PID276

System Impact Study

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PID276 System Impact Study

I. Introduction

PID276 is installing a 5 MW steam turbine synchronous generator to be interconnected to the Entergy distribution system. The proposed interconnection is at Mermentau 69kV tapped station on the 13.8kV feeder 535F. This study, as identified in the scope of work provided by Entergy, was performed to determine the impact of the generation to the Entergy grid and the effects on other Entergy customers. In this study, areas of vulnerability are identified and options are provided to mitigate the unwanted effects of the co-generation and maintain overall electrical-system reliability.

II. PID276 Station Description

The oneline diagram of the PID276 electrical system is shown in Appendix B. The PID276 facility is fed via one shared feeder from Mermentau substation. The feeder from Mermentau to PID276 is approximately 3 miles.

The system includes a 12.5kV generator, a 12.5kV generator circuit breaker, a 12.5kV intertie breaker, and three single-phase 12.5/13.8kV line voltage regulators connected to feeder 535F. The maximum power output of the generator-set is limited to 4.5 MVA.

The line voltage regulators are of the autotransformer type connected phase-ground on each phase. The neutral bushings (SOLO) of the regulators are connected solidly grounded.

III. Modes of Operation

A summary of the modes of operation is as follows:

1) PID276 will normally generate in parallel with the Entergy power system via feeder 535F. The proposal is to export all generation capacity of approximately 4.5 MW based on thermal limits of the turbine.

2) Entergy will not supply any power to PID276. The customer will install generation to support auxiliary loads during offline and start-up modes.

3) Upon loss of utility, PID276 will be capable of isochronous operation.

Switching equipment, synchronizing equipment, protective relaying, islanding detection, and interlocking logic will be utilized to accomplish the appropriate transfers between these modes of operation. All of this equipment will be the responsibility of PID276.

IV. Synchronizing

All synchronizing, closing logic, and close operations will be performed at the customer's facility by the customer. Sync-check equipment will be used to prevent out of synchronism closing and disruption to the Entergy system. Sync-check supervision of manual and automatic synchronizing should be incorporated into the customer's synchronizing system.

Mermentau feeder circuit breaker 535F will have only dead-line closing capabilities verified on two phases.

V. Interconnect Protective Relaying by PID276

Co-generators are responsible for providing protection of the co-generation system and to provide a means of disconnect in the event of a fault on the Entergy system as described in the Entergy distribution standard DR07-01. Specifically, the PID276 interconnection should:

1) Provide local protection for their generator and associated power system for faults and abnormal conditions that occur on their system or the Entergy system.
2) Maintain a communication system capable of receiving a transfer trip signal from the Entergy substation to trip the intertie circuit breaker.
3) Provide local protection to disconnect their generating source from Entergy in the event of abnormal operating conditions at Mermentau.

The protective relay shown on the PID276 electrical oneline at the point of common coupling (POCC) is an SEL351-7. The proposed protection elements to be utilized by PID276 include the following: 27/59, 51V, 51G, 81O/U, 67, and 25. This scheme should be expanded to include 46 and 47 protection functions. Furthermore, these elements should be coordinated with the Entergy feeder relaying where applicable.

The incoming utility breaker protection shall be equipped with 3-phase, line-neutral PTs on the source-side of the main breaker. This is necessary to detect phase-ground overvoltages and undervoltages that may occur on the system. Delta connected PTs should not be used in this application.

The CT ratios of the intertie circuit breaker should be selected to provide reliable performance and adequate sensitivity for the system operating conditions. This is important because CT performance is proportionately reduced at lower ratios while higher ratios provide less sensitivity.

VI. Breaker failure protection at PID276

The intertie breaker should be equipped with breaker failure protection that would trip the the generator breaker in the event of an intertie breaker failure to trip.

The generator breaker should be equipped with breaker failure protection to trip the intertie circuit breaker in the event of a generator breaker failure.

Generator breaker failure operation should be supervised with an overcurrent fault detector relay and timer for breaker failure scenarios initiated by fault detecting relays such as: 87G, 51V, etc.

Breaker failure initiate should be supervised by breaker position and a timer for abnormal condition relays such as: 81O/U, 40, 46, 27, 59, etc.

VII. Intertie and Generator Circuit Breakers by PID276

The intertie and generator circuit breakers must have interrupting ratings and 'close and latch' ratings that are adequate to handle the available fault current. They should also be capable of synchronizing duty which will apply two times the phase-phase voltage across the contacts. According to IEEE 1547, the "system paralleling device shall be capable of withstanding 220% of the interconnection rated voltage."

VIII. Power Factor Requirements

Automatic power factor control at the intertie is required by PID276. This will require monitoring of the power factor at the point of interconnect and feeding this information back into the voltage regulation system.Automatic power factor control will keep power factor near unity which will minimize voltage flicker upon generator trip under load. Automatic power factor control also eliminates the cumbersome task of manually monitoring and controlling power factor.

PID276 shall not be allowed to export VARs to Entergy nor import VARs from Entergy.

IX. Voltage Flicker

Voltage flicker was evaluated in ETAP. The maximum allowable voltage flicker created by a customer is +/– 4%. ETAP studies show an approximate 4.9% dip in voltage at the POCC when the distributed generation is tripped at 4.5 MVA and an approximate power factor of 98%. This exceeds acceptable guidelines at the POCC.

The amount of generator-unit trips will determine the long term affects of voltage flicker. The sudden loss of the generating source is an unusual operation since normal modes of operation for generating plants are to ramp load up or down at an appropriate rate. The frequency of a sudden loss of the distributed generator is expected to be low and not pose numerous voltage fluctuations on the Entergy system. If after installation this is found to be a frequent occurrence, then corrective actions will be necessary. A high reliability communications link would minimize generator-unit trips due to loss of communications.

If voltage flicker becomes a significant problem to the system, it may be necessary to operate the distributed generator at reduced power output. ETAP shows that if the PID276 generator were operated at 3.5MW at 98% power factor the voltage flicker will be reduced to approximately 3.9% when the generation is tripped offline.

Another option is to upgrade the distribution transformer at Mermentau substation. ETAP shows that if a 30MVA power transformer with typical impedance values is used instead of the existing 7.5 MVA transformer, then the voltage flicker will be reduced to approximately 4% when the generation is tripped offline at 4.5MVA.

X. 13.8kV Surge Protection at POCC

Station-class metal-oxide surge arresters shall be installed at the point of common coupling. These arresters should have the same voltage rating as other arresters used on the distribution system. This is to protect other Entergy customers and PID276 from overvoltage surges.

XI. Voltage Stability and Control

When generation is added to a standard distribution circuit, there can be unwanted interaction between the utility's LTC and the generator AVR. The distributed generation should be operated in the reactive droop mode while generating in parallel with Entergy and transfer to isochronous mode when islanded. It is critical that enough droop compensation is added to accommodate the bandwidth of the LTC under minimum and maximum loading conditions. Additionally, droop compensation should be adjusted to accommodate VAR flow changes due to capacitor bank switching. PID276 system operators should monitor generator response to capacitor bank switching to assure the droop setting will accommodate this as well.

XII. Transfer Tripping of the PID276 Generation

Feeder 535F at Mermentau substation is a shared feeder with a max loading of approximately 8.5 MVA and a minimum loading of approximately 1.2 MVA. In the event that feeder circuit breaker 535F trips, the PID276 interconnection must be transfer tripped to prevent the distributed generation from feeding the Entergy system under islanded conditions. Back feeding the Entergy system under islanded conditions imposes the risk of supplying Entergy customers for an extended period of time at voltage and frequency levels outside of normal limits. This has the potential of causing damage to other customer's facilities and Entergy equipment and poses a safety hazard to maintenance personnel and the general public. Due to these risks, high speed protection is required to trip the PID276 interconnection for the various conditions that cause a loss of utility power to the substation or a trip of feeder circuit breaker 535F.

Various methods of communication for transfer tripping can be utilized as follows:

1.) Fiber optic
2.) Wireless communication
3.) Leased pair

The most reliable method of transfer tripping is done via dedicated fiber optic cable. This is the best method for the customer since it is free from disturbances such as power system noise, ground potential rise, and bad weather conditions. The dedicated fiber optics provide reliable, high speed tripping and security from false trips. Due to railroad and waterway crossings of the feeder, an alternate path should be investigated. Implementing fiber communications across railroad crossings and waterways could add significant costs and delays to the project.

The second method of transfer trip is via wireless communication. This method may be the most economical and easiest to implement; however, this method requires "line-of-sight" from the substation to the POCC. Any obstructions such as buildings, trees, or other wireless communications systems could cause interference or malfunctions. Depending on the type of wireless communication used, repeaters may be required to achieve communication. Another drawback of this method is that bad weather can limit its capability to transfer trip at precisely the time transfer tripping capability is needed. There are two methods that are available to accomplish wireless communications. The first method is to use 900MHz unlicensed radio communications. This system is limited to less than one watt and repeaters will be required. This makes the scheme more complicated and speed becomes an issue. The second method is to use higher powered radio communications systems; however, path obstructions may still be a factor. If wireless communication is chosen, testing and experimentation with the transceivers, repeaters and path will be required in order to ensure reliable performance. This will add some cost and delay to the implementation of the wireless communication system.

The third method of transfer trip is via leased pair provided by the telephone company. This typically requires ground-potential-rise (GPR) isolation. If Mermentau substation already has a method of GPR isolation in place then it could be utilized; however, it must have the capacity to be expanded to include the required transfer trip features. The shortcoming of a leased pair is that the communications pair could be subjected to failure with no notice as it is not controlled by either Entergy or the interconnecting customer.

Since voltage flicker is of concern for this specific interconnection (see section IX.) a high reliability communication path is important to Entergy; however, any of the above communication methods will be acceptable with Entergy and therefore PID276 should choose the best method that meets reliability and economic needs.

For any method of transfer tripping utilized, upon loss of communications, PID276 should not be permitted to synchronize with Entergy. If PID276 is generating in parallel in the event of a loss of communications, then tripping of their intertie circuit breaker or the generator circuit breaker will be required. This tripping logic will be the responsibility of PID276.

Since high speed transfer tripping of the intertie circuit breaker is critical, it should be initiated by a protective relay at Mermentau and not the closing of a circuit breaker auxiliary contact. This will allow the distributed generation to be taken offline approximately 4 cycles faster. The feeder circuit breaker 535F should be equipped with high speed auxiliary tripping relays as required.

A transfer trip cutout switch and test switch at the Entergy substation with SCADA indication should be considered to facilitate maintenance. This switching arrangement should also be incorporated at the customer end with annunciation back to the Entergy SCADA system.

A transfer trip test scheme should be included that will allow the communications path to be tested and regularly scheduled tests should be conducted.

XIII. PID276 System Grounding

The Entergy distribution system is solidly grounded. The majority of Entergy loads are connected line-ground and require a solidly grounded source to feed them. The distributed generator is high-resistance-grounded(HRG) with a 100 amp resistor. ETAP studies show that during a 1LG fault, the unfaulted phases will be subjected to approximately 120% overvoltage before Entergy trips offline and approximately 170% after Entergy trips offline (See appendix C). A solidly grounded generator mitigates this problem and therefore is required for this interconnection.

Due to the overvoltage condition, significant damage could be experienced by other customers on the distribution system. Other customers would be subjected to this overvoltage for as long as the generator can maintain voltage. The magnitude and duration of the overvoltage conditions can be determined from the generator decrement curve.

The overvoltage conditions will also elevate the voltage on the line-ground voltage regulators at the PID276 facility.

XIV. Normal Operating Conditions at Entergy Substation

This interconnection with Mermentau substation is designed for operation under normal substation operating procedures. For this interconnection, normal operation is defined as:

- the 69kV transmission line in service and normally feeding Mermentau substation from Jennings sub via Jennings breaker 18295
- the 69kV PTs for the UV/OV scheme in service
- the 13.8kV operating bus and its PTs in-service
- feeder breaker 535F closed and connected to 13.8kV operating bus
- healthy communication between Entergy and PID276 established.

Any other configuration is considered abnormal and will require disconnection of parallel operation.

Tripping of PID276's intertie circuit breaker 52L is required in the event that they are generating in parallel when an abnormal condition occurs. It is the responsibility of PID276 to develop local logic that will disconnect generation during abnormal conditions. The logic should be such that if PID276 is generating, then intertie breaker 52L will be tripped. If the PID276 generator is offline, then the generator should be blocked from synchronizing.

XV. Mermentau Distribution System Relaying

A oneline diagram of Mermentau substation is shown in Appendix A. Mermentau 69kV sub is tapped off of a radial transmission line. The voltage is stepped down to 13.8kV. This station has no main breaker since there is only a single feeder, 535F.

Feeder 535F is equipped with an SEL351S relay utilizing conventional overcurrent protection. Additional elements and functionality that should be utilized include:

A.) Directional (67) phase and ground overcurrent elements looking back into the substation transformer are necessary to prevent the distributed generator from backfeeding transformer faults.
B.) Underfrequency and overfrequency (81) elements shall be required for backup protection for islanded conditions.
C.) Undervolatge (27) and overvoltage (59) elements shall be required for backup protection for islanded conditions.
D.) Negative sequence current (46) elements for unbalanced conditions are critical due to the fuses on the highside of the substation transformer. If a single fuse opens due to a fault on the highside of the substation transformer, the distributed generator will backfeed the Entergy distribution system and support system voltages. Therefore, high speed operation of this protection function is necessary.
E.) Negative sequence voltage (47) elements for unbalanced conditions are critical due to the fuses on the highside of the substation transformer. High speed operation of this function is also necessary to supplement the 46 element.
F.) Logic functions that may be required to provide for transfer trip to the PID276 intertie breaker.

(*Note: The design phase of the project will determine the specific logic associated with the above relay elements.)

These relay upgrades are necessary and intended for the protection of the Entergy distribution system only. None of these upgrades are in lieu of PID276's own protection requirements specified in the Distribution Standards and Engineering Guideline DR07 for generator system protection.

This feeder relay requires voltage inputs from PTs connected to the 13.8kV operate bus at Mermentau in order for the above proposed protection elements to work. In order to achieve this, the CSP PTs on the 13.8kV operate bus will need to be upgraded to conventional PTs. This work may require a bus outage which will require an alternate supply of power to the feeder or the installation of a mobile substation transformer.

The reclosing scheme on feeder breaker 535F shall be modified to ensure dead line closing only to prevent closing the breaker with an out of synchronism condition. This can be achieved with the addition of a PT installed on the load side of the feeder breaker. A bypass switch that would allow hotline closing may be required to allow distribution feeder switching operations under abnormal conditions. The position of this switch should be monitored by the Entergy SCADA system.

XVI. Breaker Failure Protection at Mermentau

Due to the Mermentau substation configuration, breaker failure protection is not required since any trip initiation of feeder breaker 535F will also initiate transfer trip on the PID276 intertie breaker.

XVII. Metering

Two way directional watt-hour, var-hour, and demand metering will be required at PID276's facility. Metering data will need to be brought back to Entergy by some means of communication. If fiber optic communication is used with transfer trip, then this medium could be used to send metering data as well. Otherwise, an alternate method of communication will be required.

XVIII. Distribution Line Upgrade

It is required to reconductor approximately 8300' of three phase primary to 336 ACSR due to line loading requirements.

In order to maintain existing line sectionalizing, a line recloser shall be installed on feeder 535F between Mermentau sub and the PID276 facility.

The addition of a line recloser requires the installation of communications that can transfer trip the distributed generation anytime the recloser trips. This is required to prevent back feed of the Entergy system and out of synchronism closing in on the distributed generator.

A PT connected phase-phase on the load-side of the recloser will be required for deadline closing supervision.

XIV. Mermentau LTC Control

The Mermentau Substation Power transformer LTC controller is a Beckwith M-2001B. This is a microprocessor based controller that can accommodate bi-directional power flow and is sufficient for use with this interconnection.

XX. Entergy 69kV System Relaying

Currently, the minimum load on the Mermentau transformer is approximately 1.2 MVA, thus the 5 MW generator will normally back feed the Entergy 69kV transmission system. This poses hazards to the transmission system and maintenance personnel in the event of a transmission fault or a loss of the 69kV transmission source. Therefore, an undervoltage/overvoltage relay scheme for high speed tripping of the PID276 intertie circuit breaker is proposed as follows:

1.) (27) Phase Fault Protection
Undervoltage protection shall be used to detect a loss of source on the 69kV system.

2.) (59) Ground Fault Protection

Overvoltage protection shall be used to detect ground faults on the 69kV system that are back fed by the delta high side winding of the Entergy substation transformer.

3.) (81O/U) Under Frequency/Over Frequency
Frequency protection shall be used to detect islanded conditions and loss of source.

Implementing this scheme requires installing 69kV PTs on the primary side of the Mermentau transformer. These potentials need to be sensed by a protective relay. An additional SEL351 relay shall be installed to provide the above functions for 69kV system faults. This relay will be used to isolate the distributed generation from Entergy.

XX. 69kV Surge Arresters

The existing lightning arresters installed on the Mermentau transformer highside and installed on the 69kV transmission lines feeding Mermentau substation are the old style porcelain, gap-type arresters. It is required to replace the existing arresters with modern, metal-oxide type arresters that can withstand the dynamic overvoltages and the AC overvoltages on the 69kV system. In the event of a 69kV 1LG fault, the unfaulted phases can elevate in potential to as high as 1.73 times the line-ground equipment ratings.

XX. SCADA Indication

Positions of the PID276 intertie and generator circuit breakers should be communicated back to the Entergy SCADA system at Mermentau via the communication link. If the communication link is fiber optic, this can be easily accomplished through the SEL relays or an SEL2505 remote I/O device. This information would be helpful to the system dispatcher in maintaining reliable operation of the cogeneration intertie.

It is stated in the Entergy Distribution Standards DR07 that "An RTU (Remote Terminal Unit) shall be installed by [PID276] to gather accumulated and instantaneous data to be telemetered to a specific [Entergy] control center. [Entergy] shall approve the RTU and its configuration. Instantaneous analog Watt and VAr flow information and breaker/switch status must be telemetered directly to the center. These signals will display the current status of the generation facility."

Additionally, PID276 may require some discreet logic to be communicated back from Mermentau Substation. The SEL351 and SEL2505 devices provide 8 transmit bits and 8 receive bits of communications between the terminals.

XXI. Distribution System Fault Conditions

Fault detection sensitivity may be affected on the distribution line with the addition of the generating source. Relay settings, transformer and distribution line fuses, and any other protective devices on this feeder should be reviewed for adequate sensitivity considering arc resistance and the in-feed effects of the PID276 generating source.

XXIV. Summary of Costs

Substation & Transmission Line Upgrades	**$ 225,000**
- Install 69 kV PTs - Replace 69 KV Lightning Arresters - Install Relay for OV/UV Scheme	
Distribution Line Upgrades	**$ 395,000**
- Reconductor Approximately 1.6 Miles of Mermentau Feeder 535F - Install Recloser on Feeder 535F - Install 13 kV Arresters at POCC - Install Utility Metering	
Communications	**$ 60,000**
- Install Approximately 3 miles of Fiber - Install Terminal Equipment at Substation & Recloser	
TOTAL	$ 680,000

Appendix A

Requests for Entergy

1.) Transmission and substation onelines showing preferred and alternate feeders.
Attached.

2.) Fault data at substation, Customer facility and at end of distribution line (3LG, L-L, L-G).
At substation: 1LG=3535A, 3LG=3329A
At PID276 facility: 1LG=1477A, 3LG=1814A

3.) Feeder impedance from substation to congenerating facility.
Attached.

4.) Maximum and minimum load (excluding cogenerator) on preferred and alternate feeders. 8.5MVA Max. 1.2MVA Min. No Alternate feeds.

5.) Maximum and minimum load on substation mains.
No mains at this sub and no alternate feeds.

6.) Relay settings and type on substation main. SEL 351-S, Phase info is as follows:
U2 family curve, tap = 5, Time Dial = 1.5, CT ratio = 600:5
Ground info is as flollows: U2 family curve, tap = 3, TD = 3, CT ratio = 600:5

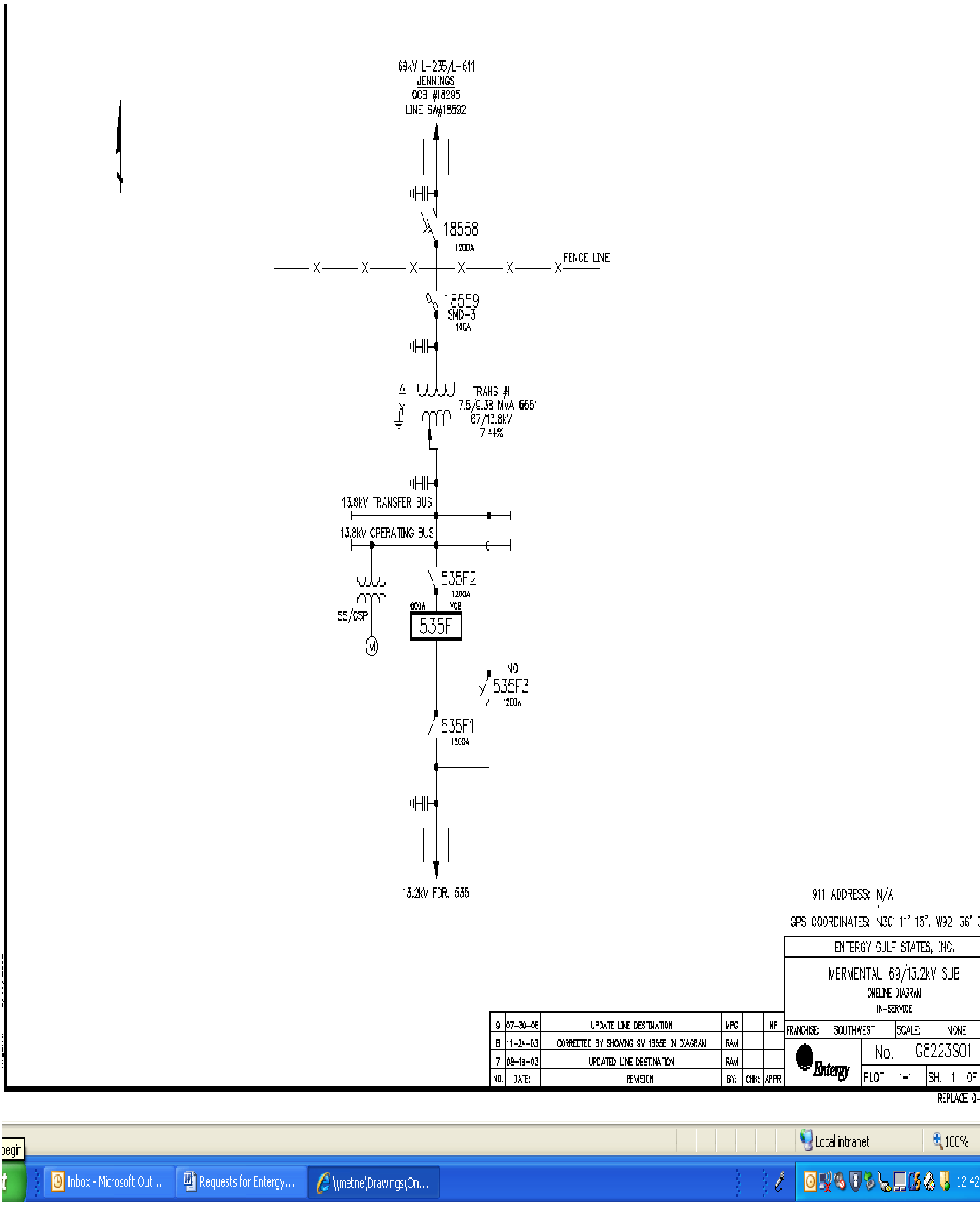
7.) Relay settings and type on preferred and alternate feeders.
N/A. No alternate feeds.

8.) Ground grid resistance at substation. Subsation grid and fence grounds are not connected. Therefore 1.014 ohms is the resistance.

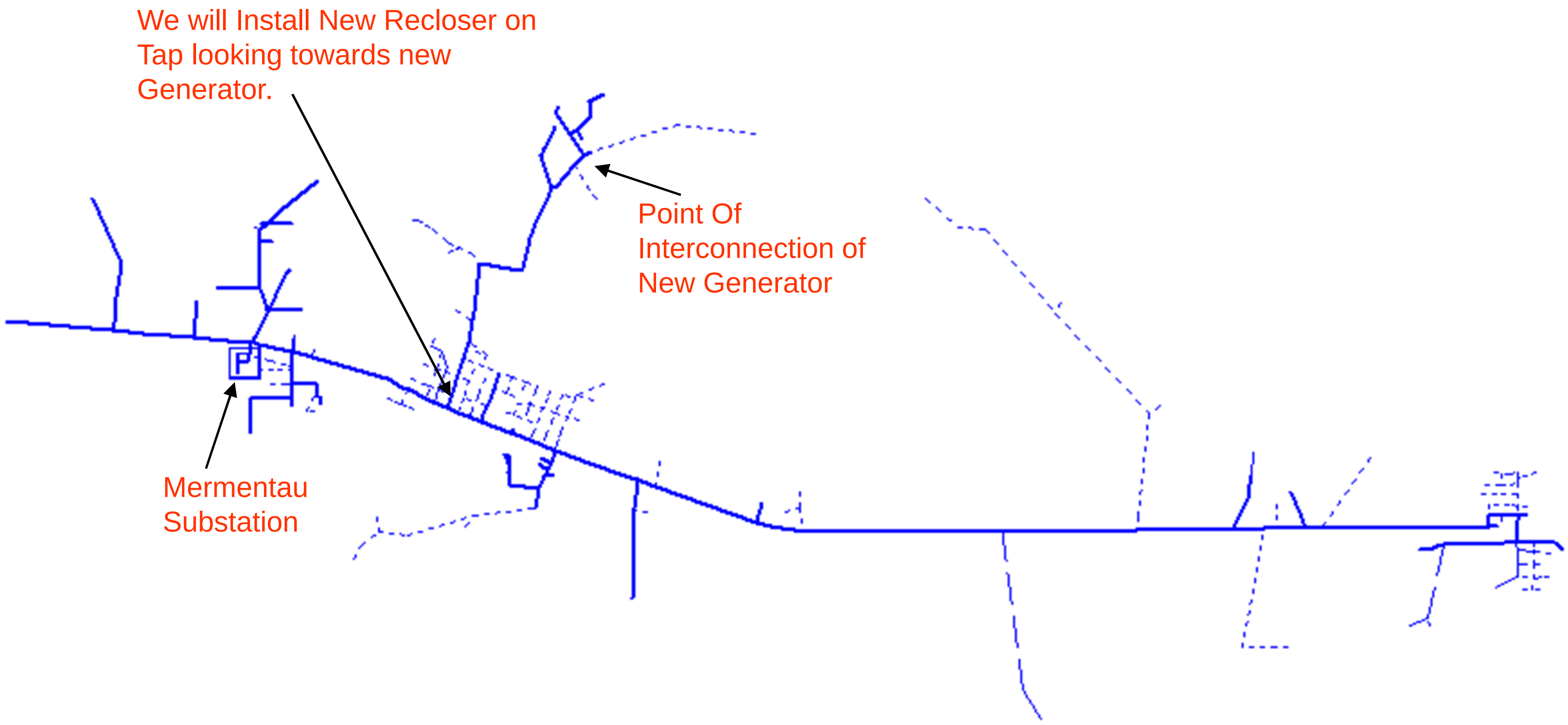
9.) Is there a recloser on the preferred/alternate feeders?
Recloser will be installed between substation and PID276

10.) Power factor requirements for cuctomer. Attached

11.) A copy of the application for generator connection to the Entergy system. This should include descriptions of proposed compliance to Entergy's requirements for interconnection of generators. Attached.



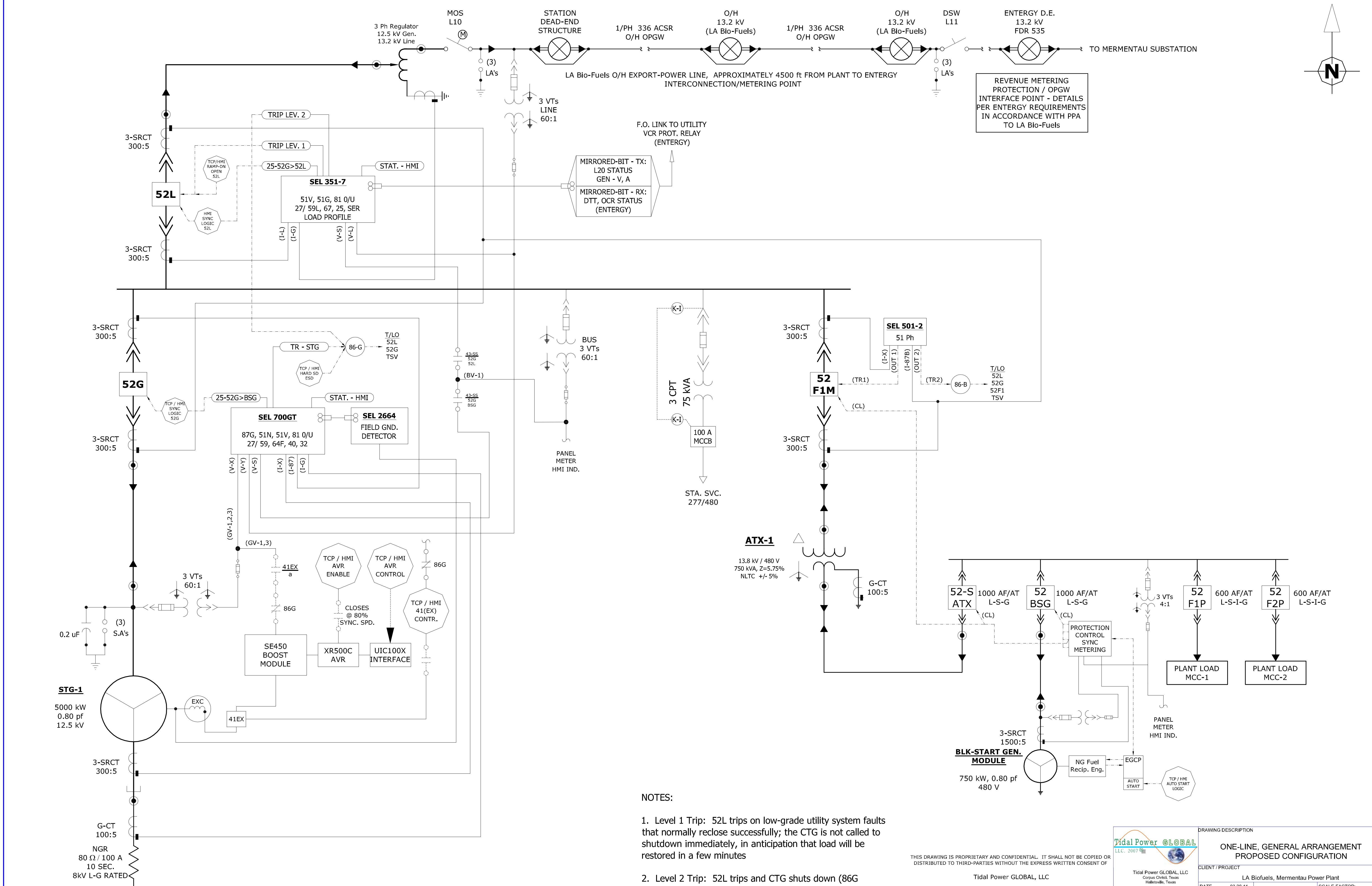
69kV L-235/L-611
JENNINGS
OCB #18295
LINE SW#18592
18558
1200A
FENCE LINE
18559
SMD-3
100A
TRANS #1
7.5/9.38 MVA 65C
67/13.8kV
7.44%
13.8kV TRANSFER BUS
13.8kV OPERATING BUS
535F2
1200A
600A
VCB
535F
55/CSP
M
NO
535F3
1200A
535F1
1200A
13.2kV FDR. 535
911 ADDRESS: N/A
GPS COORDINATES: N30° 11' 15", W92° 36'
ENTERGY GULF STATES, INC.
MERMENTAU 69/13.2kV SUB
ONELINE DIAGRAM
IN-SERVICE
FRANCHISE: SOUTHWEST
SCALE: NONE
No. G8223S01
PLOT 1=1
SH. 1 OF
REPLACE
9 07-30-08 UPDATE LINE DESTINATION MPG MP
8 11-24-03 CORRECTED BY SHOWING SW 18558 IN DIAGRAM RAM
7 08-19-03 UPDATED LINE DESTINATION RAM
NO. DATE: REVISION BY: CHK: APPR:
Entergy
Local intranet
100%
Inbox - Microsoft Out...
Requests for Entergy...
\\metne\Drawings\On...
12:42


We will Install New Recloser on
Tap looking towards new
Generator.
Point Of
Interconnection of
New Generator
Mermentau
Substation

Section - Id	Dist - MI	Symmetrical Amps - LG Min	Symmetrical Amps - LG Max	Symmetrical Amps - 3Ph
Feeder 535M	0	377	**3535**	**3329**
62861196AB(	2.69	347	**1477**	**1814**

Cumulative Impedance - R1	Cumulative Impedance - X1	Cumulative Impedance - R0	Cumulative Impedance - X0
0.14	2.29	0.06	1.89
1.1	4.06	1.9	6.82

Appendix B



NOTES:

1. Level 1 Trip: 52L trips on low-grade utility system faults that normally reclose successfully; the CTG is not called to shutdown immediately, in anticipation that load will be restored in a few minutes

2. Level 2 Trip: 52L trips and CTG shuts down (86G activated) upon receiving DTT from utility, encurring major differential zone fault or HMI Hard-Shutdown

NO.	DATE	JOB NO.	REVISION	BY	CH	COR	APP
**	mm.dd.yy	####	- - -.	***	***	***	***
**	mm.dd.yy	####	- - -.	***	***	***	***
01	03.28.11	1108	PRELIMINARY LAYOUT - FOR GENERAL INFORMATION	JMM	JMM	JMM	***

Tidal Power GLOBAL LLC 2007

Tidal Power GLOBAL, LLC
Corpus Christi, Texas
Hallettsville, Texas

DRAWING DESCRIPTION

ONE-LINE, GENERAL ARRANGEMENT
PROPOSED CONFIGURATION

CLIENT / PROJECT

LA Biofuels, Mermentau Power Plant

DATE	03.28.11		SCALE FACTOR:	1.0
DRAWN	JMM		SHEET	1 OF 1
CHECKED	JMM	*	DWG #	1108-E100-GA1
APPROVED	JMM	*	REF # TPG-1108	REV GA

Attachment 2

SMALL GENERATOR INTERCONNECTION REQUEST
(Application Form)

Transmission Provider: Entergy

Designated Contact Person: Michael Gravolet

Address: Mail Unit L-ent - 24C

Telephone Number: 504 576 4000

Fax: 504 576 6900

E-Mail Address: MGRAVOL@entergy.com

An Interconnection Request is considered complete when it provides all applicable and correct information required below. Per SGIP section 1.5, documentation of site control must be submitted with the Interconnection Request.

Preamble and Instructions

An Interconnection Customer who requests a Federal Energy Regulatory Commission jurisdictional interconnection must submit this Interconnection Request by hand delivery, mail, e-mail, or fax to the Transmission Provider.

Processing Fee or Deposit:

If the Interconnection Request is submitted under the Fast Track Process, the non-refundable processing fee is $500.

If the Interconnection Request is submitted under the Study Process, whether a new submission or an Interconnection Request that did not pass the Fast Track Process, the Interconnection Customer shall submit to the Transmission Provider a deposit not to exceed $1,000 towards the cost of the feasibility study.

Interconnection Customer Information

Legal Name of the Interconnection Customer (or, if an individual, individual's name)

Name: Louisiana Bio Fuels

Contact Person: Freddie Hebert

Mailing Address: 207 Dixie rd. Gueydan La. 70542

City: Gueydan State: La. Zip: 70542

Facility Location (if different from above): Port Rd. Mermentau Louisiana

Telephone (Day): 337 658 7384 Telephone (Evening): 337 658 7384

Fax: 337 536 6928 E-Mail Address: fhebert8@bellsouth.net

Alternative Contact Information (if different from the Interconnection Customer)

Contact Name: ____

Title: ____

Address: ____

____

Telephone (Day): ____________________ Telephone (Evening): ____________________

Fax: ______________________________ E-Mail Address: ______________________

Application is for: [✔] New Small Generating Facility
[ ] Capacity addition to Existing Small Generating Facility

If capacity addition to existing facility, please describe: ______________________________
____

Will the Small Generating Facility be used for any of the following?

Net Metering? Yes [✔] No [ ]
To Supply Power to the Interconnection Customer? Yes [✔] No [ ]
To Supply Power to Others? Yes [ ] No [✔]

For installations at locations with existing electric service to which the proposed Small Generating Facility will interconnect, provide:

______________________________ ______________________________
(Local Electric Service Provider*) (Existing Account Number*)

[*To be provided by the Interconnection Customer if the local electric service provider is different from the Transmission Provider]

Contact Name: ____

Title: ____

Address: ____

____

Telephone (Day): ______________________ Telephone (Evening): ________________

Fax: ______________________________ E-Mail Address: ____________________

Requested Point of Interconnection: __________________________________

Interconnection Customer's Requested In-Service Date: _____________________

Small Generating Facility Information

Data apply only to the Small Generating Facility, not the Interconnection Facilities.

Energy Source: ☐ Solar ☐ Wind ☐ Hydro ☐ Hydro Type (e.g. Run-of-River):______
Diesel ☐ Natural Gas ☐ Fuel Oil ☑ Other (state type) Saw Mill Waste , forest Residue , Bio mass

Prime Mover: ☐ Fuel Cell ☐ Recip Engine ☐ Gas Turb ☑ Steam Turb
☐ Microturbine ☐ PV ☐ Other

Type of Generator: ☑ Synchronous ☐ Induction ☐ Inverter

Generator Nameplate Rating: 4500 kW (Typical) Generator Nameplate kVAR: _______

Interconnection Customer or Customer-Site Load: none kW (if none, so state)

Typical Reactive Load (if known): not known

Maximum Physical Export Capability Requested: 4400 kW

List components of the Small Generating Facility equipment package that are currently certified:

Equipment Type	Certifying Entity
1. not known	
2.	
3.	
4.	
5.	

Is the prime mover compatible with the certified protective relay package? ☑ Yes ☐ No

Generator (or solar collector)
Manufacturer, Model Name & Number: Ideal SAB type
Version Number: Frame 21320-34.5

Nameplate Output Power Rating in kW: (Summer) 4400 KW (Winter) 4400KW

Nameplate Output Power Rating in kVA: (Summer) 5625___________ (Winter) 5625____________

Individual Generator Power Factor
Rated Power Factor: Leading: pt 17___________Lagging: pt11_____________

Total Number of Generators in wind farm to be interconnected pursuant to this Interconnection Request: __________ Elevation: ______ ___Single phase ___Three phase

Inverter Manufacturer, Model Name & Number (if used): ____________________________________

List of adjustable set points for the protective equipment or software: __________________________

Note: A completed Power Systems Load Flow data sheet must be supplied with the Interconnection Request.

Small Generating Facility Characteristic Data (for inverter-based machines)

Max design fault contribution current: __________ Instantaneous ___ or RMS? ____

Harmonics Characteristics: ____

Start-up requirements: ____

Small Generating Facility Characteristic Data (for rotating machines)

RPM Frequency: 1800___________
(*) Neutral Grounding Resistor (If Applicable): N/A__________

Synchronous Generators:

Direct Axis Synchronous Reactance, Xd: Not Known P.U.
Direct Axis Transient Reactance, X'_d: Not Known_____P.U.
Direct Axis Subtransient Reactance, X''_d: Not Known________P.U.
Negative Sequence Reactance, X_2: Not Known P.U.
Zero Sequence Reactance, X_0: Not Known P.U.
KVA Base: 5625_______________________
Field Volts: 12470 (will adjust to 13800)
Field Amperes: 271____________

Induction Generators:

Motoring Power (kW): 4400____________
I_2^2t or K (Heating Time Constant): ______________

Rotor Resistance, Rr: @ 25 Degrees C = 2.26
Stator Resistance, Rs: ______________
Stator Reactance, Xs: ______________
Rotor Reactance, Xr: ______________
Magnetizing Reactance, Xm: ______________
Short Circuit Reactance, Xd": ______________
Exciting Current: ______________
Temperature Rise: ______________
Frame Size: ______________
Design Letter: ______________
Reactive Power Required In Vars (No Load): ______________
Reactive Power Required In Vars (Full Load): ______________
Total Rotating Inertia, H: _____________ Per Unit on kVA Base

Note: Please contact the Transmission Provider prior to submitting the Interconnection Request to determine if the specified information above is required.

Excitation and Governor System Data for Synchronous Generators Only

Provide appropriate IEEE model block diagram of excitation system, governor system and power system stabilizer (PSS) in accordance with the regional reliability council criteria. A PSS may be determined to be required by applicable studies. A copy of the manufacturer's block diagram may not be substituted.

Interconnection Facilities Information

Will a transformer be used between the generator and the point of common coupling? ☑ Yes ☐ No

Will the transformer be provided by the Interconnection Customer? ☑ Yes ☐ No

Transformer Data (If Applicable, for Interconnection Customer-Owned Transformer):

Is the transformer: ☐ single phase ☑ three phase? Size: 5625 kVA
Transformer Impedance: _______% on __________kVA Base

If Three Phase:
Transformer Primary: _____ Volts _____ Delta _____Wye _____ Wye Grounded
Transformer Secondary: _____ Volts _____ Delta _____Wye _____ Wye Grounded
Transformer Tertiary: _____ Volts _____ Delta _____Wye _____ Wye Grounded

Transformer Fuse Data (If Applicable, for Interconnection Customer-Owned Fuse):

(Attach copy of fuse manufacturer's Minimum Melt and Total Clearing Time-Current Curves)

Manufacturer: __________________ Type: _______________ Size: ________Speed: ______________

Interconnecting Circuit Breaker (if applicable):

Manufacturer: ____________________________ Type: __________
Load Rating (Amps): _______ Interrupting Rating (Amps): ________ Trip Speed (Cycles): __________

Interconnection Protective Relays (If Applicable):

If Microprocessor-Controlled:

List of Functions and Adjustable Setpoints for the protective equipment or software:

Setpoint Function	Minimum	Maximum
1. ____	_______________	_______________
2. ____	_______________	_______________
3. ____	_______________	_______________
4. ____	_______________	_______________
5. ____	_______________	_______________
6. ____	_______________	_______________

If Discrete Components:

(Enclose Copy of any Proposed Time-Overcurrent Coordination Curves)

Manufacturer: ___________ Type: _______ Style/Catalog No.: __________ Proposed Setting: ____________
Manufacturer: ___________ Type: _______ Style/Catalog No.: __________ Proposed Setting: ____________
Manufacturer: ___________ Type: _______ Style/Catalog No.: __________ Proposed Setting: ____________
Manufacturer: ___________ Type: _______ Style/Catalog No.: __________ Proposed Setting: ____________
Manufacturer: ___________ Type: _______ Style/Catalog No.: __________ Proposed Setting: ____________

Current Transformer Data (If Applicable):

(Enclose Copy of Manufacturer's Excitation and Ratio Correction Curves)

Manufacturer: ____
Type: ________________ Accuracy Class: ___ Proposed Ratio Connection: ____

Manufacturer: ____
Type: ________________ Accuracy Class: ___ Proposed Ratio Connection: ____

Potential Transformer Data (If Applicable):

Manufacturer: ____
Type: ________________ Accuracy Class: ___ Proposed Ratio Connection: ____

Manufacturer: ____
Type: ________________ Accuracy Class: ___ Proposed Ratio Connection: ____

General Information

Enclose copy of site electrical one-line diagram showing the configuration of all Small Generating Facility equipment, current and potential circuits, and protection and control schemes. This one-line diagram must be signed and stamped by a licensed Professional Engineer if the Small Generating Facility is larger than 50 kW. Is One-Line Diagram Enclosed? ☑ Yes ☐ No

Enclose copy of any site documentation that indicates the precise physical location of the proposed Small Generating Facility (e.g., USGS topographic map or other diagram or documentation).

Proposed location of protective interface equipment on property (include address if different from the Interconnection Customer's address) ____

Enclose copy of any site documentation that describes and details the operation of the protection and control schemes. Is Available Documentation Enclosed? ☐ Yes ☑ No

Enclose copies of schematic drawings for all protection and control circuits, relay current circuits, relay potential circuits, and alarm/monitoring circuits (if applicable).
Are Schematic Drawings Enclosed? ☐ Yes ☑ No

Applicant Signature

I hereby certify that, to the best of my knowledge, all the information provided in this Interconnection Request is true and correct.

For Interconnection Customer: ____________________________________ Date: 2/1/2011

Manufacturer: ____
Type: _______________ Accuracy Class: ___ Proposed Ratio Connection: ____

Manufacturer: ____
Type: _______________ Accuracy Class: ___ Proposed Ratio Connection: ____

General Information

Enclose copy of site electrical one-line diagram showing the configuration of all Small Generating Facility equipment, current and potential circuits, and protection and control schemes. This one-line diagram must be signed and stamped by a licensed Professional Engineer if the Small Generating Facility is larger than 50 kW. Is One-Line Diagram Enclosed? ☐ Yes ☑ No

Enclose copy of any site documentation that indicates the precise physical location of the proposed Small Generating Facility (e.g., USGS topographic map or other diagram or documentation).

Proposed location of protective interface equipment on property (include address if different from the Interconnection Customer's address) ____

Enclose copy of any site documentation that describes and details the operation of the protection and control schemes. Is Available Documentation Enclosed? ☐ Yes ☑ No

Enclose copies of schematic drawings for all protection and control circuits, relay current circuits, relay potential circuits, and alarm/monitoring circuits (if applicable).
Are Schematic Drawings Enclosed? ☐ Yes ☑ No

Applicant Signature

I hereby certify that, to the best of my knowledge, all the information provided in this Interconnection Request is true and correct.

For Interconnection Customer: [signature] Date: 2/1/2011

IDEAL ELECTRIC CO.

330 EAST FIRST STREET • MANSFIELD, OHIO 44902 • USA

TELEPHONE (419) 522 - 3611 • FAX (419) 522 - 9386

SYNCHRONOUS GENERATOR DATA

S/N 042897	4500 KW	5625 KVA	0.80 P.F.
105 °C RISE	12000 VOLTS	271 AMPS	1800 RPM

REACTANCES

PER UNIT ON 5625 kVA BASE

Direct Axis Synchronous	(Unsaturated)	Xd	2.299
Direct Axis Transient	(Rated Voltage)	X'd	0.331
Direct Axis Subtransient	(Rated Voltage)	X"d	0.209
Quadrature Axis Synchronous	(Unsaturated)	Xq	1.031
Quadrature Axis Subtransient	(Rated Voltage)	X"q	0.204
Negative Sequence	(Rated Voltage)	X2	0.212
Zero Sequence	(Rated Voltage)	Xo	0.064
Short Circuit Ratio		SCR	0.462

TIME CONSTANTS

Direct Axis Open Circuit Transient	T'do	6.170 Sec.
Direct Axis Short Circuit Transient	T'd	0.888 Sec.
Direct Axis Open Circuit Subtransient	T"do	0.049 Sec.
Direct Axis Short Circuit Subtransient	T"d	0.031 Sec.
Short Circuit Armature	Ta	0.066 Sec.

RESISTANCES

Armature	(per phase at 25°C)	0.15050 Ohms
Field	(at 25°C)	2.203 Ohms
Rotor Inertia		9933 Lb-Ft²

EFFICIENCY

Load	Eff. at 0.80 P.F.
4/4	96.2%
3/4	96.0%
1/2	95.2%

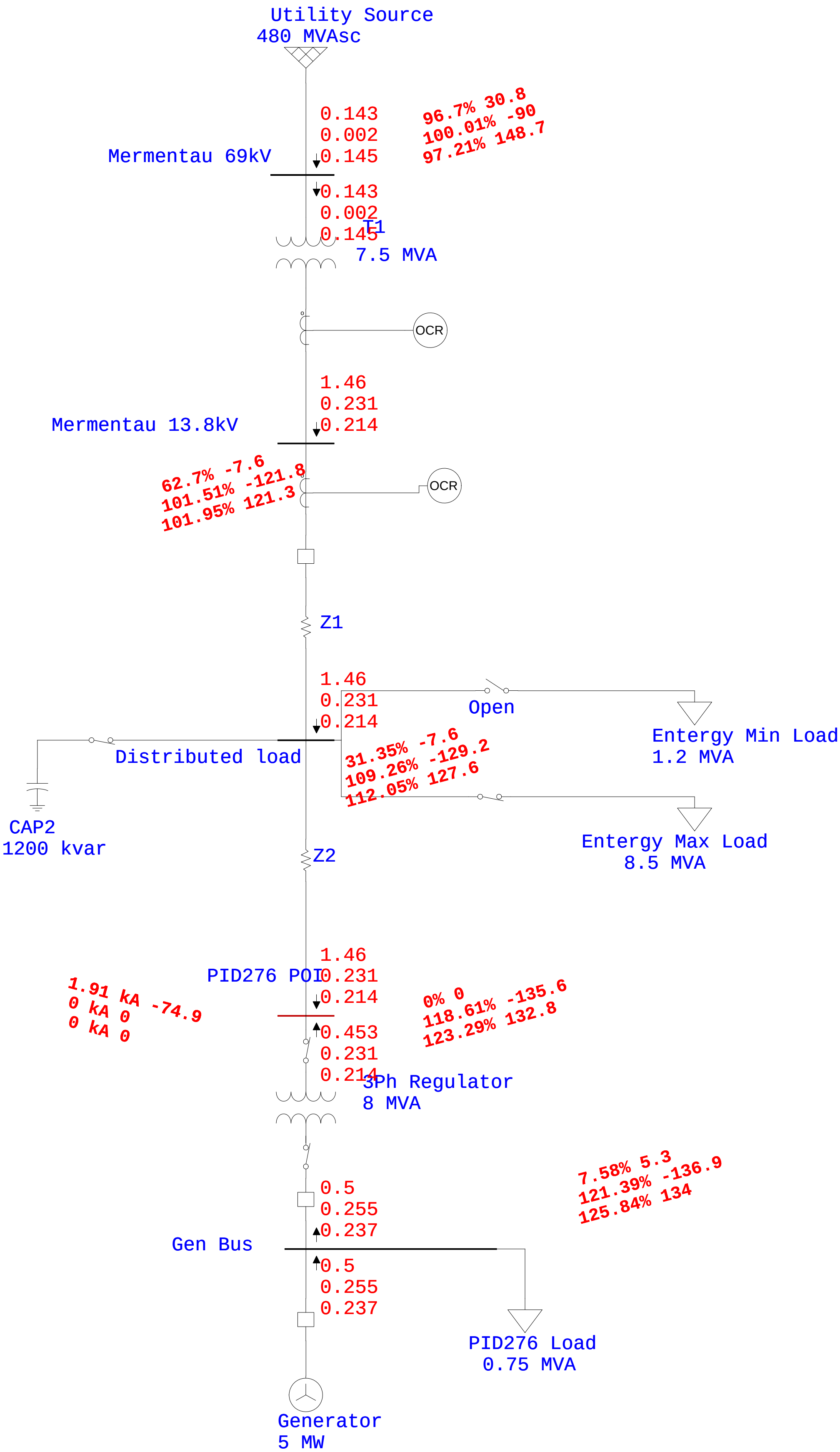
DATE 14-Jan-05 rev. 0 Ref: 2132034

Appendix C

1LG FAULT ANALYSIS

100A resistor

One-Line Diagram - OLV1 (Short-Circuit Analysis)



SHORT- CIRCUIT REPORT

Fault at bus: **PID276 POI**

Prefault voltage = 13.800 kV = 100.00 % of nominal bus kV (13.800 kV)
= 100.00 % of base kV (13.800 kV)

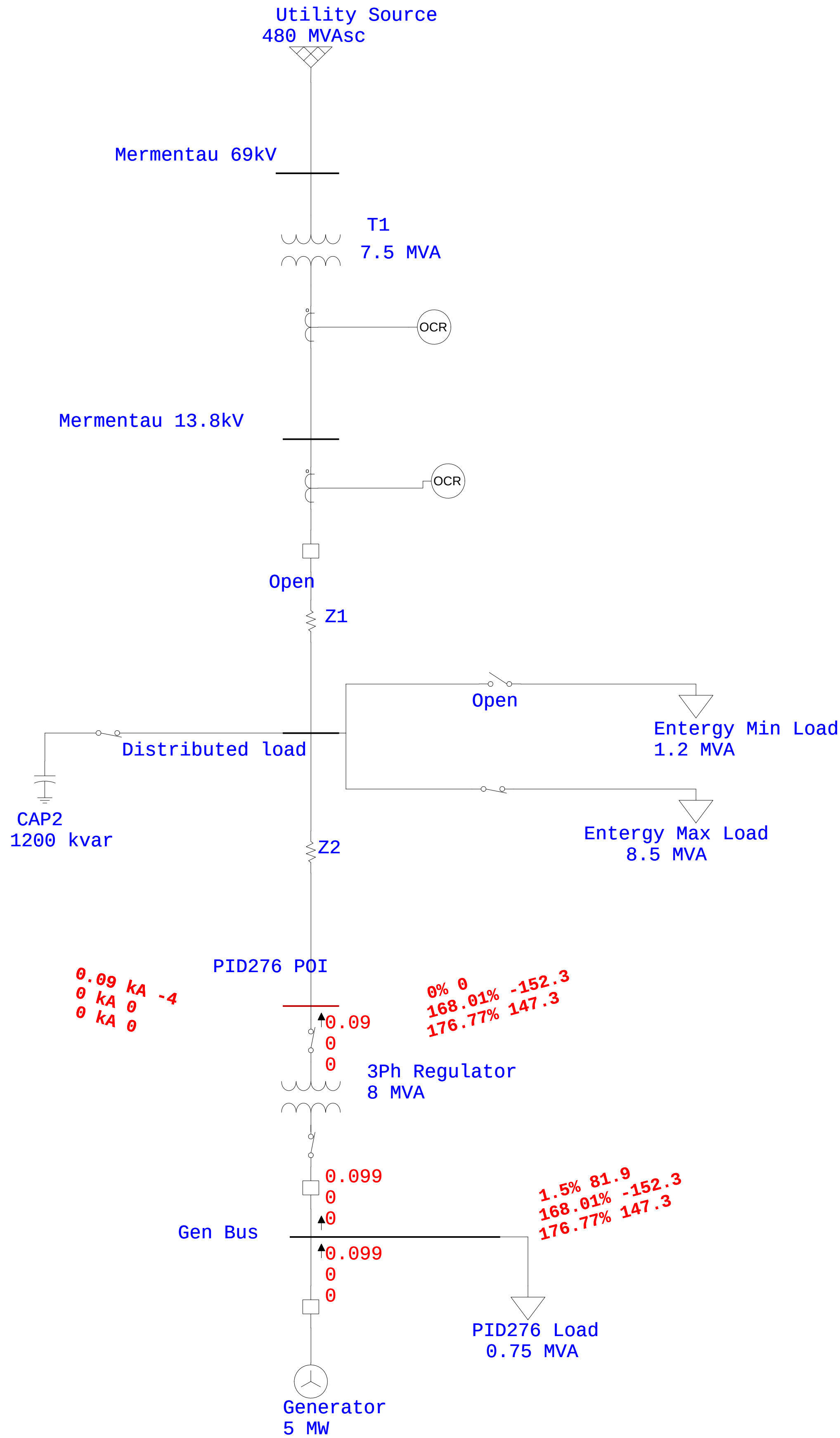
Line-To-Ground Fault

Contribution		% Voltage at From Bus						Current at From Bus (kA)						Sequence Current (kA)		
From Bus	To Bus	Va		Vb		Vc		Ia		Ib		Ic				
ID	ID	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	I1	I2	I0
PID276 POI	Total	0.00	0.0	118.61	-135.6	123.29	132.8	1.911	-74.9	0.000	0.0	0.000	0.0	0.637	0.637	0.637
Distributed load	PID276 POI	31.35	-7.6	109.26	-129.2	112.05	127.6	1.460	-73.1	0.231	-86.2	0.214	-88.0	0.415	0.416	0.632
Gen Bus	PID276 POI	7.58	5.3	121.39	-136.9	125.84	134.0	0.453	-80.7	0.231	93.8	0.214	92.0	0.227	0.223	0.017

\# Indicates fault current contribution is from three-winding transformers

* Indicates a zero sequence fault current contribution (3I0) from a grounded Delta-Y transformer

One-Line Diagram - OLV1 (Short-Circuit Analysis)



SHORT- CIRCUIT REPORT

Fault at bus: **PID276 POI**

Prefault voltage = 13.800 kV = 100.00 % of nominal bus kV (13.800 kV)
= 100.00 % of base kV (13.800 kV)

Line-To-Ground Fault

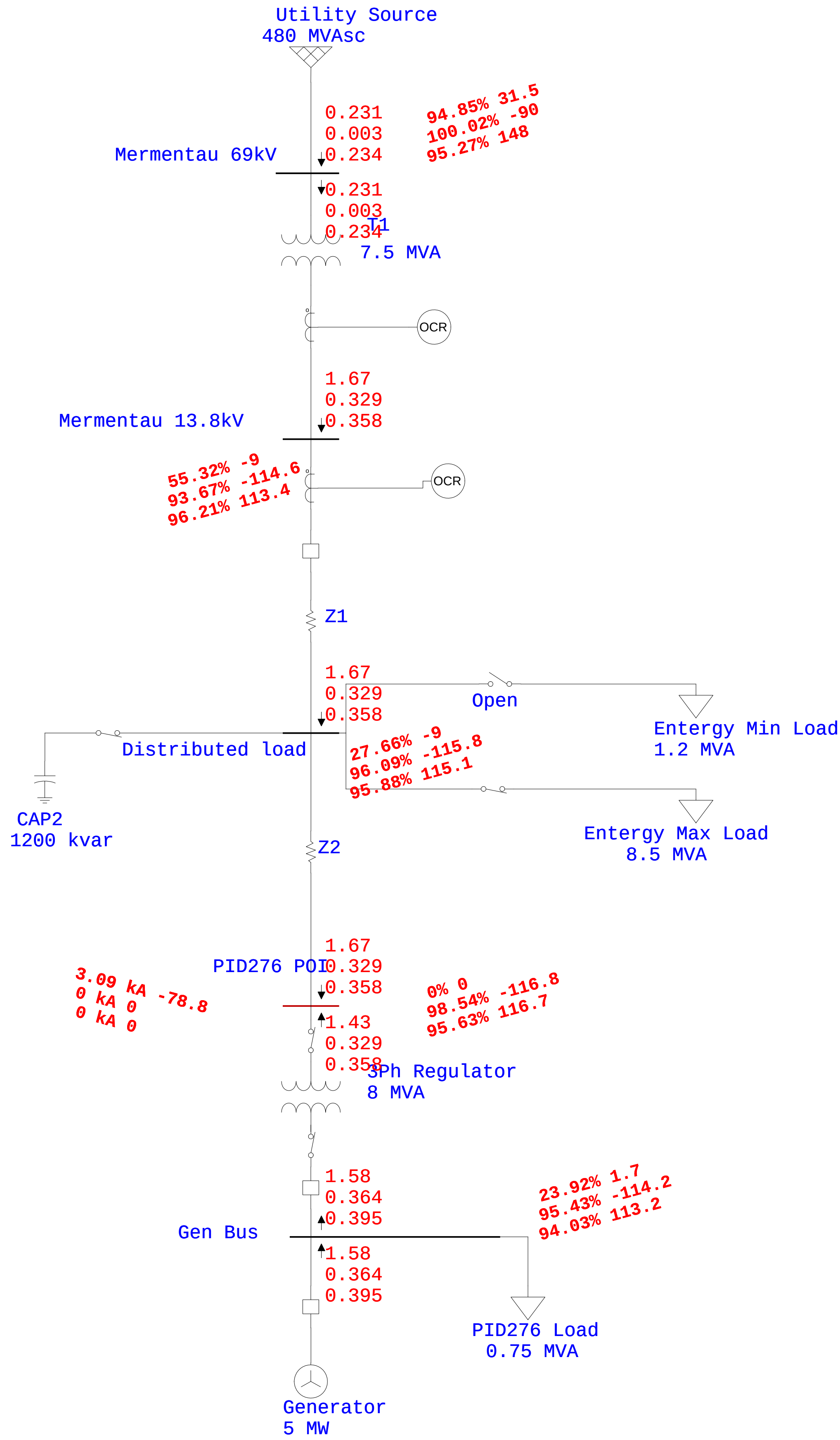
Contribution		% Voltage at From Bus						Current at From Bus (kA)								
From Bus	To Bus	Va		Vb		Vc		Ia		Ib		Ic		Sequence Current (kA)		
ID	ID	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	I1	I2	I0
PID276 POI	Total	0.00	0.0	168.01	-152.3	176.77	147.3	0.090	-4.0	0.000	0.0	0.000	0.0	0.030	0.030	0.030
Distributed load	PID276 POI	0.00	0.0	168.01	-152.3	176.77	147.3	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.000	0.000
Gen Bus	PID276 POI	1.50	81.9	168.01	-152.3	176.77	147.3	0.090	-4.0	0.000	0.0	0.000	0.0	0.030	0.030	0.030

# Indicates fault current contribution is from three-winding transformers

* Indicates a zero sequence fault current contribution (3I0) from a grounded Delta-Y transformer

Solidly Grounded Generator

One-Line Diagram - OLV1 (Short-Circuit Analysis)



SHORT- CIRCUIT REPORT

Fault at bus: **PID276 POI**

Prefault voltage = 13.800 kV = 100.00 % of nominal bus kV (13.800 kV)
= 100.00 % of base kV (13.800 kV)

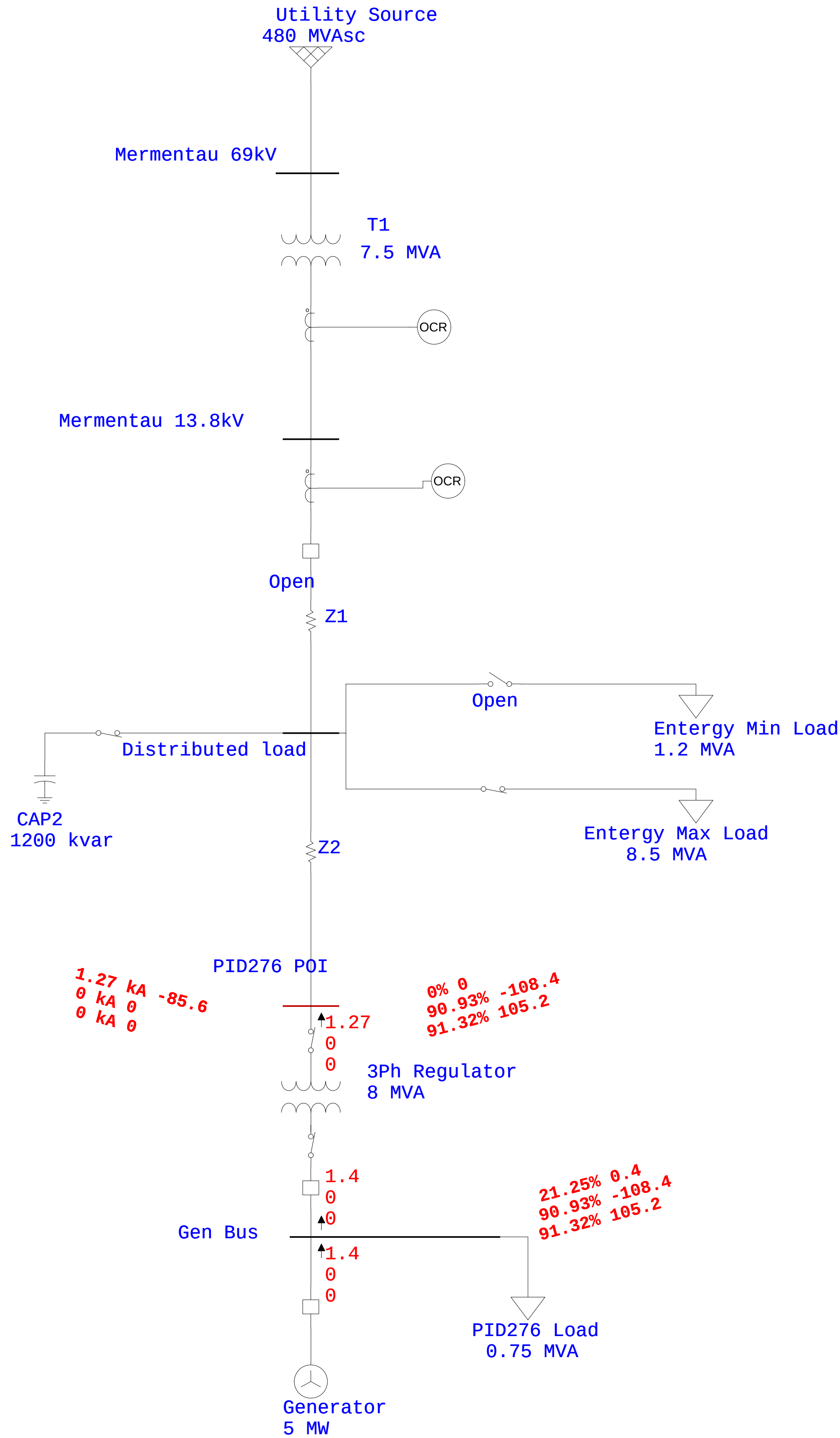
Line-To-Ground Fault

Contribution		% Voltage at From Bus						Current at From Bus (kA)						Sequence Current (kA)		
From Bus	To Bus	Va		Vb		Vc		Ia		Ib		Ic				
ID	ID	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	I1	I2	I0
PID276 POI	Total	0.00	0.0	98.54	-116.8	95.63	116.7	3.086	-78.8	0.000	0.0	0.000	0.0	1.029	1.029	1.029
Distributed load	PID276 POI	27.66	-9.0	96.09	-115.8	95.88	115.1	1.668	-74.1	0.329	102.8	0.358	103.5	0.670	0.671	0.328
Gen Bus	PID276 POI	23.92	1.7	95.43	-114.2	94.03	113.2	1.430	-84.3	0.329	-77.2	0.358	-76.5	0.366	0.361	0.704

# Indicates fault current contribution is from three-winding transformers

* Indicates a zero sequence fault current contribution (3I0) from a grounded Delta-Y transformer

One-Line Diagram - OLV1 (Short-Circuit Analysis)



SHORT- CIRCUIT REPORT

Fault at bus: **PID276 POI**

Prefault voltage = 13.800 kV = 100.00 % of nominal bus kV (13.800 kV)
= 100.00 % of base kV (13.800 kV)

Line-To-Ground Fault

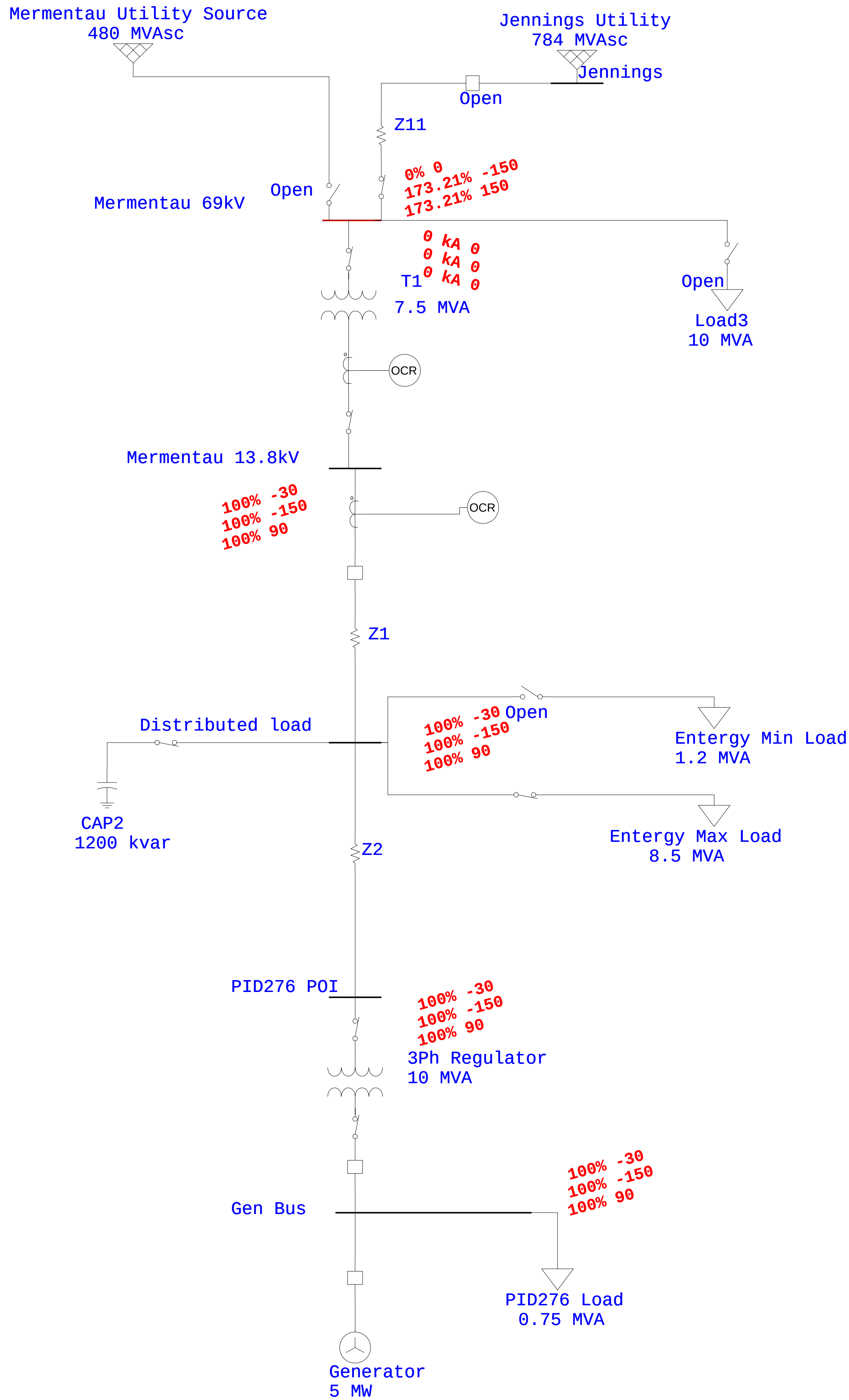
Contribution		% Voltage at From Bus						Current at From Bus (kA)						Sequence Current (kA)		
From Bus	To Bus	Va		Vb		Vc		Ia		Ib		Ic				
ID	ID	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	I1	I2	I0
PID276 POI	Total	0.00	0.0	90.93	-108.4	91.32	105.2	1.270	-85.6	0.000	0.0	0.000	0.0	0.423	0.423	0.423
Distributed load	PID276 POI	0.00	0.0	90.93	-108.4	91.32	105.2	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.000	0.000
Gen Bus	PID276 POI	21.25	0.4	90.93	-108.4	91.32	105.2	1.270	-85.6	0.000	0.0	0.000	0.0	0.423	0.423	0.423

# Indicates fault current contribution is from three-winding transformers

* Indicates a zero sequence fault current contribution (3I0) from a grounded Delta-Y transformer

69kV 1LG Fault Analysis

One-Line Diagram - OLV1 (Short-Circuit Analysis)



SHORT- CIRCUIT REPORT

Fault at bus: **Mermentau 69kV**

Prefault voltage = 69.000 kV = 100.00 % of nominal bus kV (69.000 kV)
= 100.00 % of base kV (69.000 kV)

Line-To-Ground Fault

Contribution		% Voltage at From Bus						Current at From Bus (kA)						Sequence Current (kA)		
From Bus	To Bus	Va		Vb		Vc		Ia		Ib		Ic				
ID	ID	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	I1	I2	I0
Mermentau 69kV	Total	0.00	0.0	173.21	-150.0	173.21	150.0	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.000	0.000
Mermentau 13.8kV	Mermentau 69kV	100.00	-30.0	100.00	-150.0	100.00	90.0	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.000	0.000

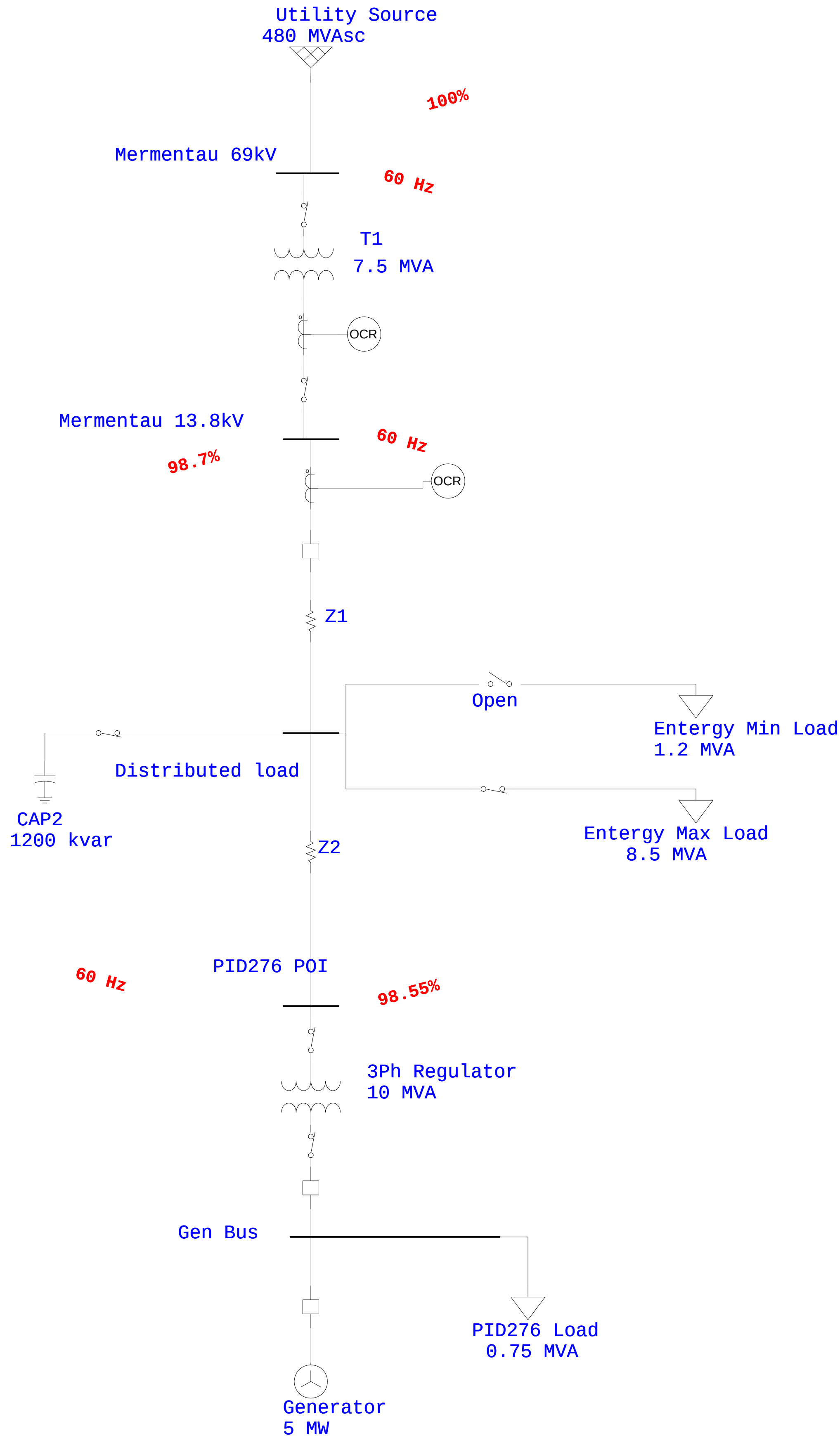
# Indicates fault current contribution is from three-winding transformers

* Indicates a zero sequence fault current contribution (3I0) from a grounded Delta-Y transformer

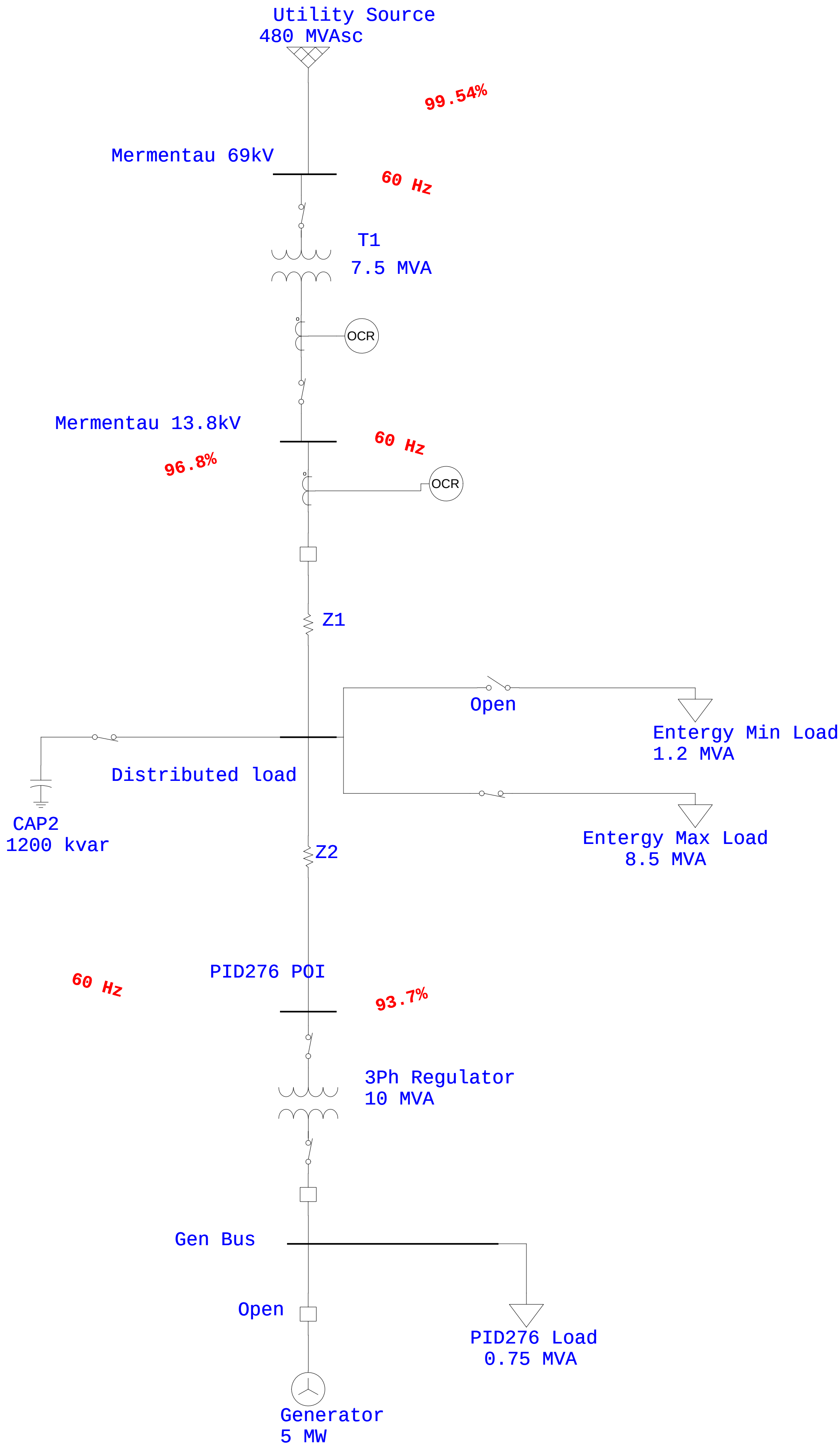
Voltage Flicker Analysis

4.5 MW Output at 98% PF

One-Line Diagram - OLV1 (Transient Stability Analysis)



One-Line Diagram - OLV1 (Transient Stability Analysis)



LOAD FLOW REPORT @ T = 0.000-

Bus		Voltage		Generation		Load		Load Flow					XFMR
ID	kV	% Mag.	Ang.	MW	Mvar	MW	Mvar	ID	MW	Mvar	Amp	%PF	% Tap
Distributed load	13.800	97.290	-3.4	0	0	7.643	1.377	Mermentau 13.8kV	-3.734	-0.894	165.1	97.3	
								PID276 POI	-3.910	-0.483	169.4	99.2	
Gen Bus	12.500	99.036	-1.1	0	0	0.543	0.263	PID276 POI	3.957	0.651	187.0	98.7	
								Generator	-4.500	-0.914	214.2	98.0	
Mermentau 13.8kV	13.800	98.697	-2.5	0	0	0	0	Distributed load	3.773	0.966	165.1	96.9	
								Mermentau 69kV	-3.773	-0.966	165.1	96.9	
* Mermentau 69kV	69.000	100.000	-0.4	0	0	0	0	Mermentau 13.8kV	3.784	1.120	33.0	95.9	
								Utility Source	-3.784	-1.120	33.0	95.9	
PID276 POI	13.800	98.549	-2.4	0	0	0	0	Distributed load	3.951	0.559	169.4	99.0	
								Gen Bus	-3.951	-0.559	169.4	99.0	
Generator	12.500	103.601	7.1	4.521	1.624	0	0	Gen Bus	4.521	1.624	214.2	94.1	
Utility Source	69.000	100.379	0.0	3.790	1.152	0	0	Mermentau 69kV	3.790	1.152	33.0	95.7	

* Indicates a voltage regulated bus (voltage controlled or swing type machine connected to it)

# Indicates a bus with a load mismatch of more than 0.1 MVA

LOAD FLOW REPORT @ T = 0.500-

Bus		Voltage		Generation		Load		Load Flow					XFMR
ID	kV	% Mag.	Ang.	MW	Mvar	MW	Mvar	ID	MW	Mvar	Amp	%PF	% Tap
Distributed load	13.800	97.290	-3.4	0	0	7.643	1.377	Mermentau 13.8kV	-3.734	-0.894	165.1	97.3	
								PID276 POI	-3.910	-0.483	169.4	99.2	
Gen Bus	12.500	99.036	-1.1	0	0	0.543	0.263	PID276 POI	3.957	0.651	187.0	98.7	
								Generator	-4.500	-0.914	214.2	98.0	
Mermentau 13.8kV	13.800	98.697	-2.5	0	0	0	0	Distributed load	3.773	0.966	165.1	96.9	
								Mermentau 69kV	-3.773	-0.966	165.1	96.9	
Mermentau 69kV	69.000	100.000	-0.4	0	0	0	0	Mermentau 13.8kV	3.784	1.120	33.0	95.9	
								Utility Source	-3.784	-1.120	33.0	95.9	
PID276 POI	13.800	98.549	-2.4	0	0	0	0	Distributed load	3.951	0.559	169.4	99.0	
								Gen Bus	-3.951	-0.559	169.4	99.0	
Generator	12.500	103.602	7.1	4.521	1.624	0	0	Gen Bus	4.521	1.624	214.2	94.1	
Utility Source	69.000	100.379	0.0	3.790	1.152	0	0	Mermentau 69kV	3.790	1.152	33.0	95.7	

* Indicates a voltage regulated bus (voltage controlled or swing type machine connected to it)

\# Indicates a bus with a load mismatch of more than 0.1 MVA

LOAD FLOW REPORT @ T = 2.000-

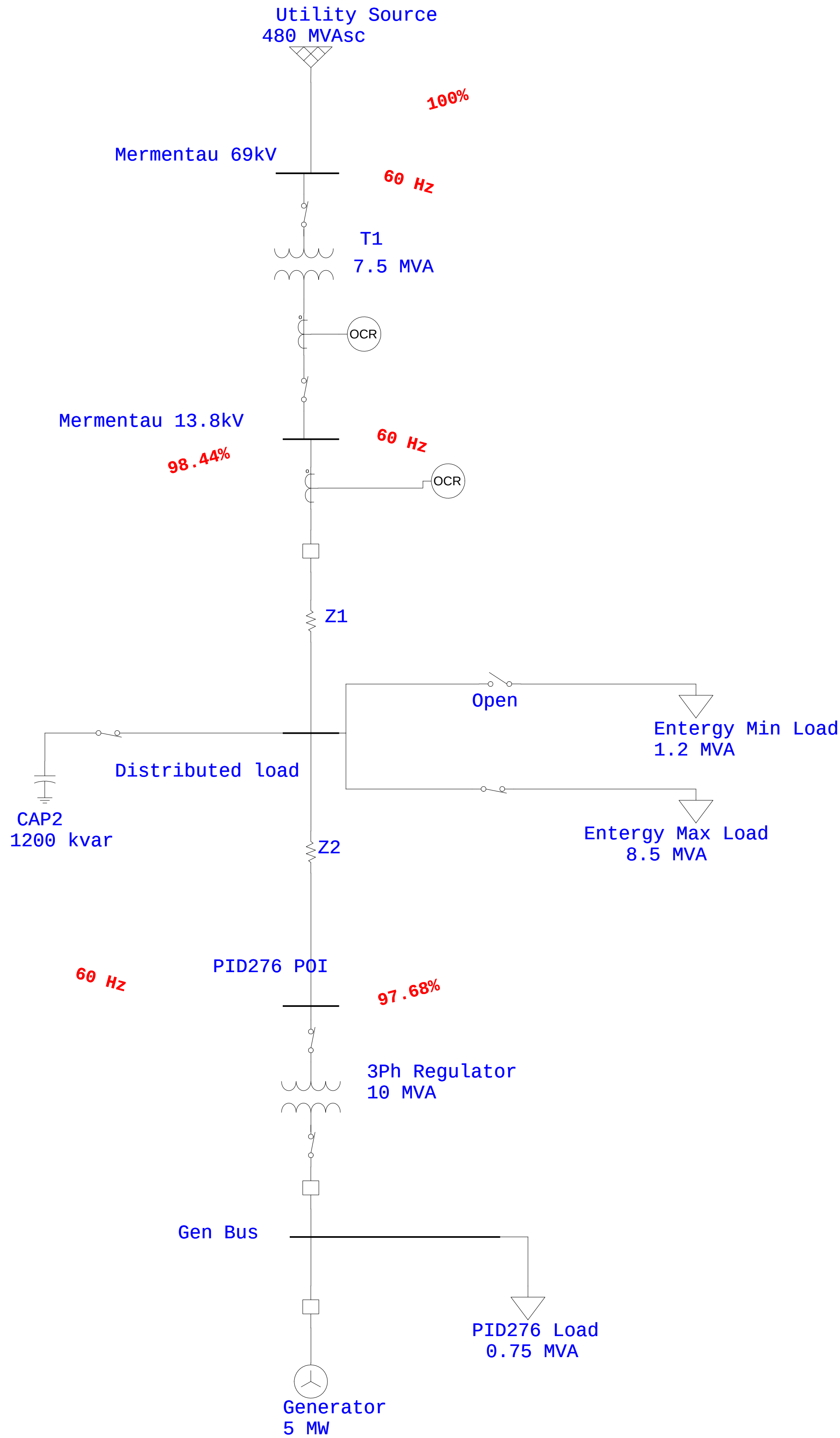
Bus		Voltage		Generation		Load		Load Flow					XFMR
ID	kV	% Mag.	Ang.	MW	Mvar	MW	Mvar	ID	MW	Mvar	Amp	%PF	% Tap
Distributed load	13.800	93.944	-7.4	0	0	7.127	1.283	Mermentau 13.8kV	-7.612	-1.521	345.7	98.1	
								PID276 POI	0.485	0.238	24.1	89.8	
Gen Bus	12.500	93.537	-7.6	0	0	0.484	0.235	PID276 POI	-0.485	-0.235	26.6	90.0	
Mermentau 13.8kV	13.800	96.798	-5.4	0	0	0	0	Distributed load	7.784	1.839	345.7	97.3	
								Mermentau 69kV	-7.784	-1.839	345.7	97.3	
Mermentau 69kV	69.000	99.545	-0.9	0	0	0	0	Mermentau 13.8kV	7.832	2.514	69.1	95.2	
								Utility Source	-7.832	-2.514	69.1	95.2	
PID276 POI	13.800	93.697	-7.5	0	0	0	0	Distributed load	-0.485	-0.237	24.1	89.9	
								Gen Bus	0.485	0.237	24.1	89.9	
Utility Source	69.000	100.379	0.0	7.858	2.654	0	0	Mermentau 69kV	7.858	2.654	69.1	94.7	

* Indicates a voltage regulated bus (voltage controlled or swing type machine connected to it)

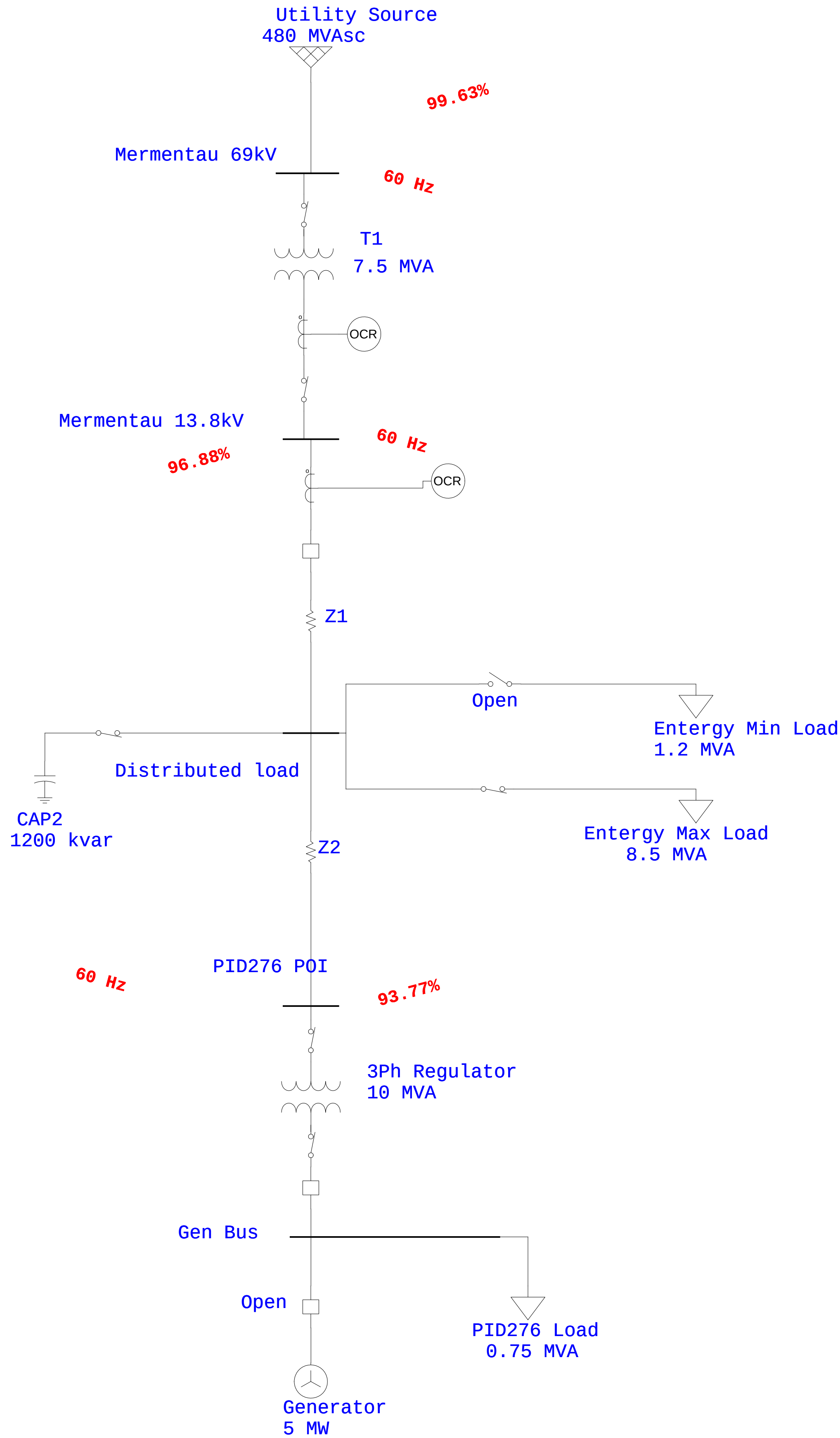
\# Indicates a bus with a load mismatch of more than 0.1 MVA

3.5 MW Output at 98% PF

One-Line Diagram - OLV1 (Transient Stability Analysis)



One-Line Diagram - OLV1 (Transient Stability Analysis)



LOAD FLOW REPORT @ T = 0.000-

Bus		Voltage		Generation		Load		Load Flow					XFMR
ID	kV	% Mag.	Ang.	MW	Mvar	MW	Mvar	ID	MW	Mvar	Amp	%PF	% Tap
Distributed load	13.800	96.738	-4.3	0	0	7.557	1.361	Mermentau 13.8kV	-4.616	-1.004	204.3	97.7	
								PID276 POI	-2.941	-0.357	128.1	99.3	
Gen Bus	12.500	98.037	-2.5	0	0	0.532	0.258	PID276 POI	2.968	0.453	141.4	98.9	
								Generator	-3.500	-0.711	168.3	98.0	
Mermentau 13.8kV	13.800	98.442	-3.2	0	0	0	0	Distributed load	4.676	1.115	204.3	97.3	
								Mermentau 69kV	-4.676	-1.115	204.3	97.3	
* Mermentau 69kV	69.000	100.000	-0.5	0	0	0	0	Mermentau 13.8kV	4.693	1.351	40.9	96.1	
								Utility Source	-4.693	-1.351	40.9	96.1	
PID276 POI	13.800	97.684	-3.5	0	0	0	0	Distributed load	2.964	0.400	128.1	99.1	
								Gen Bus	-2.964	-0.400	128.1	99.1	
Generator	12.500	101.456	4.1	3.513	1.149	0	0	Gen Bus	3.513	1.149	168.3	95.0	
Utility Source	69.000	100.463	0.0	4.702	1.399	0	0	Mermentau 69kV	4.702	1.399	40.9	95.8	

* Indicates a voltage regulated bus (voltage controlled or swing type machine connected to it)

# Indicates a bus with a load mismatch of more than 0.1 MVA

LOAD FLOW REPORT @ T = 0.500-

Bus		Voltage		Generation		Load		Load Flow					XFMR
ID	kV	% Mag.	Ang.	MW	Mvar	MW	Mvar	ID	MW	Mvar	Amp	%PF	% Tap
Distributed load	13.800	96.738	-4.3	0	0	7.557	1.361	Mermentau 13.8kV	-4.616	-1.004	204.3	97.7	
								PID276 POI	-2.941	-0.357	128.1	99.3	
Gen Bus	12.500	98.037	-2.5	0	0	0.532	0.258	PID276 POI	2.968	0.453	141.4	98.9	
								Generator	-3.500	-0.711	168.3	98.0	
Mermentau 13.8kV	13.800	98.442	-3.2	0	0	0	0	Distributed load	4.676	1.115	204.3	97.3	
								Mermentau 69kV	-4.676	-1.115	204.3	97.3	
Mermentau 69kV	69.000	100.000	-0.5	0	0	0	0	Mermentau 13.8kV	4.693	1.351	40.9	96.1	
								Utility Source	-4.693	-1.351	40.9	96.1	
PID276 POI	13.800	97.684	-3.5	0	0	0	0	Distributed load	2.964	0.400	128.1	99.1	
								Gen Bus	-2.964	-0.400	128.1	99.1	
Generator	12.500	101.456	4.1	3.513	1.149	0	0	Gen Bus	3.513	1.149	168.3	95.0	
Utility Source	69.000	100.463	0.0	4.702	1.399	0	0	Mermentau 69kV	4.702	1.399	40.9	95.8	

* Indicates a voltage regulated bus (voltage controlled or swing type machine connected to it)

# Indicates a bus with a load mismatch of more than 0.1 MVA

LOAD FLOW REPORT @ T = 2.000-

Bus		Voltage		Generation		Load		Load Flow					XFMR
ID	kV	% Mag.	Ang.	MW	Mvar	MW	Mvar	ID	MW	Mvar	Amp	%PF	% Tap
Distributed load	13.800	94.023	-7.4	0	0	7.138	1.286	Mermentau 13.8kV	-7.625	-1.524	346.0	98.1	
								PID276 POI	0.486	0.238	24.1	89.8	
Gen Bus	12.500	93.616	-7.6	0	0	0.485	0.235	PID276 POI	-0.485	-0.235	26.6	90.0	
Mermentau 13.8kV	13.800	96.879	-5.4	0	0	0	0	Distributed load	7.797	1.842	346.0	97.3	
								Mermentau 69kV	-7.797	-1.842	346.0	97.3	
Mermentau 69kV	69.000	99.628	-0.9	0	0	0	0	Mermentau 13.8kV	7.845	2.519	69.2	95.2	
								Utility Source	-7.845	-2.519	69.2	95.2	
PID276 POI	13.800	93.775	-7.5	0	0	0	0	Distributed load	-0.485	-0.237	24.1	89.9	
								Gen Bus	0.485	0.237	24.1	89.9	
Utility Source	69.000	100.463	0.0	7.871	2.658	0	0	Mermentau 69kV	7.871	2.658	69.2	94.7	

* Indicates a voltage regulated bus (voltage controlled or swing type machine connected to it)

# Indicates a bus with a load mismatch of more than 0.1 MVA