

Power Quality

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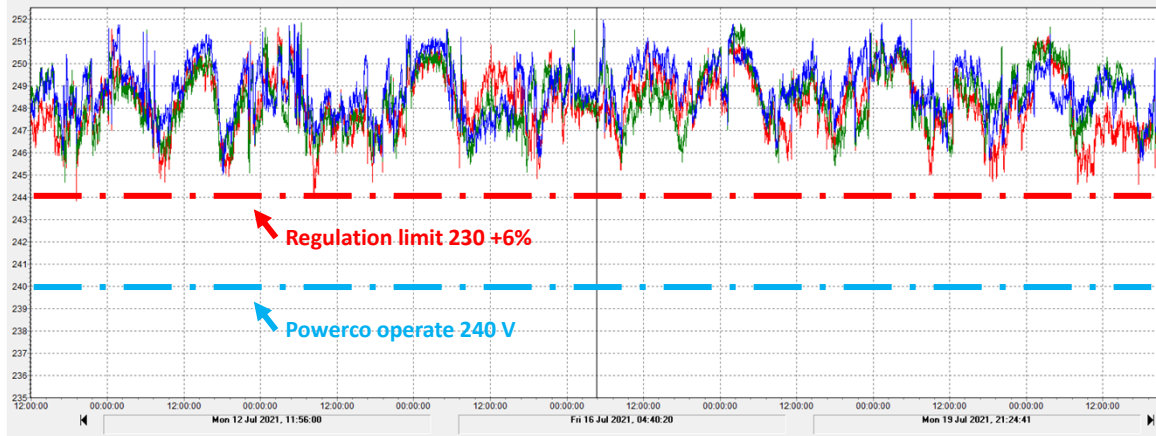
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Agenda

1. LV overvoltage
2. Harmonics
3. Light flicker
4. Motor shorting
5. PQ monitoring of the Kapuni 11kV DG site

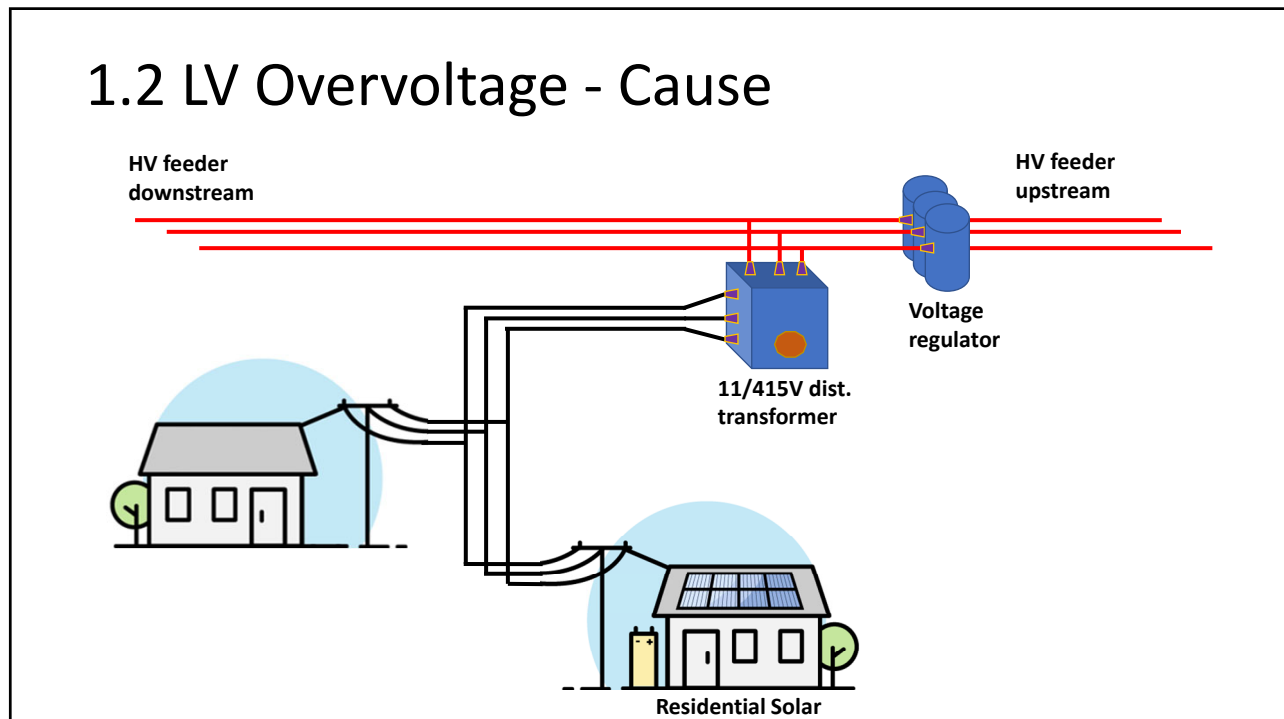
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1.1 LV Overvoltage – Waveform



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1.2 LV Overvoltage - Cause



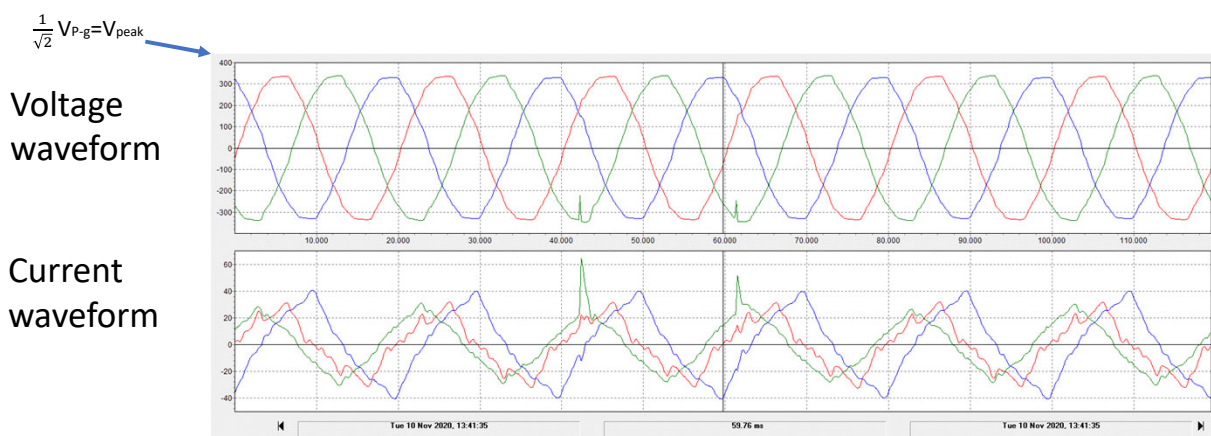
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1.3 Overvoltage - Solutions

- 1) Apply Line drop compensation at the voltage regulator
- 2) Perform tap change (tap up) on (or all) concerning dist. transformer
- 3) Check Volt-var, volt-watt setting on solar inverter is active

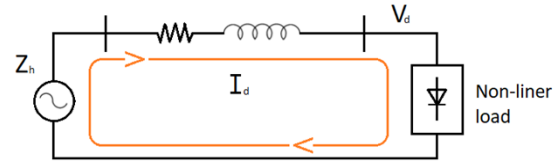
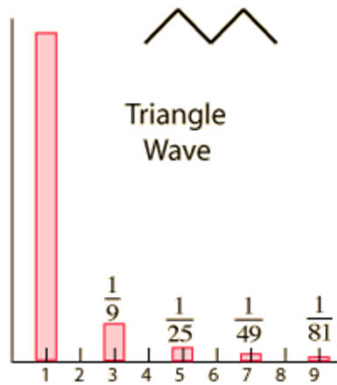
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2.1 Harmonics – Waveform



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2.2 Harmonics – Cause

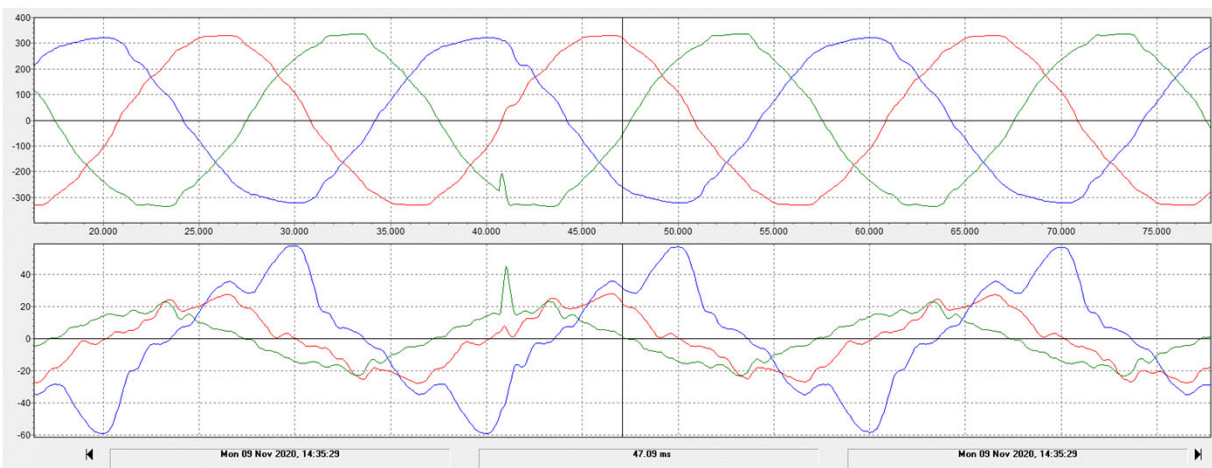


- Z_h (system impedance) = $Z_1 + Z_2 + Z_3 + Z_n$
- V_d (voltage distortion) = $V_1 + V_2 + V_3 + V_n$
- I_d (current distortion) = $I_1 + I_2 + I_3 + I_n$

$$V_d = I_d Z_h$$

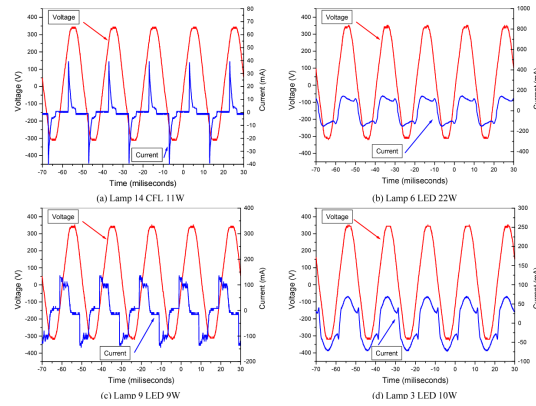
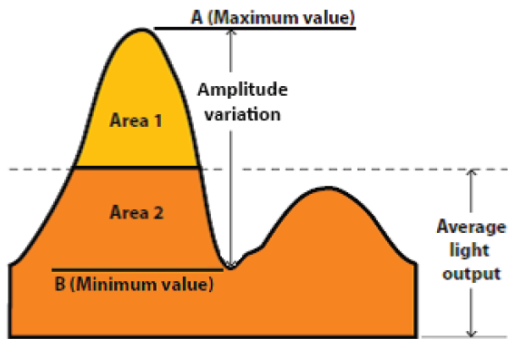
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3.1 Light Flicker – Waveform



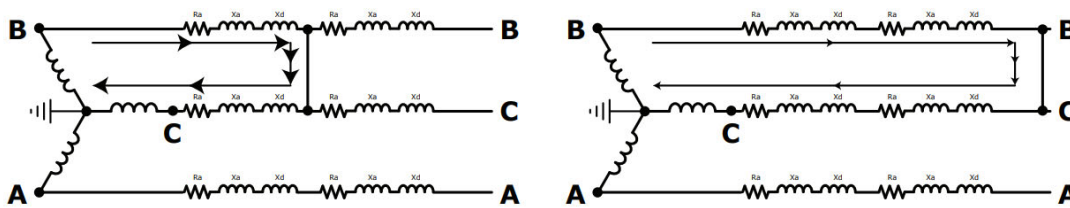
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3.2 Light Flicker – Cause



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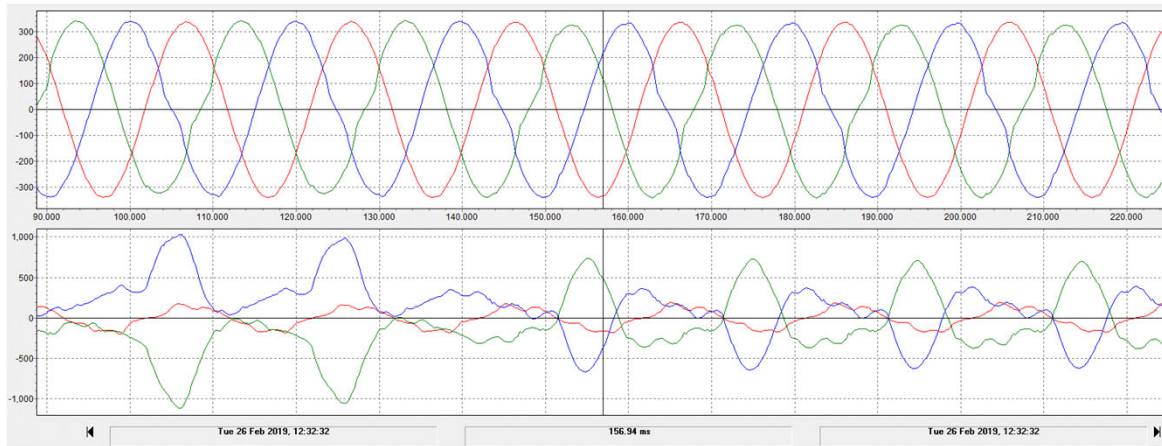
4.1 – Quick Intro to 2-Phase Faults



- 0 Q r }hur 0vhtxhqfh fxuuhqw
- 0 Srvlyh0vhtxhqfh fxuuhqw@ qhjdwlyh0vhtxhqfh fxuuhqw
- 0 E skdvh fxuuhqwihhg wkh idxow@ F skdvh Fxuuhqwidxowuhwuxj s dwk

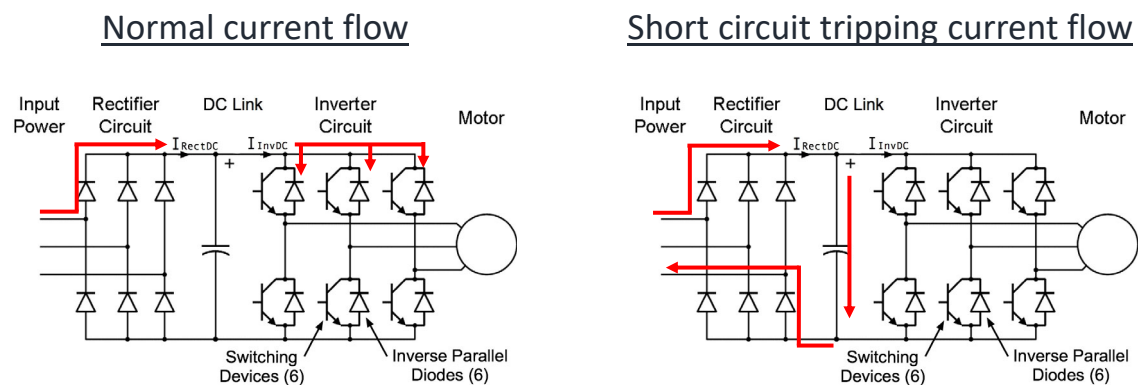
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4.2 Motor Shorting - Waveform



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4.3 Motor Shorting - Cause



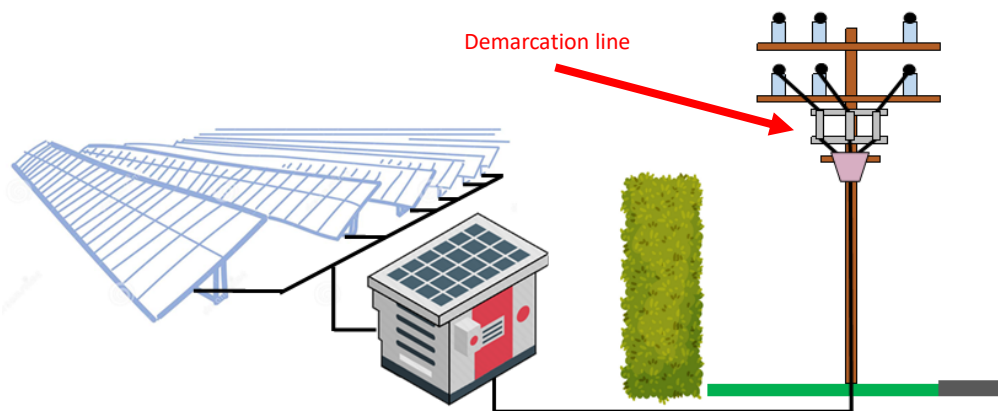
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Kapuni Solar Plant PQ Monitoring Project



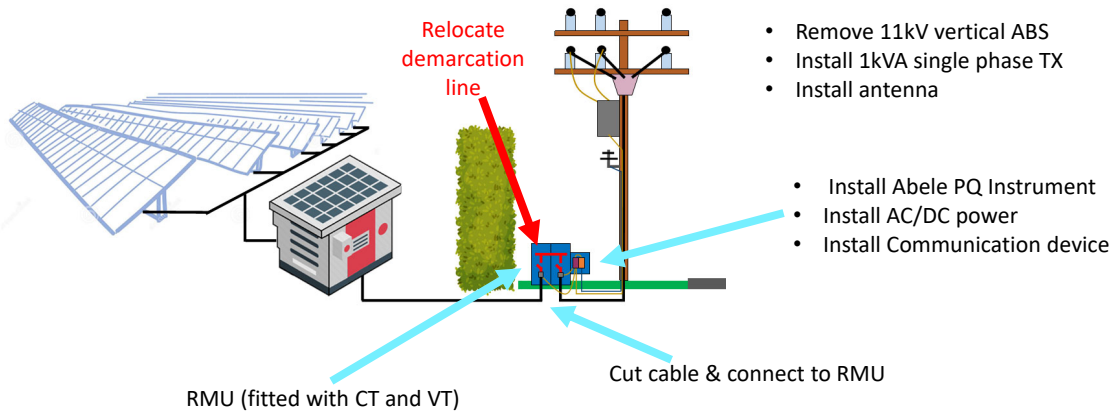
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5.1 Present Solar Plant Connection to Network



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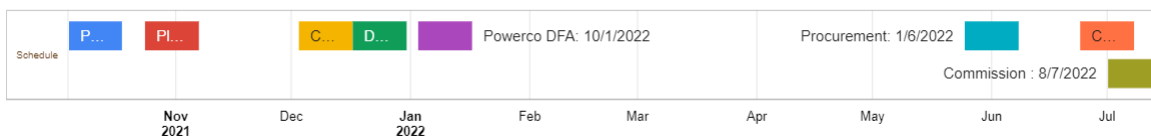
5.2 Proposed Network Change



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5.3 Project Cost and Timeline

8DJH RR RMU unit cost, with CT and VT	\$41,470.00
A-Eberle PQ-DE monitoring instrument	\$4630.00
RMU Installation cost	\$20,000.00
1kVA single phase TX:	\$1,500.00
DC Supply Power converter	\$500.00
Moxa 3120 communication device	\$2,000.00
Pole modification works	\$18,000.00
Expected Cost	\$88,100.00



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Questions