



1

'Safety in Design' at Orion

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Orion New Zealand Ltd

EEA Health and Safety Workshop 2019 - Wellington

31st October 2019

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2

About Orion

- Canterbury based Electricity Distribution Network serving more than 200,000 homes and businesses in remote rural areas, regional towns and city of Christchurch
- Key responsibility to provide a **safe**, resilient, reliable, efficient and sustainable electricity delivery service that benefits long term interests of customers and community

3



3

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4



4

Legislation and Industry Good Practice

- Health and Safety at Work Act 2015 (HASAWA) – greater emphasis on duties of Designer who must now *'so far as is reasonably practicable, ensure that the plant, substance, or structure is designed to be without risks to the health and safety of persons'*
- 2016 – EEA Safety in Design Guide – Good Industry Practice

5

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5

Project Purpose and Key Deliverables

- Development and Implementation of an Orion Safety in Design (SiD) standard and process to incorporate and exceed requirements of HASAWA, EEA Guide and similar industry good practice guides
- Key project deliverables:
 - Closer design collaboration between Orion, Contractors and Design Consultants
 - Improved documentation and communication of design decisions
 - Reduced asset lifecycle costs
 - Promotion of innovative and safe design solutions

6

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6

Change Management Approach

- Change Management Approach to introduce, develop and implement SiD process – ensure and emphasise:
 - ‘Buy-in’ from stakeholders¹, to capture attention and to motivate
 - Stakeholders fully informed of objectives, context and benefits of SiD
 - Significance of SiD
 - ‘Safe Design’ not a new concept, always been an important part of business objectives

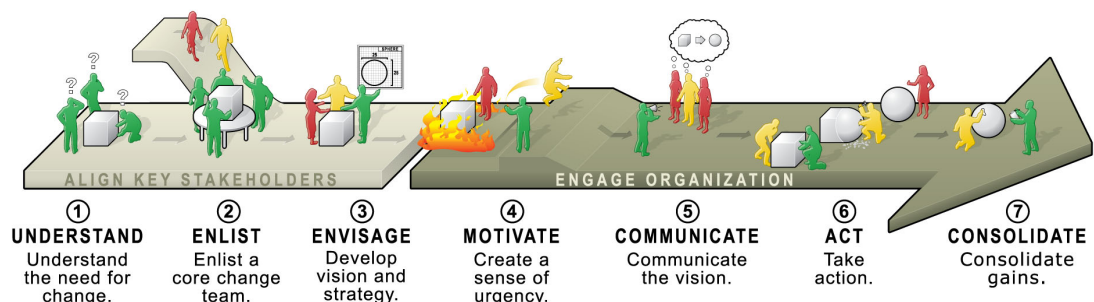
1. Stakeholders include Orion staff, contractors and design consultants

7

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7

Change Management Approach



© ExperiencePoint

8

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8

Change Management Process

- **UNDERSTAND** – need for change
- **ENLIST** – a core change team
- **ENVISAGE** – develop vision and strategy
- **MOTIVATE** and **COMMUNICATE** – create a sense of urgency and communicate
- **ACT** – take action
- **CONSOLIDATE** – gains

9



9

Understand

- Helped stakeholders **UNDERSTAND** the need for a SiD process by way of an open invite to introductory sessions
- Invite extended to Orion staff, contractors and design consultants
- Key themes of introductory sessions:
 - **Meaning and significance of SiD**
 - **Significance of design duties as outlined in HASAWA**
 - **Benefits to be realised from a robust and routinely applied process**
 - **Proposed pathway for change journey ahead**
- Sessions attended by over 70 Orion staff, and 10 key representatives of contractors and design consultants

10



10

Enlist

- Invited a core change team to ENLIST in seven group sessions to brainstorm ideas around SiD
- Participants included 45 Orion staff, and 7 key representatives of contractors and design consultants

11

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11

Envisage

- Primary purposes of brainstorming group sessions to ENVISAGE vision of an Orion SiD process and to develop a strategy
- Enabled by asking 'appreciative enquiry' type questions:
 - **What's currently working? (i.e. learnings from successes)**
 - **What's currently not working? (i.e. identifying weaknesses)**
 - **What would you like to see? (i.e. describe SiD vision)**

12

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12

Envisage

- Recurring responses to questions:
 - *“SiD process should be simple and easy to implement”*
 - *“Contractors and Design Consultants should be able to participate ad-hoc in SiD reviews prior to tendering or contract award”*
 - *“Works designed to approved standard designs should not require a SiD review, unless there is a situational reason to do so”*
 - *“New or modified standard designs should be subject to a SiD review”*
 - *“SiD process should be able to be applied to existing designs and equipment, new equipment and network operational procedures”*
 - *“Network Operators and Controllers should be involved with SiD reviews as early as possible”*

13



13

Motivate and Communicate

- **MOTIVATE** and retain sense of urgency
- Continue to **COMMUNICATE** vision:
 - Regular staff updates on process development
 - Further targeted presentations to teams such as field operators and network controllers
 - Regular discussions around office

14



14

Act

- SiD standard drafted in mid-2017
- Communicated to stakeholders via email and intranet
- Invitation to provide feedback:
 - Received from Orion staff, and external contractors and design consultants
- 1st Edition of standard implemented into business processes in December 2017

15

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15

Consolidate

- Presentations to Executive Management team
- Significant change to Auto Reclosing practices
- Reviews of legacy and contemporary switchgear types
- Reviews of 'non-network' equipment such as vehicles and trailers
- Conceptual stage reviews
- Dedicated resource in engineering team
- Integration into AMP objectives
- High level of stakeholder participation and engagement
- Increased understanding of risk based approach to design

16

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16

Orion Design Hazard Assessment Register (HAZID)										Prepared By: A Reid		Date: 11/05/2018	
Project: Application of Motorised Disconnectors & Earth Switches										Reviewed By: SID Review Group			
HAZID Phase: All													
Identified Hazards, Causes & Risks Associated with Design/Redesign of New or existing Assets and/or Introduction of New Asset Types, or a change to the Operating Conditions of Assets					Proposed Risk Treatment/Mitigation Measures & Residual Risk Ratings					Notes to Residual Risk (Which Must be 30 Far As is Reasonably Practicable and Manageable)			
ID	Risk Hazard & Cause - Inherent & Without Any Form of Mitigation	Inherent Consequence	Inherent Likelihood	Inherent Risk Rating	Risk Owner	Proposed Mitigation (Eliminate or Reduce/Control), Include Existing & Proposed Mitigation Measures	Revised Consequence	Revised Likelihood	Residual Risk Rating	Estimated Cost of Mitigation (£)	Cost of Mitigation Disproportionate to Risk?	Risk Owner	Notes to Residual Risk
A - Planning & Conceptual Design													
A1	"ADD MORE RISK AS REQUIRED"												
A2	"ADD MORE RISK AS REQUIRED"												
B - Detailed Design, Installation & Commissioning													
B1	Manual Operation of 6.6 kV disconnectors & earth switches (including remote operation) causing electrical flash - Major to Operator	Severe	Unlikely	Medium	Ordn	Use motorised disconnectors & earth switches that can be operated from a remote location i.e. suitable for remote operation	LIMITED	LIMITED	LIMITED	<£1000 pa	No	Ordn	Risk ELIMINATED (for the disconnector or earth switch in question at the particular site in question) by Motorised Remote Control
B2	Inadvertent Manual Operation of 6.6 kV disconnectors into drawn from connected state i.e. significant risk of significant capacitance from remote loads causing inrush and/or equipment failure - Major to Operator	Severe	Possible	High	Ordn	Use motorised disconnectors that can be operated from a remote location in a substation control room or via SCADA. Design and implement as far as is reasonably practicable electrical and/or mechanical interlocks and operational procedures that prevent the possibility of closing disconnectors when system conditions present the risk of inrush current	LIMITED	LIMITED	LIMITED	<£1000 pa	No	Ordn	Risk ELIMINATED (for the disconnector in question at the particular site in question) by Motorised Remote Control, incorporating where practicable and Operational Procedures
B3	Inadvertent closure of earth switches in bus - Major to Safety of Operator	Major	Unlikely	High	Ordn	Use motorised remote control earth switches where practicable. Design and implement electrical and/or mechanical interlocks and operational procedures that prevent the risk of inrush current	LIMITED	LIMITED	LIMITED	<£1000 pa	No	Ordn	Risk ELIMINATED (for the earth switch in question at the particular site in question) by Motorised Remote Control, incorporating where practicable and Operational Procedures
B4	Inadvertent remote operation (either via the protection in the substation or via a remote command from SCADA) of motorised disconnectors or earth switches during maintenance or working on energised equipment - Injury or Fatality to Personnel	Major	Rare	High	Ordn	Design and implement electrical and/or mechanical interlocks and operational procedures that prevent remote operation of disconnectors and earth switches when they are being maintained or used for isolation purposes. Prevent use of remote SCADA operation for earth switches, unless it is not an integral part of the main switching (i.e. a safety related measure). Reinforce operation of earth switches from protection relay in the substation	LIMITED	LIMITED	LIMITED	-	No	Ordn	Risk ELIMINATED (for the disconnector or earth switch in question) by designing interlocks that prevent remote operation of motors during maintenance or when switch used for isolation purposes
B5	"ADD MORE RISK AS REQUIRED"												
C - Construction & Commissioning													
C1	"ADD MORE RISK AS REQUIRED"												
C2	"ADD MORE RISK AS REQUIRED"												
D - Operation & Maintenance													
D1	"ADD MORE RISK AS REQUIRED"												
D2	"ADD MORE RISK AS REQUIRED"												
E - Decommission & Disposal													
E1	"ADD MORE RISK AS REQUIRED"												
E2	"ADD MORE RISK AS REQUIRED"												
Notes: - Use this space to describe the Project and further information that cannot be described in the hazards above, and any other information that is important to document as part of the safety in Design assessment													
Review Group Members: (Name, Role in Estimate, ID, Review Group Participation)													
Technical Manager:													
Technical Engineer:													
Asset Manager:													
Backlog Manager:													
1 ISSUED													

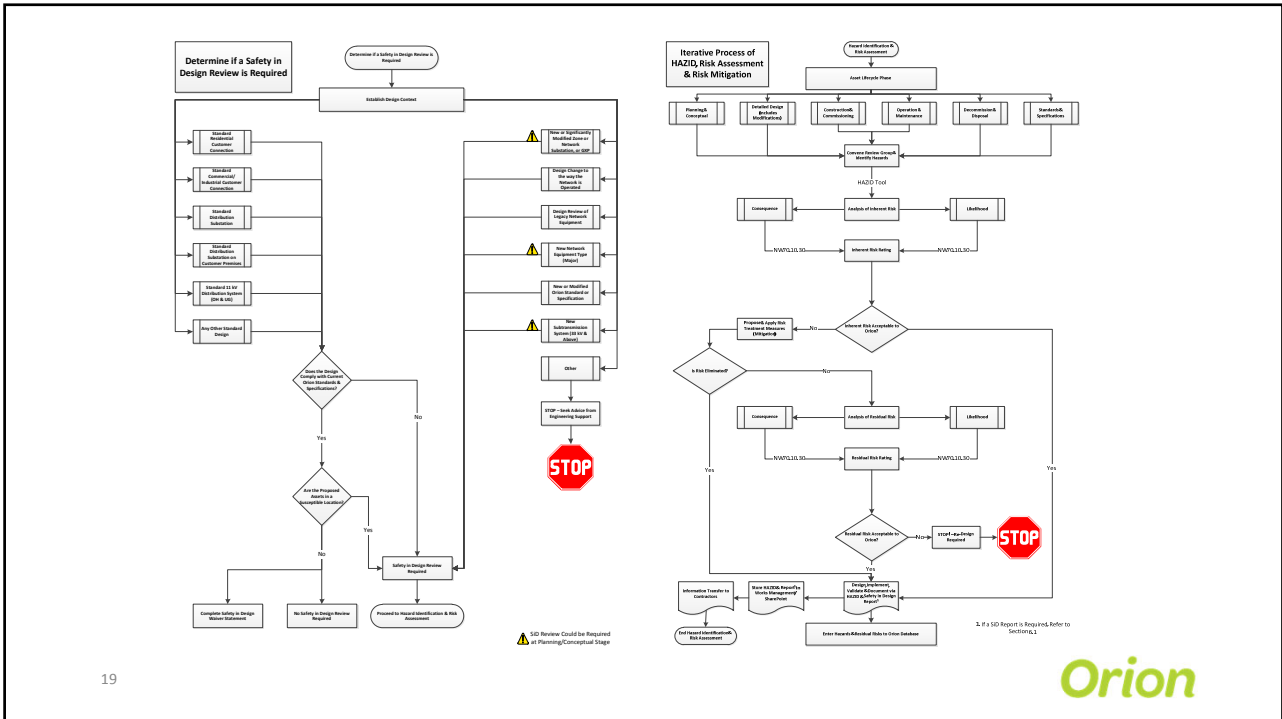




SAFETY IN DESIGN

INFRASTRUCTURE MANAGEMENT
ELECTRICITY NETWORK DESIGN STANDARD
NW70.50.07
AMENDMENT 0





19

Safety in Design Example – Auto Reclosing

- SiD review of Orion’s Auto Reclosing practices
- 20 hazards identified and risk assessed, 7 significantly reduced and eliminated

Likelihood	Almost Certain	High	High	Very High	Extreme	Extreme
	Likely	Medium	High	Very High	Very High	Extreme
	Possible	Low	Medium	High	Very High	Very High
	Unlikely	Low	Medium	Medium	High	Very High
	Rare	Low	Low	Medium	High	Very High
		Minor	Moderate	Serious	Major	Severe
		Consequence				

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20

20

Safety in Design Example – Auto Reclosing

- Significant risk mitigation realised by implementation of 2 key mitigation measures:
 - **Reduction in Reclose Shot Count¹ to 1**
 - **Reduction in Dead Time² to a maximum of 2 Seconds**
- Mitigation implemented with no reliability impact

1. *Number of Auto Close Attempts following a Protection Trip*

2. *Time between Protection Trip and Auto Close Command*

21

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21

Safety in Design Example – Protection System

- Significant expenditure on innovative special protection systems that have theoretical risk mitigation potential
- SiD determined that the ‘introduced’ risks;
 - Exceeded the risk mitigation potential
 - Could not be mitigated practicably
- Systems have subsequently been decommissioned as a direct result of SiD review

22

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22

Summary

- Successful development and implementation of business wide SiD standard using a change management process
- Standard and process follows good industry practice and EEA Guide
- Inclusive development of standard via positive and engaging collaboration between stakeholders
- Use of appreciative inquiry and brainstorming techniques
- Process successfully applied to numerous projects and procedures
- Example of significant risk mitigation achieved by changing auto reclose procedures

23

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23

Questions?

24

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24



25