National power outage reasonable worst case planning assumptions – steel and metals stakeholder questionnaire

Introduction / background

The BEIS Steel and Metals team is feeding into a cross-government programme that has been established to increase industry and government preparedness for a national power outage (NPO) event. The aim of the programme is to ensure that the impacts of a nationwide power outage are well understood, and the appropriate steps are taken to ensure we are prepared for such events.

As part of this programme, we are drafting a set of reasonable worst case planning assumptions that outline the impacts the steel and metals sector may experience during an NPO.

To help us arrive at these assumptions, please could you complete the questions on pages 4-6 on behalf of your business / sector.

Please return your responses to: Alice Ellison, (Senior Policy Adviser, Steel & Metals), alice.ellison3@beis.gov.uk, tel. 030 0068 6893 / 07768 700 759 **by cob on Tuesday 5 October 2021**.

Please see below:

- Reasonable worst-case scenario (RWCS) planning assumptions (p. 2-3)
- Questions for stakeholders (p. 4-6)
- FAQs (p. 7-8)

Thank you very much in advance for your participation!

Reasonable worst-case scenario (RWCS) planning assumptions

- You should assume that there will be no notice to a failure of supply.
- An NPO is different from local/regional outages – there will be no help available from other areas

Restoration Timeline – Key phases post-NPO

- **Phase 1 (0 – 2 hours)**
  - An event results in the technical failure of the National Electricity Transmission System (NETS), leading to an NPO.
  - All premises without back-up generation lose power supply immediately and without warning.
  - The National Grid Electricity System Operator initiates a technical procedure to restore the GB electricity system.
  - **Please assume all premises without back-up generation do not have power supply during this phase.**
- **Phase 2 (2 – 48 hours**)
  - Small pockets of discrete domestic customers begin being reconnected at the beginning of this phase and gradually more customers are restored as the phase progresses.
  - Supply to customers is intermittent due to faults or imbalances between the power being generated and consumed by customers.
  - **Please assume all premises without back-up generation do not have power supply during this phase.**
- **Phase 3 (2 – 7 days)**
  - The majority of large power stations and all nuclear power stations have been reconnected.
  - 60% of national power has been restored by the beginning of this phase - this is geographically spread across GB and it is not possible to prioritise or pre-empt which customers have been restored.
  - More customers are restored as this phase progresses.
  - Supply is on an intermittent basis due to controlled power being implemented to ration supply fairly across the customer base on a rotational basis.
  - Certain pre-assigned protected customers maintain continuous power supply during this period of rotating controlled power.
  - **Please assume that 60% of premises within your sector have been restored and those that have been restored will have intermittent power (three hours on supply, three hours off supply) from day 2 until day 7.**
- **Phase 4 (day 7 onwards)**
  - On day 7, 100% of customers have power supply.
  - Sectors may experience disruption as they return to normal operations for example due to delays in the supply chains or damage to infrastructure.
  - **Please assume that all premises have power from day 7 and normal operation of transport takes two months to resume and normal operation of fuel and water systems takes one month to resume.**

Key overarching reasonable worst-case scenario (RWCS) planning assumptions

- **Season:** The NPO event occurs in winter with a high demand for electricity.
- **Weather**: The Met Office National Severe Weather Warning Service has in place warnings for severe wind across the UK from now to the next seven days. Storm force winds are affecting all regions of the UK for six hours on this day. Most inland, lowland areas experience average wind speeds in excess of 55mph with gusts in excess of 85mph. The daily mean temperature is low.
- **Warning**: There is no prior warning of a NPO event and no other concurrent risks occurring.
- **Communication**: All mains-operated and mobile forms of communication are lost within the first hour following a NPO, including access to the internet.
- **Broadcast**: TV and radio broadcast networks are disrupted. The BBC maintains output of national FM radio broadcasts of two radio services (R4 and R2) for 7 days. Citizens are able to access FM radio services on battery powered radio sets or in-car radio equipment (note DAB radios also have a FM tuner)
- **Transport**: All transport is severely disrupted or non-operational. This includes air transport, seaports, international and domestic rail, and road transport. Safe evacuation of rail network begins.
- **Water:**
  - Mains water and sewage systems are non-operational for the 7 days of the NPO.
  - Domestic households located near water treatment works - which have back-up generation - may have intermittent water supply, but the remainder of households and businesses have no access to water.
  - Boil notices are in place, but a high proportion of the population do not receive this message and become sick.
  - Temporary use bans and boil notices remain in place until water treatment sites can receive uninterrupted power supply.
  - Water treatment and sewage systems will then return to normal operational levels after one month (day +38).
- **Fuel**:
  - All fuel infrastructure is non-operational for the 7 days of the NPO. This includes forecourts due to their reliance on electric pumps.
  - As fuel becomes available again during Phase 4, there is likely to be significant disruption to the supply chains and so fuel supply will be managed by Government and Industry.
  - From day 7, category 1 responders (police, fire, ambulance and local authorities) will be prioritised for fuel needs and there will be limits on maximum purchases of fuel for the general public for at least 4 weeks after power has been restored.
- **Mobile back-up generation:** There will be high demand for mobile back-up generation, with some sectors competing to secure the same resources. Contractors may not be able to fulfil all obligations.

Questions

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1. **Please provide details of your business / sector including:**
   - **Name, location (s)**
   - **The essential functions or high-level services that your business or sector provides to GB.**
   - **Key facts and figures about your business or sector, including, but not limited to, number of assets, number of employees, service users, direct customers, range of services or quantity of goods produced.**

2. **Please provide details of any additional planning assumptions you will be using that are specific to your sector or business.**

3. **Which RWCS time of day / week will provide more challenging sector/ business impact?**

4. **Phase 1: 0-2 hours - NPO occurs: Please outline any risks / impacts that may materialise 0-2 hours following an NPO. Please assume:**
   - **All premises without back-up generation lose power supply immediately and without warning.**
   - **There is disruption / loss to usual communication channels, and all transport is severely disrupted or non-operational.**

5. **Phase 2: 2-48 hours - Local power restoration: Please outline any risks / impacts that may materialise from 2 – 48 hours following an NPO. Please assume:**
   - **All premises without back-up generation do not have power supply.**

6. **Phase 3: (from 2 – 7 days) – controlled power cuts2-48 hours: Please outline any risks / impacts that may materialise from 2 – 7 days following an NPO. Please assume:**
   - **60% of power supply restored at the beginning of this phase – this is geographically spread across GB.**
   - **Premises that have been restored will have intermittent power (three hours on supply, three hours off supply).**
   - **The remaining 40% are still off-supply. It is not possible to pre-identify which sites will have power supply.**

   You may want to consider that some key assets are amongst those that have not been restored yet.

7. **Phase 4: (day 7+) – recovery: Please outline any risks / impacts that may materialise from day 7 following an NPO. Please assume:**
   - **All premises have power from day 7 onwards. All communications and broadcasting are re-established.**

- **Normal operation of all transport takes two months to resume, and normal operation of fuel and water takes one month to resume.**

8. **Detail any sectors that your reasonable worst case is dependent on.**

9. **Detail any sectors that your reasonable worst case is likely to affect directly.**

10. **Please provide contact details should we have follow up questions/ clarifications**

If you have any queries when completing this questionnaire, please contact: Alice Ellison (Senior Policy Adviser, Steel & Metals), alice.ellison3@beis.gov.uk, tel. 030 0068 6893 / 07768 700 759

Frequently asked questions (FAQs)

What is a NPO?

- A NPO refers to an event where all electricity customers in GB lose their mains power supply instantly, simultaneously, and without warning.

What could cause a NPO?

- The National Electricity Transmission System (NETS) transports the electricity produced by generators, across GB; the total failure of this system would cause a nationwide loss of power supplies.
- The NETS is highly resilient and any event that has the ability to cause its failure would be rare, hard to predict and outside the realm of normal expectations.
- The most likely cause is considered to be an extreme weather event combined with the malfunction of automated protection systems, although terrorism, cyber-attack and technical failure are also potential causes.

What is the likelihood of a total loss of power supplies occurring in GB?

- The likelihood of a total failure of the electricity transmission network is low; it has never occurred in GB however recent international experiences demonstrate that in the right conditions, it is a credible risk.
- The most recent and relevant events include outages in North-East America (2013), Italy (2013), South Australia (2016) and Argentina (2019).

What are the key impacts of a NPO?

- An NPO could result in impacts across critical utilities networks (including telecoms, water, gas and sewage).

Electricity System Restoration (ESR)

- Electricity System Restoration (ESR) is the technical recovery process that would be implemented by the electricity industry to restore power following a NPO.
- Designated power stations across GB can restart electricity generation without any reliance on external power supplies, by using their on -site back-up generators. In the event that the ESR process is required, these power stations would be instructed to start up and would slowly reconnect to local customers to establish *power islands*.
- The power island grows by connecting to other local power stations and more customers, providing increased stability and supply. This would continue until all power islands across the country are connected and all customers restored.

How long would it take to restore electricity to all customers?

- The time taken to restore power is highly dependent on what has caused the failure of the NETS and the extent of the damage to the network. It could take **up to 7 days** for the reasonable worst-case scenario.
- In the event of nationwide disruption, all electricity stakeholders including generators, network companies and the Electricity System Operator would work to restore power as soon as possible. Seven days is the reasonable worst-case scenario.
- Following the initiation of the ESR process, small pockets of customers would be reconnected within a few hours as the ESR-designated generators start-up. Gradually more customers would be restored as the power island grows but their supply would be intermittent with power being disrupted and restored again.
- We expect major power stations and 60% of GB's power supplies to be restored **within 2 days**. Following this, controlled power cuts would be implemented to rotate available power supplies across re-connected customers. Certain pre-assigned *protected customers* could maintain continuous power supply during this period of power cuts.

- Pre-designated protected sites/ customers: For a site to be considered for “protected” status it must meet the following criteria:
  - Sites must fall within the list of approved designated services.
  - Sites must not have standby generation and should demonstrate that it is not possible to install standby generation.
  - The electricity demand of the site is not intensive, i.e., it would be reasonable to provide this level of power during an electricity supply emergency.

Distributed generators

- Sites with distributed generators (e.g., solar panel, wind turbine, combined heat and power plant) do not consume the power being generated. Instead, they are configured so that they export the electricity being produced onto the local network and consume the power being supplied by the electricity system.
- In the event of a NPO, the distributed generator will be unable to export power onto the network until the site has been restored.
- Only distributed generators that have been specifically configured and installed with back-up generation will be able to power sites.