Interim Response Plan v1.1

New Zealand Space Weather Response Plan

National Emergency Management Agency
Te Rākau Whakamarumaru

New Zealand Government

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June 2024
Published by the National Emergency Management Agency

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Document management

Document handling

Classification	**UNCLASSIFIED**
Caveats	Nil
Releasable to	All agencies

Document control

Document owner	National Emergency Management Agency

Version history

Date	Version	Description of change
7 June 2024	1.0	First iteration
5 August 2024	1.1	Second iteration

Approved by

This document has been approved by:

Name	Role	Version	Date	Signature
John Price	Director, Emergency Management	1.0	7 June 2024	
John Price	Director, Emergency Management	1.1	5 August 2024	

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Section 1 Introduction

Background

Space weather refers to events beyond the Earth's atmosphere that impact upon our technology and near- Earth space environment. The primary source of space weather is the sun, with the greatest disturbances usually caused by solar flare and coronal mass ejections, and subsequent radio and geomagnetic storm activity.

While extreme space weather is a low probability event, it has the potential for far reaching, and potentially catastrophic consequences. Extreme space weather may disrupt, damage, or cause the loss of critical infrastructure and may affect technology and the near-Earth space environment by:

- causing strong variations of the Earth's magnetic field,
- enhancing electrical fields and currents in the atmosphere and the ground,
- increasing the amount of radiation entering the upper atmosphere, and
- varying the density and stability of the upper atmosphere.

If critical infrastructure is damaged during a space weather event, the recovery period may be prolonged due to the significant international demand on replacement equipment with New Zealand potentially competing with larger markets.

The Interim New Zealand Space Weather Response Plan "this *Plan*" details key roles and responsibilities for a range of agencies in supporting the preparedness and response to a space weather event. It promotes effective emergency management, accountability, and transparency by designating Lead Agency emergency management functions, key decision makers, information and data flow arrangements and emergency management mechanisms and capabilities, in the event New Zealand's critical services are threatened or disrupted by significant space weather events.

Purpose

This *Plan* will operate as a temporary guide with minimum response requirements until a more fulsome response plan is developed, as recommended by the Director for Civil Defence Emergency Management, and in consultation with relevant stakeholders. The activation of this *Plan* does not change roles and responsibilities outlined in the National Civil Defence Emergency Management Plan Order 2015.

Note: At time of publication, wider sector and partner engagement is yet to be determined.

Scope

This *Plan* is for the national coordination of a space weather event, if the event is directed at the Earth, and there is a realistic expectation there will be disruptions to critical infrastructure or systems that critical infrastructure is dependent on (hereafter referred to as a 'significant space weather event'). This *Plan* aims to coordinate the immediate actions of the All-of-Government response by identifying interim governance arrangements, interim lead agency and agency responsibilities.

The response approach has been built off the *Australian Government Space Weather Event Plan* to enable rapid plan development.

Out of scope

- Longer term impacts from space weather, such as health impacts to aircrew or corrosion of fuel pipelines
- Regional Civil Defence Emergency Management (CDEM) response plans and arrangements maintained by CDEM Groups.
- Readiness and response to New Zealand's interests impacted overseas.
- Other New Zealand Government agency bilateral or multi-lateral response agreements already in place.
- Re-entry of space debris, resulting from a space weather event or otherwise.
- Other natural hazards and threats from and within the space environment.
- Malicious threats.

Planning assumptions

This *Plan* is applicable for the national coordination of significant space weather events that may cause:

- Partial loss of satellite infrastructure with disruption to satellite communications.
- Disruptions to systems such as Global Position Systems (GPS) navigation and radio communications.
- Significantly degraded and unreliable precision (position), navigation and timing (PNT) systems.
- Intermittent disruptions to very high frequency (VHF)/ultra-high frequency (UHF) telecommunications systems.
- Loss of high frequency (HF) communications systems.
- Possible power supply instability and transformer damage—while widespread loss of power is unlikely during most events, at the larger end of realistic events (a 100-year event) widespread loss of power is likely, prolonged outages to major metropolitan areas could occur, and transformer damage is possible.
- Second and third order consequences to a wide range of sectors including government, health, energy, water, aviation, communications, shipping, transportation, agriculture, and defence sectors.

Section 2 Roles and Responsibilities

Lead Minister

The Minister for Emergency Management and Recovery is the nominated Lead Minister responsible for space weather events, unless the Prime Minister chooses to appoint another Minister.

Upon receipt of notification of a significant space weather event, the Lead Minister is responsible for:

- Working closely with the Minister of Transport, Minister of Energy and the Minister for Media and Communications.
- Keeping Cabinet informed of developments.
- Deciding whether to declare a State of National Emergency.

Lead Agencies

NEMA is the interim Lead Agency for space weather response using the powers of the Civil Defence Emergency Management Act 2002, and arrangements in the National Civil Defence Emergency Management Plan Order 2015. NEMA is responsible for the All-of-Government coordination arrangements to facilitate preparedness, response, and recovery processes in the event of nationally significant impacts and consequences resulting from space weather events.

The coordination and response responsibilities for NEMA are encapsulated in the arrangements set out in the phases of this *Plan*. This includes:

- Receiving international alerts (from the United States Space Weather Prediction Centre and the Australian Space Weather Forecasting Centre) for imminent space weather events.
- Coordinating All-of-Government response to an emergency, including public messaging (see Appendix A).
- Providing rolling situational awareness via (depending on the scale of the event) NEMA's Monitoring Alerting and Reporting Centre, NEMA's National Coordination Centre, or the National Crisis Management Centre.
- Working with the Department of Prime Minister and Cabinet's (DPMC) Strategic Crisis Management Unit to establish whether the activation of the Officials Committee for Domestic and External Security Coordination (ODESC) system is required. If the ODESC system is activated, NEMA will report to ODESC and provide policy advice.
- Advising the Minister on the declaration of a State of National Emergency.
- If a State of National Emergency is declared, supporting the exercise of powers by the Director of Civil Defence Emergency Management and the National Controller.
- It is likely to be a requirement for emergency communication methods to enable coordination across all stakeholders and agencies if the usual technology-based methods are rendered inoperable.

Existing plans and arrangements will be used for consequence management, including widespread impacts to communities.

The recovery responsibilities are to determine what recovery assistance may be required and to lead coordination in recovery efforts through the National Recovery Coordination Group. The National Recovery Coordination Group will be established at the onset of this event.

Supporting Agencies

All New Zealand government agencies will need to implement their own business continuity arrangements and may have responsibilities as a supporting agency under this *Plan*. By default, the arrangements in the National Civil Defence Emergency Management Plan Order 2015 will be used to manage the second and third order consequences from a space weather event.

For the purposes of this *Plan*, key agencies involved in supporting the preparedness, response, and recovery processes in the event of national significant impacts and consequences resulting from space weather events are:

- **New Zealand Defence Force –** Responsible for supporting domestic operations under existing arrangements, including CONPLAN Awhina, if requested.
- **Department of the Prime Minister and Cabinet (DPMC) –** Responsible for activating and coordinating the ODESC system.
- **Ministry for Business Innovation and Employment (MBIE)** - Policy responsibility for the energy markets and telecommunications regulatory systems (note: key input for operational readiness plans for energy and telecommunications will be informed by relevant Sector Coordinating Entities).
    - **New Zealand Space Agency –** Responsible for coordinating All-of-Government policy advice and regulatory frameworks related to civil space sector activities. If requested, the Agency can assist with research and operational connections with overseas space agencies and other institutions with relevant capabilities.
- **GNS Science -** Responsible for providing data and information in the following areas: the Earth's geomagnetic field, geodetic measurements, and modelled crustal conductivity. GNS Science work closely with partners, notably University of Otago.
- **Ministry of Foreign Affairs and Trade (MFAT) –** Responsible for supporting the lead agency on international elements of emergency preparedness and response including international assistance. MFAT manage the New Zealand overseas missions and posts delivery of services to impacted New Zealanders overseas.
- **MetService –** The New Zealand Meteorological Service (MetService) is responsible (under ICAO ANNEX 3 of the Chicago Convention on International Air Navigation) for disseminating Space Weather Advisories issued by ICAO-approved Global Space Weather Advisory Centres (SWXCs) to all aircraft operators within the New Zealand domestic and international Flight Information Regions. Additionally,

MetService maintains relationships with other national meteorological services under the World Meteorological Organisation framework and can support access to relevant space weather capabilities of allied nations operating Space Weather Centres (including the Australian Bureau of Meteorology, the United States National Weather Service under their National Oceanic and Atmospheric Administration, and the United Kingdom Met Office.

Sector Coordinating Entities

Sector Coordinating Entities are entities that coordinate emergency response activities through a single point of contact as per Clause 2(1) of the National Civil Defence Emergency Management Plan Order 2015. For the purposes of this *Plan*, key Sector Coordinating Entities involved in supporting the preparedness, response, and recovery processes in the event of national significant impacts and consequences resulting from space weather events are:

- **Transpower –** Responsible for the electric power transmission in New Zealand. Transpower will run and manage the electricity sector technical response and advise NEMA of the electricity sector capabilities. Transpower also maintain Sector Coordinating Entity responsibilities for the electricity sector.
- **Ministry of Transport –** The government's system lead for transportation and chairs the Transport Resilience and Security Advisory Group.
- **Telecommunications Emergency Forum –** The Telecommunications Forum governs and operates the Telecommunications Emergency Forum who activate in an emergency as the Sector Coordinating Entity.
- **Reserve Bank of New Zealand** – The nation's central bank and are the steward of the cash system. Reserve Bank are the chair of the Cash Industry Sector Coordinating Entity.

Lead Senior Officials

The Lead Senior Official is the Director of Civil Defence Emergency Management, NEMA, who may delegate the functions and powers to the National Controller under section 10(1) of the Civil Defence Emergency Management Act 2002. The Director of Civil Defence Emergency Management, NEMA, is responsible for:

- Ensuring that relevant coordination arrangements are activated and relevant response activities under those arrangements are coordinated and deconflicted across the New Zealand government.
- Chairing the multi-agency Incident Management Team meeting to coordinate New Zealand government and CDEM Group efforts in the coordination of assistance.
- Advising the Lead Minister, relevant agencies including Supporting Agencies, and other relevant senior decision makers on coordination arrangements and actions being undertaken to facilitate and coordinate assistance to the incident.
- Communicating with other Senior Officials, to ensure streamlined coordination between relevant government agencies.
- Attending the appropriate level of the ODESC system meetings

and briefings on the situation and nature of the response arrangements established, the key strategic risks arising; any resource requirements and what the plan is to provide coordinated communications and messaging.
- Leading and amplifying key public communications activities for the incident.
- Activating this *Plan* in line with requirements set out in the phases described below.

The Lead Senior Official for Early Recovery is the National Recovery Manager, NEMA, who is responsible for

- Communicating with other Senior Officials, to ensure streamlined coordination between relevant stakeholders and agencies.
- Liaising with Group Recovery Managers, as appropriate.
- Identifying what recovery assistance is necessary.
- Advising the Lead Minister and other relevant senior decision makers on any recovery arrangements and actions being taken to facilitate and coordinate recovery assistance to the incident.

Officials Committee for External Security and Coordination (ODESC) system

The ODESC system is the strategic crisis response governance mechanism for emerging or actual crisis. The role of ODESC is to provide collective leadership and set strategic direction. The Chair of ODESC is the Chief Executive of DPMC. The Strategic Crisis Management Unit within DPMC are the stewards of the ODESC system and carry out the role of ODESC secretariat.

Following indication of a potential or actual significant space weather event, NEMA (as the lead agency), will notify the Strategic Crisis Management Unit duty officer. NEMA and the Strategic Crisis Management Unit will consult with the Chair of ODESC to determine whether the ODESC system should be activated.

If activated, all of government strategic coordination will occur through the ODESC system. A meeting commensurate to the situation and level of decision making required will be convened. This meeting will be used to:

- ensure a consistent understanding of the situation;
- ensure coordination of agency activities;
- identify key strategic risks and implications, and that these are being managed appropriately;
- ensure that the lead agency and support agencies have the resources they need;
- prioritise resources and response activities (if required);
- ensure appropriate communication arrangements (to Ministers, other stakeholders, and the public) are in place; and
- identify triggers for escalation.

Section 3 Response

There are three phases of this *Plan (this is consistent with the Australian Government Space Weather Event Plan)*[1]:

- STANDBY
- ALERT
- ACTIVE

This *Plan* may be activated when there is a nationally significant space weather event forecasted to impact upon New Zealand and/or its dependencies.

The Director of Civil Defence Emergency Management or National Controller, NEMA, is responsible for authorising phase changes to this *Plan*. NEMA is responsible for the All-of-Government notification of this *Plan* phase changes.

STANDBY

The Plan is maintained in STANDBY phase as the default condition. Under STANDBY the following activities are undertaken by NEMA:

- Monitor potential space weather events.
- Undertake contingency planning for potential responses.
- Undertake training and exercises to ensure this *Plan* remains fit for purpose.

ALERT

When notification of a Geomagnetic Storm 3 (G3), Solar Storm 4 (S4) or Radio blackout 4 (R4) or greater is received from the either the United States Space Weather Prediction Centre or the Australian Space Weather Forecasting Centre, NEMA's Monitoring Alerting and Reporting Centre will advise the Director of Civil Defence Emergency Management and the National Controller, NEMA, who may call a multi-agency Incident Management Team meeting to discuss the expected impacts and consider authorising a phase change of this *Plan* from STANDBY to ALERT.

When a phase change is agreed, NEMA's National Coordination Centre may be activated by NEMA. If a State of National Emergency is declared, the National Crisis Management Centre will be activated. Support agencies and other relevant stakeholders may be asked to provide a liaison officer, to be physically present within NEMA's National Coordination Centre / the National Crisis Management Centre.

NEMA will:

[1] *The Scales are adapted for Australian use from those produced by the United States National Oceanic and Atmospheric Administration. These scales are not formally agreed by the World Meteorological Organisation, however, are internationally accepted and used by many space weather monitoring agencies.*

- Advise appropriate stakeholders that this *Plan* has changed to ALERT phase via the Director of Civil Defence Emergency Management or National Controller, NEMA. Activate other relevant supporting plans and arrangements in anticipation of it being required.
- Hold a multi-agency Incident Management Team meeting to coordinate the anticipatory actions of New Zealand Government and private sector required in responding to the impact of a space weather event.
- Refine, in consultation with relevant stakeholders, targeted public messaging and directives in relation to the potential impacts of the predicted space weather event.
- Request relevant stakeholders provide liaison officers to be stationed within NEMA's National Coordinating Centre / the National Crisis Management Centre.
- The Public Information Management function will focus on likelihood and consequences to disruption to networks, including shutdown of parts of the electricity grid. NEMA's duty Public Information Management function will amplify Transpower's messaging through NEMA's channels.

The actions undertaken within the ALERT phase are in anticipation of the impact of a space weather event disruption or severing communication capabilities. ALERT phase will automatically revert to STANDBY phase after 72 hours unless otherwise advised.

ACTIVE

Where a significant space weather event is imminent and geographic location has been confirmed, an alert will be issued from NEMA's Monitoring Alerting and Reporting Centre. The National Coordination Centre will advise the Director of Civil Defence Emergency Management and the National Controller, NEMA, who may authorise a phase change of this *Plan* from ALERT to ACTIVE.

The Director of Civil Defence Emergency Management or National Controller, NEMA, may also authorise a phase change of this *Plan* from ALERT to ACTIVE where a significant space weather event has occurred without a prior alert being issued. This may occur due to the nature of an event or where a geographical location could not be adequately determined.

Under ACTIVE the following activities will be undertaken.

Pre-Impact Window:

Where a significant imminent space weather alert has been made by the Australian Space Weather Forecasting Centre identifying a pre-impact window.

NEMA will:

- Advise appropriate stakeholders that this *Plan* has been ACTIVATED.

- Undertake a Holistic Consequence Analysis and develop subsequent planning products to enable a uniform response.
- Hold further multi-agency Incident Management Team meetings to ensure all coordinated requirements are in place in anticipation for the potential disruption or severing of communications.
- Release approved public messaging in a coordinated manner within the earliest possible timeframe. NEMA will take a leading role and NEMA's Public Information Management function will scale up in a response. This will be impact-focused, including information and advice to the public about what people should and should not do. If widespread impact is forecast, NEMA's Public Information Management function can activate the Memorandum of Understanding with radio and television broadcasters. In the event of an electricity grid shutdown or major forecast impact, NEMA can issue Emergency Mobile Alerts.

Where a pre-impact window is unable to be identified, the Director of Civil Defence Emergency Management or National Controller, NEMA, may authorise these actions be undertaken in the ALERT phase of this *Plan*.

Post-Impact:

After the impact of a space weather event, NEMA will:

- Hold post-impact multi-agency Incident Management Team meetings upon re-instatement of communications to coordinate information flows relating to shared situational awareness of impacts, consequences and post-impact actions of New Zealand Government and private sector.
- Provide talking points and public messaging relating to the impacts of the space weather event on behalf of the New Zealand Government.

Post-impact consequences management and subsequent requests for physical assistance will be maintained under existing plans and arrangements.

Section 4 Coordination Arrangements

All-of-Government coordination

During ALERT and ACTIVE phases, All-of-Government coordination will be led by NEMA.

All-of-Government strategic coordination

During ALERT and ACTIVE phases, the ODESC system will be used for All-of-Government strategic coordination, if required. As stewards of the ODESC system, DPMC will initiate this coordination.

Multi-Agency Incident Management Team meeting

The multi-agency Incident Management Team meeting brings together relevant New Zealand, national, regional, and local government officials, the private sector, industry bodies, not-for-profit organisations and eminent individuals for coordination, communication and collaboration during response and recovery to domestic emergencies.

- The Director of Civil Defence Emergency Management or National Controller activates and chairs the multi-agency Incident Management Team. The National Recovery Manager (or delegate) may also chair a multi-agency Incident Management Team where the focus is on the recovery phase of the emergency.
- CDEM Groups and industry bodies may request that a multi-agency Incident Management Team is held for a specific purpose/issue.

All-of-Government situational awareness

All-of-Government situational awareness for space weather events will continue to be maintained by the NEMA's National Coordinating Centre or the National Crisis Management Centre during the activation of this *Plan*.

New Zealand Government Emergency Communication and Public Information

NEMA is responsible for coordinating New Zealand government emergency communication products, including All-of-Government talking points, in relation to the response undertaken in line with this *Plan* with the support of the other listed Support Agencies, as required.

Section 5 Post-Incident

Upon completion of all active tasks and confirmation of no further requirement of coordinated activity, the Director of Civil Defence Emergency Management or National Controller, NEMA, will approve this *Plan*, reverting to STANDBY.

Supporting New Zealand Government agencies will be notified of the phase change via the Director of Civil Defence Emergency Management or National Controller, NEMA.

NEMA will conduct an end-of-operation evaluation and lessons identified activity and participate, as required, in those after action activities conducted by other parties.

Appendix A – Space weather message pack

About space weather

- “Space weather” is caused by activity on the surface of the Sun. Sometimes, storm-like activity can throw out bursts of electromagnetic radiation and charged particles (plasma from the sun) which can impact Earth-based infrastructure systems, especially electricity generation.
- Extreme solar storms are rare. Two recent extreme events that impacted Earth’s magnetic field are the Carrington Event in 1859 and the May 1921 event. Smaller storms over the past decades have damaged electrical transmission equipment – for example, a solar storm in November 2001 damaged a transformer in Dunedin, and multiple events have been observed to have impacted communications, positioning and more.

How NEMA monitors

- NEMA’s 24-7 Monitoring, Alerting and Reporting Centre monitors space weather forecasts from the United States National Oceanic and Atmospheric Administration and Australia’s Bureau of Meteorology.
- Transpower anticipates that New Zealand will get at least 12 hours’ notice of an extreme solar storm (Coronial Mass Ejection – G type forecast) that is likely to impact power systems – it should be noted that arrival times of this storm have high uncertainty in terms of timing (+/- 7 hours) and characteristics (size and polarity) until observed by L1 satellites, approximately 15-60 minutes before they impact Earth. This advanced warning enables the industry to switch the power system to the most resilient state so that damage is minimised.
- For the Radio Blackout (R) and Solar Flare (S) type events, warning times may be much shorter (minutes for R, minutes to hours for S).
- If a storm is detected, NEMA’s Monitoring Alerting and Reporting Centre will contact Transpower and other stakeholders, and activate NEMA’s standard operating procedures for a space weather event. These focus on the impact to New Zealanders of a major infrastructure failure.

What NEMA is doing

- Space weather is linked to solar activity, which rises and falls across an 11-year cycle. The next “solar maximum” – a period of high activity – is estimated to occur in 2025. However, space weather events can happen at any time.
- NEMA’s current planning revolves around the potential impact of a space weather event. In a severe event, this could involve widespread power outages, as well as impacts on radio and navigation systems.
- As with any major infrastructure failure, if space weather is forecast to cause significant disruption then NEMA would co-ordinate a response to help manage the impacts and consequences.

- NEMA is involved in regular discussions with Transpower, the Civil Aviation Authority and other government agencies, as well as local and international scientists.

What can the public do?

- NEMA's public education focus is centred around the impacts to New Zealanders. In a space weather event, the most likely impact will be power cuts which could last for some time.
- This is a timely reminder to prepare your whare and whānau for emergencies – power outages can happen anywhere at any time.
- Make sure you have emergency supplies including torches and a solar or battery powered radio, and food that does not need to be cooked. Find out more at our Get Ready site: No power — Get Ready — Emergency preparedness in New Zealand