chair, Jonathan Porter)
3:45	Board on Enterprise Economic Development (Chair, Heidi Centola)
4:00	Board on Enterprise Strategic Topics (Chair, Tanja Fransen)
4:15	Quick updates on: <ul style="list-style-type: none"> • New Ad Hoc Committee on Wildland Fire Weather, Technology and Risk (Past Commissioner, Bill Mahoney / CFWWTR Chair, Branko Kosovic) • Mind the Gap Workshop and Follow-on (BEED Chair, Heidi Centola / “Next” Future Commissioner, Sue Haupt)
4:30	Special Topics: <ul style="list-style-type: none"> • Board on Global Strategies: Status, Discussion of Re-vectoring Purpose/Goals (BGS Chair, Stephanie Herring) • Radio Frequency Allocations (CRFA Chair, Jordan Gerth)
5:30	NWS Director Remarks (Louis Uccellini)
5:45	Open Discussion <ul style="list-style-type: none"> • Round Robin Feedback From Steering Committee
6:00 PM	Adjourn

Meeting Notes

1. Commissioner’s Opening Remarks

- Pam Emch opened the meeting and the committee and guests did self-introductions. Pam showed a brief set of charts that illustrated the reorganization of the CWWCE during 2019. In mid-2019 the Council approved moving the ICWWCS responsibilities from the BGS to the higher-level AMS IAC, and moving the CSC from the BEST to the BGS. The Commissioners await the approval of the Council on the proposals of moving the EC and REC from the BGS to the BEED, and moving the CRFA and the COEIS from the BEED to the BEC. These elements of reorganization are expected to make the CWWCE more efficient, yet maintain a balance across boards. Two new ad hoc committees have been created – Fire Weather, Technology, and Risk and another focused on Oceans, Atmosphere and the Blue Economy. The Ad Hoc Committee on Naming Winter Storms has completed its report and has been sunset. Renee Leduc, formerly chair of the ICWWCS, said that moving the ICWWCS into the IAC has already been of benefit with respect to organizing activities for this year’s annual meeting.
- Pam also described CWWCE accomplishments for 2019 that included our major events: the 10ENERGY and 7CWWCE at the 2019 Annual meeting in Phoenix, the 2019 AWF, and the 2019 SCM in Albany, NY. The CWWCE also co-organized the Mind the Gap Workshop and updated the AMS Statement on the Energy Sector, Earth Observations, Sciences, and Services.

- Pam provided a list of all the CWWCE board and committee meetings taking place at this year's Annual Meeting, as well as Town Halls (Presidential and otherwise) and Presidential Forums that we have been involved in organizing.
- Proposed new Steering Committee Member Beth Sanabia was introduced at the start of the meeting. Approval of her appointment, and of extending the term of SC Member Julie Campbell are awaiting votes by the AMS Council.

2. AMS President's Remarks

- Jenni Evans (AMS President) talked about the theme of the 2020 meeting: The AMS Past, Present and Future: Linking Information to Knowledge to Society (LINKS). This year is the 100 Year Anniversary of the AMS and so this Centennial Meeting is a very special one. Jenni and the Organizing Committee have some interesting activities planned. Mary Glackin, AMS President-Elect, noted that the theme for next year's annual meeting (2021) focuses on strengthening engagement.

3. Board on Enterprise Communication (BEC) (Chair, Jonathan Porter)

- Jon provided an overview of the BEC's 2019 and planned 2020 activities. The discussion highlighted the 2019 Summer Community Meeting (SCM) that took place at SUNY Albany in NY, and Jon provided initial information on the summer 2020 meeting in Norman. The Norman meeting, planned for July 28-29, is expected to be followed once again by the NWS Partners Meeting. This pairing of the SCM with the Partners Meeting has proved to be very productive.
- There was discussion about the high value of participating in the SCM and if there would be some possible way to fund people to attend it.

4. Board on Enterprise Economic Development (BEED) (Chair, Heidi Centola)

- Heidi provided an update on 2019 and planned 2020 BEED activities. The discussion highlighted the 27-29 March 2019 AMS Washington Forum. The BEED's AWF Planning Committee is organizing the upcoming 2020 AWF, scheduled for April 21-23. It was mentioned that a session with agency leads is not included at this point. Several SC members pointed out that this differs from prior AWF's and this session is usually one of the biggest draws for the private sector. Kevin Petty pointed out that potential attendees from the private sector need to know early what the topics will be at CWWCE/AMS meetings, including this one – they need to decide whether to fund attendance this meeting vs. other options.
- Heidi and Sue Ellen Haupt provided a brief update on the "Mind the Gap" Workshop that took place during summer of 2019. This was co-organized with the AMS Commission on Education and Human Resources. BEED member Steve Bennett was a driving force for the event as well. This successful event grew out of discussions that took place during the 2019 AMS Annual Meeting in which students declared that they had limited awareness of opportunities within energy-related fields among others. The Mind the Gap Workshop was subsequently organized to address this gap between academic studies and the atmospheric and

- related sciences and various potential occupations. Funding from NSF was secured and the event was held at NCAR.
- Heidi presented the BEED Chair Gavel to Jennifer Sprague-Hilderbrand, incoming Chair.
5. Board on Enterprise Strategic Topics (Chair, Tanja Fransen)
- Tanja reviewed the general program for the Eighth Symposium on the Weather, Water, and Climate Enterprise, which is held during the Annual Meeting and organized by the BEST. The Symposium has grown over the years. This year 16 sessions, two Presidential Town Halls, and two Presidential Forums have been planned.
 - Jerry Brotzge, current chair of the NNoN Committee, will be moving from the BEST to take on the role of incoming (2021) BEC Chair. Therefore, Tanja, and Becky DePodwin, BEST Vice Chair, are looking for a new NNoN Chair to take his place. SC Member Rich Spaulding said he may have some recommendations.
6. New Ad Hoc Committee on Wildland Fire Weather, Technology and Risk (CWFWTR)
- Past Commissioner, Bill Mahoney and CWFWTR Chair, Branko Kosovic provided a brief update on this new ad hoc committee. The idea of initiating a committee focused on this topic has been percolating for a couple of years. Last fall Bill and Branko developed the draft Terms of Reference and a slate of ~ six initial members. One telecom ahs already been held and the committee will meet during this coming week for the first time. They will review the draft ToR and think about additional members that might be approached.
 - Mary Glackin said that the National Academies Board on Atmospheric Sciences and Climate is organizing a workshop on Fire Weather this coming spring/summer. Synergy across these two activities would be useful.
7. Special Topic: Radio Frequency Allocations (CRFA Chair, Jordan Gerth)
- Committee on Radio Frequency Allocations (CRFA) Chair Jordan Gerth led a discussion of the status and activities related to spectrum auctions/allocations. See Appendix 1 for details on this topic – the information in this appendix was provided to the SC ahead of time to facilitate discussion. CRFA members Dave Lubar and Renee Leduc have been equally as engaged as Jordan in this and provided additional information.
 - Jon Porter, Don Berchoff and other attendees pointed out that we need to somehow change the game with respect to 5G/RFA. We can perhaps try to facilitate discussions between the 5G/telecom community and our community. There is possibly some approach that works for both but we cannot arrive at it without joint discussion. Pam mentioned that the NAS BASC had planned a workshop for last summer, 2019, to be led by Bill Gail. It was expected to approach the topic in just

this way. The workshop was canceled due to too many critical attendees declining to attend.

- During the coming week there will be a Side Panel and two technical presentations focused on this topic. Dave Lubar said that The Aerospace Corporation will be releasing a related paper on Monday in conjunction with the Side Panel.

8. Remarks by Louis Uccellini, NWS Director

- Louis focused his comments on the WMO and how elements/activities of the US weather enterprise are in many ways a role model for the WMO. He said that the WMO members resonate with the Fair Weather Report and work that we in the US Weather Enterprise wrt public-private partnerships. The CWWCE was initiated by the AMS in 2005 as a result of recommendations contained in the NAS Fair Weather Report that were developed to help improve the communication between all three sectors (public, private, academic), but in particular, the public and private sectors. Louis emphasized the importance of the CWWCE in moving the US weather enterprise forward.
- Louis also said that the international community is embracing IDSS (Impact-Based Decision Support Services). He referred to a BAMS article on which John Ten Hoeve is a co-author that includes discussion of decision support.

9. Special Topic: Board on Global Strategies: Status, Discussion of Re-vectoring Purpose/Goals (BGS Chair, Stephanie Herring)

- Board on Global Strategies (BGS) Chair Stephanie Herring led this discussion topic to get SC feedback on potential changes/additions to the goals and purpose of the Board on Global Strategies. See Appendix 1 for details – the information in this appendix was provided to the SC ahead of time to facilitate discussion.
- Pam said that the BGS has failed to succeed in gaining major traction related to globally focused activities; this has been the case for ~ the last 5 years, since the formation of the BGS.
- Current BGS members are not strongly focused on global activities and would like to vector more towards decision support, but this could include global aspects. This is evidenced by the committees that the CWWCE is keeping within this board, all of which deal with topics that are global in nature: climate, water resources, environmental security.
- Renee Leduc, former BGS Member, former Chair of the ICWWCS, and now member of the AMS IAC noted that the IAC will be discussing its roles at this Annual meeting. One difficulty with the ICWWCS was in recruiting members.
- Mary Glackin expressed that the BGS' global charge seems to have been "looking for a problem that isn't there".
- Louis Uccellini said that the AMS is seen internationally as a gold standard and the CWWCE, as one of the strongest facilitators of cross-sector partnerships, as much to offer. We need to think both strategically as well as tactically. The AMS STAC has international interfaces, e.g. holding some meeting outside of the U.S. on a regular basis. The CWWCE/BGS can think about this as well.

- Bill Mahoney feels that that we need to have some sort of CWWCE effort in international. He advocates this at the board level – so, the BGS.
- Pam questioned at which level we might have the internationally-focused entity. Why not an entity outside the boards in the CWWCE that could report directly to the CWWCE Commissioner? Such an entity could work international activities and information- sharing across all CWWCE boards.
- Dave Lubar and Ron Sznajder said we should look at the enterprise and see which areas have international aspects. For example, Ron said that data sharing is a topic that comes up frequently with his international colleagues.
- This topic, and the feedback received from the Steering Committee members will be discussed at the BGS meeting this coming Wednesday.

10. Open Discussion

- We had reached the end of the meeting time and had already engaged in extensive discussion and so the meeting drew to an end.
- In closing Pam thanked the members of the Steering Committee, presenters, and guest attendees. Then, since she is ending her term, she cheerfully handed the CWWCE Commissioner Gavel to Incoming Commissioner Doug Hilderbrand.

2019 and (Expected) 2020 CWWCE Steering Committee Members are shown in Appendix 2.

Next SC Meeting – To be confirmed, but likely Monday, 20 April 2020 at the AAAS Building. The SC meeting (and dinner) will be held approximately 6 to 8 PM, the evening before the AMS Washington Forum.

ADDITIONAL POST STEERING COMMITTEE MEETING INFORMATION

1. The AMS Council approved ... This is where to add a note if the SC member requests are voted on and approved by Council prior to distributing these minutes.

APPENDIX 1

**AMS Commission on the Weather, Water, and Climate Enterprise (CWWCE)
Steering Committee Meeting**

**Saturday, 11 January 2020
Boston, MA**

Special Discussion Topics

We plan to discuss two special topics at the January CWWCE Steering Committee (SC) Meeting. Below is a description of each with some background.

1. Special Discussion Topic: CWWCE Board on Global Strategies (BGS)

This is introduced as a discussion topic to get SC feedback on potential changes/additions to the goals and purpose of the Board on Global Strategies.

Background

The CWWCE (at that time the CWCE) was formed in 2005. A reorganization of the CWWCE was initiated in 2012 by Commissioner Matt Parker, and approved by the AMS Council in January 2014. Part of the 2012 reorganization included adding a new, fourth, board to the CWWCE: the Board on Global Strategies (BGS). Creating this new board served several purposes. The Board on Enterprise Economic Development (BEED) had grown too large, with the expansion of the Energy Committee into Renewable Energy and the addition of the Water Resources Committee. Also, within the prior two years, several ad hoc committees had been established, including one focused on Environmental Security. After discussion, it was decided to create a fourth board that would nominally focus on “global” activities, and to pull into it some of the CWWCE committees that did/could have global applicability. In brief, “The Board on Global Strategies (BGS) is aligned with energy, renewable energy, environmental security, water resources, and international concerns as outlined by the US State Department as being critical to humanity in all parts of the globe”.

Five years after the reorganization is a good time to reassess the CWWCE structure, including specific boards and committees, and make adjustments if needed. Therefore, during 2018-2019 the CWWCE has discussed and is implementing some restructuring and/or re-vectoring in elements of the organization. Several of these changes were approved by the AMS Council in September 2019. A second set of change approval requests is included in the December 2019 CWWCE Report to the Council. Approval is expected at the January 2020 Council Meeting at the Annual Meeting. Once all of these changes are implemented, the BGS will contain the following three committees: Committee on Environmental Security, Water Resources Committee, and Climate Services Committee.

The members of the BGS, in conjunction with the CWWCE Executive Committee (commissioners, board chairs, AMS policy staff), have discussed the goals and purpose of the BGS. The current Terms of Reference (TOR) are provided below. A revision of the TOR of the BGS is under discussion; changing the name of the board is a possibility as well. The BGS members desire to contribute and make an impact within AMS and the enterprise, and believe that a re-vectoring will be helpful.

Discussion points have included:

- There appears to be a need within AMS and the CWWCE for an entity focused at least partly on decision support.
- Although a focus on global strategies/topics appears to be important within AMS and the CWWCE, the BGS has not thus far been able to gain sufficient traction to attract members pro-actively interested in global topics. It could be that a board is too low a level within AMS to be effective in this area. The International Committee on Weather, Water and Climate Strategies (ICWWCS), formerly within the BGS, was recently combined into the high-level AMS International Affairs Committee (IAC), to help strengthen AMS's international activities at that higher level.
- BGS members would like to vector more towards decision support, but this could include global aspects, as evidenced by the committees that the CWWCE is keeping within this board, all of which deal with topics that are global in nature: climate, water resources, environmental security.
- With three standing committees, there is room to consider and possibly add a new standing committee, or ad hoc committee, that will allow the BGS to explore some new areas.
- There has been discussion in AMS about a new committee called "Partnerships" that may include reaching out to other professional societies. A charter for this committee is expected to be drafted in 2020. It is possible that the BGS can play a role in implementing/facilitating some of the goals of this committee.

With respect to decision support, the BGS has discussed a possible two-pronged approach to what the board might do:

1. Serve AMS Scientists with building awareness on how they can improve how they serve and communicate to policy/decision makers.
 - a. Look across the different communities within AMS and see how they approach decision support and how they approach the stakeholder communities they are serving. Look across how all the communities are doing it and how they can learn from each other.
2. Bring in policy/decision makers to understand how the relationship has had value. How do you leverage this information for decision making? What are the tools you find valuable?

Ask:

The CWWCE Commissioner and the BGS Chair would like CWWCE SC input on the following:

- Thoughts on the course of action the BGS members would prefer: a focus on decision support, which is applicable both nationally and globally.
- As far as we know, although there is the high-level International Affairs Committee, there is no board or committee within the commissions that has a specific focus on global topics. However, the BGS, in the past five years, has not gained traction and has drawn few new members interested in its “global” aspects. We appreciate discussion on the topic of minimizing the global focus of this board.

Current BGS Terms of Reference

Overview: Across the globe, the availability and quality of water, food, and energy, all of which relate to environmental security, are affected by weather and climate. Today, one in three people across the globe lack adequate water to meet daily needs. Two billion of the world's seven billion people lack food security at least intermittently. At the same time, 1.3 billion people are without electricity and 2.6 billion people in developing countries must rely on traditional biomass for cooking and heating. Global energy demand is projected to double from 13 terawatts (TW) in 2001 to 27 TW in 2050 and to triple to 43 TW by 2100. Lack of water, food, and energy security are problems particularly pressing in the developing world. However, adequate quantities and quality of water, food, and energy can be problematic in developed countries, as well. Human activities, as well as extreme weather and climate events, can stress the environment and exacerbate societal conflicts. Improved observations, models, and predictions of weather and climate can lead to better planning and management of resources that supply and protect water, food, energy, and environmental security. As human populations grow and develop economically, increasing understanding of and access to the most advanced meteorological and climatological information will facilitate water, food, energy, and environmental security and sustainability.

Purpose: The purpose of the American Meteorological Society (AMS) Board on Global Strategies (BGS) is to promote development of and access to the most advanced meteorological and climatological observations, models, and predictions by all people across the globe, with particular emphasis on improving water, food, energy, and environmental security.

Goals:

- To promote collaboration in the development of and access to high-quality, sustainable, long-term meteorological and climatological observations, models, and predictions around the globe.
- To increase access to such meteorological and climatological information (above), especially in developing countries, to improve continuity of business, better health, and safer environmental conditions, in spite of severe weather events and a changing climate.

2. Special Discussion Topic: Updates on radio frequency allocations of interest to the meteorological community and a look forward

Summary of topic

The AMS Committee on Radio Frequency Allocations (RFA) is handling two urgent matters of importance to the weather, water, and climate enterprise, with a risk of substantial impacts to the collection and delivery of weather satellite observations.

The primary issues are related to:

- sudden Federal Communications Commission (FCC) action on 24 GHz, which was auctioned in March 2019, over the objection of NOAA and NASA, and
- a May Notice of Proposed Rulemaking (NPRM) for the 1675 to 1680 MHz band, currently adjacent to important GOES-R series downlink communications, but which is recommended for sharing with terrestrial communication networks.

The primary role of the AMS RFA Committee has been (1) drafting statements to file in relevant FCC dockets, (2) fielding calls from the media and providing technical and policy expertise, and (3) organizing and participating in panel discussions and events that increase education on these matters and explain their importance.

The AMS will be hosting a spectrum panel discussion on Monday at lunch (of the annual meeting) with a range of perspectives on the topic from science to policy.

Ask

We encourage members of the AMS CWWCE Steering Committee to assist with public outreach and contact with legislators. The support does not need to be technical or specific to a particular band (e.g., 24 GHz) but must express confidence in the constitution of the global satellite constellation and its benefit for weather forecasting and the weather industry. This support could be in the form of individual advocacy, on behalf of a company or organization, or through a group willing to meet with a Congressional delegation on the topic.

In addition, we ask that the AMS consider efforts that articulate the value of government weather model forecasts, weather data generally, and the weather industry for the American and/or global economy. This must be in concrete terms because the 5G community is largely focused on the economic benefits of faster networks. Without providing comparable economic benefit evidence for observations and the enterprise, we lose the opportunity to provide a direct comparison.

24 GHz

The FCC conducted an auction of 24 GHz in March 2019 despite pressure from some members of Congress to delay. This 5G band is immediately adjacent to the 23.8 GHz

passive microwave sensing band that is sensitive to tropospheric water vapor and surface emissivity. The 23.8 GHz band is part of the Advanced Technology Microwave Sounder (ATMS) and exists on other legacy and current, national and international weather satellite microwave instruments. This band will also be part of future satellites in the Joint Polar Satellite System (JPSS). Based on peer-reviewed literature, the loss of this band is likely to lead to an irrecoverable degradation in numerical weather prediction forecast skill, and make the skill less reliable over time due to increased sensitivity to other observational platforms.

This matter has gained a significant amount of media attention following letters sent to the FCC from both House and Senate members, with coverage from local radio stations to national television and newspapers in mid to late May. The topic has also been discussed in testimony of the NOAA and NASA administrators during House and Senate hearings. Some members of the AMS RFA Committee have been instrumental in providing expertise to the House and Senate staffers. AMS RFA Committee members have continued to respond to national and international media inquiries from summer through fall, as Congress continues to press this issue.

The most recent news from the International Telecommunication Union (ITU) World Radiocommunication Conference (WRC) is of enhanced constraints on 5G base station emissions operating in the 26 GHz band. These constraints are an improvement toward protecting vital observations of global weather conditions that are the basis for numerical weather predictions. However, the constraints are not as low as would have been preferable to maintain the precision of the 24 GHz microwave data at around 0.1 K.

The WRC compromise of international positions will limit unwanted 5G station emissions to -33 dBW/200 MHz in the 26 GHz band until 2027, then -39 dBW/200 MHz in subsequent years as new hardware is deployed.

It is not certain whether the United States will adopt the WRC technical conditions for this band to protect weather satellite observations of water vapor and land emissivity around 24 GHz. The United States has levied an unwanted emissions threshold of -20 dBW/200 MHz in the May 2019 auction of the adjacent 5G domestic band.

5G interference with passive microwave remote sensing under these new constraints will ultimately depend on the spatial density and extent of network base stations as they are deployed. While stronger constraints than the compromise are preferable to the meteorological enterprise, the WRC result validates the concern that scientists have articulated and demonstrated in recent months.

As the demand for 5G continues to grow, other passive microwave bands must also be protected to maintain reliable weather observations and storm predictions for communities worldwide. The AMS RFA Committee continues to advocate for an informed decision-making process on this matter. There is concern about planned

FCC auctions adjacent to another passive microwave sensing band around 36 GHz, and potential immediate action around oxygen absorption bands used for constructing vertical temperature soundings between 50 and 60 GHz.

1675 to 1680 MHz

In May 2019, the FCC decided to proceed with a Notice of Proposed Rulemaking (NPRM) in the 1675 to 1680 MHz band. The AMS submitted a joint statement with the American Geophysical Union and National Weather Association. The statement asked the FCC to consider delaying any progress on rulemaking until NOAA completed their two-year spectrum study, no earlier than March 2020.

Rulemaking would require spectrum sharing with non-federal transmitters other than approved radiosondes, which are currently the only other signal permitted. No known non-federal radiosonde sites are registered, and federal radiosondes are in the process of exiting the band. The central concern is that this is spectrum adjacent to the GOES-R Rebroadcast (GRB) and overlaps with the Data Collection Platform Report (DCPR) relay. Interference from cell phone towers operating in the 1675 to 1680 MHz range would disrupt the much weaker satellite signal, leading to data loss from in- and out-of-band emissions. The DCPR signal is the primary method of reporting for river, stream and coastal gauges, wildfire weather sensors, and gauges in support of inland river and port navigation.

The AMS RFA Committee has continued a multi-year advocacy effort against sharing this important spectrum, in large part because the GOES-R series weather satellites whose downlink signals are impacted will be in orbit for well over an additional decade yet. Renee Leduc has led the effort to join filings with other agencies and companies in the relevant FCC dockets. She has also arranged informational briefings with partners, such as meteorologists from Airlines for America. Prior to the NPRM, she organized a series of ex parte meetings with staff of all five FCC commissioners that was effective in leading to a NPRM that included better citations to prior AMS and weather enterprise filings on this matter. Overall, though, the progress with the NPRM process has not been desirable and support from FCC commissioners in reconciling sound opposition from NOAA and the weather enterprise is not yet known.

Ligado Networks is the likely party that would benefit from an expanded use allocation for the 1675 to 1680 MHz band. However, the Ligado application to FCC for their 5G network also includes spectrum closer to the allocations for Global Positioning System (GPS) operations. There has been significant objection from the government GPS users about Ligado operating a network that may interfere with high-precision GPS receivers. The executive branch interagency committee has not recommended the approval of the Ligado application. In their review transmitted in early December, they conveyed the significant value of GPS for private sector use as well as its role in developing 4G LTE wireless technology. In particular, the

Department of Defense has objected to the application due to the potential for significant negative impact on military operations.

There may be more developments on 1675 to 1680 MHz between now and the AMS meeting. There could finally be an outcome on this issue in 2020 depending on whether the FCC makes a final determination on all or part of the interagency argument and/or Ligado become financially constrained without FCC approval.

[[Jordan Gerth and Dave Lubar, 12 December 2019]

APPENDIX 2

2019 AMS CWWCE Steering Committee Membership (As of 12 December 2019)			
Name	Term	Position	Organization/Sector
COMMISSION EXECUTIVE COMMITTEE (CEC) - MEMBERS BY POSITION - VOTING			
Pam Erch	2018-2020	Commissioner (ex-officio)	Northrop Grumman
Bill Mahoney	2018-2020	Past Commissioner (ex-officio)	NCAR
Doug Hilderbrand	2018-2020	Future Commissioner (ex-officio)	NOAA/NWS
Heidi Centola	2017-2020	Chair, BEED (ex-officio)	IBM
Jonathan Porter	2018-2021	Chair, BEC (ex-officio)	AccuWeather
Tanja Fransen	2019-2022	Chair, BEST (ex-officio)	NOAA/NWS
Stephanie Herring	2019-2022	Chair, BGS (ex-officio)	NOAA/NCEI
COMMISSION EXECUTIVE COMMITTEE (CEC) - MEMBERS BY AMS POSITION - NON-VOTING			
Paul Higgins	Open term	Director, AMS Policy Program (ex-officio)	AMS
SENIOR MEMBERS (6) FROM PROVIDER COMMUNITY - VOTING			
Louis Uccellini	N/A	Director, NWS (ex-officio)	NOAA/NWS
Tim Hall	N/A	President (ex-officio)	ACM
Jennifer Mahoney	2020-2023	Acting Director & Deputy Director	Global Systems Division, NOAA/ESRL
Michael Farrar	2017-2020	Chief Scientist	Air Force Weather Operations
Kevin Petty	2018-2021	Director, Science and Forecast Operations and Head, Public-Private Partnerships	The Weather Company, IBM
Rich Spaulding	2017-2021	President and CEO	Earth Networks, Inc.
SENIOR MEMBERS (5) FROM USER COMMUNITY - VOTING			
Steve Root	N/A	President (ex-officio)	AWCIA
Tom Murphree	2016-2020	Professor	Naval Postgraduate School
Ron Sznajder	2019-2022	Vice Chairman	DTN
Julie Pullen	2018-2021	Director of Product	Jupiter Intelligence
Kevin Kloesel	2018-2021	Director, Oklahoma Climatological Survey	University of Oklahoma
MEMBERS (3) AT LARGE TO ENSURE DIVERSITY - VOTING			
Janice Bunting	N/A	Executive Director (ex-officio)	NWA
Deanna Hence	2017-2021	Professor	University of Illinois
Julie Campbell	2017-2020	President	Campbell Marketing Group
STUDENT MEMBERS (2) - VOTING			
Mohammed Ombadi	2019-2022	Graduate Student	University of California, Irvine
		TBD Student	
MEMBERS (5) BY AMS POSITION - NON-VOTING			
Maureen McCann	2016-2022	AMS Professional Affairs Commissioner (ex-officio)	News 13, Orlando
Genevieve Fisher	2019-2021	AMS STAC Commissioner (ex-officio)	NOAA/NCEP
Kevin Goebbert	2020-2023	AMS Education and Human Resources Commissioner (ex-officio)	Valparaiso University
Keith Seitter	Open term	AMS Executive Director (ex-officio)	AMS
Jenni Evans	2019-2020	AMS President (ex-officio)	Penn State University

2020 AMS CWWCE Steering Committee Membership (Expected; Post 12 January 2020)			
Name	Term	Position	Organization/Sector
COMMISSION EXECUTIVE COMMITTEE (CEC) - MEMBERS BY POSITION - VOTING			
Doug Hilderbrand	2020-2022	Commissioner (ex-officio)	NOAA/NWS
Pam Emch	2020-2022	Past Commissioner (ex-officio)	Northrop Grumman
Sue Haupt	2020-2022	Future Commissioner (ex-officio)	NCAR
Jennifer Sprague-Hilderbrand	2020-2023	Chair, BEED (ex-officio)	NOAA/NWS
Jonathan Porter	2018-2021	Chair, BEC (ex-officio)	AccuWeather
Tanja Fransen	2019-2022	Chair, BEST (ex-officio)	NOAA/NWS
Stephanie Herring	2019-2022	Chair, BGS (ex-officio)	NOAA/NCEI
COMMISSION EXECUTIVE COMMITTEE (CEC) - MEMBERS BY AMS POSITION - NON-VOTING			
Paul Higgins	Open term	Director, AMS Policy Program (ex-officio)	AMS
SENIOR MEMBERS (6) FROM PROVIDER COMMUNITY - VOTING			
Louis Uccellini	N/A	Director, NWS (ex-officio)	NOAA/NWS
Tim Hall	N/A	President (ex-officio)	ACM
Jennifer Mahoney	2020-2023	Acting Director & Deputy Director	Global Systems Division, NOAA/ESRL
<i>Michael Farrar</i>	<i>2017-2020</i>	<i>Chief Scientist</i>	<i>Air Force Weather Operations</i>
Kevin Petty	2018-2021	Director, Science and Forecast Operations and Head, Public-Private Partnerships	The Weather Company, IBM
Rich Spaulding	2017-2021	President and CEO	Earth Networks, Inc.
SENIOR MEMBERS (5) FROM USER COMMUNITY - VOTING			
Steve Root	N/A	President (ex-officio)	AWCIA
<i>Elizabeth Sanabia</i>	<i>2020-2023</i>	<i>Captain; Associate Professor</i>	<i>U.S. Naval Academy</i>
Ron Sznajder	2019-2022	Vice Chairman	DTN
Julie Pullen	2018-2021	Director of Product	Jupiter Intelligence
Kevin Kloesel	2018-2021	Director, Oklahoma Climatological Survey	University of Oklahoma
MEMBERS (3) AT LARGE TO ENSURE DIVERSITY - VOTING			
Janice Bunting	N/A	Executive Director (ex-officio)	NWA
Deanna Hence	2017-2021	Professor	University of Illinois
Julie Campbell	2017-2020	President	Campbell Marketing Group
STUDENT MEMBERS (2) - VOTING			
Mohammed Ombadi	2019-2022	Graduate Student	University of California, Irvine
		TBD Student	
MEMBERS (5) BY AMS POSITION - NON-VOTING			
Maureen McCann	2016-2022	AMS Professional Affairs Commissioner (ex-officio)	News 13, Orlando
Genevieve Fisher	2019-2021	AMS STAC Commissioner (ex-officio)	NOAA/NCEP
Kevin Goebbert	2020-2023	AMS Education and Human Resources Commissioner (ex-officio)	Valparaiso University
Keith Seitter	Open term	AMS Executive Director (ex-officio)	AMS
Mary Glackin	2020-2021	AMS President (ex-officio)	Glackin & Associates