**SPECIFYING LIGHTNING ARRESTER FOR SUBSTATIONS**

Based on IEEE C62.22 Standard

### STEP 1 - DISCHARGE VOLTAGE & MCOV

**SUBSTATION OR EQUIPMENT BIL**

Pick arrester with discharge or residual voltage rating below this limit

**MAXIMUM VOLTAGE (PH-G)**

**NOMINAL VOLTAGE (PH-G)**

#### EXAMPLE

Substation BIL: 650kV  
Nominal Voltage: 138kV Ph-Ph  
Grounding: Low impedance

Specify arrester using below table

#### MCOV Calculations

- **Maximum voltage (PH-PH):** $138 \times 1.05 = 145kV$
- **Maximum voltage (PH - G):** $145/\sqrt{3} \approx 84kV$

Choose MCOV $\geq 84kV$

#### Discharge voltage calculations

- Removing 20% from 650 yields - 520kV BIL

Choose discharge voltage $\leq 520kV$

Using table, an adequate arrester has 86kV MCOV and 280kV discharge voltage @10kA

### STEP 2 - TOV & ENERGY CLASS

**SYSTEM OR EQUIPMENT BIL**

Pick arrester **TOV** rating above this limit

**TEMPORARY OVERVOLTAGE**

**MAXIMUM VOLTAGE (PH-G)**

**NOMINAL VOLTAGE (PH-G)**

#### TEMPORARY OVERVOLTAGE

Multiply maximum voltage (Ph-G) with multipliers that match your system neutral grounding.

- 4-Wire multi-grounded system 1.25 x
- 3-Wire/4-wire source grounded 1.4 x
- High impedance grounded 1.73 x
- Delta or ungrounded 1.73 x

#### ENERGY CLASS

During arrester operation, primarily due to a switching surge, the surge current generates heat. If the heat produced > heat dissipated, even after system restoration, the arrester fails.

IEEE C62.11 defines classes A thru N, with N having the highest energy rating.

Are you installing arresters at a location with excessive switching operation? Specify one with a higher energy class.

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