

Reference list

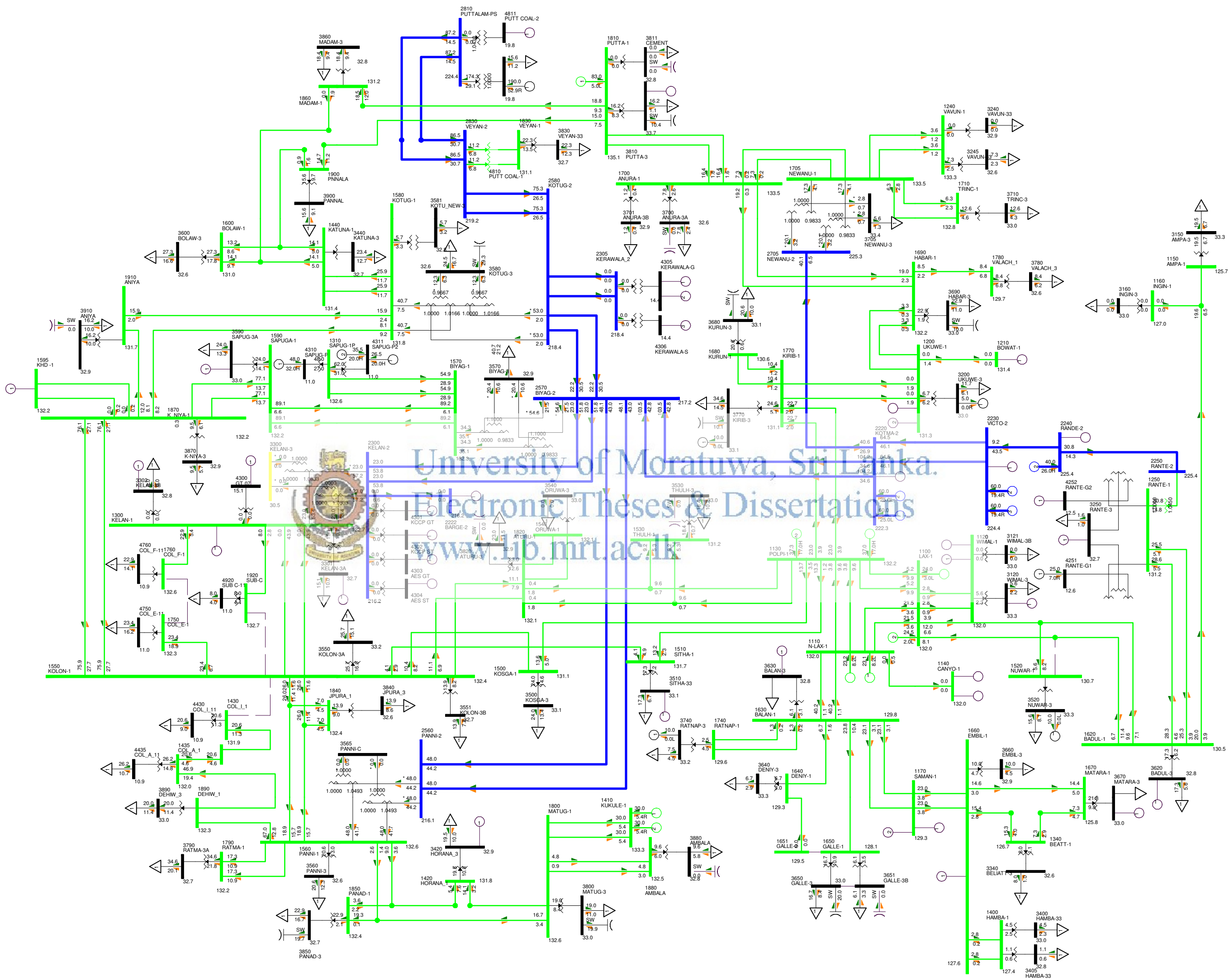
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Appendix A: Load Flow Network Diagram of HMOP condition



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Present Transmission Network

Bus - VOLTAGE (kV)
 Branch - MW/Mvar
 Equipment - MW/Mvar
 100.0% RATE
 1.000000 / 0.000000
 kV <- 60.000 << 120.000 <<< 200.000 >>> 200.000

Appendix B: Dispatch Scenario during HMOP Condition

Machine	ID	MW
O/LAX-I	1	24
O/LAX-II	2	24.5
N-LAX-1	1	23.1432
N-LAX-1	2	23.2156
WIMAL-1	1	25
WIMAL-1	2	0
POLPI-1	1	37
POLPI-1	2	37.3
CANYO-1	1	30
CANYO-1	2	0
SAMAN-1	1	60
SAMAN-1	2	0
UKUWE-1	1	18
UKUWE-1	2	0
BOWAT-1	1	11
KELAN-1	1	0
KUKULE-1	1	30
KUKULE-1	2	30
KHD -1	1	46
EMBIL-1	1	40
PUTTA-1	1	83
KOTMA-2	1	0
KOTMA-2	2	60
KOTMA-2	3	60
BARGE-2	1	60.4
VICTO-2	1	0
VICTO-2	2	60
VICTO-2	3	60
RANDE-2	1	0
RANDE-2	2	40
RANTE-G1	1	25
RANTE-G2	1	0
GT 07	1	0
KCCP GT	1	0
KCCP ST	1	0
AES GT	1	0
AES ST	1	0
KERAWALA-G	1	81.3
KERAWALA-G	2	50
KERAWALA-S	3	90
SAPUG-P	1	48
SAPUG-P2	1	26.5
SAPUG-P2	2	35.5
PUTT COAL-1	1	190
Total		952.1588

Appendix C: Technical Details of Load Shedding relay

4 Technical Data

4.13 Frequency Protection 81 O/U

Setting Ranges / Increments

Number of Frequency Elements	4; each can be set $f>$ or $f<$	
Pickup Frequency $f>$ or $f<$ with $f_{Nom} = 50$ Hz	45.50 Hz to 54.50 Hz	Increments 0.01 Hz
Pickup Frequency $f>$ or $f<$ with $f_{Nom} = 60$ Hz	55.50 Hz to 64.50 Hz	Increments 0.01 Hz
Delay times T	0.00 s to 100.00 s or ∞	Increments 0.01 s
Undervoltage Blocking with Three-phase Connection: Positive Sequence Component V_1 with Single-phase Connection: single-phase phase-ground or phase-phase voltage	10 V to 150 V	Increments 1V

Times

Pickup times $f>$, $f<$	approx. 150 ms (7SJ62/63) approx. 80 ms (7SJ64)
Dropout times $f>$, $f<$	approx. 150 ms (7SJ62/63) approx. 80 ms (7SJ64)

Dropout Frequency

$\Delta f = I$ Pickup value - Dropout value I	approx. 20 mHz
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Dropout Ratio



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Dropout Ratio for Undervoltage Blocking	approx. 1.05
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Tolerances

Pickup Frequencies 81/O or 81U	10 mHz (with $V = V_{Nom}$; $f = f_{Nom}$)
Undervoltage Blocking	3 % of setting value or 1 V
Time Delays 81/O or 81/U	1 % of setting value or 10 ms

Influencing Variables

Power Supply DC Voltage in Range $0.8 \leq V_{PS}/V_{PSNom} \leq 1.15$	1 %
Temperature in Range $23.00 \text{ }^\circ\text{F} (-5 \text{ }^\circ\text{C}) \leq \Theta_{amb} \leq 131.00 \text{ }^\circ\text{F} (55 \text{ }^\circ\text{C})$	0.5 %/10 K
Harmonics	
Up to 10 % 3rd harmonic	1 %
Up to 10 % 5th harmonic	1 %

Appendix D: 33 kV Circuit Breaker Timing Test Results

