VOLTAGE DIP IMMUNITY
CLASSES AND APPLICATIONS

Presented by:

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Introduction of voltage dip immunity labels

• Facilitate the communication and exchange of information
• Advice on what steps to take to ensure that process is not adversely affected by voltage dips
• Allow equipment manufacturers to report dip immunity of their equipment using only a few key test points
Immunity classes and applications

• Classification of equipment dip immunity and equipment behaviour: \textit{Voltage dip immunity labels}
  – Classification of equipment dip immunity
  – Equipment Performance Criteria

• \textit{Assessment and improvement} of process dip immunity
Voltage dip immunity labels

1. What degree/level of equipment dip immunity is required?
   • Introducing equipment dip immunity classes

2. What is the required behaviour of equipment during and after a voltage dip?
   • Equipment performance criteria
Classification of equipment dip immunity

- 5 Classes are introduced
  - Class A - highest level of equipment immunity
  - Class B - good level of equipment immunity
  - Class C1 - reasonable level of equipment immunity
  - Class C2 - similar to class C1, take into account certain nominal voltage levels
  - Class D - basic level of equipment dip immunity
Class A

Class A specification of equipment dip immunity against type I + II dips
Class A specification of equipment dip immunity against type III dips
Class B

Class B specification of equipment dip immunity against type I + II dips

Class B specification of equipment dip immunity against type III dips
Class C1

Class C1 specification of equipment dip immunity against type I + II dips

Class C1 specification of equipment dip immunity against type III dips
Class C2 specification of equipment dip immunity against type I + II dips

Class C2 specification of equipment dip immunity against type III dips
Class D

Class D specification of equipment dip immunity against type I + II dips

Class D specification of equipment dip immunity against type III dips
Potential number of trips

Exposure to dips for the site

Class A
Class B
Class C
Class D

Potential number of trips
Class A specification of equipment dip immunity against type III dips

Country MANY Company MANY→ 1-500 kV (grouped, p2p incl. cumulative)
#sites 847, #dips 11650, percentile 95%, type III

≤4,5 / year

3,5 – 1 + 1,5 – 0,5 + 1 = 4,5

CP95
Equipment Performance Criteria

- Full (normal) operation
- Self-recovery
- Assisted-recovery
Voltage dip immunity labels

<table>
<thead>
<tr>
<th>Immunity class</th>
<th>Voltage dip immunity label</th>
<th>Equipment performance criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Full operation</td>
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<tr>
<td></td>
<td>A</td>
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<td>C1</td>
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<td>C2</td>
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<td>D</td>
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Prague, 8-11 June 2009

**Class D**

As proposed by CIGRE-CIRED-UIE Joint Working Group C4.1.10

**Equipment Immunity Specification**

**Voltage dip immunity Class D**

**Class D curve for type I + II**

**Class D curve for type III**

<table>
<thead>
<tr>
<th>Voltage dip immunity label</th>
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<tr>
<td>Immunity class</td>
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<tr>
<th>Testing Procedure Requirements</th>
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<tr>
<td>Testing for Type I and II voltage dip required:</td>
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<tr>
<td>- 80% for 3 seconds</td>
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<tr>
<td>- 70% for 500 milliseconds</td>
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<tr>
<td>(Testing methods shall be according to IEC-61000-4-11 &amp; IEC-61000-4-34)</td>
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<tr>
<td>Testing for Type III voltage dip required:</td>
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<tr>
<td>- 80% for 3 seconds</td>
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<td>- 70% for 200 milliseconds</td>
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PIT = ____________

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Assessment and improvement of process dip immunity

- **STEP 1**: Supply dip performance
- **STEP 2**: Process performance requirement
- **STEP 3**: Process immunity requirement
- **STEP 4**: Process immunity time (PIT)
- **STEP 5**: Equipment performance requirement
- **STEP 6**: Selection of equipment or mitigation devices/measures
Supply performance

Process performance requirement

Process immunity time

Process immunity requirement

Equipment performance requirement

Equipment selection or selection of other mitigation methods
CONCLUSION

• LABEL
  – Classification
  – Performance criterion

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• DESIGN METHOD

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