Why should I get an **Arc Flash Study** done and what does it involve?

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FLEXIBILITY | DILIGENCE | COST EFFECTIVENESS

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ISO 9001 | ISO 14001 | ISO 45001

Achilles FPAL Verified

PLEASE NOTE: This webinar will be recorded

- The recording will start when we switch to the next slide
- All attendees are **on mute**, therefore your voice won't be recorded.
- After the webinar the recording will be stopped and you will have the opportunity to ask questions through the 'chat box'
- You can also use the chat function at any time to direct questions, which will be covered at the end of the presentation
- Thank you for attending and we hope you find this presentation informative and useful
- Following this presentation please feel welcome to contact me – clive.sury@reecesfety.co.uk – to discuss any requirements you have

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Introduction

- Why do an arc flash study
- What will it tell you
- How to do a study

Overview of Arc Flash

Inadvertent contact
between
live conductors

Explosion

Impact on Plant Impact on Production **Impact on Personnel** Impact on Owner Impact on Employer

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Image from: https://www.creativesafetysupply.com/articles/arc-flash/

Arc Flash Vs Electric Shock

Electric Shock

- Higher likelihood
- Lower consequences
- **Well** understood and managed

Arc Flash

- Lower likelihood
- Higher consequences
- **Poorly** understood and managed

Both hazards should be considered as part of a
Health and Safety Management System

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Arc Flash = hazard

Arc Flash is “just” another hazard.

Employer has a **legal obligation** to identify and manage hazards.

Demonstrate managed hazards through risk assessment.

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Risk Assess Arc Flash

Determine through an **Arc Flash Study**

Determine through other assessment

Use this to inform Safety Policy

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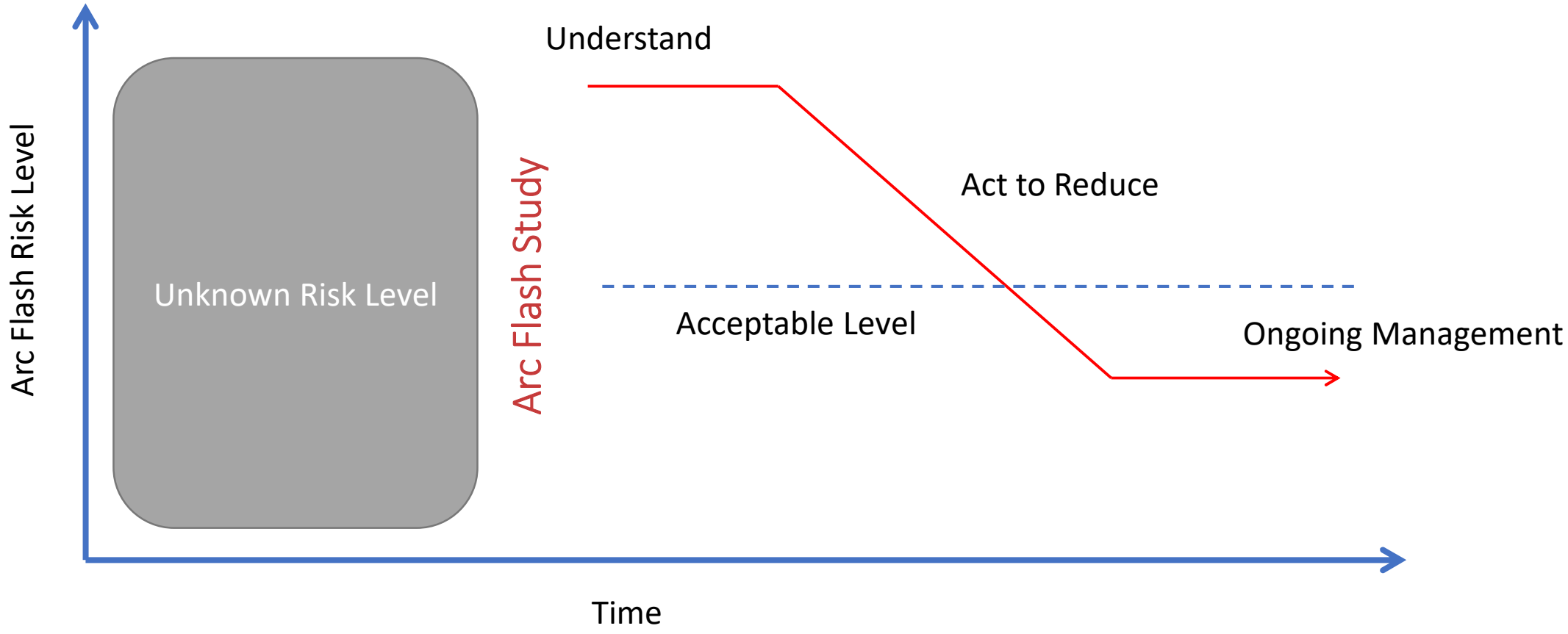
Arc Flash Risk Management



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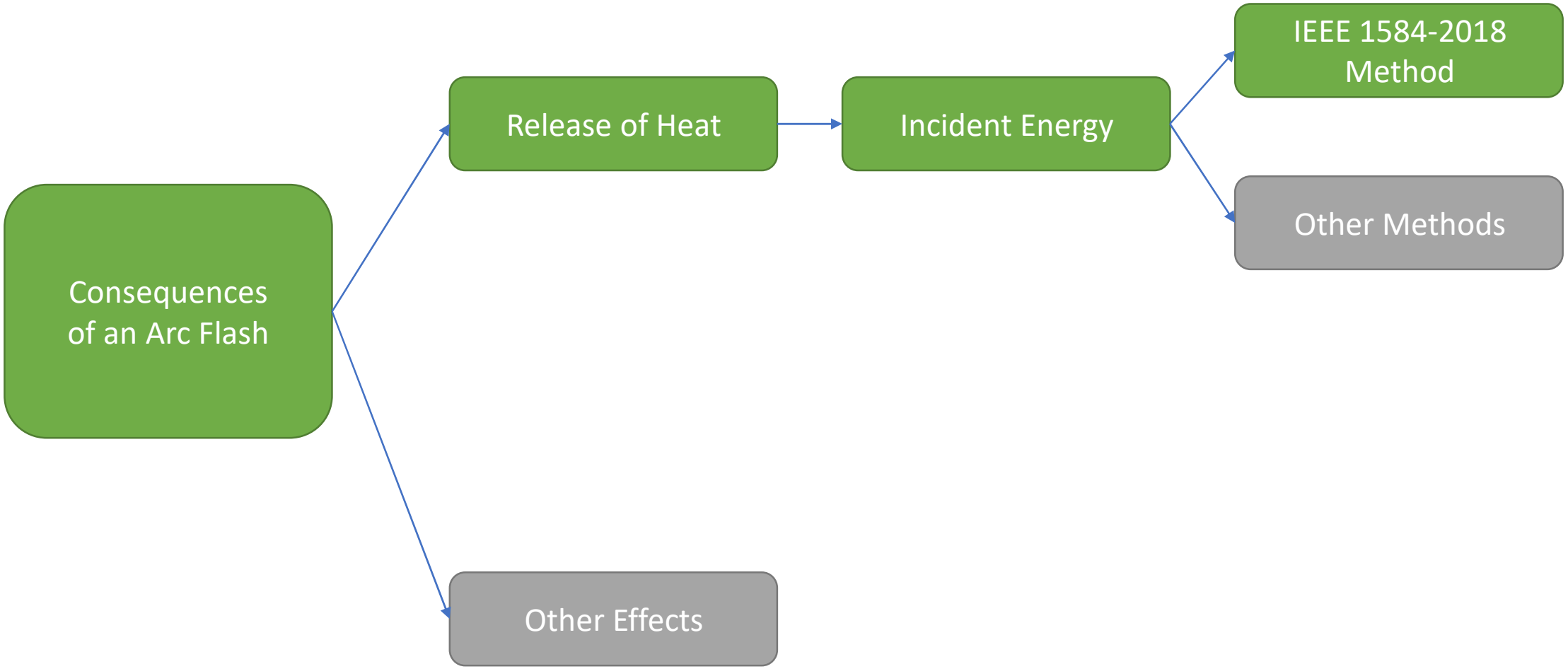
Limitations of an Arc Flash Study



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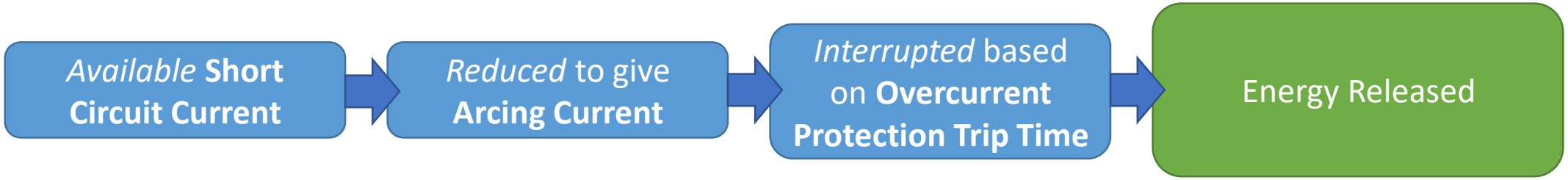
Arc Flash Study Basics – IEEE 1584 Method



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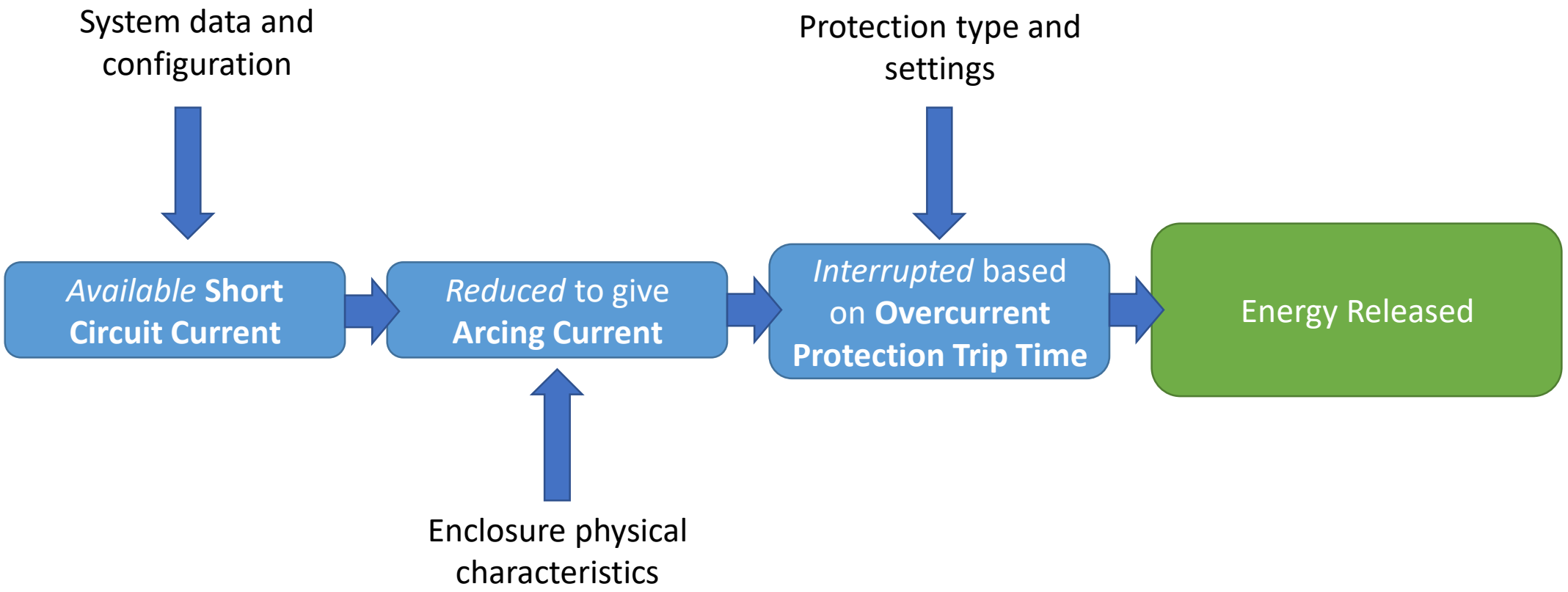

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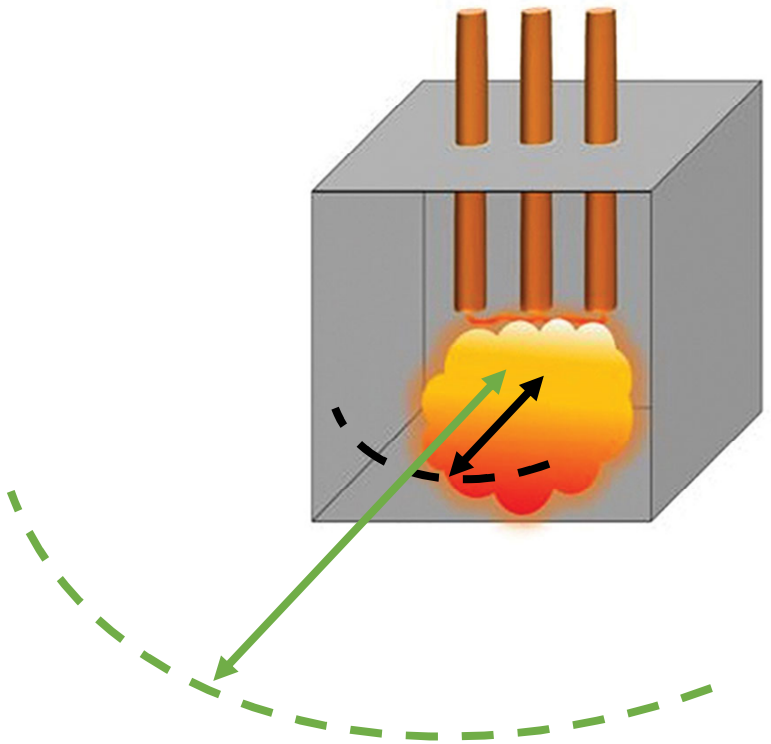
Arc Flash Study Outputs

Incident Energy is the **heat energy** **in cal/cm²** at the **working distance** experienced by a person over the **duration of the event**

Arc Flash Boundary is the **distance** from the arc at which the energy **reduces to 1.2 cal/cm²**



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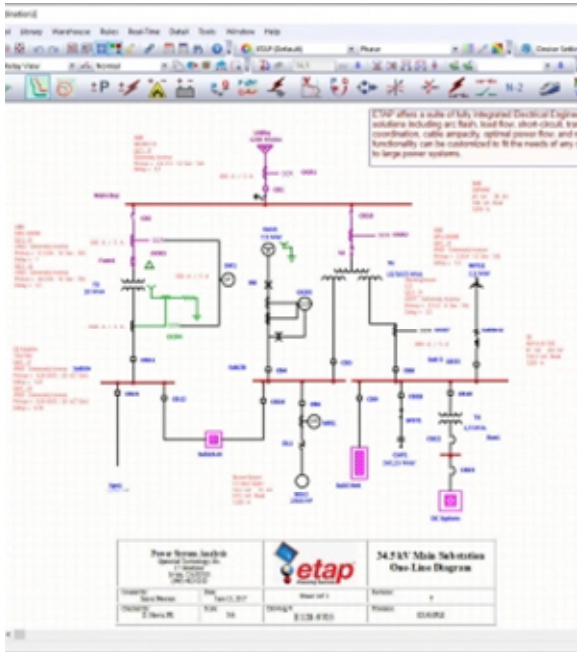
Options for Arc Flash Study

By Hand?

With Excel?

Arc Flash Calculator (IEEE 1584: 2018) for 0.6kV<Voc<15kV			
Plant	NSP	**Iarc**	13.84 kA
Switchboard	04-1	**IE**	8.62 cal/cm2
Arc Flash Study Scenario	AF1	**AFB**	3.212 m
Input Data			
Three-Phase Switchboard Voltage	Voc	11	kV rms
Three-Phase Bolted Fault Current at Switchboard	Ibf	15.19	kA sym rms
Electrode Configuration		VCB	
Gap Between Electrodes	G	152	mm
Working Distance	D	914.4	mm
Enclosure Width	W	762	mm
Enclosure Height	H	1143	mm
Enclosure Depth	L	762	mm
Arcing Currents			
Iarc at 600V	10.909	kA	
Iarc at 2700V	12.857	kA	
Iarc at 14300V	14.234	kA	
Iarc_1	20.557	kA	
Iarc_2	13.842	kA	
Iarc_3	-12.698	kA	
Final Arcing Current	**13.842**	**kA**	
Trip Time at Arcing Current	**516.000**	**ms**	
Size Correction Factor			
Enclosure Type	Typical		
Equivalent Width	29		
Equivalent Height	45		
Equivalent Enclosure Size	37		
Correction Factor	1.292		
Incident Energy Calculation			
IE_600V	25.212	j/cm2	
IE_2700V	33.061	j/cm2	
IE_14300V	36.904	j/cm2	

With Power Analysis Software?



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Power System Analysis Benefits

- Load Flows
- Short Circuit
- Motor Starting
- Arc Flash
- Harmonics
- Complex Networks
- Multiple Operating Scenarios
- Protection Settings and TCCs
- Equipment Changes
- Network Expansion

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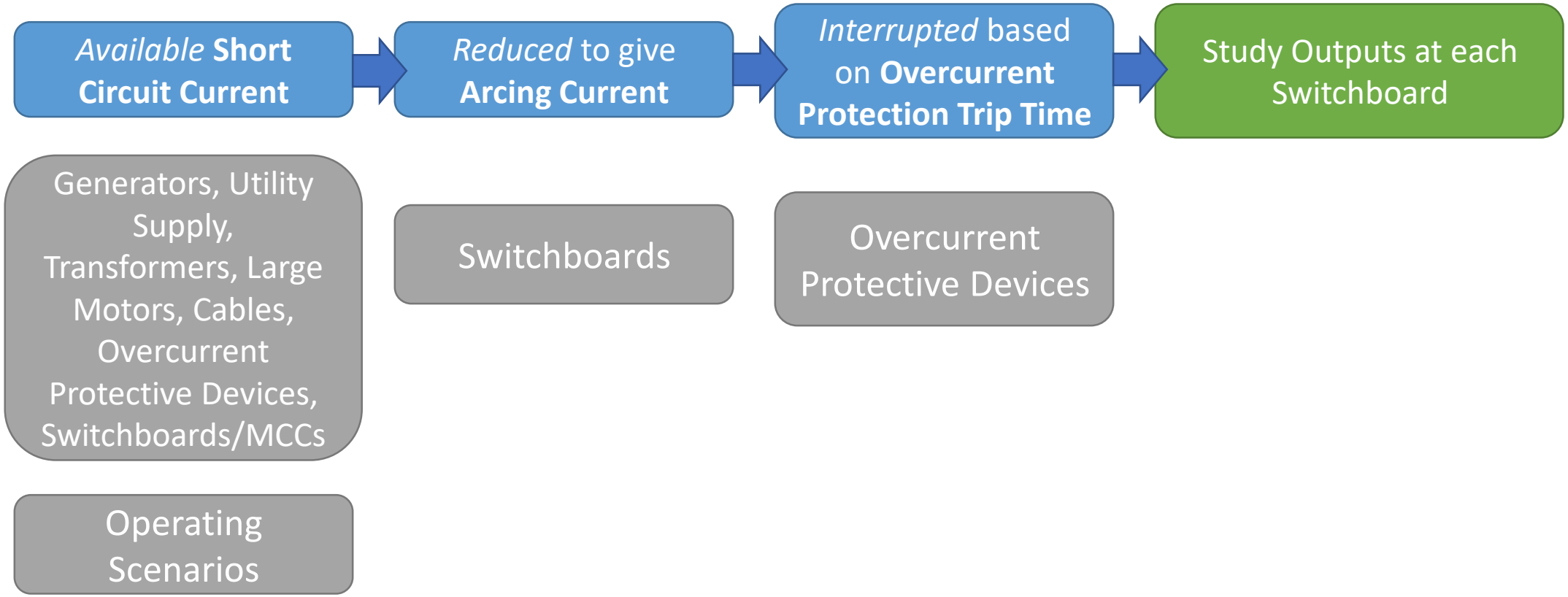
Typical Inputs to a Study



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Video Demonstration

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Study Results

	Normal Operation	Emergency Operation
Main Switchboard	**15 cal/cm²**	N/A
Emergency Switchboard	8 cal/cm²	**45 cal/cm²**
Production MCC	8 cal/cm²	N/A
Utilities MCC	**20 cal/cm²**	N/A
Emergency MCC	6 cal/cm²	**65 cal/cm²**

	Normal Operation	Emergency Operation
Main Switchboard	**2 m**	N/A
Emergency Switchboard	1.5 m	**5 m**
Production MCC	1.5 m	N/A
Utilities MCC	**2.5 m**	N/A
Emergency MCC	1 m	**8 m**

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Using Arc Flash Study Results

Establish a threshold Incident Energy level

Below Threshold

Determine risk

Manage with training, task specific risk assessments and PPE

Above Threshold

Determine risk

Apply **hierarchy of controls** to reduce the Incident Energy.

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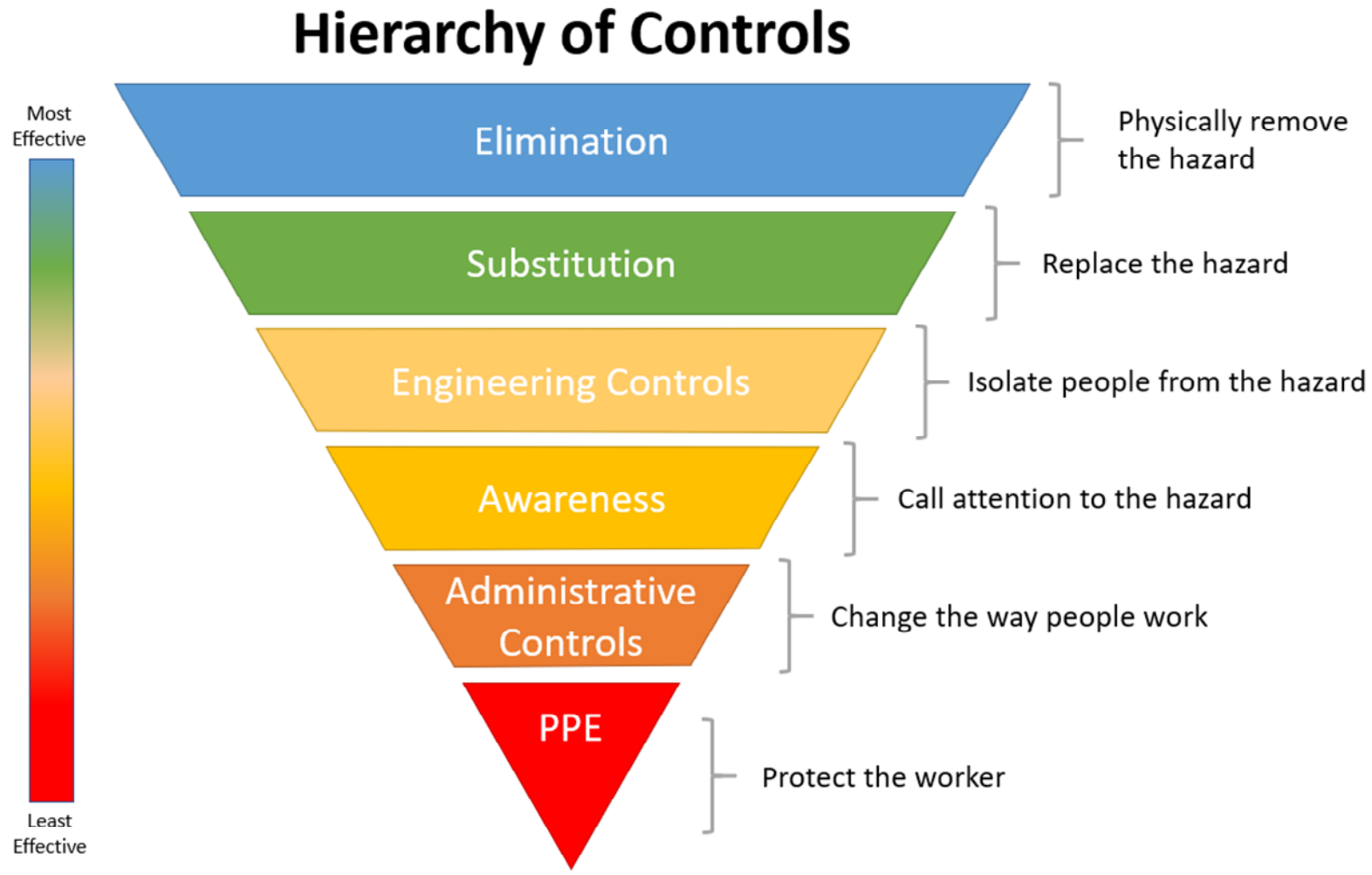
Controlling the Hazard



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Using Study Results

Adopt 12 cal/cm^2 PPE across site for all work in switchrooms

Install an arc detection system to lower Incident Energy

No action – no personnel in switchroom during Em Ops

	Normal Operation	Emergency Operation
Main Switchboard	**15 cal/cm^2**	N/A
Emergency Switchboard	8 cal/cm^2	**45 cal/cm^2**
Production MCC	8 cal/cm^2	N/A
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Reduce upstream protection trip times to lower Incident Energy

Typically few activities – retrofit upstream protection with Maintenance Mode

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Electrical Safety Programme

Arc Flash Safety in your ESP might include:

- Arc Flash labelling
- Inclusion in task risk assessments
- Education and training of electrical & non-electrical personnel
- Changes to operational procedures
- Mandatory minimum PPE
- Supplemental PPE for specific tasks/equipment

Summary

The hazard posed by Arc Flash should be recognised and managed just like any other hazard.

An Arc Flash study will give you quantifiable information about the arc flash risk at your site.

The results should be used to inform and develop an appropriate strategy for managing arc flash risk as part of your existing H&S systems.

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Standard Service Levels

Profile 1:

Simple network & scenarios

System data readily available & supplied by Client

Basic arc flash results

Profile 2:

Moderate network & scenarios

Data gathering included

More work beyond the basic study results

Profile 3:

Complex network that may be poorly documented

Full modelling and study work

Complete arc flash hazard management programme

Level A

Lowest cost option

Minimal outputs

Typical Duration: 4-6 weeks

Level B

Optimal value for newer sites

Option for verification survey

Typical Duration: 8-12 weeks

Level C

Most complete solution

Supported at each stage

Typical Duration: 3 to 6 months

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Questions?

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Arc Flash Services

- Data Gathering and Site Surveys
- Power System Modelling
- Arc Flash Energy Calculations
- Arc Flash Risk Assessments
- Arc Flash Hazard Reduction Studies
- Arc Flash Warning Labels & Drawings
- Risk Assessment Materials
- Arc Flash Training and Awareness Materials
- Selection and Supply of PPE

Find out more at:
katoni.com/services/Arc-flash