
Emerging Risk Report – 2015
Innovation Series

SOCIETY & SECURITY

Business Blackout

Appendix 1

*Guide to insurance
portfolio loss estimation*

Key contacts

→ **Trevor Maynard**
Head, Exposure Management & Reinsurance
Trevor.Maynard@lloyds.com

→ **Nick Beecroft**
Manager, Emerging Risks & Research
Nick.Beecroft@lloyds.com

→ **For general enquiries about this report
and Lloyd's work on emerging risks,
please contact**
emergingrisks@lloyds.com

Disclaimer

This report has been produced by Lloyd's and the University of Cambridge Centre for Risk Studies for general information purposes only. While care has been taken in gathering the data and preparing the report, Lloyd's does not make any representations or warranties as to its accuracy or completeness and expressly excludes to the maximum extent permitted by law all those that might otherwise be implied.

Lloyd's accepts no responsibility or liability for any loss or damage of any nature occasioned to any person as a result of acting or refraining from acting as a result of, or in reliance on, any statement, fact, figure or expression of opinion or belief contained in this report. This report does not constitute advice of any kind.

This report presents a hypothetical stress test scenario developed by the University of Cambridge Centre for Risk Studies to explore management processes for dealing with extreme external shocks. It does not predict any catastrophes.

© Lloyd's 2015 All rights reserved

Contents

Erebus Cyber Blackout Scenario: Guide to portfolio loss estimation	05
Power generation companies	05
Defendant companies	06
Companies that lose power	07
Companies indirectly affected	08
Homeowners	08
Specialty	08
Total	08

Cambridge Centre for Risk Studies
 University of Cambridge Judge Business School
 Trumpington Street
 Cambridge, CB2 1AG
 United Kingdom
 enquiries.risk@jbs.cam.ac.uk
 www.risk.jbs.cam.ac.uk/

May 2015

**Erebos Cyber Blackout Scenario Research
 Project Team**

Simon Ruffle, Director of Technology Research &
 Innovation, Project Lead
 Éireann Leverett, Senior Risk Researcher
 Dr Andrew Coburn, Director of Advisory Board, Centre
 for Risk Studies, and Senior Vice President of RMS Inc.
 Jennifer Copic, Research Assistant
 Dr Scott Kelly, Senior Research Associate
 Tamara Evan, Contributing Editor

Cambridge Centre for Risk Studies Research Team

Professor Daniel Ralph, Academic Director
 Dr Michelle Tuveson, Executive Director
 Dr Olaf Bochmann, Research Associate
 Dr Louise Pryor, Senior Risk Researcher
 Jaclyn Zhiyi Yeo, Research Assistant

Acknowledgements

The research project team gratefully acknowledges the inputs and assistance of the following reviewers and contributors. All errors and interpretations of the advice received are however entirely those of the Cambridge research team.

Nick Beecroft, *Lloyd's*
 Joe Hancock, Rick Welsh and Neville Drew, *Aegis*
 Tom Hoad, *Tokio Marine Kiln*
 James Nevitt and Russell Kennedy, *Brit Insurance*
 Dr Mike Maran, *XL Catlin*
 Russell Bean, Jahangeez Chaudhery, Benjamin Kiely,
 David Spratt, Charity Bare, *Talbot Validus*
 Dr Bob Reville and Dr RJ Briggs, *Praedicat*
 Dr Gordon Woo, Peter Ulrich and Paul VanderMarck,
RMS Inc.
 James Snook, *UK Government, Cabinet Office*
 Jason Larsen, *IOActive*
 Tim Yardley, *University of Illinois Urbana-Champaign*
 Tim Roxey and Ben Miller, *North American Electric
 Reliability Corporation; Electricity Sector Information
 Sharing and Analysis Center (ES-ISAC)*
 Tom Finan, *Department of Homeland Security,
 United States Government*
 Dr Richard Clayton and Dr Frank Stajano, *Cambridge
 Computer Laboratory, University of Cambridge*
 Chris Sistrunk, *Mandiant*
 Michael Toecker, *Context*
 Robert M Lee, *Dragos Security*

We are also grateful to other contributors who preferred not to be cited.

Erebos Cyber Blackout Scenario: Guide to portfolio loss estimation

This guide provides the University of Cambridge Centre for Risk Studies' recommended guidelines for insurance companies to estimate what their own losses would be to the hypothetical stress test scenario of the Erebos Cyber Blackout Scenario, to be consistent with the loss estimation in the report that accompanies this document.

Power generation companies

Identify power generation companies in your portfolio with property cover and affirmative cyber insurance. Power generation companies can be identified by the following industry sector codings.

Company type	NAICS ¹	SIC ¹	GICS ¹
Power generation companies	221118 Electric power generation	4931 Electric and Other services combined	55101010 Electric utilities

Property loss

Identify the insured generators in the scenario footprint, as listed in Schedule 1.

Schedule 1: Geographical footprint of scenario

State	Code
Connecticut	CT
Delaware	DE
District of Columbia	DC
Indiana	IN
Maine	ME
Maryland	MD
Massachusetts	MA
Michigan	MI
New Hampshire	NH
New Jersey	NJ
New York	NY
Ohio	OH
Pennsylvania	PA
Rhode Island	RI
Vermont	VT
West Virginia	WV

Alternatively identify those in the power grid zones of NPCC and RFC.

If you do not have geographical location information for these sites, choose the largest one-third of your accounts.

Rank the identified insured generators in the zone of interest by total insurable value (TIV) or capacity size, select the accounts for the companies that operate them, and select the largest 7% (one in 14) for S1 and S2 and largest 14% (one in 7) for X1. List the plants or generating sites where each of the selected generators are located.

If you insure fewer than 14 generators, select the largest generator and assume 100% loss.

Assume that the selected generators are damaged to the following % of TIV:

Schedule 2: Repair cost ratios (RCR) to be applied to selected generators for property loss

Variant	Generators	RCR
S1	Largest generator	100%
	All other generators	30%
S2	Largest generator	100%
	All other generators	40%
X1	Largest two generators	100%
	All other generators	40%

Apply appropriate deductibles and limits as per the policy terms for these accounts, and calculate the total property damage loss for your portfolio.

Business interruption

List the plants or generating sites where each of the selected generators are located.

Assume that all of the power generation from those sites is suspended for the durations specified in Schedule 3.

Apply appropriate deductibles and limits for the business interruption, as per the policy terms for these accounts, and calculate the total business interruption loss for your portfolio.

Schedule 3: Durations of business interruption to be applied to selected generating sites

	S1	S2	X1
Average months out of service	3.5	4.5	5.5

¹ Industry classification systems: North American Industry Classification System (NAICS); Standard Industrial Classification (SIC); Global Industry Classification Standard (GICS)

Incident response costs

Assume that for each of the selected sites there is an additional \$0.5m of incident response cost.

Apply appropriate policy terms for these accounts, and calculate the total incident response cost loss for your portfolio.

Fines

Assume for each of the selected power companies there is an additional cost for statutory fines. If your policy terms for these accounts covers statutory fines, calculate the total losses from fines.

Schedule 4: Statutory fines to be applied to each selected generator

	S1	S2	X1
Fine per selected generator	\$80,000	\$160,000	\$320,000

Defendant companies

Identify all of the companies in your portfolio in each of the three categories in Schedule 5 that you insure for general liability and errors and omissions. Prioritise US companies, but you may include international companies anywhere in the world.

Schedule 5: Types of companies to be selected as defendant companies

Company type	NAICS	SIC	GICS
Category 1 Manufacturers and suppliers of large scale industrial generators	336412 Aircraft engine and Engine parts manufacturing	3600 Electronic and Other electrical equipment	20105010 Industrial conglomerates
Category 2 Suppliers of electrical power generating control systems and industrial control system software	335314 Relays and Industrial Controls	3625 Relays and Industrial Controls	20104010 Electrical Components and Equipment
	541512 Computer Systems Design Services	7373 Computer Integrated Systems Design	45102020 Data processing and Outsourced services
	335999 All other Miscellaneous Electrical Equipment	8742 Management and Consulting Services	20104020 Heavy Electrical Equipment
Category 3 Vendors of security software systems and cyber protection security services	51121001 Software Publishers	7372 Prepackaged Software	45103020 Systems Software

Select the largest account in each of the three categories. Rank the three accounts and select the top two accounts as 'defendant companies' in this scenario.

For each of the two selected 'defendant company' accounts, assume that they are found liable for the following amounts:

Schedule 6: Liability settlements per defendant company

	S1	S2	X1
Liability settlement per defendant company	\$375m	\$400m	\$530m

Apply appropriate deductibles and limits for the liabilities, as per the policy terms for these accounts, and calculate the total liability loss to defendant companies in your portfolio.

Companies that lose power

Perishable contents

Identify accounts in your portfolio that have contents insurance for perishable contents in their property insurance policies, with locations in the geographical region specified in Schedule 1.

Schedule 7: Types of companies to be selected for perishable contents loss

Company type	NAICS	SIC	GICS
Supermarkets	452910 Warehouse clubs and Supercenters	5331 Retail Variety Stores	452910 Warehouse clubs and Supercenters
Food processing companies	311919 Other Snack Food manufacturing	2000 Food and Kindred products	311919 Other Snack Food manufacturing
Distribution warehouses with chilled/frozen food and cold storage units	492110 Couriers and express delivery services	4513 Air Courier Service	492110 Couriers and express delivery services
Medical Laboratories with perishable contents	325412 Pharmaceutical preparation manufacturing	2834 Pharmaceutical preparations	325412 Pharmaceutical preparation manufacturing

Assume that the following proportions of identified accounts in the affected region suffer losses (see Schedule 8). Select a random sample of accounts to represent the relevant proportion, by ranking accounts by size and selecting every *n*th account from the list.

Schedule 8: Proportion of accounts with assumed perishable contents loss

	S1	S2	X1
Proportion of companies with an assumed claim	10% 1 in 10 of accounts	17% 1 in 6 of accounts	25% 1 in 4 of accounts

For each selected company, assume a total loss of any identified cold storage contents scheduled on the insurance policy or \$500,000, whichever is greater. Apply appropriate policy terms, including deductible and limits for these accounts, and calculate the total perishable contents loss for your portfolio.

Contingent Business Interruption - suppliers extension (SE)

Identify accounts in your portfolio that have suppliers extension coverage on their property insurance policies, with locations in the geographical region specified in Schedule 1.

Exclude accounts that use CL380 wording, or that have territorial limits in their terms and conditions.

Rank the selected accounts by size and select the top percentages of accounts as specified in Schedule 9, and assume that they have the specified total number of days interrupted business.

Apply the number of days of interruption to the insured value of business interruption for each account, applying appropriate policy terms, including deductible and limits for these accounts, and calculate the total Suppliers Extension losses for your portfolio.

Schedule 9: Proportion of accounts and business interruption (BI) durations to be assumed for policies with Business Interruption cover in geographical footprint

	Top	Next	Final	Total % of accounts
% of accounts	3%	5%	17%	25%
Days of BI	30	24	15	
% of accounts	5%	7%	23%	35%
Days of BI	34	27	17	
% of accounts	7%	9%	29%	45%
Days of BI	38	30	24	

Liability

Identify accounts in your portfolio that are US companies and that have Directors' and Officers' coverage in their casualty liability policies, with locations or headquarters in the geographical region specified in Schedule 1.

If your policy information does not have sufficient geographical data to determine whether companies are located in the area defined in Schedule 1, then assume that the largest third of all accounts in your portfolio are located in the area of interest.

Select the largest **10%** of accounts for S1, **15%** for S2 and **20%** for X1. Identify *the market capitalisation valuation* of each company.

Assume that each account has a payout for liability equivalent to **10% of their market capitalisation**.

Apply appropriate policy terms, including deductible and limits for these accounts and calculate the total liability loss for companies that lose power in your portfolio.

Companies indirectly affected**Contingent Business Interruption – Critical Vendor coverage**

Identify all companies in your portfolio that have Critical Vendor Coverage in a contingent business interruption sublimit for property insurance

- a) anywhere in the United States;
- b) anywhere in the world.

Select accounts that have a nominated supplier located in Schedule 1.

If there are accounts that do not have a schedule of nominated suppliers or that otherwise do not identify their suppliers, then select the largest one-third of these accounts.

Rank the selected accounts by size and select the top percentages of accounts as specified in Schedule 9, and assume that they have the specified total number of days of interrupted business. Note that the insured's business interruption duration is assumed to be the same as the duration of interruption of the critical vendor.

Apply the number of days of interruption to the insured value of business interruption for each account, applying appropriate policy terms, including deductible and limits for these accounts, and calculate the total Critical Vendor losses for your portfolio.

Liability

Identify accounts in your portfolio that have Directors' and Officers' coverage in their casualty liability policies, anywhere in United States.

Select the largest **2%** of accounts for S1, **4%** for S2 and **7%** for X1. Identify the *market capitalisation valuation* of each company.

Assume that each account has a payout for liability equivalent to **10% of their market capitalisation**.

Apply appropriate policy terms, including deductible and limits for these accounts, and calculate the total liability loss for your portfolio.

Homeowners**Household contents**

Identify the number of homeowner insureds in your portfolio that have contents insurance that covers food spoilage from fridge and freezer defrosting, for example HO-3 home insurance policies, within the geographical location defined in Schedule 1.

Assume that **50%** of them make claims for the maximum limit of their freezer contents cover, or \$700, whichever is greater.

Apply appropriate policy terms, including deductible and limits for claims from these accounts, and calculate the total household contents loss for your portfolio.

Specialty**Event cancellation**

Identify the number of event cancellation policies in your portfolio that cover events within the geographical location defined in Schedule 1 in the month that contains the greatest number of events for the next year.

Rank them by insured value (total compensation if they were to be cancelled).

Assume that the largest **20%** of these events (the top one-fifth of all accounts) are cancelled.

Apply appropriate policy terms, including deductible and limits for claims from these accounts, and calculate the total event cancellation loss for your portfolio.

Total

Total all of the components of loss into a grand total of losses for your portfolio.

