Department for Energy Security & Net Zero

Space Environment Impacts Expert Group (SEIEG) – Minutes and Actions

Wednesday 09 August 2023, 11:00-16:30

No.	Item
1.	**Welcome, Apologies, Review Agenda**

Key Points

1. Attendees:

Prof Richard Horne (RH)	Chair, British Antarctic Survey	Mr David Gibbs (DG)	Civil Aviation Authority
Dr Mike Hapgood (MH)	Rutherford Appleton Lab.	Prof David Jackson (DJ)	Met Office
Dr Mario Bisi (MB)	Rutherford Appleton Lab.	Ft Lt Bryn Jones (BJ)	UK Space Operations Centre
Dr Jonathan Eastwood (JE)	Imperial College London	Dr Rick Tanner (RT)	UK Health Security Agency
Mr Mark Gibbs (MG)	Met Office	Peter Goodwin (PG)	GO-Science
Simon Machin (SM)	Met Office	Yusuf Adam (YA)	DESNZ
Prof Jim Wild (JW)	Lancaster University	Paul Corre (PC)	DESNZ
Dr Ciaran Beggan (CB)	British Geological Survey	Abi Clarke (AC)	DESNZ
Dr Ellen Clarke (EC)	British Geological Survey	Julia Robbie (JR)	DESNZ
Prof Clive Dyer (CD)	University of Surrey	Leo Lagan (LL)	DfT
Dr Sean Elvidge (SE)	University of Birmingham	Stephen James (SJ)	DESNZ
Prof Richard Harrison (RH2)	Rutherford Appleton Lab.	Jenny O'Kane (JO)	Defence, Science and Tech. Lab.
Prof Keith Ryden (KR)	University of Surrey	Dr Matthew Angling (MA)	In-Space Missions Ltd

2. This is the second meeting of 2023 and the first meeting hosted by the Department of Energy Security and Net Zero. The Chair all participants and invited all members to briefly introduce themselves.
3. The Chair emphasised that the SEIEG Committee is independent of Government and members offer independent advice.
4. The Chair announced that the Department for Energy Security and Net Zero had offered to take the minutes of the meeting and would circulate them for comment.

2.	**Items arising from the last meeting**

Key Points

5. The Chair confirmed most actions are now closed. The following actions were discussed:
    - The Andy Richards (National Grid) report was found and has now been circulated to SEIEG members.
    - Space Based Solar Power – The Chair has followed up with the team responsible and will discuss further, later in the meeting.
    - The Review of SEIEG Membership is still underway but highest on the agenda following the meeting

3.	**Update on DESNZ/Gov risk assessments – DESNZ/MO**

Key Points

6. The Department for Energy Security and Net Zero (DESNZ) presented an update as the Lead Government Department for the Severe Space Weather risk. They are responsible for both understanding and mitigating the impacts of a severe space weather event on the Energy Sector, and for coordinating preparedness activities across Government to ensure the UK is resilient and able to respond to a severe incident.
7. DESNZ emphasised the commitments of the Severe Space Weather Preparedness Strategy and updated the group on the work that they have been doing as part of them.
8. They are aiming to use traction from the outputs of the recent Mighty Oak exercise to build on Space Weather.
9. The group discussed the role of ESA and suggested a better relationship with ESA, since they will be working with them should a Severe Space Weather event occurs when ESA is operational.
10. The group suggested that DESNZ rename the Ground based digital components impact assessment to Ground based digital systems which would be more effective in analysing the impacts and identifying ownership.
11. The updated National Risk Register was published on 03/08.

New Actions

- **DESNZ to consider renaming "Ground based digital components" as per SEIEG's recommendation.**

4.	**Recent SSW events and impacts**

Key Points

12. An overview of recent SSW events was delivered to SIEIG members. The events were contextualised by analysing the frequency and comparing them to the previous solar cycle.
13. Discussion on need for a platform whereby people can access a database of Severe Space Weather events.
14. Discussion on ability for the aviation industry to capture reports of Space Weather activity. Confirmed that this can be reported through the Mandatory Occurrence Report (MOR). Anyone in the aviation industry can submit and MOR.
15. Broad agreement that there seems to be an overall lack of awareness when it comes to Space Weather. It isn't one of the first thoughts when there's an issue for comms for example. It could be worth considering editing MOR forms to add a box which accounts for Space Weather. The group also suggested raising awareness with applicable industry stakeholders.
16. An upcoming workshop with CAA/DfT was flagged as a good opportunity to further explore that.

New Actions

- **SEIEG to consider need for a new data-sharing platform to record dates of SSW events.**

- **SEIEG/Met Office to discuss MOR forms offline with DfT/CAA.**
- **Met Office to suggest ways of increasing awareness with applicable industry stakeholders during upcoming workshops with CAA/DfT and feed back to SEIEG.**
- **Recent SSW Events slides to be published on SEIEG website.**

5.	**Feedback and comments from S6 workshops**

Key Points

17. Overview of the SWIMMR S6 project and discussion on first draft.
18. Overall, there was a general concern about the content of the report by members. SEIEG members mentioned that the report is more of a survey than an actual report.
19. Some members highlighted instances in the report where the theory was incorrect.
20. The SWIMMR S6 team asked members to send feedback to them so that they could action.
21. The group agreed to collect comments and send to the SWIMMR S6 team. They also suggested introducing themselves to the SWIMMR S6 group and offering help where necessary.

New Actions

- **SEIEG Chair to collect comments on S6 report from SEIEG members and send to SWIMMR S6 team.**
- **SEIEG to inform S6 group to be aware of their members and offer help.**

6.	**Criteria for initiating a Severe SW warning discussion**

Key Points

22. The criteria of the initiation of a Severe SW warning were explained, outlining the differences between informal and formal briefings.
23. Discussion on how we currently observe Severe Space Weather and what improvements can be made. You can look at an active region on the surface of the sun and suggest the likelihood of a CME occurring. You would see magnetic loop systems which can be described as magnetically complex. Put simply, if a region looks angry, it has a greater likelihood of exploding.
24. Discussion on whether we could identify a CME onset from associated solar activity/phenomena. The answer to this is an erupting prominence and (EUV) coronal dimming are a good indicator that CMEs have taken off. Flares (particularly brighter ones) are closely associated with CMEs. These are both good indicators but not sufficient. The best you can do is issue an amber warning.
25. A table was shown which outlined an assessment of CME associated events with a comments row detailing the importance. For a proper warning, we need to see the CME to make the forecast which enables you to issue green, amber or red alerts.
26. Longer duration flares are more likely to produce CMEs and accelerate particles. You can also get protons without CMEs which are a danger to aviation.
27. Discussion on what level of probabilistic certainty is necessary to issue a formal warning. Forecasters would make the judgements based on their confidence in the likelihood of the Severe Space Weather event occurring – to which they would consider a range of factors.

28. Previous Severe Space Weather events were explored, and some complexities were highlighted. The group spoke about the steps taken by scientists and government officials in response to the Severe Space Weather and what they possibly could have improved on.

29. Suggestion of a SEIEG presentation at the next Severe Space Weather Steering Group so other Lead Government Departments can understand what actions they would take during a Severe Space Weather event.

30. Suggestion that we should consider the effects of social media and the fact that you could be speaking to your counterparts through a different means. It would be effective to have an explanation to manage the response.

New Action

- **SEIEG to create a small sub-group to determine the relevant pre-cursors for a significant solar eruption.**
- **SEIEG to present at the next Severe Space Weather Steering Group so other Lead Government Departments can understand what actions they would take during a Severe Space Weather event.**

7.	**Update on Space Based Solar Power**

Key Points

31. The Chair provided an update on their recent meeting with Martin Soltau (CEO of Space Solar). Martin Soltau heads up the Space Energy Initiative, which is a collaboration which includes UK Government and over 80 organisations, with a shared belief in the potential and vision of Space-Based Solar Power.

32. Martin Soltau had addressed the main concerns about Space Based Solar Power. However, not much work has been completed to account for Space Weather as part of Space Based Solar Power.

33. Discussion surrounding whether the Space Based Solar Power team have accounted for any previous studies such as one which took place in the 1980s. The Chair has sent over an URSI report from 2003. Suggestion for SEIEG to invite someone within the SBSP team to present at a future SEIEG meeting.

New Action

- **The Chair to arrange for someone within the Space Based Solar Power team to present at a SEIEG meeting.**

8.	**Key new research papers with impact – short summaries / AOB**

Key Points

34. The group provided a summary of some new research papers which they thought were useful.

35. Power Grid - Mc Manus et al (2023) - NZ Powergrid". This paper offered an analysis on work in the NZ Power grid. They concluded that up to 35% of the Transformers would be at risk during a SSW event. Took previous events, scaled them up. This provided information about the durability of their Transformers to GICs. They did a good job of getting buy-in from the grid. A member mentioned that McManus is coming soon and will be working with BGS who hope to replicate some of his work to the UK grid.

36. "Satellites Meredith et al SW (2023)". They've used GPS data for a range of different locations to understand a 1/100 year flux. Based on extreme value analysis of GPS data (15 years). This gives you what the 100 year levels are.

37. Researchers in Finland have created a plot which analyses the distribution of new cosmogenic. 17 Mili Sieverts. 1/50 years. Clive Dyer to circulate the paper.

38. A recent paper from Ronan (Imperial) on solar wind.

39. Discussion on the recent update to the National Risk Register. The impact of Severe Space Weather has gone up one category from moderate to significant. This decision reflects the growing importance of space as a sector.
40. A member mentioned the requirement for permanent magnetometers will impact the ESO modelling of impacts from GICs.
41. Met Office stated that they are currently in the process of updating the GO –Science Golden-hour document on Severe Space Weather.

New Action

- **All members to circulate papers which they shared during the SEIEG meeting.**

8.	**All actions**

1) **DESNZ to consider renaming "Ground based digital components" as per SEIEG's recommendation**
2) **Met Office to consider creating a new data-sharing platform to record dates of SSW events.**
3) **SEIEG to discuss MOR forms offline with DfT/CAA.**
4) **Met Office to suggest ways of increasing awareness with applicable industry stakeholders during upcoming workshops with CAA/DfT and feed back to SEIEG.**
5) **Recent SSW Event slides to be published on SEIEG website.**
6) **SEIEG to collect comments on S6 report from members and send to SWIMMR S6 team.**
7) **SEIEG to inform S6 group of their members and offer help.**
8) **SEIEG to create a small sub-group to determine the relevant pre-cursors for a significant solar eruption.**
9) **SEIEG to present at the next Severe Space Weather Steering Group so other Lead Government Departments can understand what actions they would take during a Severe Space Weather event.**
10) **The Chair to arrange for someone within the Space Based Solar Power team to present at a SEIEG meeting.**
11) **All members to circulate papers which they shared during the SEIEG meeting.**