

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

Wednesday 22 January 2025, 10:00-16:00

Attendees:

Prof Richard Horne	Chair, British Antarctic Survey	Dr Sean Elvidge	University of Birmingham
Dr Mike Hapgood	Rutherford Appleton Lab.	Dr Lucie Green	University College London
Dr Jonathan Eastwood	Imperial College London	Prof Cathryn Mitchell	University of Bath
Simon Machin	Met Office	Prof Huw Morgan	Aberystwyth University
Krista Hammond	Met Office	Prof Keith Ryden	University of Surrey
Dr Ellen Clarke	British Geological Survey	Dr Gemma Attrill	Defence, Science and Tech Lab
Prof Clive Dyer	University of Surrey	Mike Willis	UK Space Agency
Alex Tibble	British Antarctic Survey	Dr Sangha Harneet	UK Space Agency
Dr Matthew Angling	In-Space Missions Ltd	UK Government Representation	DESNZ
Prof Paul Cannon	University of Birmingham		DSIT
Dr Ciaran Beggan	British Geological Survey		DfT
Ft Lt Bryn Jones (BJ)			Go Science

11:00 Welcome, Apologies, Review Agenda

- Brief introductions of new SEIEG members.
- RH gave an overview of the agenda for today's sessions.
- The group congratulated the Met Office space weather research team for winning Astronomical Society's (RAS) Group Achievement Award in Geophysics in 2025
- The group also congratulated Nigel Meredith on being awarded the Chapman Medal, and John Coxon the Fowler Award from the RAS.
- SEIEG members agreed to actively consider submitting nominations of members and others in the space weather community for future awards.

11:10 Minutes and Items arising from last meeting

- Members approved the minutes from the last meeting. The chair noted that DESNZ would be taking the minutes for today's session
- Update on actions from last meeting:

Action	Description	Progress
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012024/03	The Chair to arrange for someone within the Space Based Solar Power team to present at a SEIEG meeting.	Ongoing – a standalone virtual meeting to be arranged before the next meeting.
072024/01	DESNZ to circulate email to Severe Space Weather Steering Group members for the OGDs to contact Met Office with requests for specific products, or discussion on what can be achieved.	Complete.
072024/02	Draft paper on the May 2024 event to be completed by SEIEG members by UK Space Weather Week, Exeter September 2024.	Complete – on today agenda.
072024/03	SEIEG Chair to issue email invites to relevant SEIEG members to attend the core group.	Complete - new members have been added.
072024/04	SEIEG members to review and update SEIEG RWCS to support the NRSA technical assessment by late November. A virtual meeting to be scheduled by the chair.	Closed, and replaced with new action. Cabinet Office process has been delayed. Likely to take place in Summer 2025 now.
072024/05	Mike Hapgood to circulate email summarising expectation around what needs to be update in the NRSA technical assessment to account for new research.	Closed, replaced with new action.

- The group agreed to new action to review and update SEIEG RWCS to support the Met Office update of the NRSA technical assessment. Mike Hapgood noted that he has pulled together a spreadsheet on areas that should be considered and committed to recirculate this to the group.

Action 012025/01: SEIEG to review and update the current Reasonable Worst Case Scenarios ahead of Met Office update of the NSRA technical assessment.

Action 012025/02: Mike Hapgood to re-circulate email setting out views on what needs to be updated in the NRSA technical assessment to account for new research.

11:15 Recent SW events and impacts

- The Met Office provided an overview of recent space weather events. Most activity has come from the southern hemisphere of the sun.
 - 6-12 October 2024 saw some CME activity. However, not much was seen in terms of impacts (not much more than the loss of some HF comm). Aurora was visible in UK on 10 October 2024.
 - 17-24 Nov 2024 saw a S2 proton storm for a far side CME.
 - 29 Dec – 02 Jan 2025 there were a number of CME events and a Kp=8 event on New Year's Day where Aurora was also visible in UK.
- SEIEG members noted the importance of the ability to forecast the time of arrival of these events and the ambition for this to be improved.

11:45 Space Debris – NSPOC summary of recent events

- Harneet gave overview of NSPOC who monitor space hazards, working closely with the Met Office. This includes tracking of conjunction events and re-energy events.
- SEIEG members discussed what is/isn't tracked by NSPOC and how/who this information is communicated to. SEIEG members were also keen to understand how thresholds for conjunctions are being developed. It was highlighted that conversations are required with NATS and CAA on thresholds, triggers and dissemination of alerts for re-entry events. It was suggested that NSPOC consider if this can be raised as agenda item at existing XHMG working group.

Action 012025/03: NSPOC should have follow up discussion with CAA and NATS on use of NSPOC re-entry events data.

12:00 Update on the SWIMMR S6 report

- SEIEG chair gave an update on the progress of the S6 report. SEIEG provided significant feedback on the last draft of the report and had concerns that the substance of the report being taken out of context. As a result, SEIEG could not endorse the report.
- Starion and UKRI have decided to continue with publication, however this will not be accompanied by press activities or endorsed by SEIEG.
- It was noted the SEIEG members should be conscious of this position if asked to provide a view on the report, and to direct these to Ian McCrae, chair of the SWIMMR programme.
- DESNZ clarified that the report is independent of government.

Action 012025/04: SEIEG chair to circulate text on SEIEG view on the S6 report that can be used by members as required.

12:15 Update from DESNZ

- DESNZ gave an update on HMG risk planning for severe space weather.
- There are ongoing conversations between DSIT and DESNZ on LGD ownership of the Severe Space Weather Risk. It was confirmed that Met Office will remain delegated risk owners for the NSRA, but DESNZ and DSIT are considering the most appropriate LGD to manage SSW preparedness activity across HMG.
- Key policy priorities include, considering next steps following end of SWIMMR programme, implementation of exercising lessons, focus on updating impact assessments and response plans and aligned with the upcoming NRR update.

- DESNZ gave an overview of secondary impacts workshop that took place with the energy sector and considered if space weather impacts to satellite services, including PNT and telecoms would impact the sector.
- The workshop highlighted the sectors existing high level of resilience to these impacts but also identified that further work is needed to understand the impacts of space weather on ground based digital components. DESNZ confirmed that a digital infrastructure team has been established in DSIT and may be able to support on this.

12:30 SEIEG Report on the May 2024 storm discussion on recommendations

- Ask from SEIEG chair for further comments on the draft report, particularly on the appropriateness of the recommendations. The intention of these are to specifically derive lessons from the storm, not all encompassing.
- The following feedback was given:
 - Should consider need for recommendations specific to R2O2R.
 - **Power Grid:** The recommendations 1,3 and 4 are already in train. Recommendation 2 should be the priority. The other recommendations will be prefaced to acknowledge that work is ongoing.
 - **Satellites – Low Earth Orbit:** recommendation 1 should be reworded. Should be consider if the Kessler syndrome terminology is understood. Remove ‘can safely operate’ text out from rec 2.
 - Be specific when referencing historic events as not everyone will know.
 - **Aviation:** needs reformatted to identify who will do this and make it actionable.
 - It was noted that a recommendation is needed to create the right feedback loop for all sectors to report impacts felt in ‘significant’ space weather events.
 - **General:** suggestion to add MoD and PNT recommendation.
 - Suggestion that recommendations are clearly linked to the nuances of the 4 May event. This can be done in narrative/key points in the exec summary.

14:00 Aviation – status of ICAO alerts

- Clive gave an overview of the recent and current work in this area, including overview of SWPC/SWAG recommendations for the aviation sector following publication of the ‘Results of the First National Survey of User Needs for Space Weather’.
- It was highlighted that ICAO has introduced MOD and SEV (moderate and severe) radiation alerts.
- An atmospheric radiation scale was proposed to the group, as the current space weather scales are not appropriate.
- The group agreed that there is a need for appropriate SW scales for aviation and that this should be brought out in the report SEIEG is drafting on the May event.
- DFT highlighted the need for a SEIEG position on the risk to aircrafts on this to gain traction with policy.

14:30 Update from UKSA and ESA

- UKSA give an update on current missions relevant to space weather. Vigil contract with Airbus was signed in May 2024 and is progressing per schedule. UK is also involved in the AuroraD mission with Sweden. Work also on going to support development of data centre that will capture Vigil data.

- UKSA Signposted an event at RAL space on the 5th Feb. SEIEG members should reach out to Mike W if have not received and invite and interested.

15:30 Update on early solar SW warning group

- Lucie gave an update on work to support forecasters in identifying potential CMEs before they lift off the sun. To meet this ask they are pulling together a crib sheet of what to look out for. They are drafting this into a report which will be split into
 - Part one will look at how we can validate data that shows a CME has occurred.
 - Part two looking are how can we tell that a CME might be produced in the future.
 - Part three will look at how we can tell an impactful (geo-effective) CME has erupted – this may split out into separate report due to complexities.
- Essentially this work is a literature review of information over the last 50 years.

16:15 AOB and Date of next meeting All

- Bryn raised ongoing of issue of lack of feedback from all sectors, including aviation. He has been looking into this. For severe terrestrial weather, Pilots are required to complete and submit feedback form. He suggested the same should be done for space weather.
 - Formalising a process like that is a CAA responsibility, and something they are taking forward.
 - SEIEG role in there could be to propose what information would be useful to capture and would help our understanding of the space environment. Will also help us check accuracy of forecasts. SEIEG to produce paper which sets out what data is key etc to support this.
 - Further work needed to understand where this information is stored, how quick is turn over etc.
- Details were shared on upcoming Space weather events, including:
 - RAS meeting on Vigil mission, February 14th
 - Space weather photography exhibition at Lloyds of London, March 4th
 - RAS meeting on space weather and machine learning, April 11th

Action 012025/05 Bryn to draft a paper for CAA on how the aviation sector could gather the required feedback on space weather impacts.

Actions Summary:

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012025/01	SEIEG to review and update the current SEIEG Reasonable Worst Case Scenarios ahead of Met Office update of the NSRA technical assessment.	New

012025/02	Mike Hapgood to re-circulate email setting out views on what needs to be update in the NRSA technical assessment to account for new research.	New
012025/03	NSPOC should have follow up discussion with CAA and NATS on use of NSPOC re-entry events data.	New
012025/04	SEIEG chair to circulate text on SEIEG view on the S6 report that can be used by members as required.	New
012025/05	Bryn draft paper for CAA on how the aviation sector could gather the required feedback on space weather impacts.	New