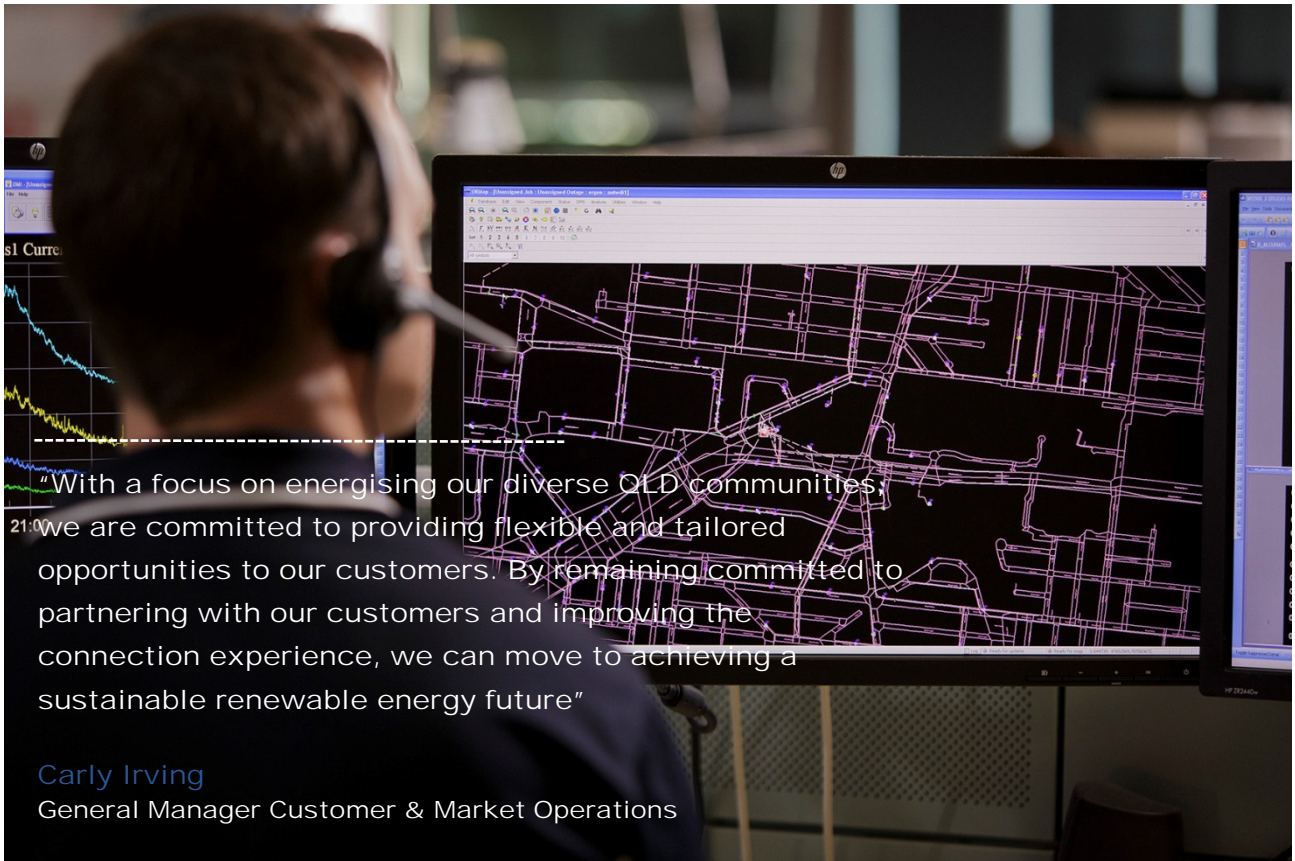




Ergon Energy Network
Register of completed
Embedded Generation Projects
➤ 200 kW
July 2014 to June 2019

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1 Introduction

Ergon Energy has a dedicated Major Customer group who are here to guide and assist you through your connection project. This register of completed embedded generation projects has been developed to improve the level of technical information available, on projects that have been successfully connected to Ergon Energy’s distribution network.



2 Purpose of this Register

Under Chapters 5 and 5A of the National Electricity Rules, Ergon Energy is required to publish a register of completed embedded generation projects:

- Connected to the Ergon Energy network within the 5 year period preceding the establishment of the register; and
- Update annually for all completed projects in the 5 year period preceding the review date.

3 Details to be included in the register

A register of the plant of completed embedded generation projects includes, but is not limited to:

- technology of generating unit (e.g. synchronous generating unit, induction generator, photovoltaic array, etc) and it's make and model;
- maximum power generation capacity of all embedded generating units comprised in the relevant generating system;
- contribution to fault levels;
- the size and rating of the relevant transformer;
- a single line diagram of the connection arrangement;
- protection systems and communication systems;
- voltage control and reactive power capability; and
- details specific to the location of a facility connected to the network that are relevant to any of the details in the bullet points above.

4 More Information

For more information about the Major Customer Group and embedded generation, please contact us;

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5 Project Register

Year Connected	Location	Technology of generating unit (e.g. synchronous generating unit, induction generator, photovoltaic array, etc)	Network Connection Voltage (kV)	Generator Unit details (Make and Model)	Generator Voltage Level (kV)	Maximum power generation capacity of all embedded generating units comprised in the relevant generating system (kw)	Contribution to fault levels (kA) at connection point	The size and rating of the relevant transformer (Voltages & kVA)	A single line diagram of the connection arrangement	Protection systems and communication systems	Voltage control, power factor control and/or reactive power capability	Details specific to the location of a facility connected to the network that are relevant to any of the details.
2014	Mt Isa	Solar PV	LV	6 x SMA STP15000TL	LV	90	0.15	1000kVA 11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Non-Export
2014	Rolleston	Synchronous EG	50kV	Rail regeneration	LV	15000	0.46	132/50kV	As per Figure 4	As per Figure 7	Power factor 0.90 lagging to 0.90 leading	Regenerator
2014	Warra	Synchronous EG	LV	Caterpillar G3508 and Caterpillar G3512	LV	500	0.83	300kVA 22/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Full Export
2015	Biloela	Synchronous EG	11kV	2 x 125kVA biogas generators	LV	200	0.07	11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.90 lagging to 0.90 leading	Full Export

Year Connected	Location	Technology of generating unit (e.g. synchronous generating unit, induction generator, photovoltaic array, etc)	Network Connection Voltage (kV)	Generator Unit details (Make and Model)	Generator Voltage Level (kV)	Maximum power generation capacity of all embedded generating units comprised in the relevant generating system (kw)	Contribution to fault levels (kA) at connection point	The size and rating of the relevant transformer (Voltages & kVA)	A single line diagram of the connection arrangement	Protection systems and communication systems	Voltage control, power factor control and/or reactive power capability	Details specific to the location of a facility connected to the network that are relevant to any of the details.
2015	Moranbah	Synchronous EG	11kV	8 x Cummins QSV91-V18 1750kW	11kV	12000	4.41	N/A	As per Figure 1	As per Figure 2	Power factor 0.90 lagging to 0.90 leading	Full Export
2015	Townsville	Solar PV	LV	SMA Tripower 10000	LV	400	0.67	1000kVA 11/0.433kV	As per Figure 1	As per Figure 2	Unity Power factor	Non-Export
2015	Mackay	Synchronous EG	33kV	Open Cycle Gas turbines (OCGT)	11kV	30000	50.08	41MVA 33/11kV	As per Figure 5	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Full Export
2016	Mt Isa	Solar PV	LV	17 x SMA Tripower 17000TL	LV	370	0.62	750kVA 11/0.433kV	As per Figure 1	As per Figure 2	Unity Power factor	Non-Export
2016	Kingaroy	Solar PV	LV	5 x ABB TRIO 30.OTL-OUTD	LV	300	0.5	750kVA 11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Non-Export

Year Connected	Location	Technology of generating unit (e.g. synchronous generating unit, induction generator, photovoltaic array, etc)	Network Connection Voltage (kV)	Generator Unit details (Make and Model)	Generator Voltage Level (kV)	Maximum power generation capacity of all embedded generating units comprised in the relevant generating system (kw)	Contribution to fault levels (kA) at connection point	The size and rating of the relevant transformer (Voltages & kVA)	A single line diagram of the connection arrangement	Protection systems and communication systems	Voltage control, power factor control and/or reactive power capability	Details specific to the location of a facility connected to the network that are relevant to any of the details.
2016	Townsville	Solar PV	LV	15 x SMA Sunny Tri-Power	LV	369	0.62	1000kVA 11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Non-Export
2016	Bundaberg	Solar PV and Battery	LV	ABB 27.6-OUTD-400 + ABB 20-OUTD-400 + Selectronic SPLC1202	LV	242	0.4	500kVA 11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Non-Export
2016	Barcaldine	Solar PV	22kV	10 x Power Electronics HEC	LV	10000	0.31	2500kVA 22/0.415kV	As per Figure 5	As per Figure 7	Voltage control of 22kV	Full Export
2016	Barcaldine	Solar PV	22kV	10 x Power Electronics HEC	LV	10000	0.31	2500kVA 22/0.415kV	As per Figure 5	As per Figure 7	Voltage control of 22kV	Full Export
2016	Bundaberg	Solar PV	LV	2 x ABB TRIO-27.6, 2 x ABB TRIO-20.0	LV	100	0.17	500kVA 11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Non-Export

Year Connected	Location	Technology of generating unit (e.g. synchronous generating unit, induction generator, photovoltaic array, etc)	Network Connection Voltage (kV)	Generator Unit details (Make and Model)	Generator Voltage Level (kV)	Maximum power generation capacity of all embedded generating units comprised in the relevant generating system (kw)	Contribution to fault levels (kA) at connection point	The size and rating of the relevant transformer (Voltages & kVA)	A single line diagram of the connection arrangement	Protection systems and communication systems	Voltage control, power factor control and/or reactive power capability	Details specific to the location of a facility connected to the network that are relevant to any of the details.
2016	North Rockhampton	Solar PV	LV	Multiple ABB TRIO TL-OUTD-400 20.0 and 27.6	LV	471	0.79	500kVA 11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Non-Export
2016	Poona	Synchronous EG	11kV	GEJ320 Biogas generator	11kV	1065	10.37	N/A	As per Figure 1	As per Figure 2	Power factor 0.90 lagging to 0.90 leading	Full Export
2016	Gladstone	Synchronous EG	11kV	GEJ320 Biogas generator	11kV	1065	10.37	N/A	As per Figure 1	As per Figure 2	Power factor 0.90 lagging to 0.90 leading	Full Export
2017	Bundaberg	Solar PV	LV	4 x SolarEdge SE25K	LV	200	0.33	1000kVA 11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Full Export
2017	Condamine	Solar PV	LV	12 x SolarEdge SE27.6K	LV	276	0.46	500kVA 33/0.415kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Non-Export

Year Connected	Location	Technology of generating unit (e.g. synchronous generating unit, induction generator, photovoltaic array, etc)	Network Connection Voltage (kV)	Generator Unit details (Make and Model)	Generator Voltage Level (kV)	Maximum power generation capacity of all embedded generating units comprised in the relevant generating system (kw)	Contribution to fault levels (kA) at connection point	The size and rating of the relevant transformer (Voltages & kVA)	A single line diagram of the connection arrangement	Protection systems and communication systems	Voltage control, power factor control and/or reactive power capability	Details specific to the location of a facility connected to the network that are relevant to any of the details.
2017	Upper Pilton	Synchronous EG	LV	3 x 250kW Camda KDGH GZ Series	LV	750	7.3	750kVA 11/0.415kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Full Export
2017	Mt Isa	Synchronous EG	LV	Olympian LL6014H	LV	500	12.5	500kVA 11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Non-Export
2017	Toowoomba	Solar PV	LV	8 x SMA STP25000TL-30	LV	200	0.33	500kVA 11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Full Export
2017	Normanton	Solar PV	22kV	5 x SMA Sunny Central 900CP XT	LV	4500	7.51	2 x 1.8MVA 22/0.405kV, 900kVA 22/0.405kV	As per Figure 5	As per Figure 2	Voltage control of 22kV	Full Export
2017	Hughenden	Solar PV	LV	4 x SMA Sunny Tripower 60	LV	240	0.4	500kVA 11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Non-Export

Year Connected	Location	Technology of generating unit (e.g. synchronous generating unit, induction generator, photovoltaic array, etc)	Network Connection Voltage (kV)	Generator Unit details (Make and Model)	Generator Voltage Level (kV)	Maximum power generation capacity of all embedded generating units comprised in the relevant generating system (kw)	Contribution to fault levels (kA) at connection point	The size and rating of the relevant transformer (Voltages & kVA)	A single line diagram of the connection arrangement	Protection systems and communication systems	Voltage control, power factor control and/or reactive power capability	Details specific to the location of a facility connected to the network that are relevant to any of the details.
2017	Toowoomba	Solar PV	11KV	25 x SMA Sunny Tripower 60	LV	1499	0.09	Unknown	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Non-Export
2017	Mt Isa	Solar PV	LV	6 x SMA STP20000TL-30, 5 x SMA STP25000TL-30	LV	295	0.49	500kVA 11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Non-Export
2017	Toowoomba	Solar PV	LV	9 x SMA Inverters (Various models)	LV	200	0.33	2 x 1500kVA 11/0.433kV A	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Full Export
2017	Meringandan	Solar PV	LV	5 x Fronius Eco 27.0-3-S	LV	150	0.25	500kVA 11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Non-Export
2017	Barcaldine	Solar PV	22kV	2 x SMA Sunny Central SC2200 Inverter	LV	3600	0.11	2 x 2.2MVA 22/0.385kV	As per Figure 6	As per Figure 7	Fixed power factor	Full Export

Year Connected	Location	Technology of generating unit (e.g. synchronous generating unit, induction generator, photovoltaic array, etc)	Network Connection Voltage (kV)	Generator Unit details (Make and Model)	Generator Voltage Level (kV)	Maximum power generation capacity of all embedded generating units comprised in the relevant generating system (kw)	Contribution to fault levels (kA) at connection point	The size and rating of the relevant transformer (Voltages & kVA)	A single line diagram of the connection arrangement	Protection systems and communication systems	Voltage control, power factor control and/or reactive power capability	Details specific to the location of a facility connected to the network that are relevant to any of the details.
2017	Barcaldine	Solar PV	22kV	2 x SMA Sunny Central SC2200 Inverter	LV	3600	0.11	2 x 2.2MVA 22/0.385kV	As per Figure 6	As per Figure 7	Fixed power factor	Full Export
2017	Kidston	Solar PV	22kV	20 x SMA Sunny Central SC2500 Inverter	22kV	53300	1.68	N/A	As per Figure 5	As per Figure 7	Voltage control of 22kV	Full Export
2017	Lakeland	Solar PV	66kV	22 x SMA Sunny Central 900XP CT	22kV	13500	0.14	20MVA 66/22kV	As per Figure 5	As per Figure 7	Voltage control	Full Export
2017	Hughenden	Solar PV	33kV	18 x Ingeteam Ingecon 1165TL B420	33kV	18000	0.38	N/A	As per Figure 5	As per Figure 7	Voltage control of 66kV	Full Export
2017	Meringandan	Solar PV	LV	11 x Fronius Eco 27.0-3-S	LV	297	0.5	750kVA 11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Non-Export

Year Connected	Location	Technology of generating unit (e.g. synchronous generating unit, induction generator, photovoltaic array, etc)	Network Connection Voltage (kV)	Generator Unit details (Make and Model)	Generator Voltage Level (kV)	Maximum power generation capacity of all embedded generating units comprised in the relevant generating system (kw)	Contribution to fault levels (kA) at connection point	The size and rating of the relevant transformer (Voltages & kVA)	A single line diagram of the connection arrangement	Protection systems and communication systems	Voltage control, power factor control and/or reactive power capability	Details specific to the location of a facility connected to the network that are relevant to any of the details.
2017	Yarranlea	Solar PV	11kV	Multiple inverters	LV	252	0.02	several 11/0.433kV	As per Figure 1	As per Figure 2	Volt-var	Non-Export
2017	Meringandan	Solar PV	LV	14 x Fronius Eco 27.0-3-S	LV	451	0.75	500kVA 11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Non-Export
2017	Townsville	Solar PV	LV	8 x SolarEdge SE25K	LV	200	0.33	750kVA 11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Full Export
2018	North Rockhampton	Solar PV	LV	8 x SMA STP60-10	LV	500	0.83	1500kVA 11/0.433kV	As per Figure 1	As per Figure 2	Volt-var	Full Export
2018	Yarranlea	Solar PV	LV	8 x Schneider CL25000E	LV	200	0.33	750kVA 11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Partial Export

Year Connected	Location	Technology of generating unit (e.g. synchronous generating unit, induction generator, photovoltaic array, etc)	Network Connection Voltage (kV)	Generator Unit details (Make and Model)	Generator Voltage Level (kV)	Maximum power generation capacity of all embedded generating units comprised in the relevant generating system (kw)	Contribution to fault levels (kA) at connection point	The size and rating of the relevant transformer (Voltages & kVA)	A single line diagram of the connection arrangement	Protection systems and communication systems	Voltage control, power factor control and/or reactive power capability	Details specific to the location of a facility connected to the network that are relevant to any of the details.
2018	Emerald	Solar PV	66KV	33 x SMA 2750	33kV	88000	0.76	80MVA 66/33kV	As per Figure 3	As per Figure 7	Voltage control of 66kV	Full Export
2018	Poona	Solar PV	LV	5 x SMA STP60-10	LV	300	0.5	750kVA 11/0.415kV	As per Figure 1	As per Figure 2	Volt-var	Full Export
2018	Mackay	Solar PV	LV	8 x SMA 25000TL-30	LV	200	0.33	1000kVA 11/0.433kV	As per Figure 1	As per Figure 2	Volt-var	Partial Export
2018	Cairns	Solar PV	LV	11 x SMA 25000TL-20	LV	275	0.46	1000kVA 22/0.433kV	As per Figure 1	As per Figure 2	Volt-var	Non-Export
2018	Bundaberg	Solar PV	LV	6 x SMA Sunny Tripower 60	LV	360	0.6	1500kVA 11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Non-Export

Year Connected	Location	Technology of generating unit (e.g. synchronous generating unit, induction generator, photovoltaic array, etc)	Network Connection Voltage (kV)	Generator Unit details (Make and Model)	Generator Voltage Level (kV)	Maximum power generation capacity of all embedded generating units comprised in the relevant generating system (kw)	Contribution to fault levels (kA) at connection point	The size and rating of the relevant transformer (Voltages & kVA)	A single line diagram of the connection arrangement	Protection systems and communication systems	Voltage control, power factor control and/or reactive power capability	Details specific to the location of a facility connected to the network that are relevant to any of the details.
2018	Collinsville	Solar PV	33kV	17 x SMA Sunny Central 2500-EV	33kV	42500	0.89	N/A	As per Figure 5	As per Figure 7	Fixed power factor	Full Export
2018	Longreach	Solar PV	66kV	7 x SMA SC2500	22kV	17500	0.15	18MVA 66/22kV	As per Figure 3	As per Figure 7	Voltage control of 66kV	Full Export
2018	Toowoomba	Solar PV	LV	Multiple Enphase S230	LV	232	0.39	750kVA 11/0.415kV	As per Figure 1	As per Figure 2	Volt-var	Non-Export
2018	Bundaberg	Solar PV	LV	7 x SolarEdge SE27.6K + 1 x SE17K	LV	210	0.35	1500kVA 11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Non-Export
2018	Bundaberg	Solar PV	LV	7 x SolarEdge SE27.6K + 1 x SE17K	LV	220	0.37	1500kVA 11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Non-Export

Year Connected	Location	Technology of generating unit (e.g. synchronous generating unit, induction generator, photovoltaic array, etc)	Network Connection Voltage (kV)	Generator Unit details (Make and Model)	Generator Voltage Level (kV)	Maximum power generation capacity of all embedded generating units comprised in the relevant generating system (kw)	Contribution to fault levels (kA) at connection point	The size and rating of the relevant transformer (Voltages & kVA)	A single line diagram of the connection arrangement	Protection systems and communication systems	Voltage control, power factor control and/or reactive power capability	Details specific to the location of a facility connected to the network that are relevant to any of the details.
2018	Proserpine	Solar PV	LV	7 x ABB TRIO 50.0-TL-OUTD	LV	350	0.58	1000kVA 11/0.433kV	As per Figure 1	As per Figure 2	Volt-var	Non-Export
2018	Mackay	Solar PV and Battery	LV	4 x Fronius Symo 20.0, 9 x Telsa Powerwall	LV	125	0.21	750kVA 11/0.433kV	As per Figure 1	As per Figure 2	Volt-var	Partial Export
2018	Bundaberg	Solar PV	LV	30 x SolarEdge SE27.6K	LV	660	1.1	750kVA 11/0.433kV	As per Figure 1	As per Figure 2	Volt-var	Partial Export
2018	Bundaberg	Solar PV	LV	8 x SMA inverter	LV	420	0.7	750kVA 11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Non-Export
2018	Bundaberg	Solar PV	LV	11 x SMA inverter	LV	660	1.1	750kVA 11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Non-Export

Year Connected	Location	Technology of generating unit (e.g. synchronous generating unit, induction generator, photovoltaic array, etc)	Network Connection Voltage (kV)	Generator Unit details (Make and Model)	Generator Voltage Level (kV)	Maximum power generation capacity of all embedded generating units comprised in the relevant generating system (kw)	Contribution to fault levels (kA) at connection point	The size and rating of the relevant transformer (Voltages & kVA)	A single line diagram of the connection arrangement	Protection systems and communication systems	Voltage control, power factor control and/or reactive power capability	Details specific to the location of a facility connected to the network that are relevant to any of the details.
2018	North Rockhampton	Solar PV	LV	11 x SMA Tripower STP2500TL	LV	275	0.46	1000kVA 11/0.415kV	As per Figure 1	As per Figure 2	Volt-var a	Non-Export
2018	Chinchilla	Solar PV	33kV	7 x SMA SC2500	33kV	17500	0.37	N/A	As per Figure 5	As per Figure 7	Voltage control of 33kV	Full Export
2018	Mackay	Solar PV	LV	13 x Fronius Symo 20.0, 3 x Fronius Symo 15.0	LV	477	0.8	500kVA 11/0.433kV	As per Figure 1	As per Figure 2	Volt-var	Partial Export
2018	Charleville	Solar PV	LV	13 x SolarEdge SE25K	LV	325	0.54	1000kVA 22/0.415kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Non-Export
2018	Charleville	Solar PV	LV	16 x SolarEdge SE25K	LV	400	0.67	1000kVA 22/0.415kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Non-Export

Year Connected	Location	Technology of generating unit (e.g. synchronous generating unit, induction generator, photovoltaic array, etc)	Network Connection Voltage (kV)	Generator Unit details (Make and Model)	Generator Voltage Level (kV)	Maximum power generation capacity of all embedded generating units comprised in the relevant generating system (kw)	Contribution to fault levels (kA) at connection point	The size and rating of the relevant transformer (Voltages & kVA)	A single line diagram of the connection arrangement	Protection systems and communication systems	Voltage control, power factor control and/or reactive power capability	Details specific to the location of a facility connected to the network that are relevant to any of the details.
2018	North Rockhampton	Solar PV	LV	10 x Fronius Symo 20.0, 2 x Fronius Symo 15.0	LV	272	0.45	500kVA 11/0.433kV	As per Figure 1	As per Figure 2	Volt-var	Partial Export
2018	North Rockhampton	Solar PV	LV	12 x Fronius Symo 20.0, 1 x Fronius Symo 15.0	LV	472	0.79	500kVA 11/0.433kV	As per Figure 1	As per Figure 2	Volt-var	Partial Export
2018	Poona	Solar PV	33kV	37 x Ingeteam IS PowerMax B Series 1740TL B670	33kV	64380	1.43	60MVA 66/33kV	As per Figure 4	As per Figure 7	Voltage Control of 66kV	Full Export
2018	Lakeland	Synchronous EG	66kV	1 x 24MW Triveni WEG SPW w/ Basler Delectric DECS250 AVR	11kV	24000	0.856	20MVA 66/11kV	As per Figure 3	As per Figure 7	Voltage Control of 66kV	Full Export
2018	Townsville	Synchronous EG	LV	1 x 500kVA Caterpillar C15	LV	500	4.8	500kVA 11/0.433kV	As per Figure 1	As per Figure 2	Power factor 0.8 lagging to 0.8 leading	Non-Export

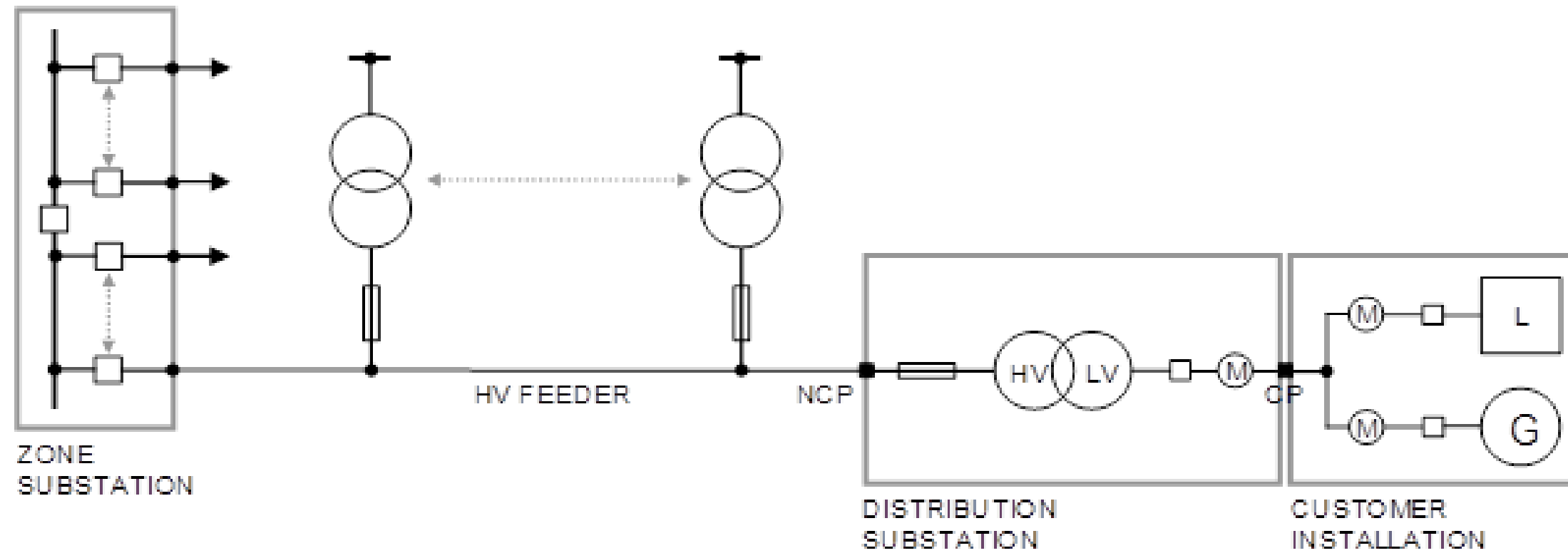
Year Connected	Location	Technology of generating unit (e.g. synchronous generating unit, induction generator, photovoltaic array, etc)	Network Connection Voltage (kV)	Generator Unit details (Make and Model)	Generator Voltage Level (kV)	Maximum power generation capacity of all embedded generating units comprised in the relevant generating system (kw)	Contribution to fault levels (kA) at connection point	The size and rating of the relevant transformer (Voltages & kVA)	A single line diagram of the connection arrangement	Protection systems and communication systems	Voltage control, power factor control and/or reactive power capability	Details specific to the location of a facility connected to the network that are relevant to any of the details.
2018	Clermont	Solar PV	66kV	37 x SMA Sunny Central SC2500-EV	33kV	92500	0.95	90MVA 66/33kV	As per Figure 5	As per Figure 7	Voltage Control of 66kV	Full Export
2018	Poona	Solar PV	33kV	49 x Ingeteam IS PowerMax B Series 1740TL B670	33kV	85260	1.87	80MVA 66/33kV	As per Figure 4	As per Figure 7	Voltage Control of 66kV	Full Export
2018	Bundaberg	Solar PV	LV	15 x SolarEdge SE27.6K	LV	414	0.67	750kVA 11/0.433kV	As per Figure 1	As per Figure 2	Fixed power factor	Non-Export
2018	Bundaberg	Solar PV	LV	15 x SolarEdge SE27.6K	LV	414	0.67	750kVA 11/0.433kV	As per Figure 1	As per Figure 2	Volt-var	Non-Export
2018	Toowoomba	Solar PV	LV	1000 x Enphase S230-60-LN-X-YY	LV	232	0.38	1000kVA 11/0.415kV	As per Figure 1	As per Figure 2	Fixed power factor	Non-Export

Year Connected	Location	Technology of generating unit (e.g. synchronous generating unit, induction generator, photovoltaic array, etc)	Network Connection Voltage (kV)	Generator Unit details (Make and Model)	Generator Voltage Level (kV)	Maximum power generation capacity of all embedded generating units comprised in the relevant generating system (kw)	Contribution to fault levels (kA) at connection point	The size and rating of the relevant transformer (Voltages & kVA)	A single line diagram of the connection arrangement	Protection systems and communication systems	Voltage control, power factor control and/or reactive power capability	Details specific to the location of a facility connected to the network that are relevant to any of the details.
2018	Oakey	Solar PV	33kV	12 x SMA Sunny Central 2500-EV	33kV	30000	0.57	2 x 74MVA 110/33kV	As per Figure 5	As per Figure 7	Voltage Control of 33kV	Full Export
2018	Proserpine	Solar PV	LV	7 x ABB TRIO-50-TL-OUTD	LV	350	0.6	1000kVA 11/0.415kV	As per Figure 1	As per Figure 2	Volt-var	Non-Export
2019	Townsville	Solar PV	11kV	1x SMA STP 15000TL-30, 10x SMA STP 20000TL-30, 10x SMA STP25000TL-30	LV	465	0.029	2.3MVA 66/11kV, 2MVA 66/11kV	As per Figure 1	As per Figure 2	Volt-var	Non-Export
2019	Rockhampton	Synchronous EG	LV	2 x Volvo TWD 1645 GE Diesel Gensets	LV	1540	14.9	2 x 500kVA 11/0.433kV	As per Figure 1	As per Figure 2	Volt-var	Non-Export
2019	Cairns	Solar PV	22kV	55 x SolarEdge SE 27.6K	LV	1518	0.04	3 x 50MVA 132/22kV	As per Figure 5	As per Figure 8	Volt-var	Full Export



Year Connected	Location	Technology of generating unit (e.g. synchronous generating unit, induction generator, photovoltaic array, etc)	Network Connection Voltage (kV)	Generator Unit details (Make and Model)	Generator Voltage Level (kV)	Maximum power generation capacity of all embedded generating units comprised in the relevant generating system (kw)	Contribution to fault levels (kA) at connection point	The size and rating of the relevant transformer (Voltages & kVA)	A single line diagram of the connection arrangement	Protection systems and communication systems	Voltage control, power factor control and/or reactive power capability	Details specific to the location of a facility connected to the network that are relevant to any of the details.
2019	Cairns	Solar PV	LV	2 x ABB TRIO-20.0TL, 1 x ABB PVS-100-TL	LV	272.8	0.38	1MVA 22/0.433kV	As per Figure 1	As per Figure 2	Volt-var	Partial Export

6 Single Line Diagram Types

Figure 1 LV Connected Generation Simple Single Line Diagram



LEGEND

- CP Connection Point
- L Internal load for embedded generation Customer
- M Metering – may be Nett or Import/Export type
- NCP Network Coupling Point
-  HV or LV fuse
-  Circuit breaker, protection or switching device

LOW VOLTAGE GENERATION AND DEDICATED LOW VOLTAGE CONNECTION

Generation at low voltage with parallel low voltage load - Dedicated low voltage connection - Shared HV feeder

Figure 2 Protection Requirements for LV Connected Generation

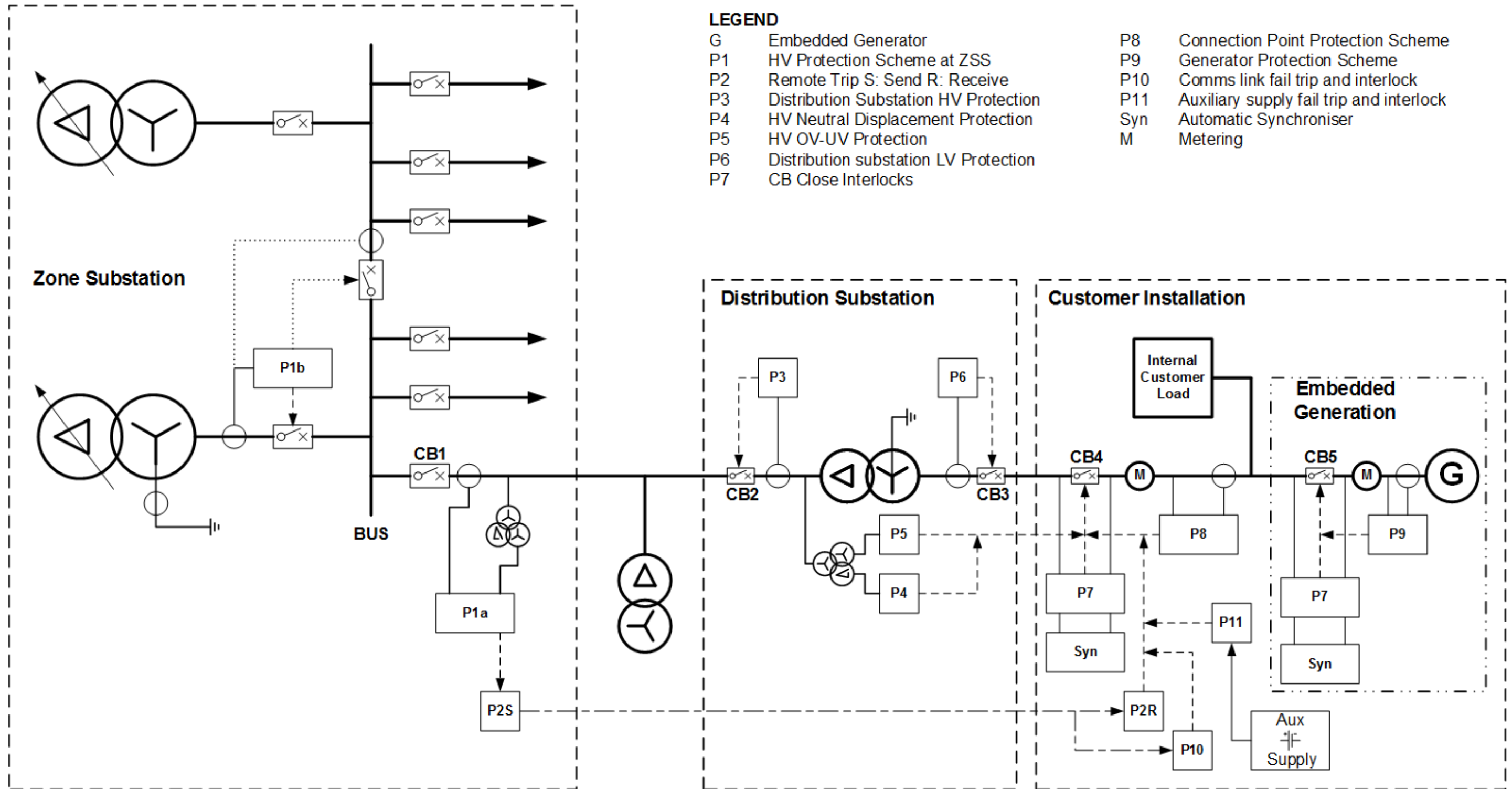


Figure 3 HV Generation Connected to Subtransmission via T-Off Connection

Bulk Supply Substation
132kV bus

Notes:

- In general, transmission connections are similar to Example 9 with the Network Coupling Point being the circuit breaker dedicated to the Customer in the Bulk Supply Substation.
- Teed feeder arrangements at transmission level are not preferred due to the potential reduction in supply reliability to other customers and can only be considered where this risk is adequately addressed. Where a customer requests a connection at a point on a transmission line, the alternatives in Example 11 & 12 of switched tee arrangements should be offered.

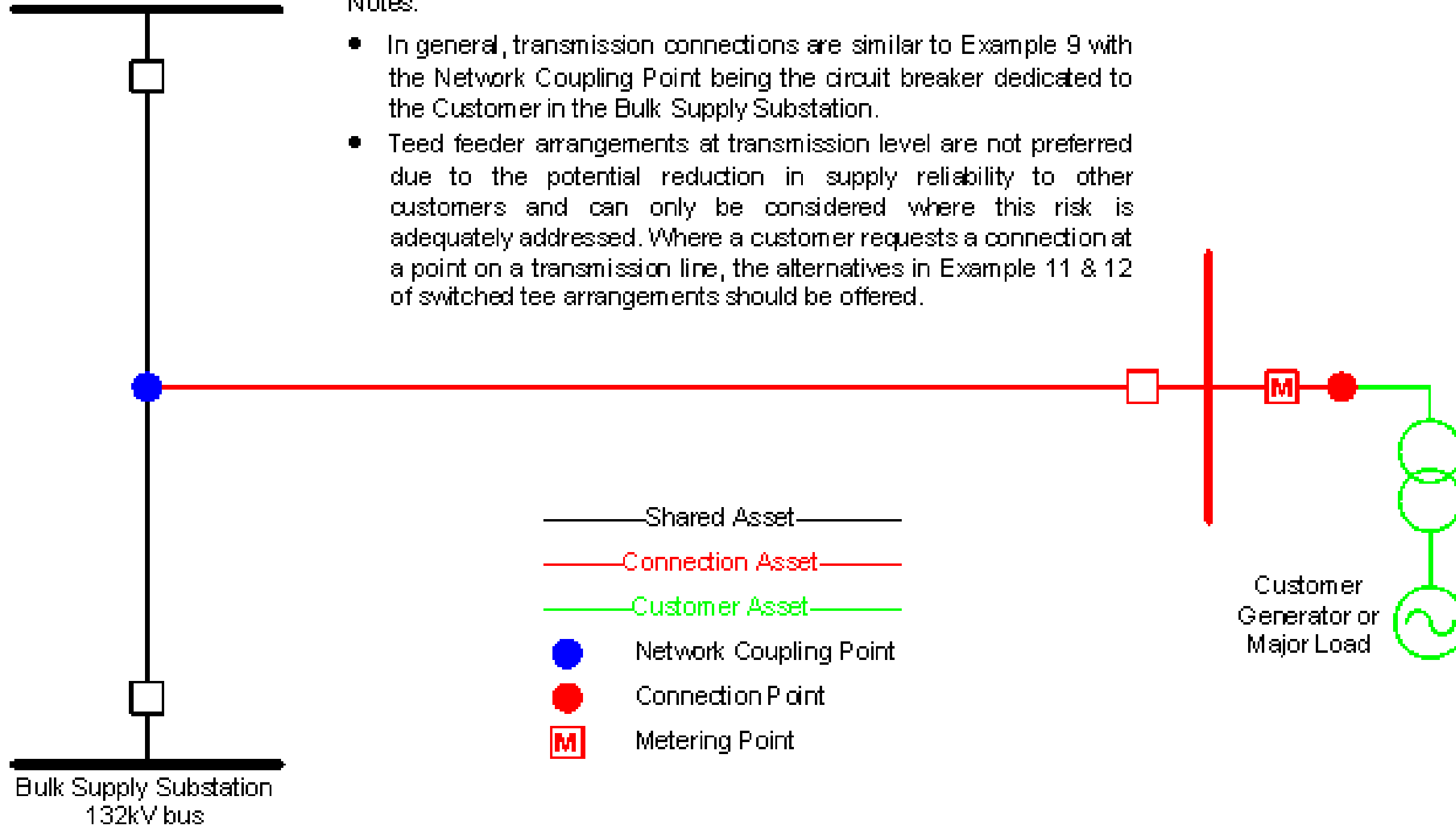


Figure 4 HV Generation Connected to Subtransmission via Switching Station

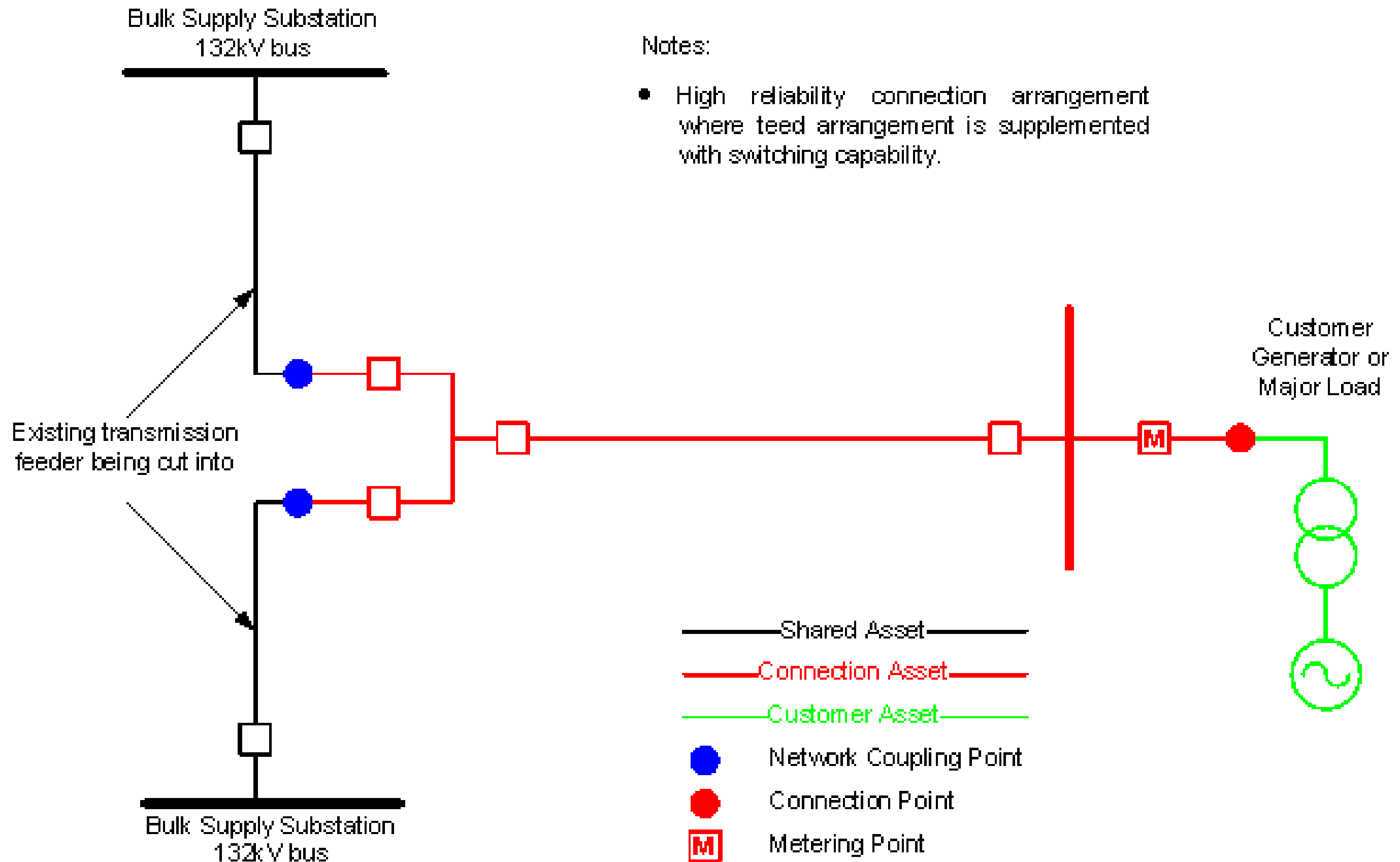
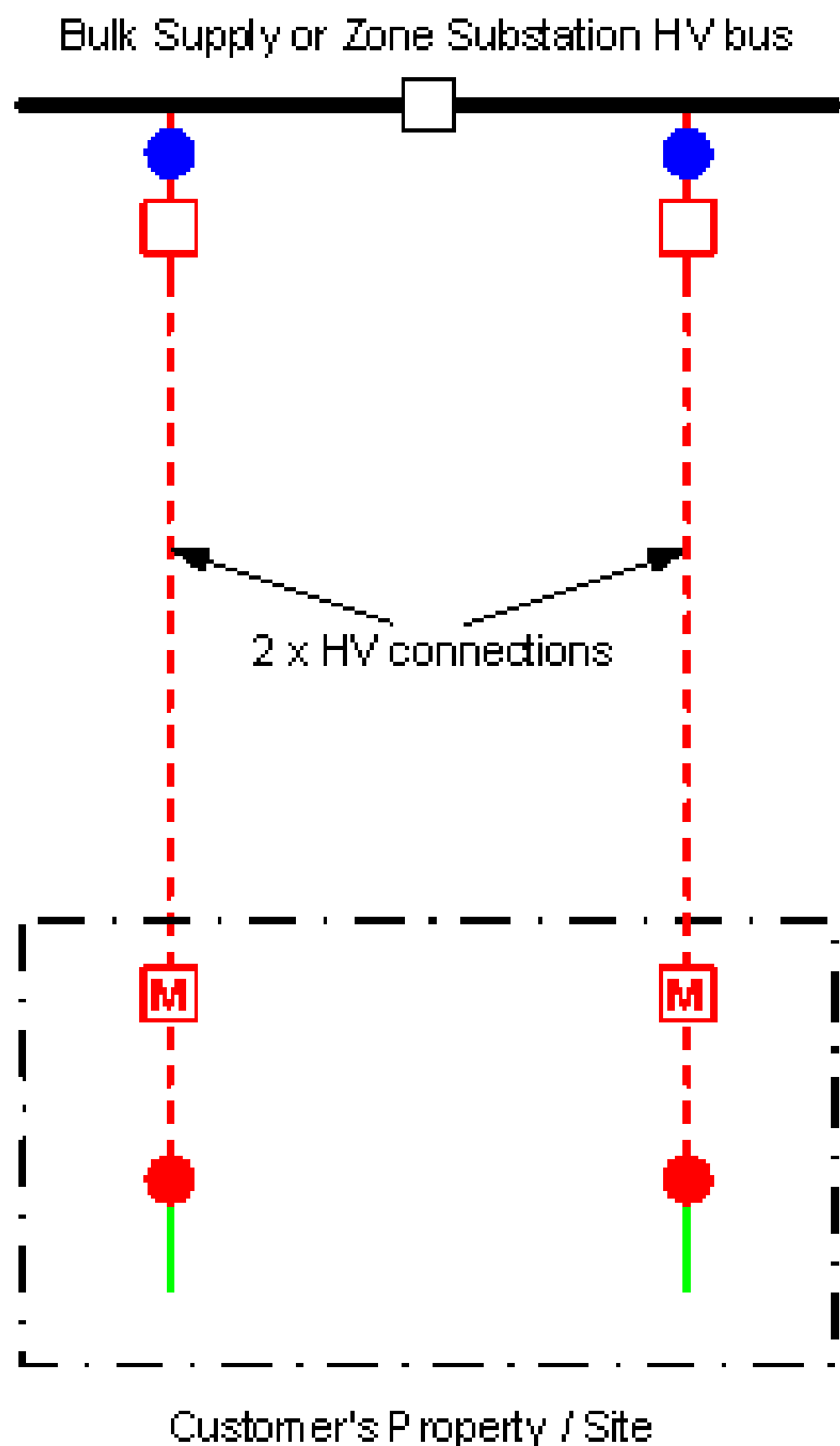


Figure 5 HV Connected Generation Via Direct Feed From Substation



Notes:

- HV feeders are *Connection Assets* if there is no future plan for connection of other customers or does not involve construction servicing other customers.
- The *Network Coupling Point* is the HV circuit breaker terminals busbar side. Feeder protection schemes may be provided as part of *Alternative Control Services*.
- The second circuit is only at the request of the customer and all costs associated with the second circuit connection are *Alternative Control Services*.

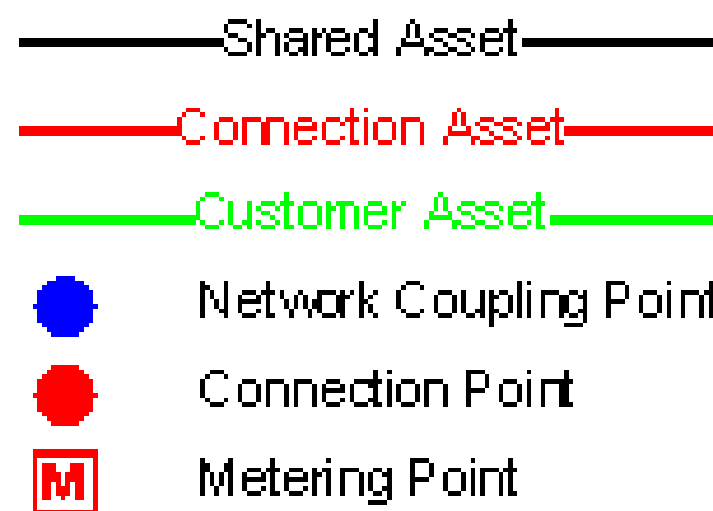
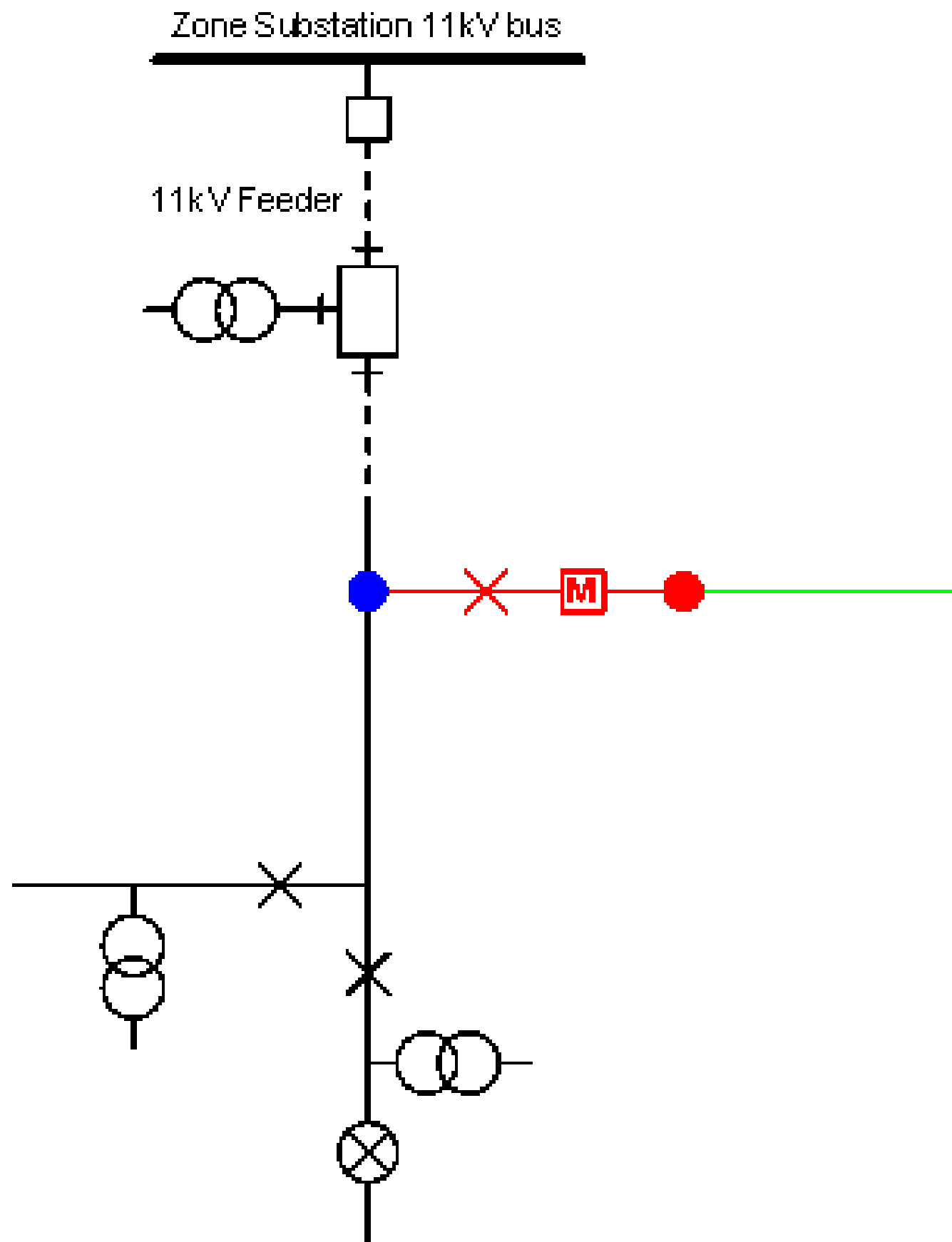


Figure 6 HV Generation Connected via T-Off from Distribution Feeder



Notes:

- Simple tee off from Shared Network where all the Dedicated Assets are on or adjacent to the customer's installation.

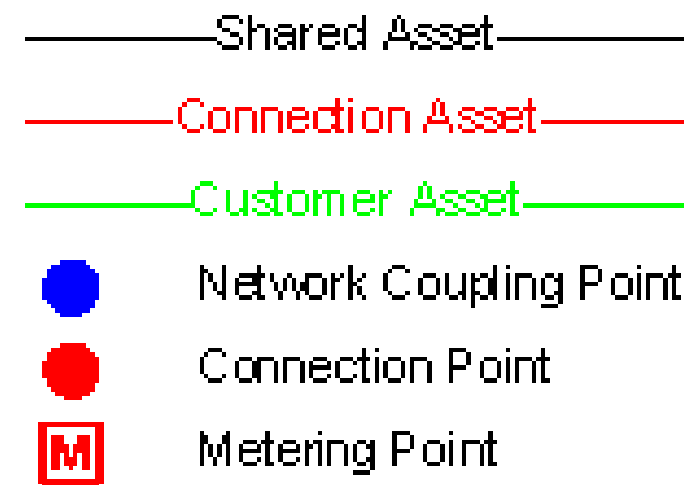


Figure 7 Dual Communications for Generation Systems >5MW

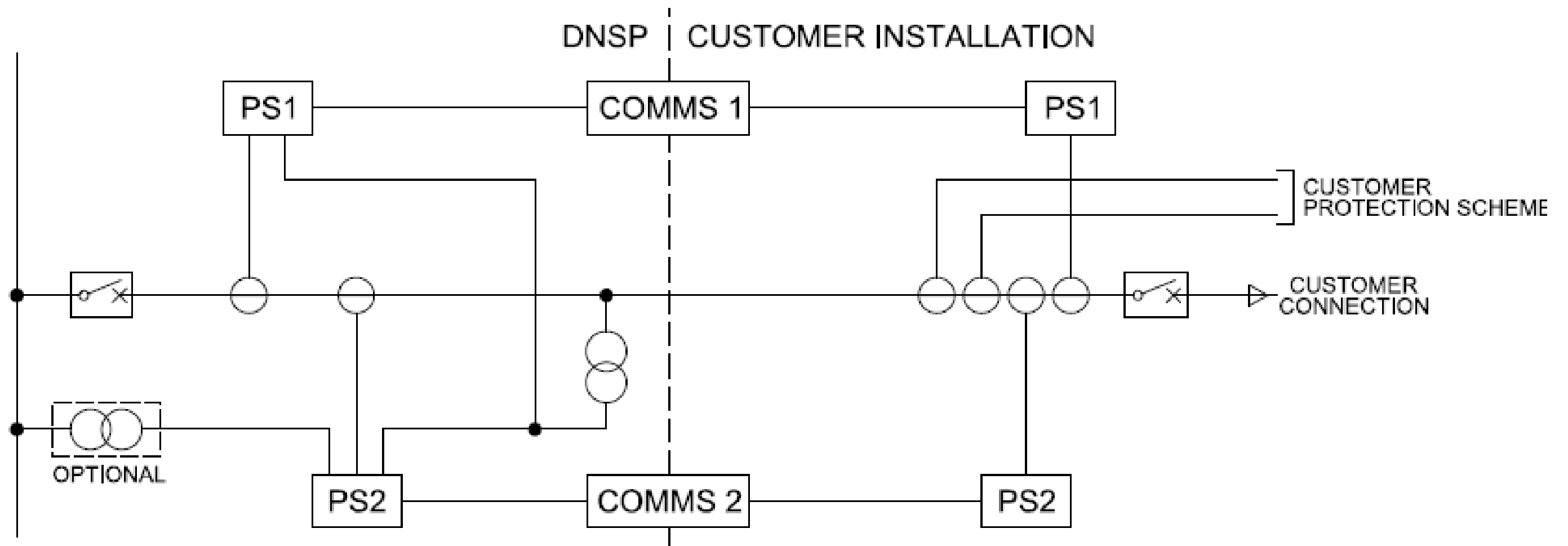
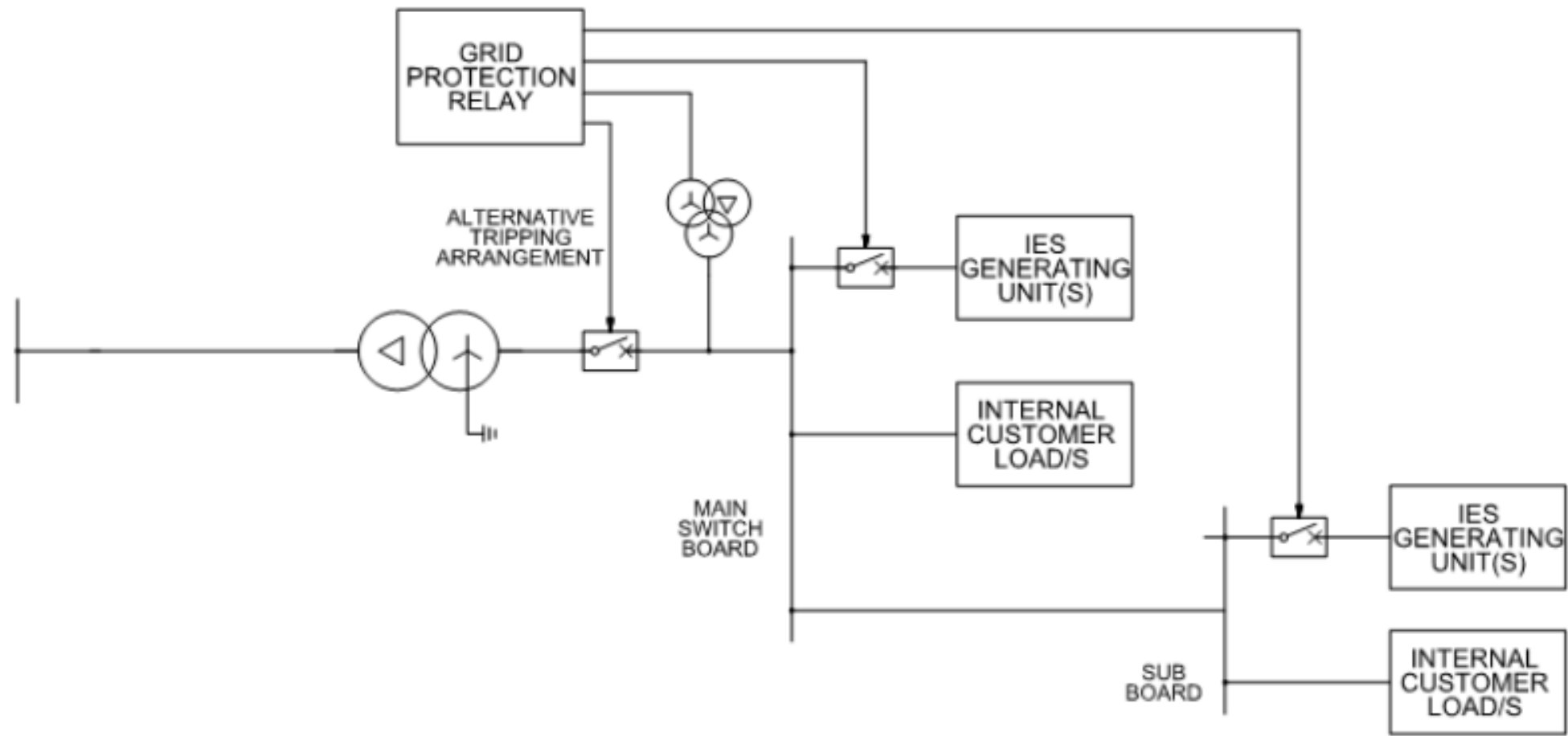


Figure 8 Protection Arrangements for Class A1 IES Systems



7 Protection Schemes and Requirements

Level 1 Backup Protection

- Over and under voltage
- Over and under frequency
- Voltage vector shift and
- Rate of change of frequency
- Reverse Power

Level 2 Backup Protection

- Neutral voltage detection/unbalance, or
- Direct intertrip from network circuit breaker (for systems above 200kW).

Protection Function	Shared LV Circuit	Dedicated LV Circuit	Dedicated Transformer Up to 200kW		Dedicated Transformer 200<x<1000 kW		Dedicated Transformer(s) Greater than 1000 kW
	Nil-Export	Nil-Export	Nil Export	Export	Nil-Export	Export	Export/Nil export
Over/under voltage	✓	✓	✓	✓	✓	✓	✓
Over/under frequency	✓	✓	✓	✓	✓	✓	✓
Voltage vector shift	✓	✓	✓	✓	✓	✓	✓
Rate of change of frequency	✓	✓	✓	✓	✓	✓	✓
Reverse Power	✓	✓	✓	✓	✓	✓	✓
Neutral voltage displacement ²					✓	✓	✓
Direct Intertrip							✓
SCADA link							✓

8 PQ Voltage and Power Factor Control

For low voltage customers, pursuant to clause 36(2)(d) of the Electricity Regulation, Ergon Energy requires the Customer to ensure that the power factor of the IES is for low voltage supply to the Customer, as per the volt-var requirements of STNW1174. This standard can be found on the Ergon Energy website, via Network > Connections > Major Business > Large Generation.

For high voltage customers, the power factor is to reflect the agreed voltage or power factor control arrangement. Please note connections must comply with the requirements set out in STNW1175, which can be found on the Ergon Energy website, via Network > Connections > Major Business > Large Generation.

9 Fault Level Contribution Factor

Indicative fault level contribution from generating systems:

Generator Type	Fault level contribution factor
Synchronous Generator unit	7 X Rating
Solar/Inverter Generator unit	1.2 X Rating

End of Document

