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July 7, 2015

VIA ELECTRONIC MAIL AND HAND DELIVERY

Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: Petition 1159: Petition of Lodestar Energy to the Connecticut Siting Council for a Declaratory Ruling for the Location and Construction of a 2.0 Megawatt Solar Electric Generating Facility at 1005 North Street, Suffield, Connecticut

Dear Council Members:

On June 22, 2015, members of the Lodestar Energy ("Lodestar") team associated with the project at 1005 North Street, Suffield, Connecticut ("Canis Major Solar") participated in a Site Visit with members of the Connecticut Siting Council. During this Site Visit, Council Members Dan Lynch and Robert Hannon and Staff Member Michael Perrone requested additional information from Lodestar Energy regarding Canis Major Solar. By way of this cover letter, the following requested information is included with this letter:

- Information regarding the construction of the solar arrays, specifically a description of how the array will be installed, an elevation view, and a clarification regarding which components will be above-ground vs. below ground;
- Carbon Debt Analysis
- Raber Associates Report and SHPO response indicating that it is SHPO's opinion that no historic structures will be affected by the proposed Canis Major Solar Project;
- Aerial view showing the distance from residences to the closest panel;
- Dismantling Plan;

- Construction schedule;
- Utility Path Drawing;
- Estimate of the capacity factor; and
- A summary of the presentations given by Lodestar to Suffield's Zoning and Planning Commission and Conservation Commission.

We look forward to the Siting Council's decision in this matter. Please contact me if you have any additional questions or need more information.

Very truly yours,

Patricia Boye-Williams (mrs)

Patricia Boye-Williams

Enclosures

cc: Jeffrey J. Macel, Esq.
Mr. Jaime A. Smith
Mr. Tim Coon
Mark R. Sussman, Esq.

PROJECT FUNCTIONAL DESCRIPTION

POWER ENGINEERS, LLC

Electrical Engineering, Power, Lighting, Technical Studies and Utility Consulting

37 Fox Den Road
Kingston, MA 02364-2150
(508) 612-0382 Phone
(781) 936-8641 Fax
Dave@PowerEngineersLLC.com

SUFFIELD, CT
1005 North Street
1995kW (AC) PHOTOVOLTAIC PROJECT
Utility Interconnection

ELECTRICAL FUNCTIONAL DESCRIPTION
January 2015

1.0 Engineering and Interconnection Requirements

1.0.0 Existing Electrical Infrastructure

The existing property (hereafter referred to as the "facility") is located at 1005 North Street, Suffield, CT. The proposed site is an open parcel. CL&P has 13.8kV primary circuit along North Street, which will be the location of the point of interconnection with a new primary tap. The proposed site would be to tap off the existing primary to the site itself.

1.0.1 Electrical Interconnection Plan

There are a number of possible options that have been reviewed to connect the proposed PV system to the existing utility distribution system. The proposed option minimizes the amount of new equipment required, while satisfying the utility interconnection requirements. The proposed interconnection is detailed on the attached Drawing E-1.1 through E-1.3, dated January 2015.

The proposed Interconnection Application will be for a 1,995.2kW AC / 2879.28KW DC PV project. The proposed existing CL&P pole tap location is 42°00'28.45"N, 72°38'36.51"W off of North Street. There will be a single interconnection at this site location.

The proposed interconnections will include a connection to the existing overhead three-phase CL&P 13.8kV primary system with a tap to new underground distribution equipment. A proposed tap would be made to an existing 13.8kV overhead feeder, to a number of new poles, with CL&P owned recloser and primary meter. This would be the Point of Common Coupling. From here the customer will construct a pole line of approximately 1,400 feet to the PV site, located on the site. At the PV site the next pole would be the customer's 3-phase air break switch for utility lockable disconnect point (S&C Omni-rupter, 15kV 900A). This would be the new customer's riser pole and then continue underground to the new padmount 15kV switchgear.

The metering location will be the Point of Common Coupling (PCC), which is the ownership demarcation point between the utility and the customer.

From the riser pole the connection would be underground to the PV system site, and then to the customer-owned step-down transformer and PV inverters. A new 15kV class three-phase power cable would be installed in a new conduit ductbank from the new riser poles to a new 15kV padmount switch and new padmount transformers.

The interconnection option includes the installation of a new pad mounted disconnect switches to provide protection for the underground primary cable, via a vacuum interrupter installed in the switch. The padmount switch (S&C Electric Vista) would be equipped with a utility-grade distribution relay (SEL-351A or equal) to provide overcurrent and ground fault protection of the utility 13.8kV feeder.

The proposed interconnection also includes the installation of REC metering and redundant utility protection at the transformer secondaries.

The proposed interconnection would provide redundant utility-grade relaying to protect the CL&P system from any negative effects of the PV system, should there be a problem, along with protecting their workers from the PV Systems exporting power into a "dead" line during an outage; which can be a safety issue. These types of protective device would be typical for a project of this size, and would allow protection for variations in voltage, frequency, etc. caused by the inverter. A relay would be included in proposed 15kV padmount interrupter switch, with a redundant protection (for voltage & frequency) installed at the inverter locations (internal inverter controller settings).

The underground primary cables to interconnect the PV System transformers would be three, single conductor, 15kV class, #1/0 AWG, aluminum cables to carry the expected maximum 1995kW AC from the project. New 15kV class cables should be installed in an underground conduit for physical protection rather than being directly buried.

1.0.2 Electrical Interconnection Details

1.0.2.1 - CL&P Interconnection Requirements

CL&P has specific standards and requirements for the interconnection of distributed generation such as the proposed PV system project. The interconnection requirements address electrical system protection, revenue metering, operation, and the configuration of the primary interconnection equipment. CL&P will review the proposed design of the electrical interconnection facilities and will perform analyses to determine the impact of the proposed generation on their electrical distribution system.

Based on the results of CL&P's analysis, certain modifications may be needed within the CL&P distribution system and/or to the interconnection facilities.

1.0.2.2 - Electrical Interconnection Equipment Details

The technical details of the major power system components associated with the electrical interconnection of the PV system inverter are described in this section.

1.0.2.2.1 Inverter Step-up Transformers

The inverter step-up transformers are described by specifying the transformer voltage rating (primary and secondary), power rating (kilovolt-amperes or kVA), winding configuration (primary and secondary), and construction type. All transformers shall be three phase, padmount type, oil-filled, self-cooled transformers.

The primary voltage rating of the step-up transformer shall be consistent with the nominal voltage of the CL&P distribution supply circuit to the facility which is 13.8kV phase-to-phase for all three phase transformers. To allow flexibility for local voltage deviations that may exist on the CL&P distribution system or within the 13.8kV interconnection circuitry, the transformer primary winding shall be equipped with five (5) fixed taps to change the primary voltage rating +/- 5% from nominal voltage in 2-½ % increments. For the inverter step-up transformer, the secondary voltage rating shall be consistent with the PV system inverter voltage which is typically 480 volts.

The three phase power rating of the inverter step-up transformer (expressed in kVA) shall be consistent with the PV system inverter power rating (expressed in kW) and increased for the allowable inverter power factor, in this project 500kVA.

1.0.2.2.2 - Interconnection Circuit 15kV Class Cables

The proposed PV system inverter interconnection option requires the use of 15kV class interconnection circuit cables. A three phase interconnection circuit of is required between each of the inverter step-up transformers, through the proposed padmount disconnect switch and to the riser pole.

The power cables shall be specified for 15kV class insulation and consist of three, single conductor cables with either aluminum or copper conductors. For this project, the size of the power cables shall be a minimum of #1/0 AWG Aluminum.

The power cable between PV system inverter step-up transformers to the 13.8kV interconnection point shall be installed in underground conduit. The conduit shall be Schedule 40 PVC that is encased in concrete. At least one (1) additional conduit for communications and control of the PV system inverter should also be included in the conduit system. It is recommended that the primary cable ductbank be 2-4" conduits.

1.0.2.2.3 - Main 13.8kV Disconnect Switch

The main 13.8kV disconnect switch specified for the proposed PV System interconnection shall be a combination manual load-break switch with relay-operated vacuum interrupter, three pole, switch. The switch shall be rated 600 amperes continuous current with a momentary rating of 12,500 amperes. The main 13.8kV disconnect switch provides an open point between the PV system and the CL&P 13.8kV supply circuit. The operating handle of the main 13.8kV disconnect switch (load-break) shall be capable of being padlocked by CL&P's lock in the open position. The 13.8kV padmount switch shall be equipped with a utility-grade protective relay (SEL-351A or equal) that provides overcurrent (51), ground over-voltage 3V0 (59N), under-voltage (27), overvoltage (59), under-frequency (81U) and over-frequency (81O) protection for the PV system, underground primary cable, padmount transformers, etc.

1.0.2.2.4 - Protective Relay Scheme

The required protective relays for the selected PV System interconnection option will be specified by CL&P based on the results of their system impact study. Based on a review of the CL&P Interconnection Requirements, it is anticipated that the protective features the PV system shall be able to detect are over/under frequency and over/under voltage and overcurrent (via the PV Panelboard circuit breakers). Upon sensing conditions that exceed allowable operating limits, the protective features shall disconnect the PV system inverter from the rest of the distribution system. Redundant protection is proposed at the transformers and at the padmount vacuum interrupter switch. The inverters will also have internal inverter controls with 27, 59, and 81O/U protection.

1.0.3 Revenue Metering Modifications

As mentioned, the proposed interconnection will need to be metered to measure energy produced by the PV system. The proposed interconnection will create a new primary metered point at the facility. A new overhead primary metering cluster is proposed for the tap off the existing CL&P system where the PV system circuit will connect to overhead 13.8kV CL&P-owned primary infrastructure. This would be the ownership point and the PCC onto the 13.8kV primary system.

The customer will provide Renewable Energy Credit (REC) metering per the project requirements.

END OF SECTION

PV PANEL TECHNICAL DOCUMENTATION

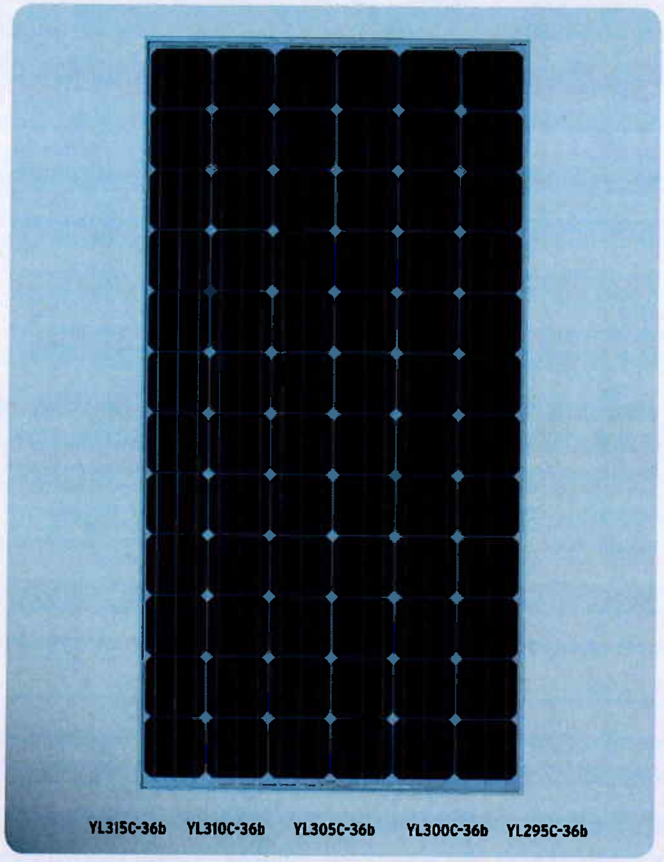
YINGLI – 310W PV MODULES

YL310C-36b

PANDA 315 SERIES

YINGLI SOLAR

panda



Yingli Solar Panda High Efficiency N-type Monocrystalline Module

ABOUT YINGLI SOLAR

» The first renewable energy company and the first Chinese company to sponsor FIFA World Cup™

» Publicly listed on the New York Stock Exchange (NYSE: YGE)

» One of the leading fully vertically integrated PV manufacturers in the world

» The first Chinese company to receive Social Accountability System SA 8000 Certification

HIGH PERFORMANCE

» N-type monocrystalline solar cells with average efficiency higher than 18.3% combined with high transmission glass leads to module efficiencies up to 16.2%

» Low degradation in comparison with traditional modules with P-type solar cells

» Better performance under high temperature conditions

» Better performance under low irradiation conditions

QUALITY & RELIABILITY

» Robust aluminum frames ensure maximum mechanical load up to 5,400Pa

» Manufactured in our new state-of-the-art production line

» Manufacturing facilities certified by TÜV Rheinland to ISO 9001:2008, ISO 14001:2004 and BS OHSAS 18001:2007

* In compliance with our Warranty Terms and Conditions
Provisional datasheet. Subject to modifications and errors

WARRANTIES

» 5-year limited product warranty*
» Limited power warranty*: 10 years at 90% of the minimal rated power output, 25 years at 80% of the minimal rated power output

QUALIFICATIONS AND CERTIFICATES

» ISO 9001:2008, ISO 14001:2004, BS OHSAS 18001:2007, SA8000
» IEC 61215 and IEC 61730 are pending

www.yinglisolar.com

YINGLI SOLAR

Official Sponsor of the 2010 FIFA World Cup™

PANDA 315 SERIES

ELECTRICAL PARAMETERS

Electrical parameters at STC (1,000 W/m², 25°C, AM 1.5 according to EN 60904-3)

Module name		Panda 295	Panda 300	Panda 305	Panda 310	Panda 315
Module type		YL295C-36b	YL300C-36b	YL305C-36b	YL310C-36b	YL315C-36b
Power output	[W]	295.0	300.0	305.0	310.0	315.0
Power output production tolerances	[%]	+/- 3	+/- 3	+/- 3	+/- 3	+/- 3
Module efficiency	[%]	15.1	15.4	15.6	15.9	16.2
Voltage at Pmax, V_{mpp}	[V]	36.0	36.3	36.4	36.6	36.7
Current at Pmax, I_{mpp}	[A]	8.19	8.27	8.37	8.48	8.58
Open circuit voltage V_{oc}	[V]	45.4	45.7	46.1	46.4	46.8
Short circuit current I_{sc}	[A]	8.79	8.83	8.87	8.91	8.97
Limiting reverse current I_r	[A]			20		
Max. system voltage	[V]			1,000 VDC		

Electrical parameters at NOCT (800 W/m², AM 1.5, wind velocity 1m/s, Tamb 20°C)

NOCT (Nominal Operating Cell Temperature)	[°C]			46 +/- 2		
Voltage at Pmax, V_{mpp}	[V]	32.6	32.8	33.0	33.1	33.2
Current at Pmax, I_{mpp}	[A]	6.58	6.63	6.72	6.80	6.88
Open circuit voltage V_{oc}	[V]	41.8	42.1	42.4	42.8	43.1
Short circuit current I_{sc}	[A]	7.08	7.12	7.15	7.18	7.23

Thermal characteristics

Temperature coefficient beta of I_{sc}	[%/K]	+ 0.04
Temperature coefficient alpha of V_{oc}	[%/K]	- 0.33
Temperature coefficient gamma of P_{mpp}	[%/K]	- 0.45

MECHANICAL PARAMETERS

Dimensions (length [mm] / width [mm] / thickness [mm])	1,970 / 990 / 50
Frame heigth [mm]	50
Weight [kg]	26.3
Front cover (material / thickness [mm])	Tempered Glass, 4.0mm
Cell type (quantity / technology / dimensions)	72 / c-Si, Monocrystalline / 156 x 156
Encapsulation materials	Ethylene Vinyl Acetate (EVA)
Rear cover (material)	Laminated Polymer Plastic
Frame (material)	Robust Anodized Aluminum Alloy

Junction box, cable & connector configuration

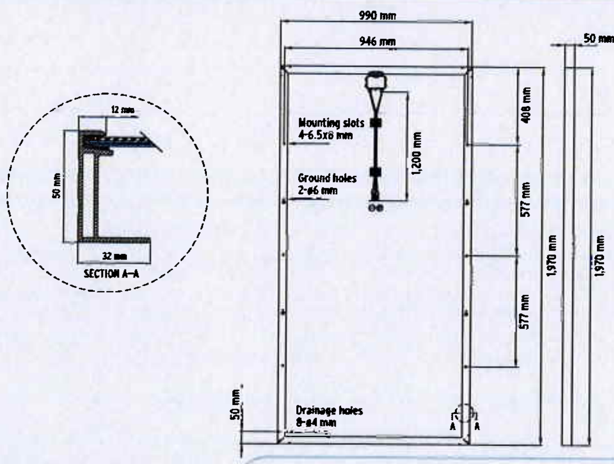
	Configuration is available with 2 different connector types	
Junction box (manufacturer / protection degree)	Renhe / IP65	
Junction box dimensions (length / width / thickness [mm])	151 / 122 / 25	
Positive cable & negative cable (manufacturer / length [mm] / cable cross-section [mm²])	Renhe / 1,200 / 4.0	
Connector (manufacturer / type / protection degree)	Renhe / 05-1 / IP67	MC / MC4 / IP67

OPERATING CONDITIONS

Operating temperature [°C]	- 40 to + 85
Max. wind load / Max. snow load [Pa]	2.4K / 5.4K
Reduction of efficiency from an irradiance of 1,000 W/m² to 200 W/m² (T_{module} = 25 °C) according to EN 60904-1	5%

PACKAGING

Number of modules per box	21
Box size (length / width / depth [mm])	1,985 / 1,140 / 1,125
Box Gross weight in kg	590
Boxes per pallet	1



* The data does not refer to a single module and they are not part of the offer, they serve for comparison only to different module types.

Provisional datasheet. Subject to modifications and errors

Electrical equipment, check with your installer

Before installation, please check the installation manual provided with the product.

Yingli Green Energy Holding Co. Ltd.
commerce@yinglisolar.com
0086 - (0)312 - 8929802

www.yinglisolar.com

DS-YL315C-36b-EU-EN-201005-A241-V02

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INVERTERS

ADVANCED ENERGY

AE3TL-23

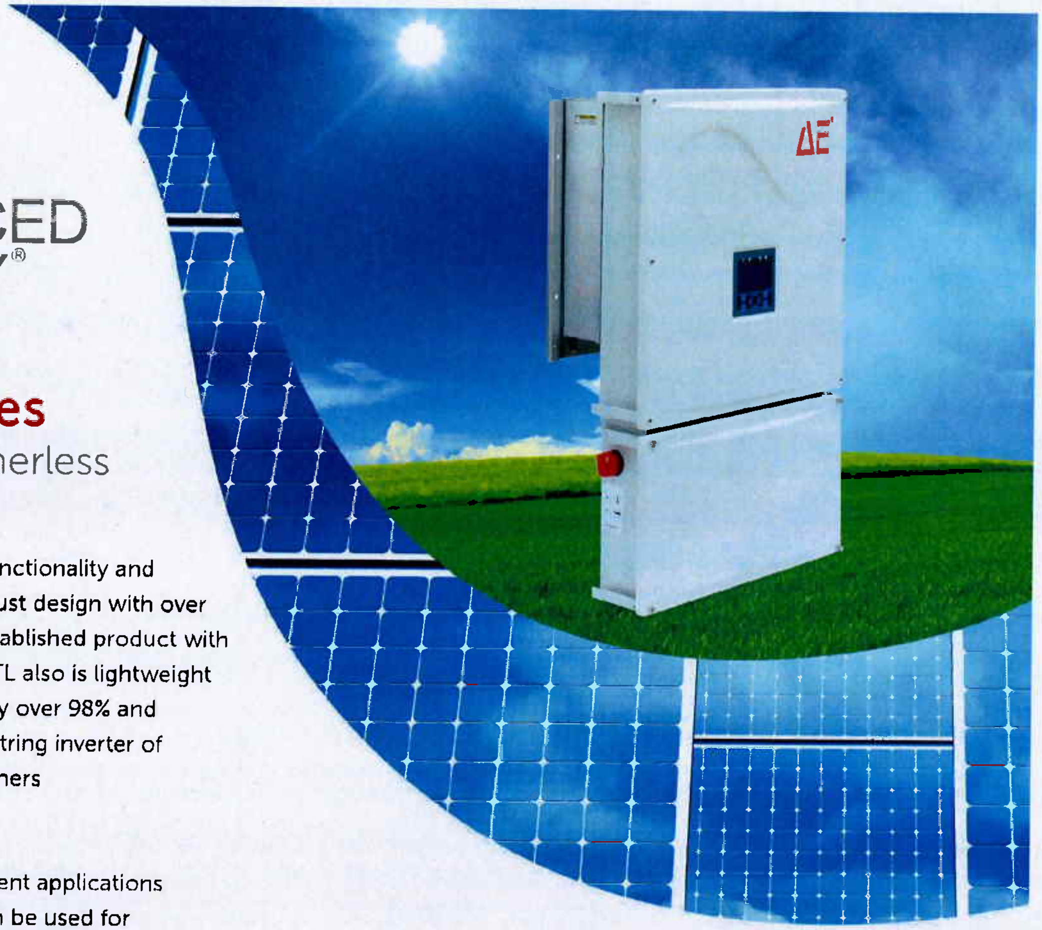
23.2KV INVERTER

TECHNICAL DOCUMENTATION

ADVANCED ENERGY®

AE 3TL 1000 Series

Three-Phase Transformerless String Inverters



The AE 3TL 1000 Series adds broader functionality and system voltage options to a proven, robust design with over 3 GW installed worldwide. It is a well established product with a great reliability track record. The AE 3TL also is lightweight and easy to install. With a peak efficiency over 98% and versatile monitoring options, this is the string inverter of choice for project developers, site designers and installers.

The AE 3TL is designed with many different applications in mind. These high-quality inverters can be used for commercial rooftop and carport installations, as well as solar power plants. With a power range of 12 to 23.2 kilowatts, the AE 3TL is situated to serve installations large and small. The AE 3TL optimizes space in the site design, allowing for placement within the array, saving site owners highly valued space.

Highly precise MPP tracking combined with AE advanced monitoring solutions gives solar stakeholders the vital data needed to operate and maintain a highly efficient site, providing maximum return for investors in solar energy.

AE listens carefully to customer demands. The AE 3TL is fully compliant to NEC 2011 with standard serviceable "touch-safe" fuses and optional AFCI. The 1000 VDC input enables a reduction of BoS costs due to longer strings, fewer home runs, and lower resistive losses. Weighing just over 100 pounds, the easily installed inverter is very well suited for rooftop or space-constrained installations. Additional savings are recognized with lowered shipping costs, and there is no need for the heavy machinery associated with installing larger, heavier inverters. Arrays designed with AE 3TL string inverters have best-in-class uptime, system yields, and problem resolution.

Versatility

- Wide range of output power allows for integration on a variety of site designs, with an emphasis on design flexibility and project yield.
- Superior efficiency, low shipping costs, and distributed design offer solar stakeholders increased return on investment and reduced upfront costs.
- Maximizes space for energy production
- Optional AFCI
- Unprecendented 1.75 DC:AC ratio enables lowest inverter cost per DC Watt.

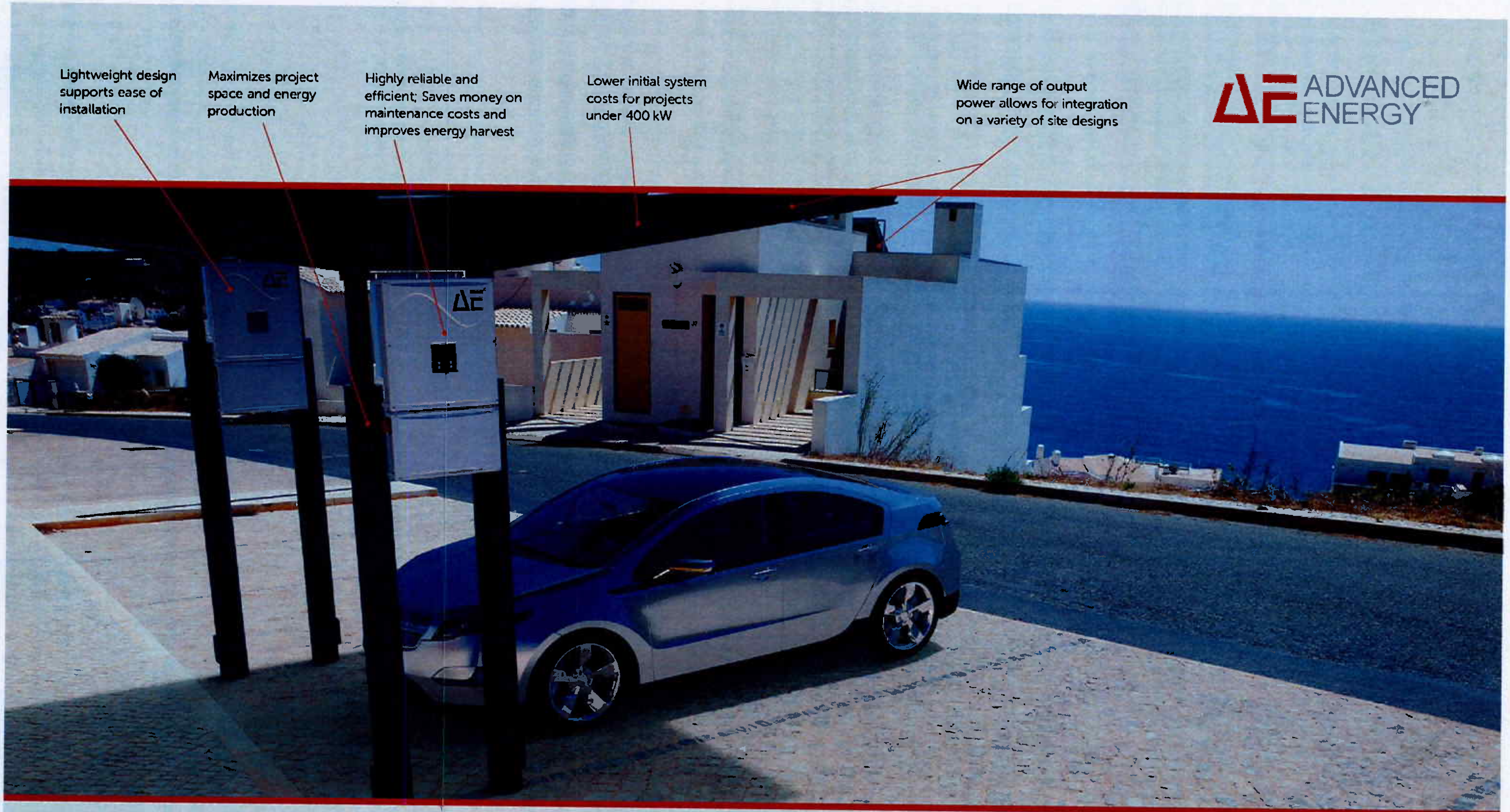
Reliability

- 3 GW installed worldwide
- Proven reliability
- Low maintenance
- Improved system uptime

Superior installability

- Lightweight, easy to install
- Less space needed on site
- Lowered balance of system (BoS) costs
- Inverters closer to array

AE Solar Energy is a US based company.


Lightweight design supports ease of installation
Maximizes project space and energy production
Highly reliable and efficient; Saves money on maintenance costs and improves energy harvest
Lower initial system costs for projects under 400 kW
Wide range of output power allows for integration on a variety of site designs
ADVANCED ENERGY

AE 3TL 1000 Series Summary Specifications*

Mechanical	AE 3TL-12	AE 3TL-16	AE 3TL-20	AE 3TL-23
Dimensions	21"(W) x 35"(H) x 11"(D) (535 x 895 x 280 [mm])			
Weight	108 lb (49 kg)			
Environmental Rating	NEMA 4/ connection box NEMA 3R			
DC Input Power Connectors	Terminal block 8-12 AWG			
AC Output Power Connectors	Terminal block 6-10 AWG			
User Interface	LCD			
Electrical				
DC Inputs				
Maximum DC Input Power**	21 kW	28 kW	35 kW	40.6 kW
Maximum Input Voltage	1000 V			
Array Configuration	Ungrounded			
Maximum Operating Input Current	27.5 A	33 A	37.5 A	40 A
Maximum Short Circuit Current (Isc)	76 A			
MPPT Voltage Range	250 V to 900 V			
Minimum Voltage for Full Power	450 V	500 V	550 V	600 V
Open-Circuit Turn-On Voltage	200 V			
Number of Strings	6			
AC Output				
Continuous Output Power	12 kW	16 kW	20 kW	23.2 kW
Operating Voltage Range	423 to 528 V			
Rated Apparent Power	12 kVA	16 kVA	20 kVA	23.2 kVA
Electrical Service Compatibility	3 AC 480 V Wye +N			
Maximum Continuous Current	14.5 A	19.3 A	24.1 A	27.9 A
Short-Circuit Fault Current	16.5 A; duration < 10 msec	21 A; duration < 10 msec	26 A; duration < 10 msec	29 A; duration < 10 msec
Nominal Frequency	60 Hz (57 Hz to 63 Hz adjustable)			
Total Harmonic Distortion	< 3%			
Efficiency				
Peak Efficiency	98.2%			
Weighted Efficiency (CEC Method)	97.5%	97.5%	97.5%	98%
Standby Losses	< 0.5 W			
Inverter Controls and Monitoring				
Anti-Islanding	In accordance with IEEE 1547 and UL 1741			
Reactive Power and Power Factor	±0.99 standard, settable from ±0.90			
Inverter Monitoring				
Communication Interfaces and Protocols	Ethernet, RS-485			
Environmental				
Operating Ambient Temp. Range**	-13°F to +131°F (-25°C to +55°C)			
Standby/Storage Ambient Temp. Range	-22°F to +158°F (-30°C to +70°C)			
Cooling	Natural convection			
Relative Humidity	95% before derating			
Elevation	6500' before derating			
Noise Emission	45 dBA at 16.5'			
Regulatory				
Agency Approvals / Regulatory Compliance	UL 1741, 1699B, IEEE 1547, CSA C22.2, FCC Part 15 (Class A and B)			
Inverter Warranty	5 years standard, extendable to 20 years			
Model Numbers Without AFCI	AE_3TL-12_10-08	AE_3TL-16_10-08	AE_3TL-20_10-08	AE_3TL-23_10-08
Model Numbers With AFCI	AE_3TL-12_10	AE_3TL-16_10	AE_3TL-20_10	AE_3TL-23_10

Subject to change without notice. Refer to user manual for detailed specification.
*Not all performance window specifications can be achieved simultaneously. Performance varies per site.
**Derating at temperatures > 122°F (50°C) for the 12 kW and 16 kW, > 113°F (45°C) for 20 kW, > 104°F (40°C) for 23 kW
Consult your AE sales or service representatives for specific PV system design questions at sales.support@aei.com.

Options

- 5, 10, and 15 year warranty extension; Extensions are optional.
- Premium monitoring solutions
- AFCI

ADVANCED ENERGY®

Advanced Energy Industries, Inc.
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ENG-AE3TL-1000V-250-07 4/14

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S&C PADMOUNT SWITCHGEAR

WITH SEL-351A PROTECTIVE RELAY

TECHNICAL DOCUMENTATION

15kV Padmount Switch Specification
Distributed Generation Project
2-Way Switch with SEL-351A Relaying

SF6 Padmount Style Switch

15 kV, 95kV BIL. SF_6 Insulated, Dead-Front, Padmounted, Front Access, Two Way, Vacuum Interrupter Switch to include:

Line Side: (Way 1)

- One (1) three-phase SF_6 Vacuum Interrupter Switch.
- 600 Amp continuous and loadbreak.
- 40kA asym. momentary and close into fault rating.
- 600 Amp Deepwell Bushing per ANSI/IEEE 386 fig. 3 - elbows and inserts not included.
- Switch ratings per ANSI C37.71-1984 and C37.72-1987.

Viewing window provided for open close indication

Load Side: (Way 2)

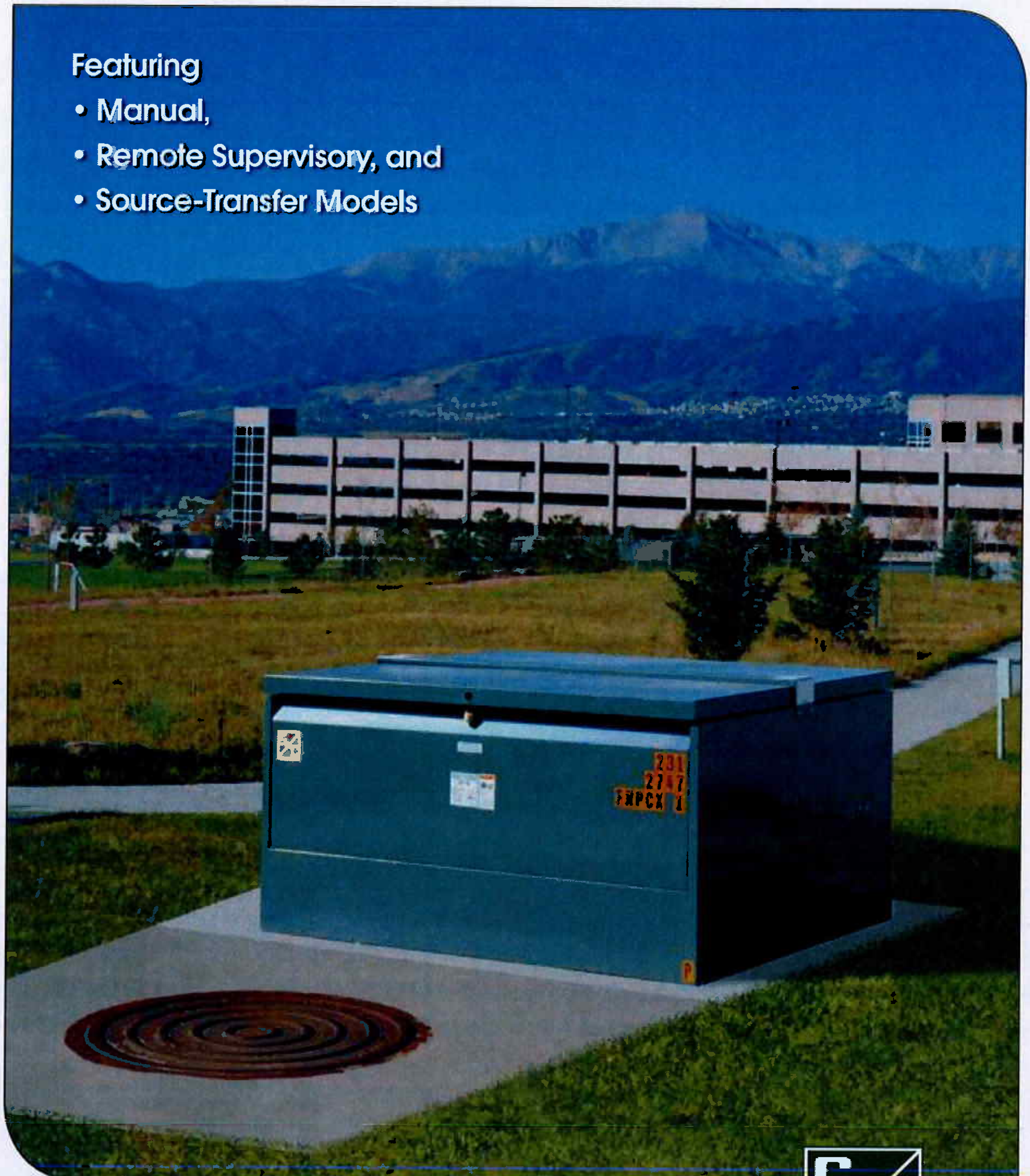
- One (1) single-phase 600 amp vacuum interrupters. Motor operator for interrupter open and close, self-powered.
- SEL351A –Multifunction relay.

  1. Overcurrent (50/51), Over/Under voltage (27/59), over/under frequency /810/U) , 3V0 GND overvoltage (59G)
  2. Housed in a NEMA 4 enclosure, batteries included.
  3. Relay and battery charger self-powered by internal medium-voltage PT's

- 200 Amp Loadbreak Bushing per ANSI/IEEE 386 - elbows and inserts not included..
- (3) Oil filled PT's for Wye System . PT ratio typically 70:1 for 13.8kV systems and 60:1 for 13.2kV primary
- Low pressure warning device.
- **12.5kA sym. maximum** interrupting rating
- Interrupter ratings per ANSI C37.60-1981.

Standard Components:

- Welded ¼" mild steel tank and frame.
- Factory filled with SF_6 gas.
- Tank painted light gray (ANSI 70)
- Parking stands for all bushings.
- Five (5) 1/2"- 13 NC grounding provisions, one per way plus one per tank.
- One removable aluminum operating handle for line side and fixed stainless steel operating handles for each load side ways.
- Padlockable operating mechanism- padlocks not included.
- Open (Green)/Close (Red) indicators on all ways.
- 3" diameter circular viewing window to verify Open/Close position, one per way on the line side plus one per phase on the load side.
- Color coded "Go/No Go" pressure gauge.
- ¼" male flare brass schraeder valve with cap.
- 300 Series stainless steel and/or brass external fittings and hardware.
- 300 Series stainless steel nameplates and aluminum line diagram.



S&C Vista®
Underground Distribution Switchgear

Outdoor Distribution, 15.5 kV through 38 kV

Vista Underground Distribution Switchgear Addresses Your Concerns

- Are you wasting money and resources on time-consuming, labor-intensive routine operation of your switchgear?
- Has coordinating upstream protective devices with downstream fusing become a headache?
- Are your customers complaining that they don't want obtrusive green boxes on their property?

S&C's Vista Underground Distribution Switchgear is the answer to these and many other underground distribution system problems. S&C worked closely with electric utilities and power users to identify and satisfy needs that were not being met by conventional underground distribution equipment. Vista UDS is an exceptional product that meets all of these needs.

Vista Underground Distribution Switchgear is available in manual, remote supervisory, and source-transfer models. All models feature load-interrupter switches and resettable, vacuum fault interrupters or arc spinners in series with disconnect switches, elbow-connected and enclosed in a submersible, SF_6-insulated, welded steel tank. Vista UDS is available with up to six "ways," in ratings through 38 kV and 25 kA symmetrical short-circuit. Large windows in the tank provide a clear view of the open gap, ground position, and ground bus.

Remote Supervisory Pad-Mounted Style Vista UDS installation.

Large viewing windows let you see open gap and grounded positions on load-interrupter switches and fault interrupters. Trip indicators are easily checked too

Optional voltage indicator with liquid-crystal display. You can check the integrity of the voltage indicator by shining a flashlight on the photo-cell-powered test circuit, while placing a gloved finger over the test button. See page 8. No flashlight needed in daylight

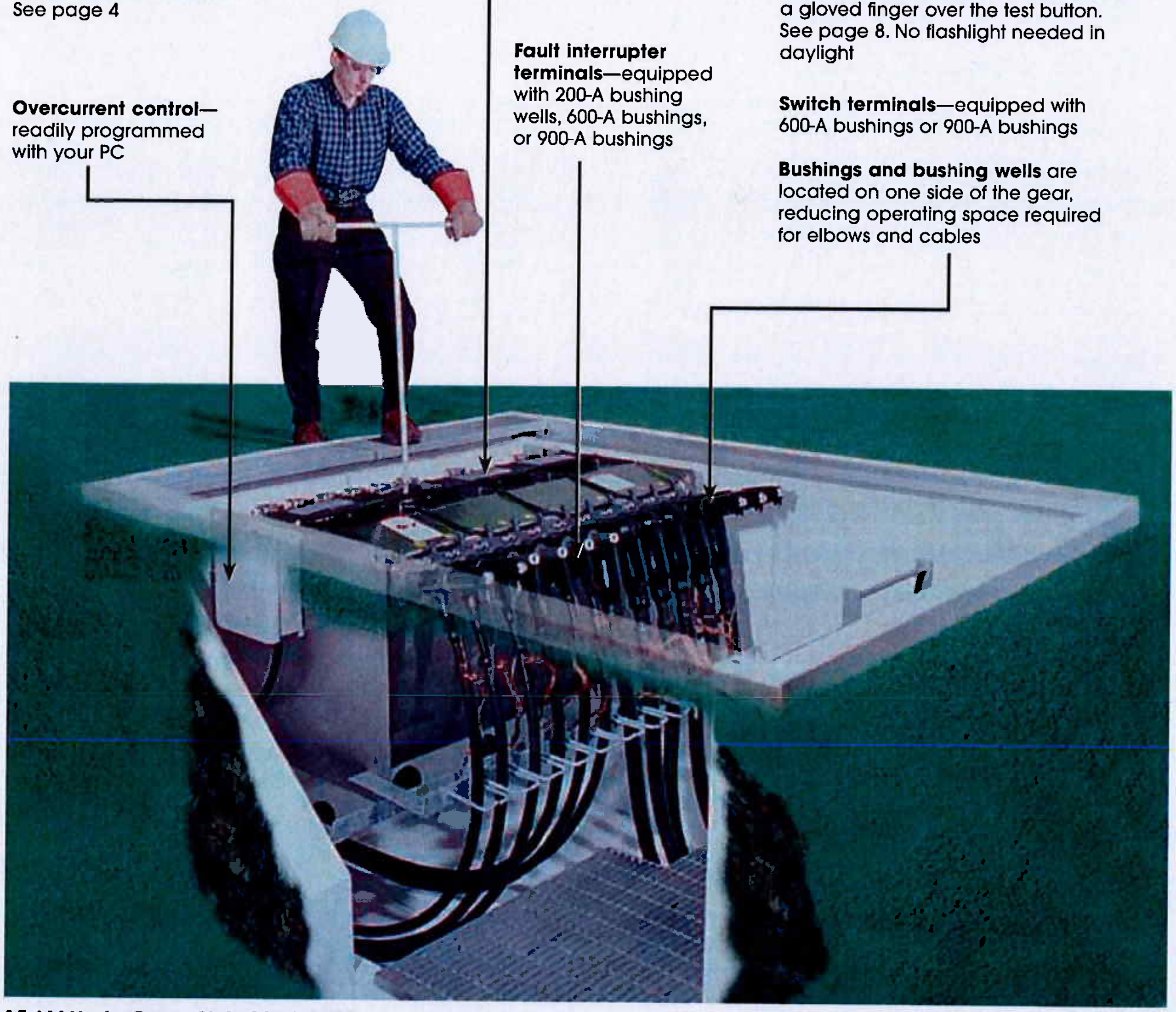
Operating panel is located near grade level so UnderCover™ Style gear is easily operated from a standing position. See page 4

Overcurrent control—readily programmed with your PC

Fault interrupter terminals—equipped with 200-A bushing wells, 600-A bushings, or 900-A bushings

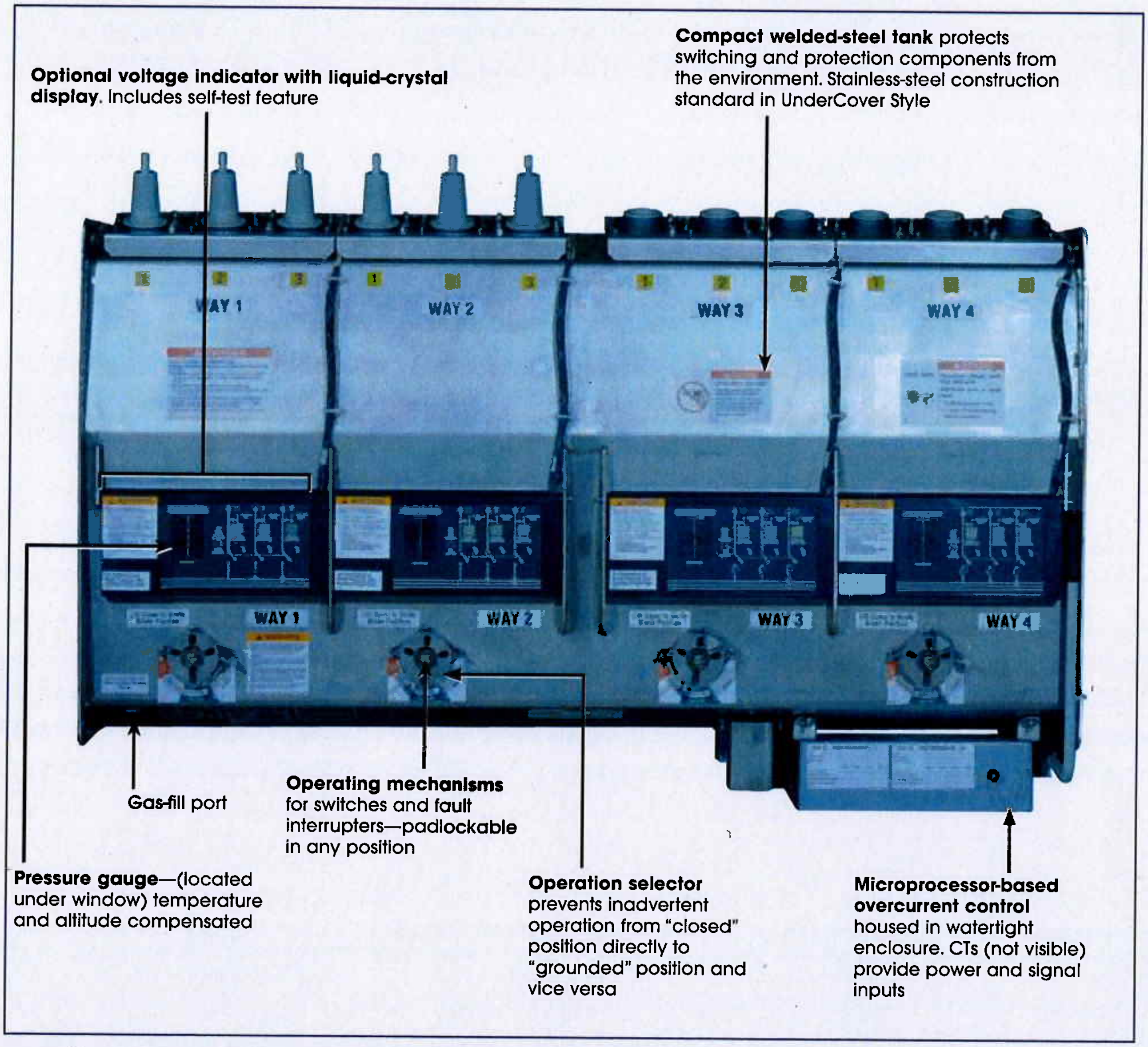
Switch terminals—equipped with 600-A bushings or 900-A bushings

Bushings and bushing wells are located on one side of the gear, reducing operating space required for elbows and cables



15-kV UnderCover Style Model 422.

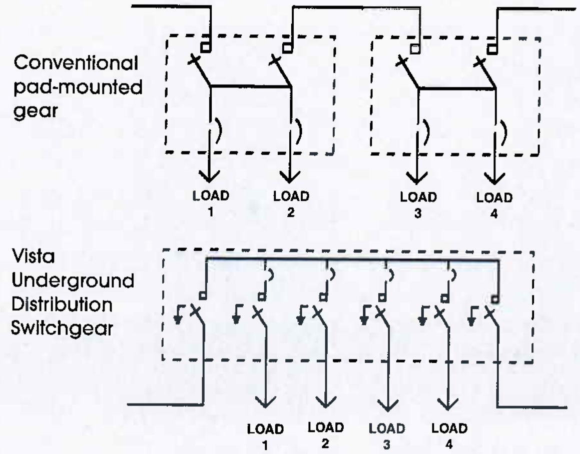
The load-interrupter switches provide three-pole live switching of 600-ampere or 900-ampere three-phase circuits. The switches have three positions (closed-open-grounded) and provide a clearly visible gap when open. The 200-ampere, 600-ampere, and 900-ampere fault interrupters offer 40-ms fault clearing, have three-position (closed-open-grounded) disconnects, and are available with either single-pole or three-pole switching. Most models of Vista UDS use in-series vacuum fault interrupters for fault clearing. However, the popular 15-kV, 12.5-kA manual models now feature arc-spinning technology for fault interruption . . . reducing the height of the tank by nearly a foot!



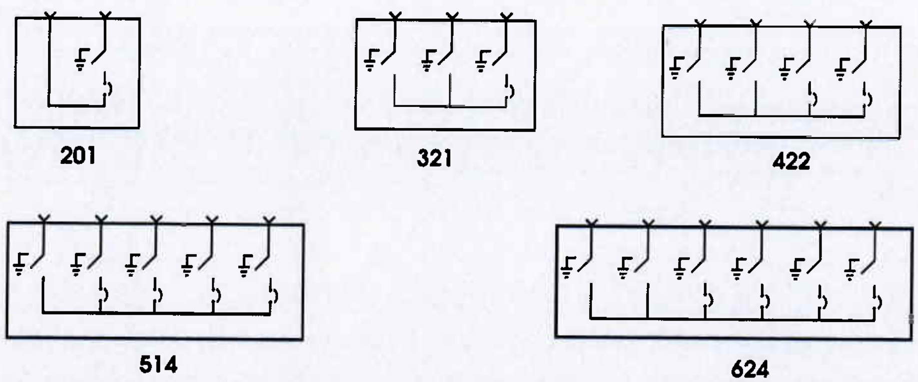
Operating panel of Vista UDS gear. Viewing windows, for confirming open gap and grounded position on load-interrupter switches and fault interrupters, are located under hinged covers of voltage indicators.

Vista UDS is available in up to six "ways." This means it can accommodate any combination of up to six bus taps, load-interrupter switches, or fault interrupters. With conventional pad-mounted gear, for a looped feeder with four taps, two units of gear are necessary. But with Vista UDS, only one six-way unit is needed. Vista UDS simplifies installation and improves aesthetics by reducing the necessary real estate.

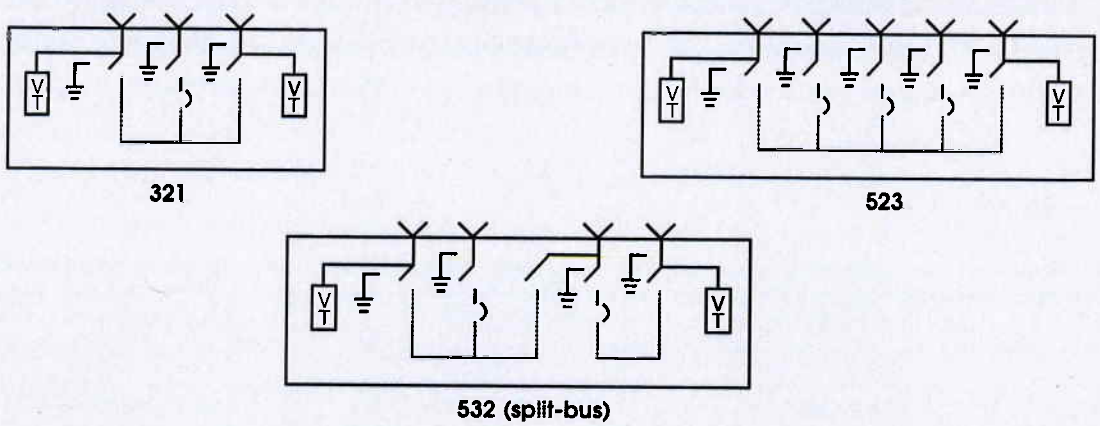
The model number indicates the total number of ways, as well as the number of load-interrupter and fault-interrupter ways. For example, Model 321 has "3" ways—"2" load-interrupter switch ways and "1" fault-interrupter way, as shown below.



TYPICAL CONFIGURATIONS OF MANUAL AND REMOTE SUPERVISORY VISTA UDS



TYPICAL CONFIGURATIONS OF SOURCE-TRANSFER VISTA UDS



Vista UDS Offers Numerous Unobtrusive Installation Options

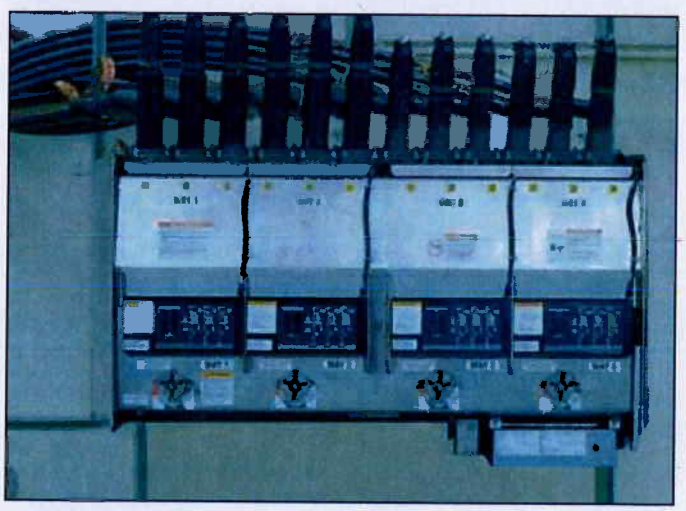
One option is the low-profile pad-mounted style. At 15, 25, and even 34.5 kV, pad-mounted Vista UDS is 6 to 14 inches shorter than the average SF_6-insulated gear. And Vista UDS's total real-estate requirement is less than one-third that of a typical SF_6-insulated design. This means that Vista UDS is easier to site and allows more room for landscaping options that further improve aesthetics.

Vista UDS's most innovative installation offering is the UnderCover style. The UnderCover style is ideal for areas with stringent real-estate restrictions or where aesthetics are extremely important. The Vista UDS gear is installed underground, but all operations are easily performed by one operator above ground. UnderCover style installations can also save money by reducing costs associated with trenching and long cable runs.

Vista UDS is also available for floor-mounted or wall-mounted vault installations, and in a man-hole style. With its compact design, rugged construction, and internal visible open point, man-hole style Vista UDS is perfect for applications where installation space is limited.

UnderCover Style.

Pad-Mounted Style.



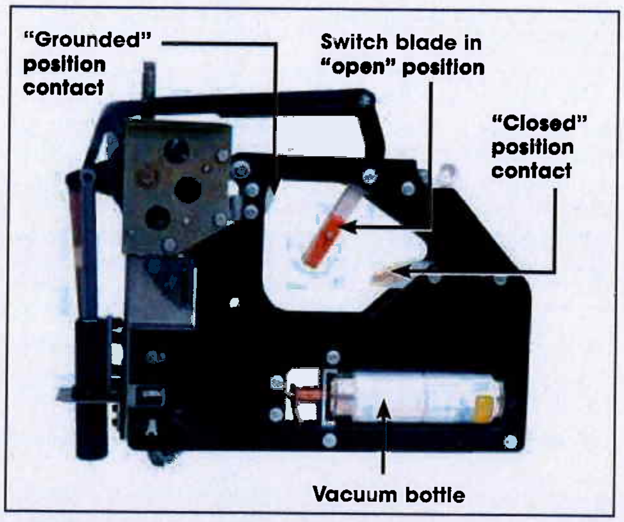
Vault-Mounted Style—available for floor and wall-mounting.

Man-Hole Style.

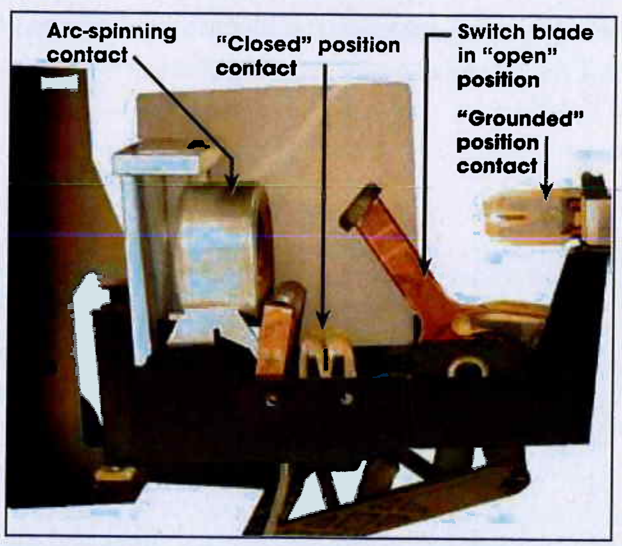
Vista UDS Operation Is Quicker, Easier, Safer

Vista UDS was specifically designed to simplify operating tasks, enhance safety, and minimize the duration of outages. Vista UDS is certified arc-resistant per IEC 298 Appendix AA, for currents up to 12.5 kA symmetrical for 15 cycles (25 kA symmetrical for 15 cycles, for models rated 25 kA short-circuit). In the event of an internal fault, the enclosure will retain its integrity.

Just one person is needed to operate Vista UDS. There's no exposure to medium voltage. The procedure is simple:



Fault interrupter furnished on all Vista UDS except 15-kV manual models.



Fault interrupter furnished on 15-kV, 12.5-kA manual models.

1. Rotate the switch operating shaft to the "open" position, then confirm the open gap through the large viewing window. See Figures 1 and 2. With ordinary elbow gear, on the other hand, specially trained operators need to remove the elbows from their bushings using a shotgun clamp stick—a tedious task that must be carefully performed. See Figure 3.

Figure 1. Opening load-interrupter switch (or fault interrupter).

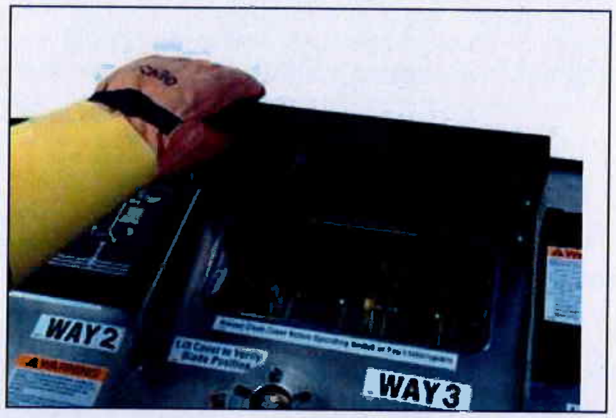


Figure 2. Window cover lifts for viewing switch-blade positions of load-interrupter switch or fault interrupter.

Figure 3. Operation of typical dead-front gear can be awkward and time-consuming.

2. Confirm that the cable is de-energized so it can be safely grounded. With traditional gear, the medium-voltage cables must be tested directly using a clampstick-mounted tester. But voltage testing with Vista UDS can be accomplished simply and easily without ever accessing the cables. Simply use the voltage indicators shown in Figure 4. The voltage indicator is even equipped with a self-test function, so you can "test the tester." See Figure 5.
3. Ground the cables. Instead of the awkward task of having to move the elbows to parking stands, along with the grounding bushings or elbows, with Vista UDS you need only rotate the switch operating shaft to the "grounded" position. See Figure 6. Grounding can easily be confirmed by looking through the viewing window.

There are even more benefits: The voltage indicator can be furnished with a low-voltage phasing option. See Figure 7. This feature allows confirmation of proper phasing without ever accessing the cables. Vista UDS allows fault-locating and hi-potting tests to be performed with the cables attached—and the bus energized.

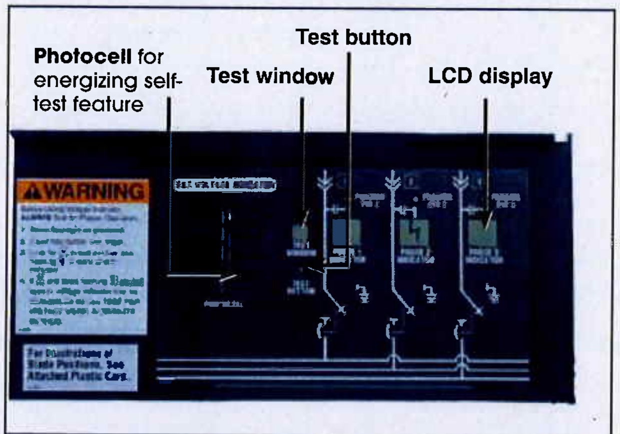


Figure 4. Voltage indicator.

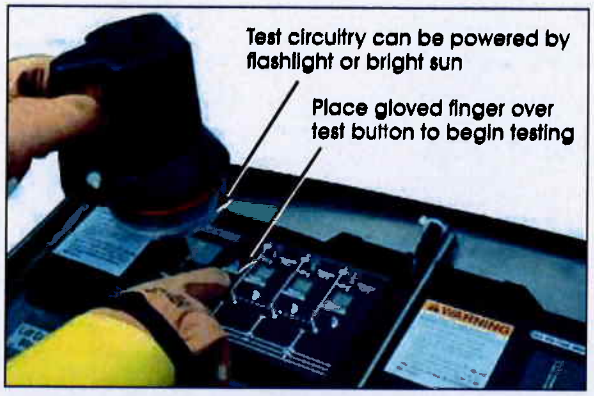


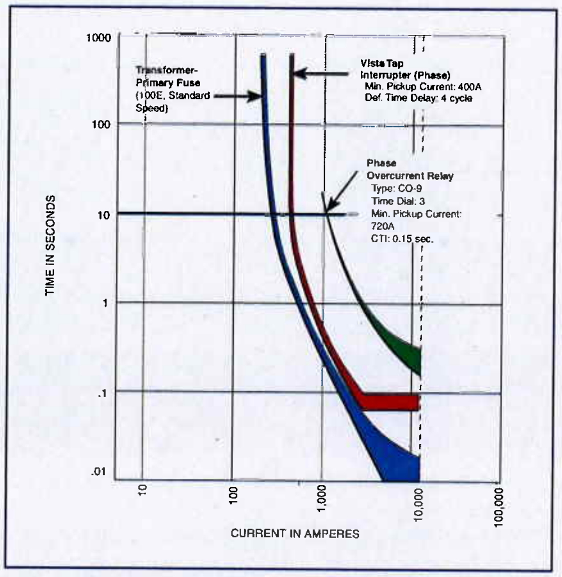
Figure 5. Testing the voltage indicator.

Figure 6. Grounding load-interrupter switch (or fault interrupter).

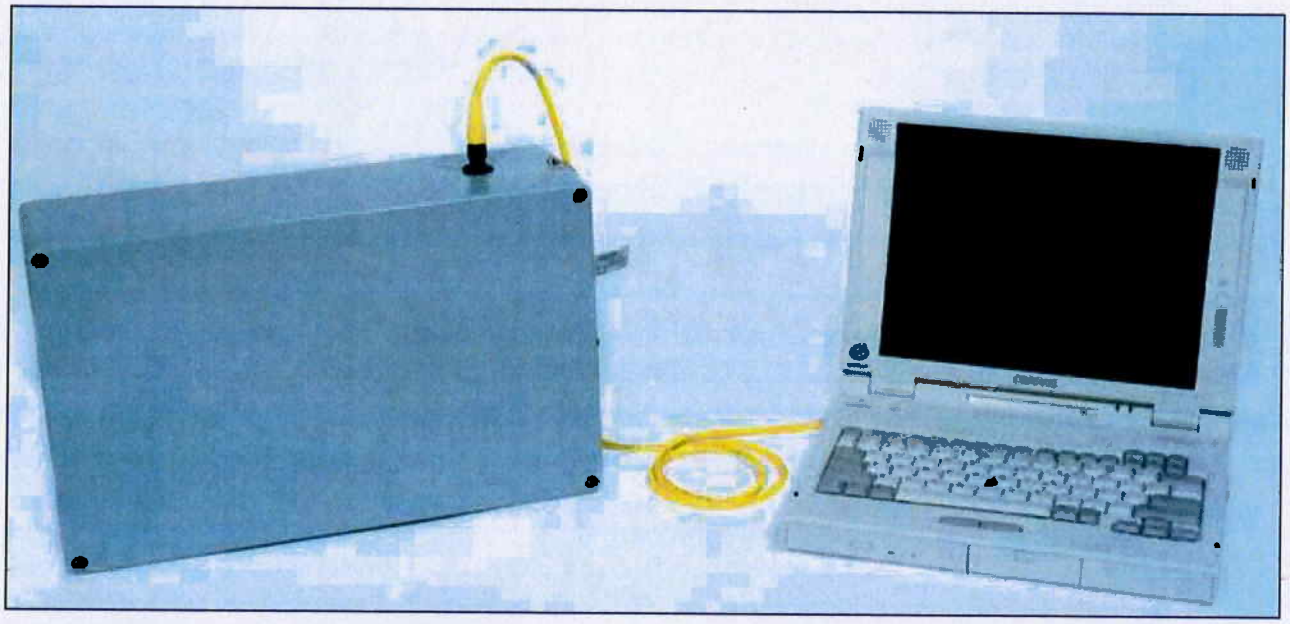

Figure 7. Measuring phase-to-phase voltage—Phase 1 to Phase 1.

Overcurrent Control for Superior Coordination

Vista UDS utilizes a unique microprocessor-based overcurrent control, housed in a watertight enclosure mounted on the gear. The overcurrent control features a variety of TCC (time-current characteristic) curves with selectable instantaneous and definite-time delay attributes, for superior coordination with upstream protective devices and downstream fusing. The parameters for the TCC curves are set using a personal computer connected to the data port of the overcurrent control. There are no knobs or dials, so the settings cannot be inadvertently changed or altered by unauthorized personnel. Integral current transformers provide power and current sensing. There is even an event recorder that captures information on the last twelve operations of each fault interrupter.



Coordinating-speed tap curve with definite-time delay eliminates miscoordination problems frequently encountered with transformer fuses.

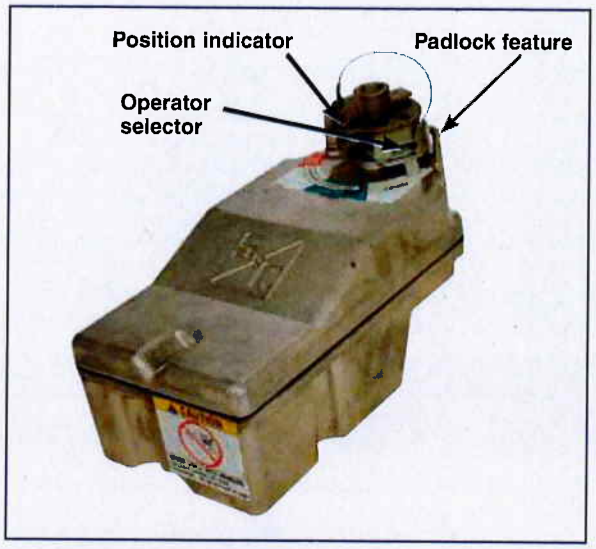


User-supplied personal computer is attached to the overcurrent control for programming the relay in the field.

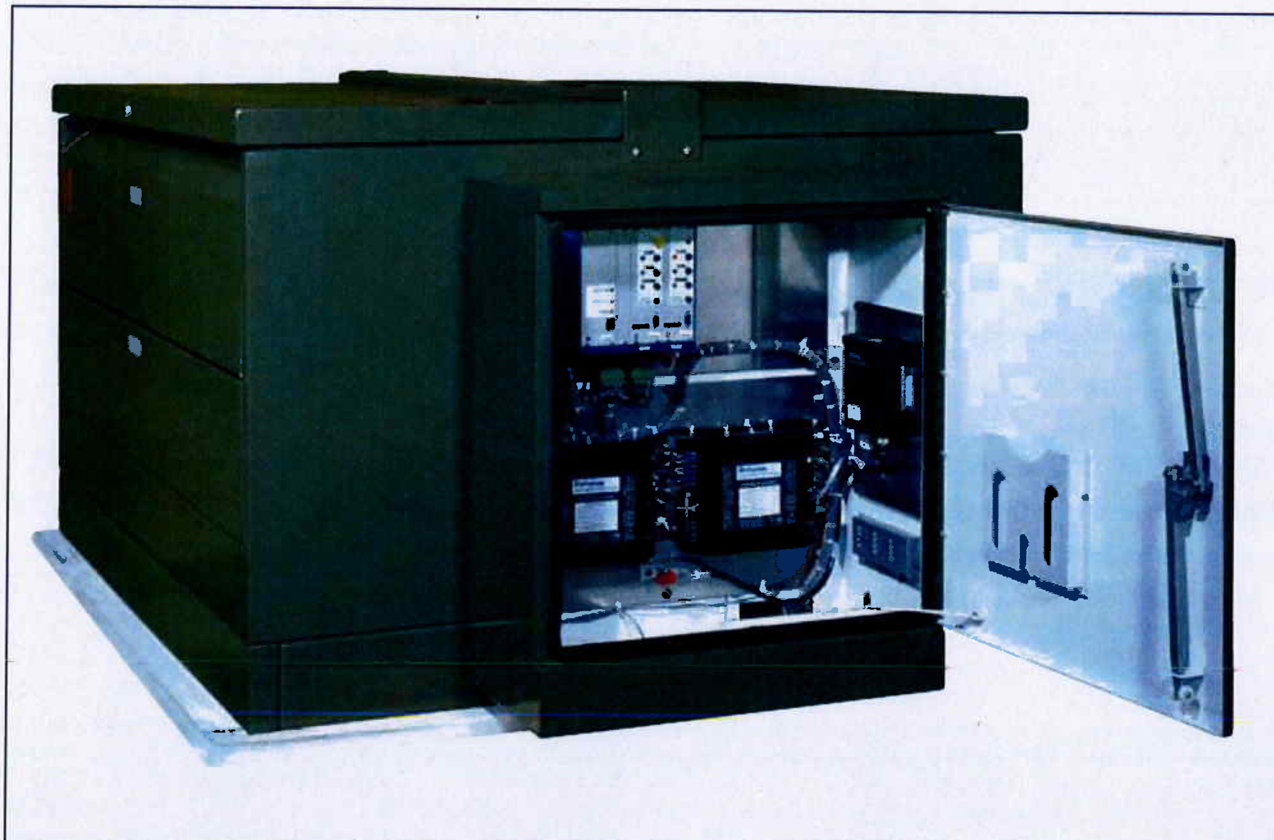
Remote Supervisory Vista UDS

For distribution automation applications, S&C offers Remote Supervisory Vista UDS. Remote Supervisory Vista UDS provides automated switching and fault protection, and can also perform auto-sectionalizing without tripping the main breaker. Automation features are also retrofittable to existing Manual Vista UDS. Motor operators, current and voltage sensors, and low-voltage compartment are easily installed in the field.

Each motor operator includes a control board that provides local push-button and remote operation between the "closed," "open," and "grounded" positions. Up to six control boards can be accommodated within the low-voltage compartment, so any or all load-interrupter switches or fault interrupters can be motor operated. The motor



Details of motor operator.



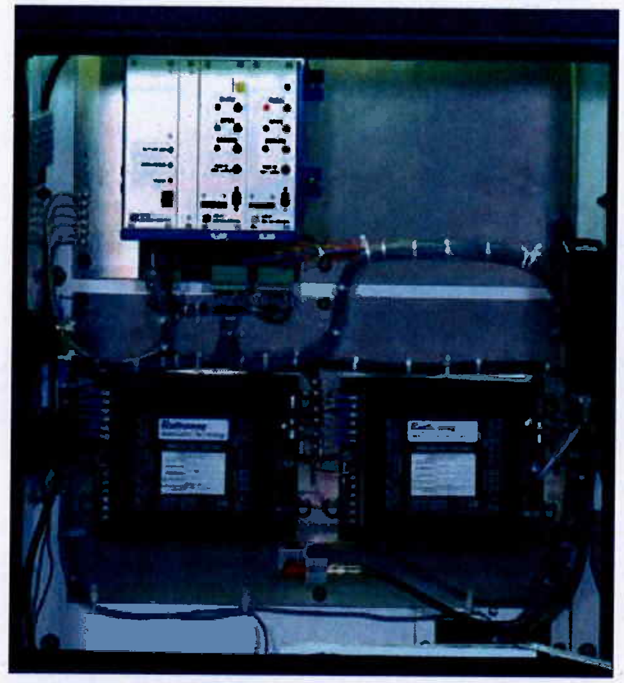
15-kV Remote Supervisory Pad-Mounted Style Model 422.

operators may be battery powered or, optionally, self-powered using internal voltage transformers. The low-voltage compartment may also contain a user-specified remote terminal unit and communication device, providing a completely automated switching and protection package. Optional voltage and current sensing round out the Remote Supervisory Vista UDS offering.

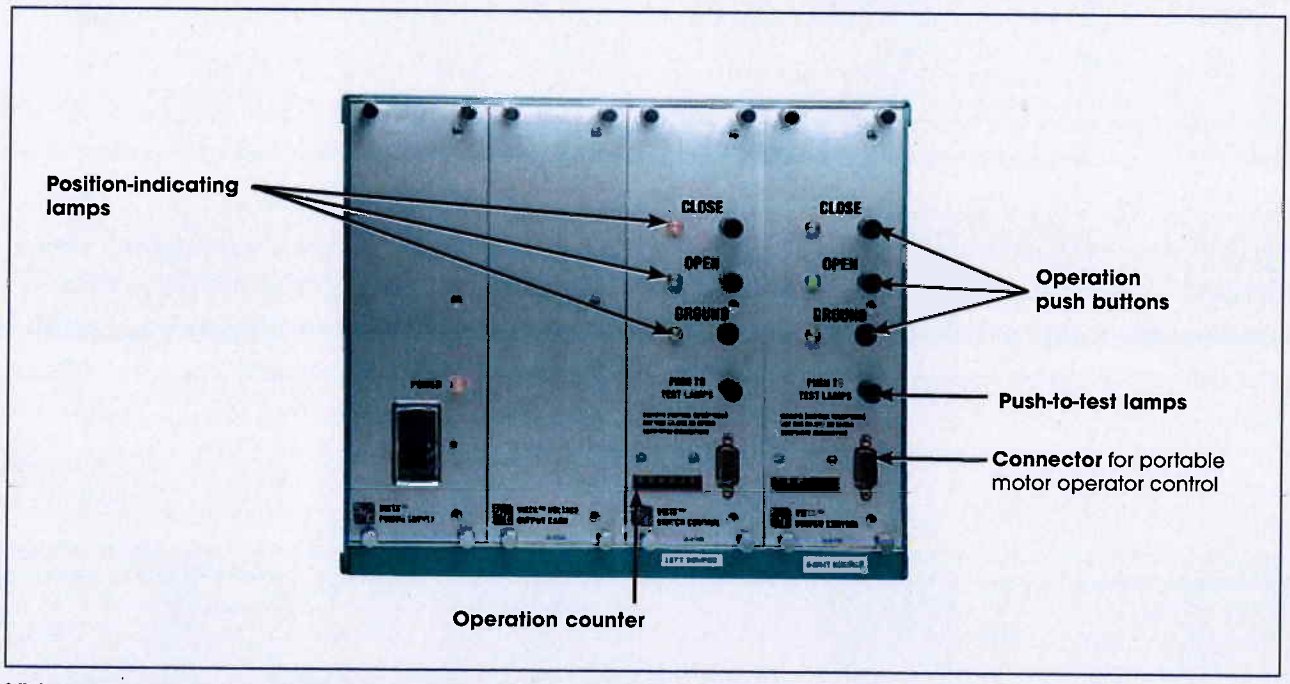
A variety of RTUs have been successfully integrated in Remote Supervisory Vista UDS, including: ACS, Harris DART, Valmet PoleCAT, QEI/Quindar, Hathaway/Systems Northwest, Motorola MOSCAD, and DAQ.

And these transceivers have been integrated: Metricom Utilinet, MDS, Dymec, H&L, and Motorola.

RTUs and communication devices of other manufacture can be accommodated too; contact your nearest S&C Sales Office.

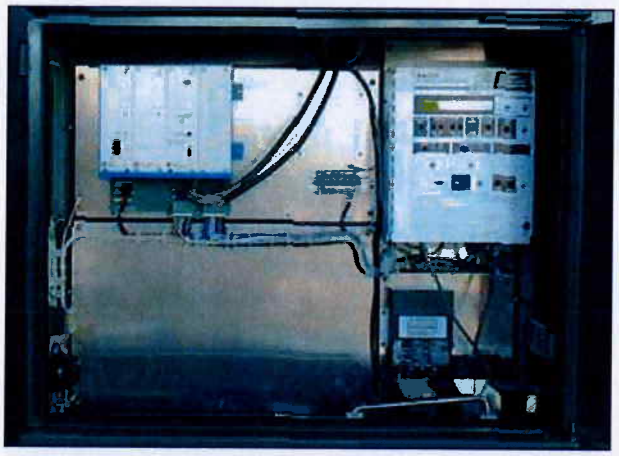


Details of low-voltage compartment of Remote Supervisory Vista UDS Model 422.



Vista motor controls for installation with two motor-operated ways.

When Remote Supervisory Vista UDS is furnished with an EnergyLine 5800 Series Switch Control, it can be a member of an IntelliTEAM®, using EnergyLine's revolutionary peer-to-peer communications. IntelliTEAM software supports automatic sectionalizing and reconfiguration, significantly reducing outage time. IntelliTEAM's peer-to-peer communication network uses distributed intelligence, eliminating the need for, but still fully supporting, a SCADA master station. And, when Remote Supervisory Vista UDS is fitted with an EnergyLine switch control, the gear can be used for automatic source transfer, with remote control and monitoring.



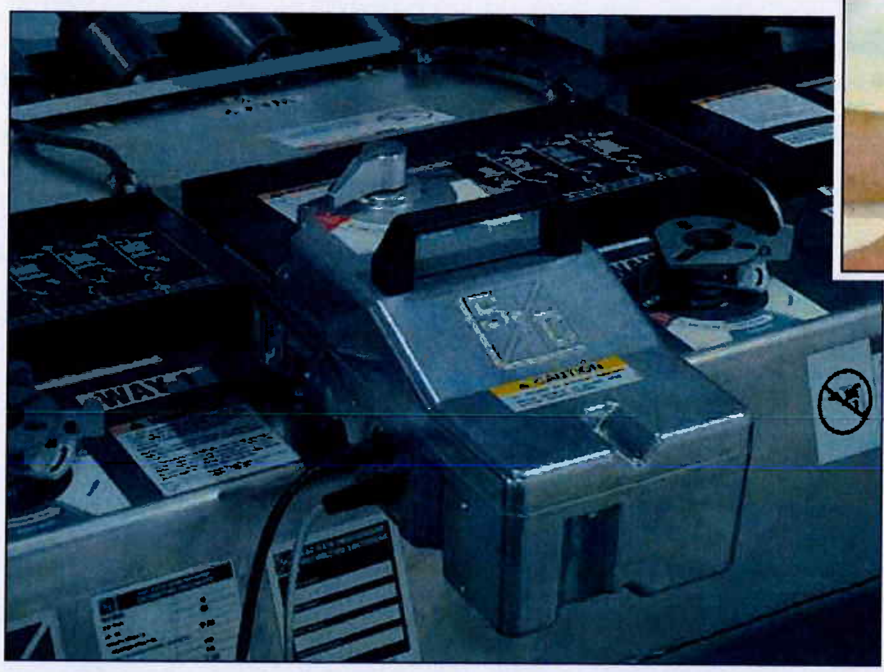
Remote Supervisory Vista UDS with 5800 Series Switch Control.

Remote Supervisory Vista UDS also allows the user to remotely trip the vacuum bottles of any three-phase fault interrupter way using external, user-specified relays. This additional shunt-trip capability permits advanced applications like sensitive earth-ground fault detection, as well as protective relay schemes using high-speed communication for closed-loop and open-loop systems.

Portable Motor Operator

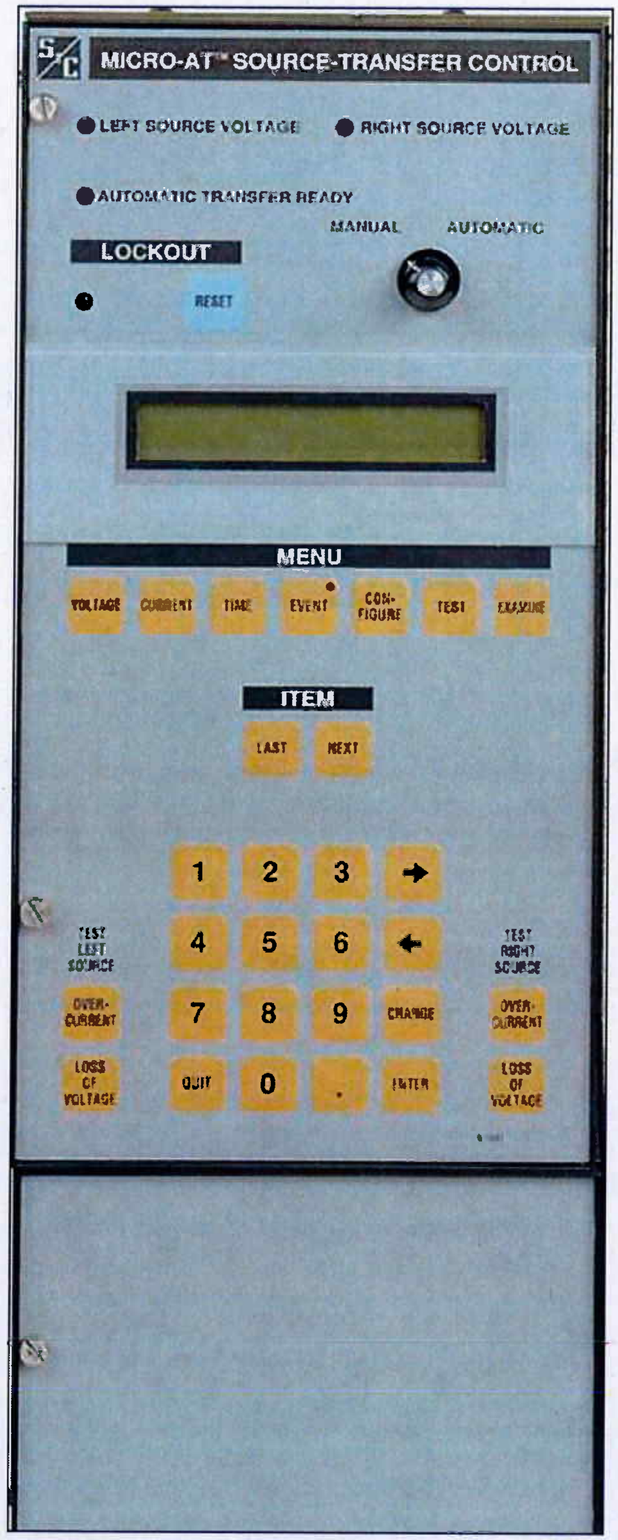
Local motor operation of Vista UDS gear is also available for users who do not require a complete automation package. The portable motor operator includes cabling and hand-held control, all in an easily portable, durable case.

The operator easily attaches to any load-interrupter switch or single-pole or three-pole fault interrupter. Then simply plug in the power cable and the control cable. The hand-held control features "open," "close," and "ground" push buttons, an "enable" button to prevent inadvertent operation, and a "ready" indicating light.



Vista UDS Portable Motor Operator. Inset shows hand-held control.

Case for Vista UDS Portable Operator.



Micro-AT Source-Transfer Control.

Source-Transfer Vista UDS

Source-Transfer Vista UDS provides fully automatic primary-selective service for one, two, or three critical load circuits. This package includes all the features of Manual Vista UDS, plus the S&C Micro-AT® Source-Transfer Control, three-phase voltage sensing on source ways, and internal power provided by voltage transformers. It is available in common-bus and split-bus configurations.

The Micro-AT Source-Transfer Control, located in the low-voltage compartment, ensures a high degree of critical-load continuity by minimizing interruptions resulting from the loss of one source. Excluding the intentional time delay to coordinate with upstream protective devices and/or transition dwell time, transfer is achieved in 6 seconds maximum.

The Micro-AT Source-Transfer Control utilizes an advanced microprocessor to perform control operations, as directed by settings programmed into the device at the factory and in the field. Such settings, consisting of the control's operating characteristics and voltage-, current-, and time-related operating parameters, are entered into the control by means of a keypad on the front panel.

An unbalance detection feature may be field-programmed in the Micro-AT Source-Transfer Control. This feature protects the loads from any source-side open-phase condition at the same voltage as the Vista Underground Distribution Switchgear. If the voltage unbalance exceeds a preset reference level for a period of time sufficient to confirm that the loss is not transient, an output signal is produced which initiates automatic transfer to the other source.

An overcurrent-lockout feature may be furnished which prevents an automatic transfer operation that would close a source load-interrupter switch into a fault. A light-emitting diode lamp indicates when lockout has occurred. Test keys are provided for simulating an overcurrent condition on each source.

Standard Three-Phase Ratings①②③

Applicable Standard	Frequency, Hertz	Amperes, RMS								
		Fault Interrupter			Load-Interrupter Switch					
		Continuous, Load Dropping, and Load Splitting (Parallel or Loop Switching) ④⑤⑥	Fault-Closing, Sym.	Fault Interrupting, Sym.	Continuous, Load Dropping, and Load Splitting (Parallel or Loop Switching) ④⑤⑥	Fault-Closing, Sym.	Momentary, Sym.	1 Sec., Sym.	Short-Circuit, Sym.	Main Bus Continuous Current⑦
IEC	50 or 60	200 or 630	12 500▲	12 500	200 or 630	12 500▲	12 500	12 500	12 500	600
		630	25 500●	25 000	630	25 500●	25 000	25 000	25 000	600
ANSI	50 or 60	200 or 630	12 500▲	12 500	200 or 630	12 500▲	12 500	12 500	12 500	600
		600	25 500●	25 000	600	25 500●	25 000	25 000	25 000	600

① Refer to the nearest S&C Sales Office for other ratings.

② IEC ratings have been assigned in accordance with the applicable portions of IEC 265-1 for a Class A switch.

③ ANSI ratings have been assigned in accordance with the applicable portions of ANSI C37.71, C37.72, and C37.73.

④ Fault interrupters and load-interrupter switches are rated 600 amperes (630 amperes IEC) continuous, load dropping, and loop splitting when furnished with 600-ampere bushings (standard for load-interrupter switches and 25-kA fault interrupters, optional for 12.5-kA fault interrupters). The rating is limited to 200 amperes if 200-ampere bushing wells are used (standard for 12.5-kA fault interrupters, optional for 12.5-kA load-interrupter switches). Models rated 25-kA are only available with 600-ampere bushings.

⑤ Fault interrupters and load-interrupter switches can switch the magnetizing current of transformers associated with the load-dropping rating. In addition, unloaded cable switching ratings are as follows: 10 amperes at 15.5 kV and 20 amperes at 29 kV and 38 kV.

⑥ 900 ampere is also available.

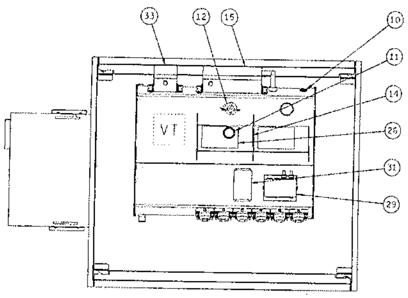
⑦ 1200 ampere is also available.

▲ 32,500-ampere peak ten-time duty-cycle rating.

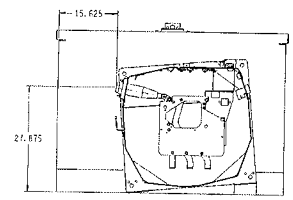
● 65,000-ampere peak three-time duty-cycle rating. Ten-time duty-cycle fault-clearing rating is 16,000 amperes symmetrical, 41,600 amperes peak.

Printed in U.S.A.

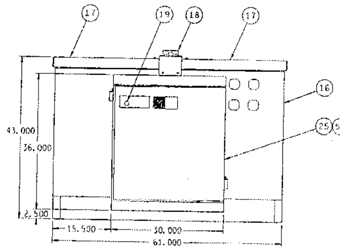
THIS VISTA UDS IS EQUIPPED WITH FAULT-INTERRUPTERS THAT ARE THREE-POLE GROUP-OPERATED FOR MANUAL SWITCHING



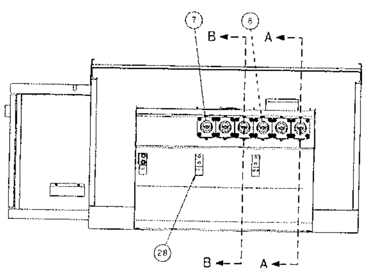
Sectional Open Top View



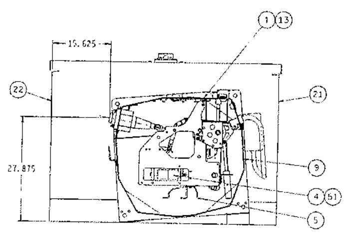
Section A-A: Bus Terminal



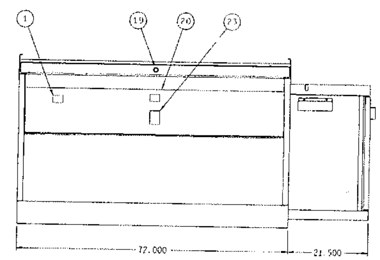
Enclosure Left Side View



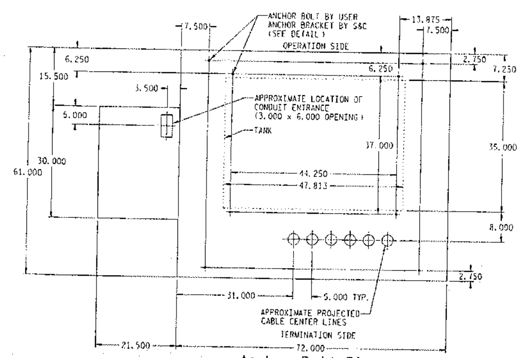
Sectional Open Termination View



Section B-B: Fault Interrupter

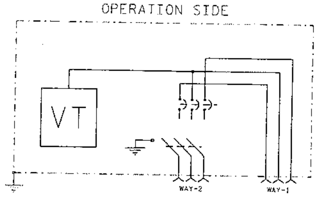


Enclosure Operation View

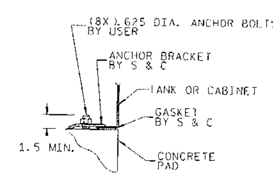


Anchor Bolt Plan

OPERATION SIDE



TERMINATION SIDE
Connection Diagram



ANCHOR BOLT DETAIL

FEATURES:

1. ALUMINUM NAMEPLATE
4. THREE-POLE FAULT-INTERRUPTER WITH THREE-POSITION (CLOSED-OPEN-GROUND) DISCONNECT
5. 600-AMPERE ALUMINUM BUS
7. 200-AMPERE BUSHING WELLS FOR FAULT-INTERRUPTERS
8. 200-AMPERE BUSHING WELLS FOR BUS TERMINALS
9. SF6-INSULATED STEEL TANK
10. GAS-FILL PORT
11. PRESSURE GAUGE
12. OPERATING MECHANISM
13. MANUAL OPERATING HANDLE
14. WINDOW FOR VIEWING OPEN GAP AND GROUNDED POSITION OF LOAD-INTERRUPTER SWITCH OR FAULT-INTERRUPTER
15. OVERCURRENT CONTROL (S&C 1000 RELAY) AND REMOTE SHUNT TRIP
16. 14-GAUGE PAD-MOUNTED ENCLOSURE
17. HINGED LIFT-UP ROOF WITH RETAINER TO HOLD ROOF IN POSITION
18. RETRACTABLE LIFTING TAB
19. PENTAHEAD BOLT LOCKING MECHANISM ACCOMMODATES PADLOCK WITH .375" DIAMETER SHACKLE
20. REMOVABLE PANEL
21. OPERATION COMPARTMENT LABEL
22. TERMINATION COMPARTMENT LABEL
23. WARNING SIGN
25. REMOTE SUPERVISORY VISTA LOW-VOLTAGE ENCLOSURE, MILD STEEL
26. POTENTIAL INDICATION WITH TEST FEATURE
28. TWO-HOLE GROUND PAD, ONE PER WAY
29. VISTA JUNCTION BOX ASSEMBLY
31. VOLTAGE SIGNAL AMPLIFIER FOR VOLTAGE SENSING
33. INTERNAL VOLTAGE TRANSFORMER SECONDARY FUSE ENCLOSURE

SPECIAL FEATURES:

50. 30" WIDE X 21.5" DEEP LOW VOLTAGE ENCLOSURE
51. AUXILIARY CONTACTS ON VUCUUM BOTTLES (TRIPPED) AND DISCONNECT SWITH (CLOSED-OPEN-GROUND) FOR FAULT-INTERRUPTER WAY
52. SEL-351A PROTECTION SYSTEM P/N 0351A0H0X2B11X1

SUFFIXES:

-D1	3-PHASE VOLTAGE SENSING (WAY 1)
-L1	POTENTIAL INDICATION WITH TEST FEATURE
-O	TWO-HOLE GROUND PAD, ONE PER WAY
-P4	PAD-MOUNTED STYLE, THREE OR FOUR-WAY, MILD-STEEL OUTER ENCLOSURE, OLIVE GREEN FINISH
-R11	REMOTE LOW-PRESSURE ALARM WIRED TO LOW-VOLTAGE ENCLOSURE
-R31	EXTERNAL TRIP PROVISIONS IN ADDITION TO STANARD OVERCURRENT CONTROL FOR FAULT-INTERRUPTER
-T1	THREE POLE, GROUP OPERATED FAULT-INTERRUPTER: QTY. 1
-Y4	INTERNAL CONTROL POWER FOR 13.8-14.4 KV SYSTEM VOLTAGE VIA AN INTERNAL VOLTAGE TRANSFORMER, 70:1 RATIO ABB CATALOG NUMBER 7525A66G07

WIRING DIAGRAMS:

OCDR-14444	REMOTE SUPERVISORY WIRING DIAGRAM, MODEL 201
CDR-6436-S138	OVERCURRENT CONTROL AND REMOTE SHUNT TRIP AND AUXILIARY CONTACTS — WAY 2

942012-D1L1OP4R11R31T1Y4-S121

RATINGS

HERTZ			50	60
KV. MAXIMUM			12	15.5
KV. BIL			75	95
AMPERES RMS	MAIN BUS	CONTINUOUS	600	600
	FAULT INTER-RUPTER	CONTINUOUS	200	200
		LOAD DROPPING	200	200
		FAULT CLOSING DUTY-CYCLE TEN TIME SYMMETRICAL	12,500	12,500
		INTERRUPTING SYMMETRICAL	12,500	12,500
	SHORT-CIRCUIT	SYMMETRICAL	12,500	12,500

PRINT IDENTIFICATION

DATE: 9/27/2010
S&C S.O. NO.: 244881
CUSTOMER: Yale Electric Supply - Canton
CERTIFIED BY:
PURCHASE ORDER NUMBER: 8032525
RELEASE ORDER NUMBER:
SUBSTATION / OTHER :
PROJECT: Mwra Wind Turbine
DRAWING NO.: 942012-D1L1OP4R11R31T1Y4-S121

DRAWING NO. 942012-S121 MST

MATERIAL: | FINISH: | DRAWING SIZE: D | DRAWN BY: boutrovn | SCALE: 1:16 | ORIGINATION DATE: 09-21-10

PROPRIETARY STATEMENT

USED ON

NEXT ASSEMBLY

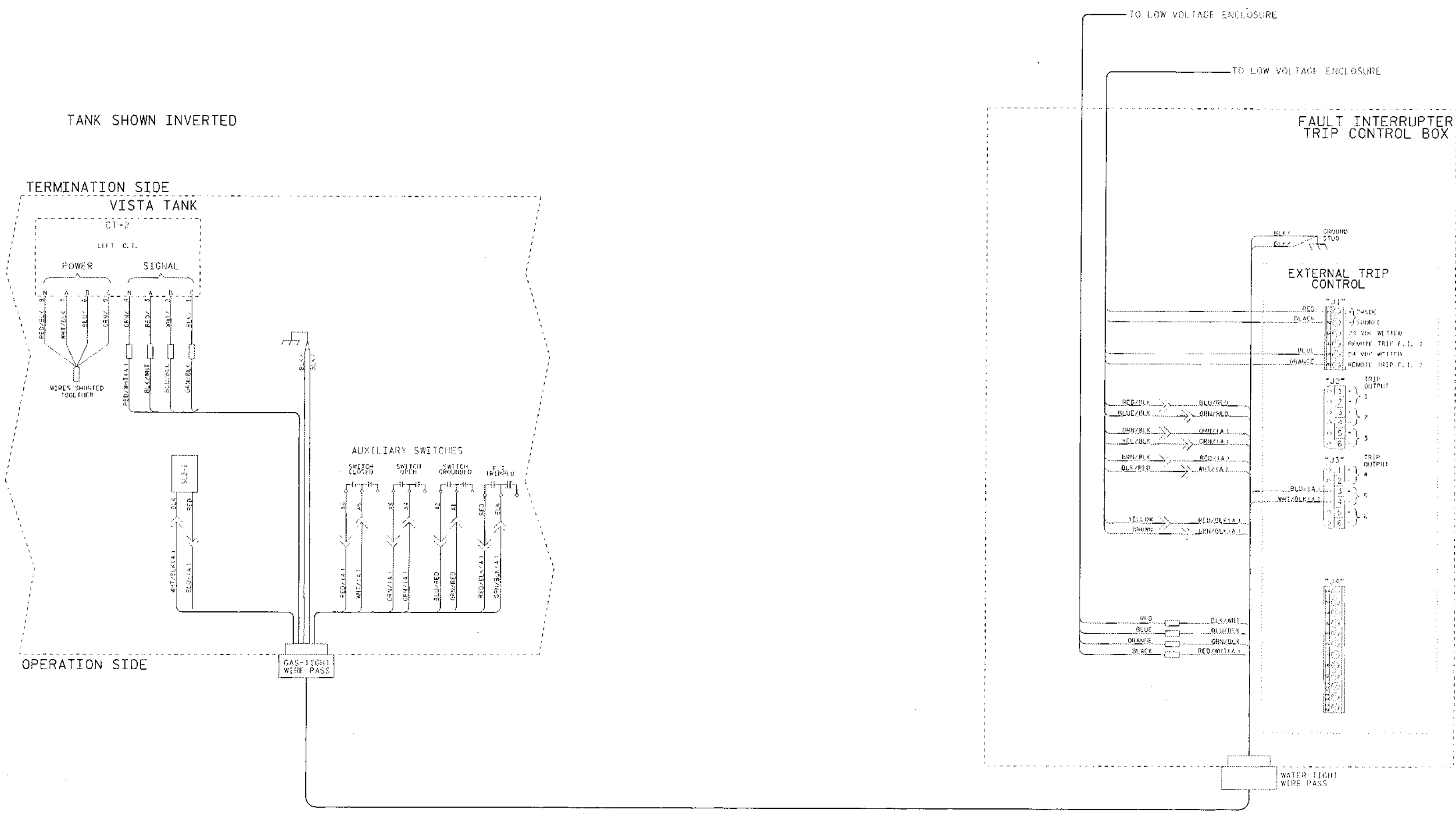
PRODUCT DESCRIPTION: VISTA REMOTE SUPERVISORY

S&C ELECTRIC COMPANY GENERAL OFFICES • CHICAGO — Specialists in Electric Power Switching and Protection

DESCRIPTION: S&C VISTA REMOTE SUPERVISORY UNDERGROUND DISTRIBUTION SWITCHGEAR MODEL 201, 15.5KV

CATALOG DIMENSIONAL

DRAWING NO. 942012-S121 MST



NOTES:
1. THE CONTROL POWER VOLTAGE TYPE IS SELECTABLE USING A JUMPER LOCATED ON THE PRINTED CIRCUIT BOARD. THE JUMPER MUST BE IN THE DC POSITION.
2. WIRE COLORS ARE REFERENCED AND MARKED "SOLID/STRIPE(STICKER)"

⚠ CAUTION

NO.	DATE	NOTICE NO.
0	09-20-10	SCS10XXX

REVISIONS

CDR-6436-S138

PROPRIETARY STATEMENT

USED ON

S&C ELECTRIC COMPANY

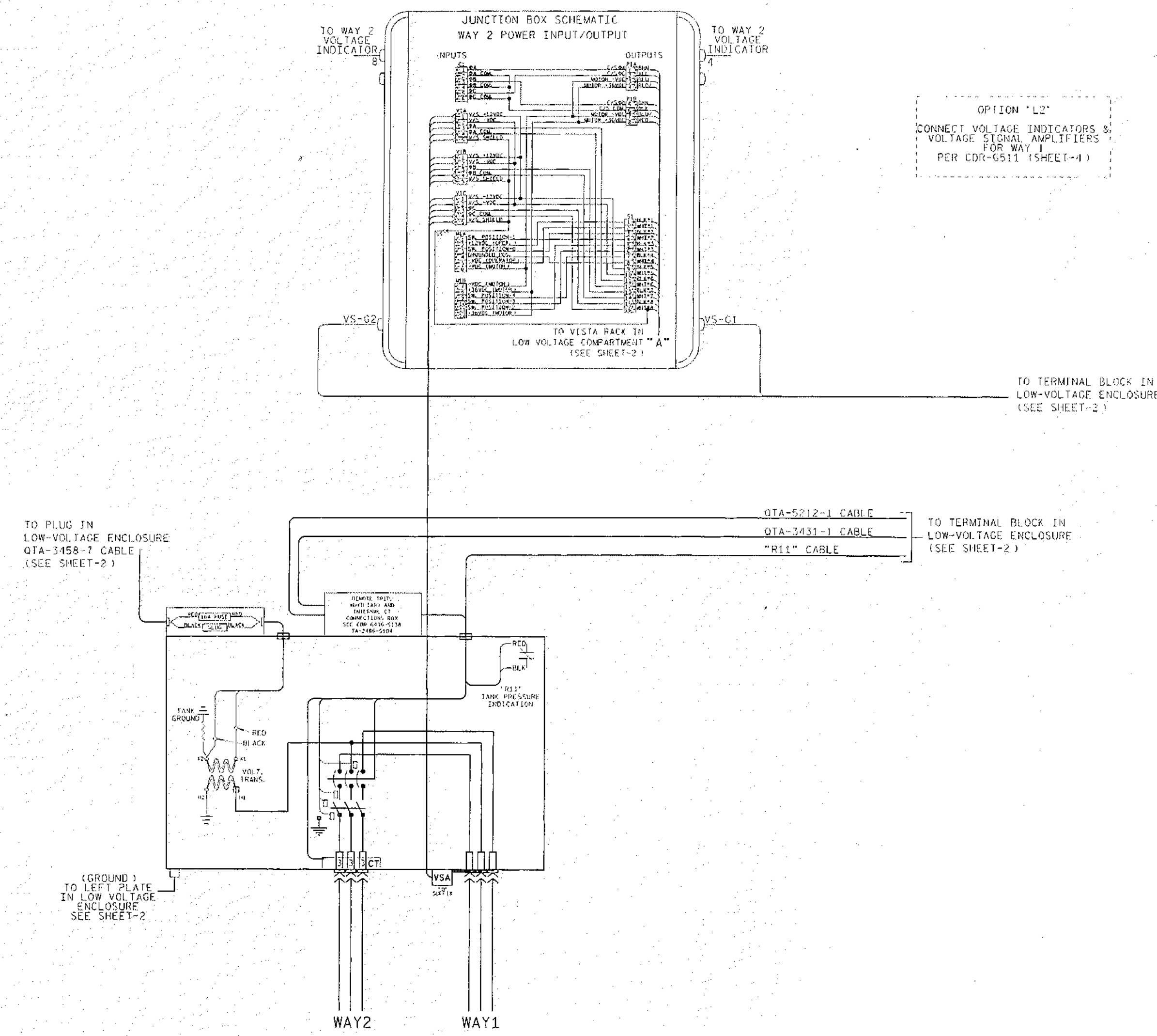
Specialists in Electric Power Switching and Protection

DESCRIPTION

VISTA FAULT INTERRUPTER TRIP CONTROL W/ AUX. CONTACTS WIRING DIAGRAM

DRAWING NO.

CDR-6436-S138



⚠ CAUTION

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REVISIONS

NO.	DATE	NOTICE NO.
0	09-16-10	SC530XXX

DRAWING NO. QCDR-14444

MATERIAL | FINISH

PROPRIETARY STATEMENT

DRAWING SIZE	D
DRAWN BY	MCM
SCALE	NONE
ORIGINATION DATE	09-16-10
USED ON	
NEXT ASSEMBLY	942012-S121
PRODUCT DESCRIPTION	VISTA REMOTE SUPERVISORY

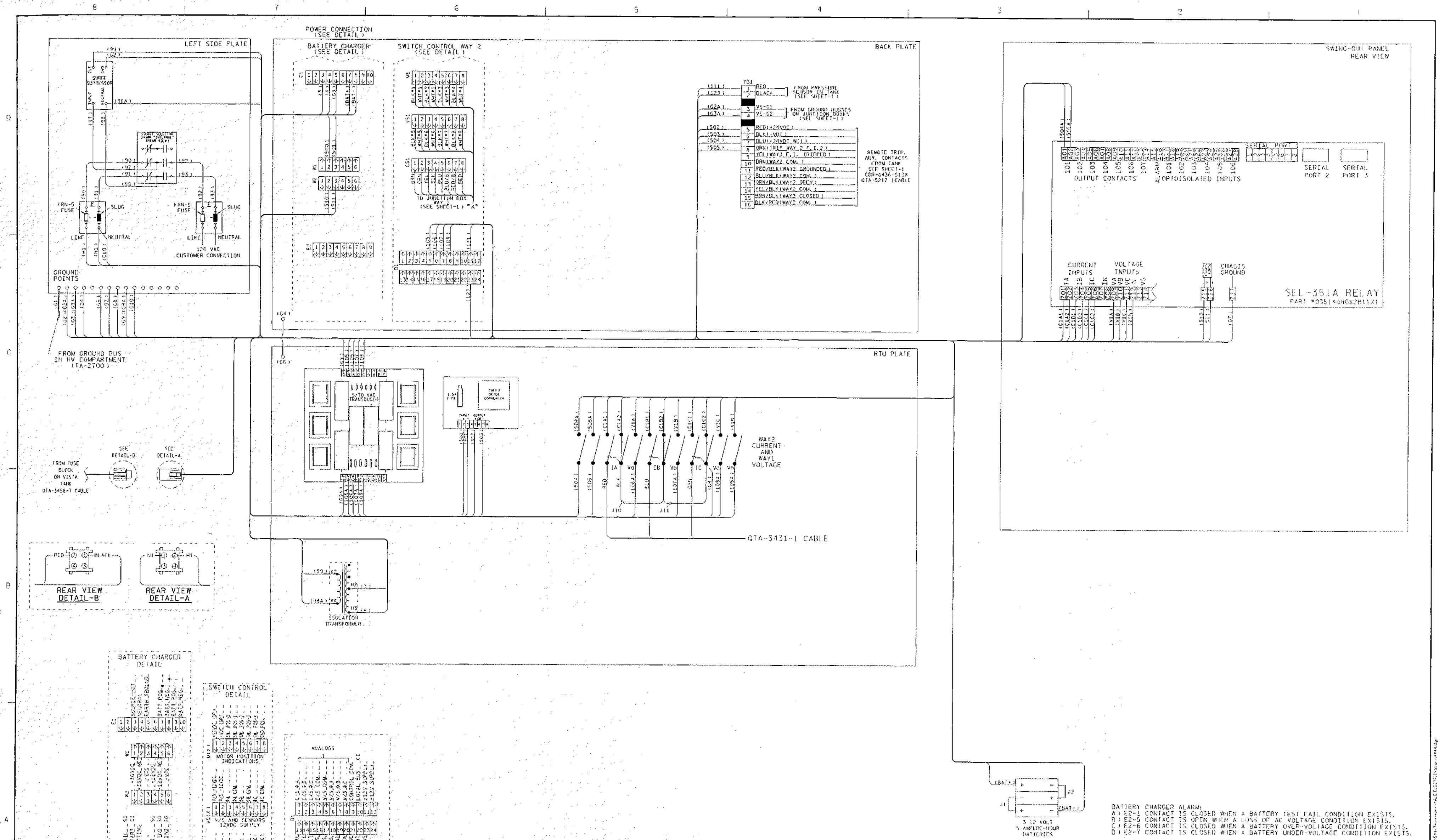
S&C ELECTRIC COMPANY
GENERAL OFFICES • CHICAGO
Specialists in Electric Power Switching and Protection

DESCRIPTION

VISTA REMOTE SUPERVISORY
WIRING DIAGRAM
MODEL 201

SHEET 1 OF 2

DRAWING NO. QCDR-14444



BATTERY CHARGER ALARM:
A) E2-1 CONTACT IS CLOSED WHEN A BATTERY TEST FAIL CONDITION EXISTS.
B) E2-5 CONTACT IS OPEN WHEN A LOSS OF AC VOLTAGE CONDITION EXISTS.
C) E2-6 CONTACT IS CLOSED WHEN A BATTERY OVER-VOLTAGE CONDITION EXISTS.
D) E2-7 CONTACT IS CLOSED WHEN A BATTERY UNDER-VOLTAGE CONDITION EXISTS.

⚠ CAUTION

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REVISIONS

NO.	DATE	NOTICE NO.
0	09-16-10	SC539XXX

DRAWING NO. QCDR-14444

MATERIAL: | FINISH: | DRAWING SIZE D | DRAWN BY MCM | SCALE NONE | ORIGINATION DATE 09-16-10

PROPRIETARY STATEMENT

USED ON
NEXT ASSEMBLY 942012-S121
PRODUCT DESCRIPTION VISTA REMOTE SUPERVISORY

S&C ELECTRIC COMPANY
GENERAL OFFICES • CHICAGO
Specialists in Electric Power Switching and Protection

DESCRIPTION
VISTA REMOTE SUPERVISORY
WIRING DIAGRAM
MODEL 201

SHEET 2 OF 2

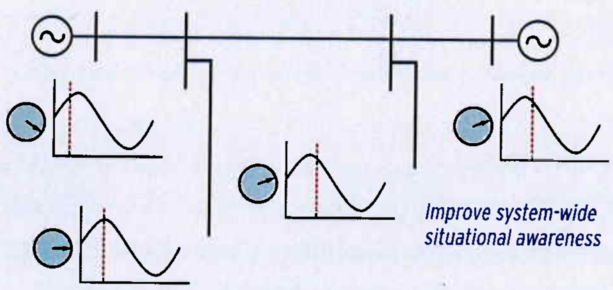
DRAWING NO. QCDR-14444 MS1

SEL-351A Protection System

Standard SEL-351A protection system.

The SEL-351A provides comprehensive distribution and overcurrent protection for control and monitoring in a compact, secure, and economical package.

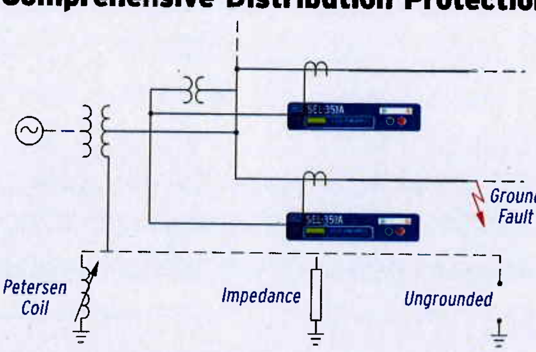
Built-In Synchrophasors



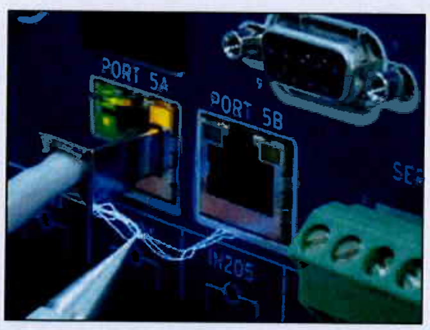
Improve system-wide situational awareness

Industry standard IEEE C37.118 protocol

Comprehensive Distribution Protection



Substation-Hardened Ethernet



Modbus® TCP, Telnet, DNP3, and IEC 61850 protocols

Withstands electrostatic air discharge of 15 kV

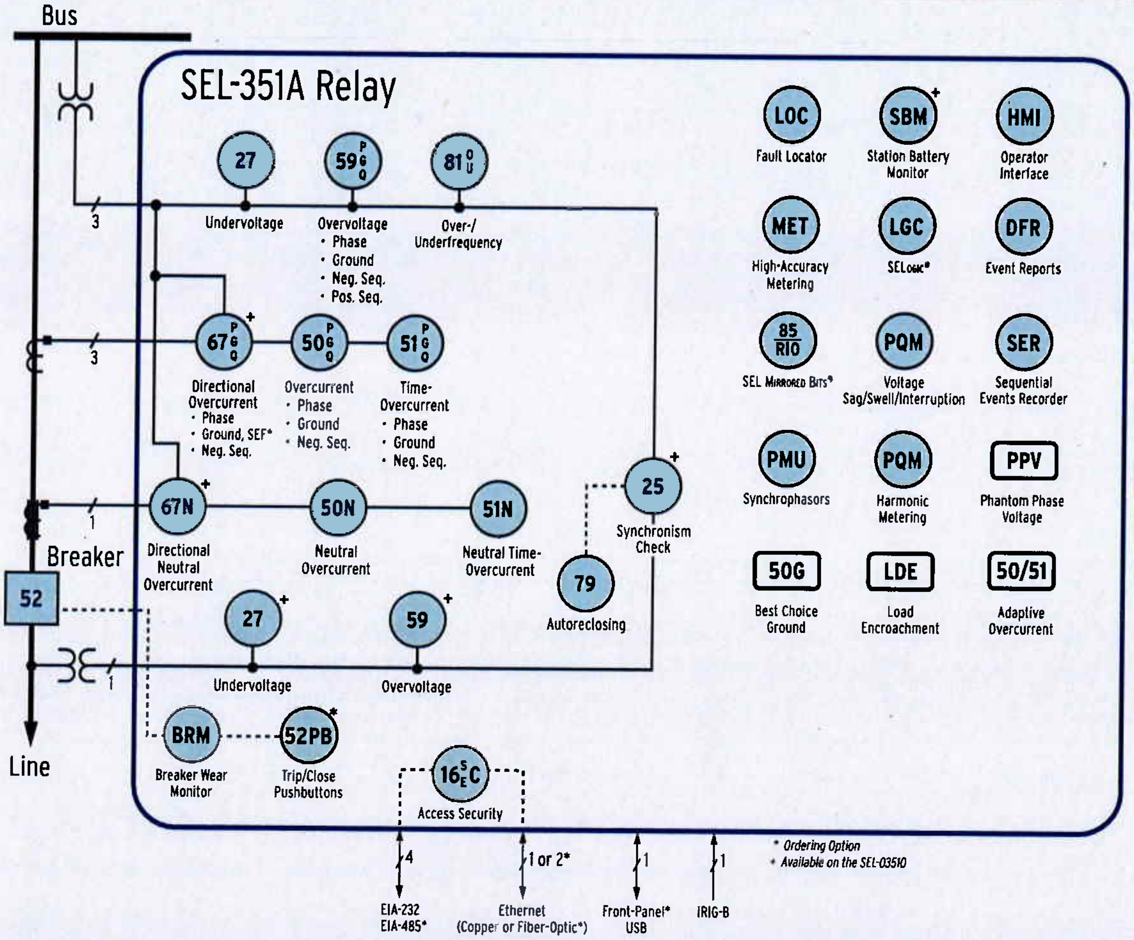
Industry-Leading Quality, Reliability, and Service

−40°C

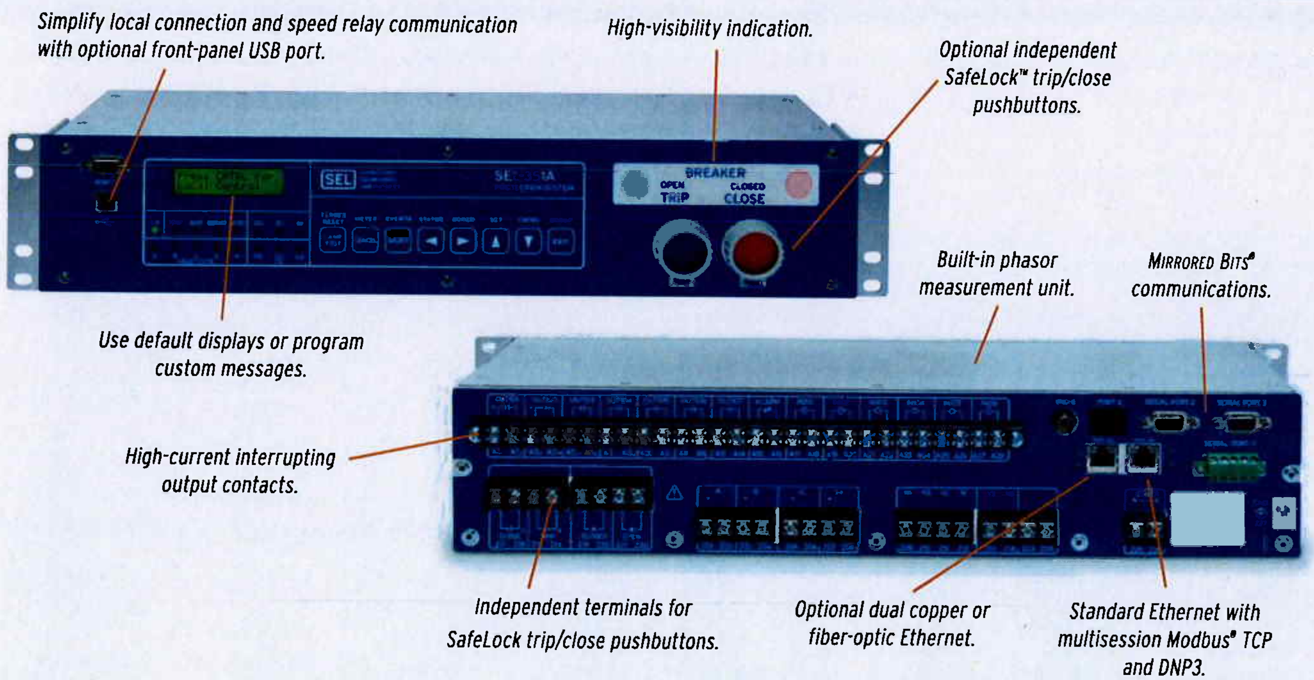
+85°C

Making Electric Power Safer, More Reliable, and More Economical®

Functional Overview



Feature Overview



Flexible Communications

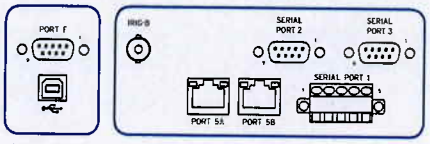
Communications Protocols

- MIRRORED BITS® Communications
- IEEE C37.118 Synchrophasors
- IEC 61850
- Modbus TCP
- Modbus RTU
- Telnet
- DNP3 Serial
- DNP3 IP
- Web Server
- Simple Network Time Protocol (SNTP)
- FTP
- SEL Fast Messages
- ASCII
- IRIG-B

Communications Media

- 10/100BASE-T Ethernet
- 100BASE-FX Ethernet
- EIA-232 Serial
- EIA-485 Serial
- USB Type B
- BNC

The SEL-351A Relay offers many communications options.

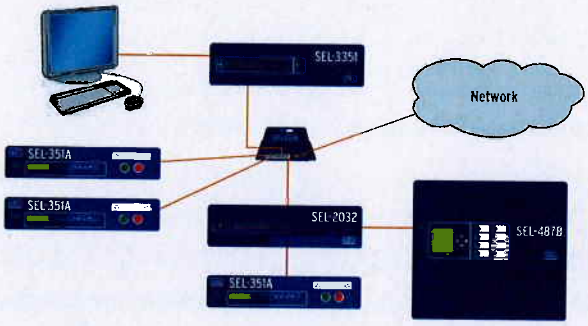


Front panel *Rear panel*

Integrate With Ethernet Networks

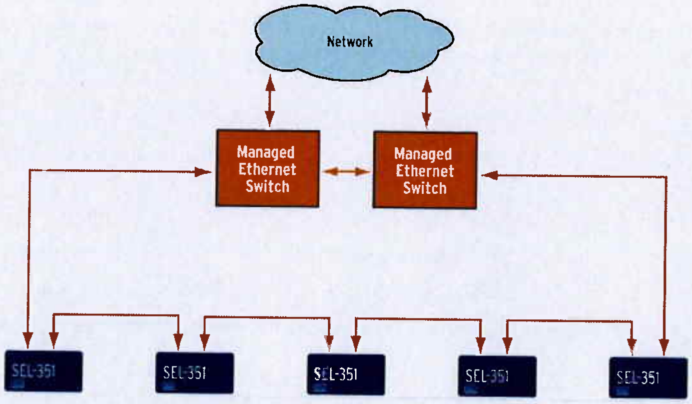
Apply SEL-351A Relays with Ethernet directly to a local network or through an SEL communications processor.

- Use DNP3 LAN/WAN or Modbus TCP to quickly send information through your networks.
- Provide information to the right people for improved system performance.
- Increase communications reliability with failover redundant communications ports.
- Transfer data with high-speed Ethernet for fast HMI updates and file uploads.
- Use popular Telnet applications for easy terminal communication with SEL relays and other devices.
- Combine IEC 61850 technology, Ethernet network, and the SEL-351A for the fastest overall performance of IEC 61850 relays for substation automation and control.
- Access basic relay information on a standard Ethernet network with the built-in web server. View relay status, Sequential Events Recorder (SER) reports, metering information, and settings. Web server access requires relay password and is limited to read-only viewing of information.
- Simplify wiring and installation by receiving a time signal over existing Ethernet networks. SNTP makes a good backup to more accurate IRIG-B time synchronization.

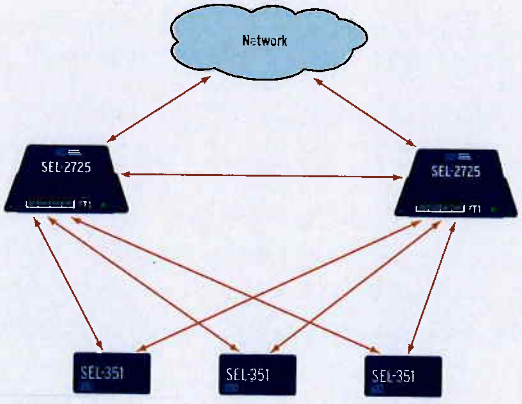


Reliable, Secure Networking Options

Increase network reliability and availability by incorporating dual-port Ethernet SEL-351A Relays with external managed or unmanaged switches. Implement a self-healing ring structure with managed switches, or use unmanaged switches in a dual-redundant configuration.



Typical network configuration for switched-mode operation.

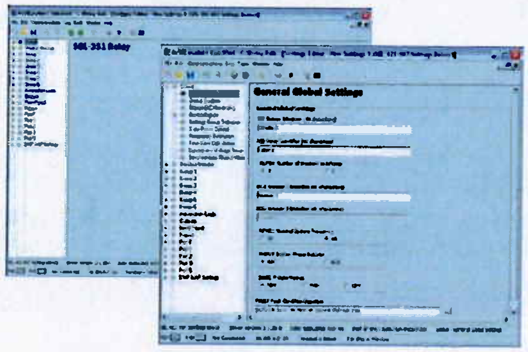


Typical network configuration for failover-mode operation.

Easy to Set and Use

Use acSELerator QuickSet® SEL-5030 Software to set, monitor, and control the SEL-351A.

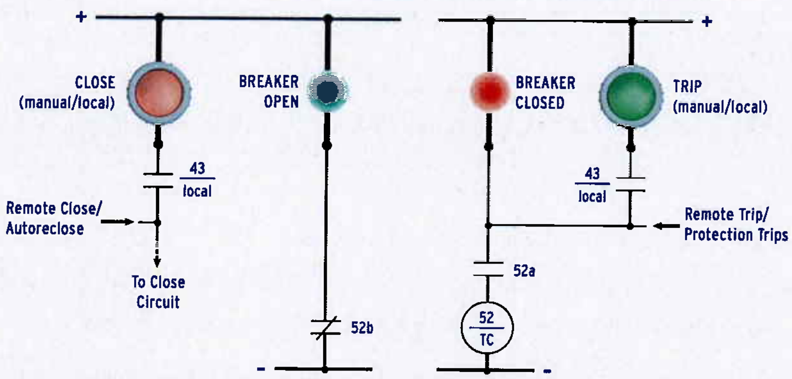
- Save engineering time while maintaining flexibility. Communicate with the SEL-351A through terminal software or with the acSELerator QuickSet graphical user interface.
- Develop settings offline with a menu-driven interface and completely documented help screens. Speed installation by copying existing settings files and modifying application-specific items.
- Simplify the setting procedure with rules-based architecture to automatically check interrelated settings—out-of-range or conflicting settings are highlighted for correction.
- Streamline configuration of IEC 61850-enabled relays with acSELerator Architect® SEL-5032 Software.



Easily set, monitor, and control the SEL-351A with acSELerator QuickSet® SEL-5030 Software.

Eliminate Panel-Mounted Breaker Control Switches

Specify optional SafeLock trip/close pushbuttons and indicating lamps for your next SEL-351A application. The independently operated switches and breaker status lamps are functional even if the relay is out of service. Switch contacts and indicating lamps are separately wired to screw-terminal blocks on the rear of the relay. Choose the wiring arrangement that best suits your need for breaker control and status indication. The trip/close pushbuttons are equipped with the SafeLock system to prevent inadvertent operation and facilitate tagout procedures.



Optional trip/close pushbuttons operate independently from the relay function.

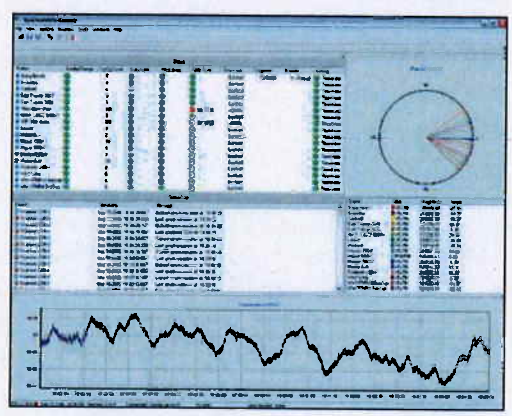
Add Synchrophasors to Your System

Improve System Performance With Synchrophasor Technology

SEL offers complete synchrophasor solutions, including hardware, communication, data collection, viewing and analysis software, and data archiving.

- Improve system performance using real-time, system-state measurement with the time-synchronized voltages and currents available in SEL-351A Relays.
- Help system operators prevent cascading blackouts and monitor system stability with a new synchrophasor view of the power system.
- Use SEL-5078 synchroWAVe® Console Software or third-party software to view and analyze system phase angle, load oscillations, voltage profiles, and other critical system information. Stream synchrophasor data with IEEE C37.118 standard format at up to 60 messages per second.
- Monitor distribution and transmission networks to detect potential cascading voltage collapse before it happens.

SYNCHROWAVE.



SEL synchroWAVe® Software displays and archives power system operating conditions.

Pullman, Washington USA
Tel: +1.509.332.1890 • Fax: +1.509.332.7990 • www.selinc.com • info@selinc.com

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DATE	3-10-15
SCALE	1"=100'
JOB NUMBER	2014-115
SHEET	3 of 8

OVERALL SITE PLAN

Canis Major Solar

Prepared For

Lodestar Energy, LLC

Rear Land of 1005 North Street
Suffield, Connecticut
Map 39H Block 29 Lot 21 Zone: R-90

BY: TAC
CHK: JEU

REVISIONS

6-24-15	ADD DISTANCES TO NEAREST HOUSES
5-14-15	PETITION SUBMITTAL
4-02-15	CLEARING LIMIT LINE; ADD PROPOSED GAS EASEMENT

LODESTAR ENERGY

RUSSO
SURVEYORS · ENGINEERS
SERVING CT & MA
J.R. Russo & Associates, LLC

RBI SOLAR

Solar Mounting Systems

GROUND MOUNT

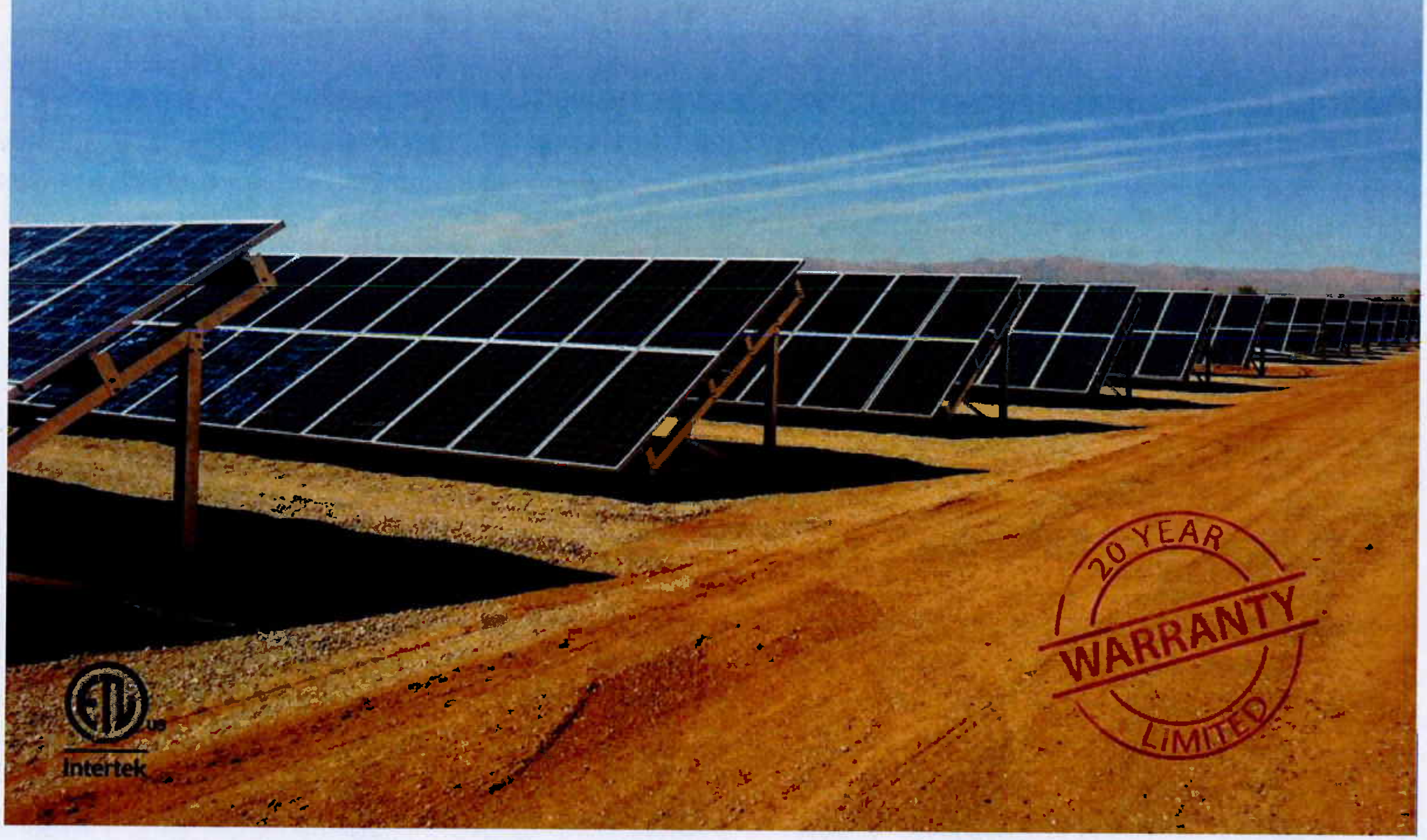
DESIGN ENGINEERING MANUFACTURING INSTALLATION

www.rbisolar.com

RBI Solar designs, engineers, manufactures and installs solar mounting systems. This single-source responsibility is focused on delivering value throughout the solar value chain.

Features & Benefits

- **Custom engineered to specific site conditions**
- **High strength steel with corrosion protection**
- **Designed to minimize field installation labor**
  - Reduced number of posts compared to traditional racking
  - Follows contours to mitigate civil/site work
  - Same hardware throughout
  - Optional pre-assembly
- **Design and engineering at every step of the way**
  - In-house engineers
  - Stamped drawings including foundation
- **Pile driving test available**
- **Flexible to mount any module type**
- **Nationwide installation**
- **Various foundation options**
- **UL 2703 classification available**
- **Procurement and manufacturing:**
  - Leverage with national and international facilities
  - Material certification available
  - ARRA compliant; "Made in the USA" certification available



RBI Solar Background

Family owned and operated, we pride ourselves in 80+ years of experience in commercial design-build specialty structures. RBI Solar's unique design capabilities and multiple manufacturing facilities help us develop the most economical, reliable and robust solutions for any structural solar mounting challenge. We are committed to taking single point responsibility for the entire project starting from the initial design to complete installation of solar modules.

Engineered Foundation Options

Our engineers consider many factors when determining the most reliable and cost-effective foundation solution for our projects. Incorporating and analyzing data from available certified geotechnical reports, on-site pile testing, wind tunnel testing, and all applicable codes and loading considerations, our team can provide various foundation options:

- Driven post
- Concrete pier
- Dual post
- Screw piles
- Pre-cast or cast-in-place concrete ballast
- Spread footings

Installation Services

With experience of completing multiple solar racking jobs for commercial, institutional and utility customers, RBI Solar is the most trusted name when it comes to solar racking installation. Our highly trained project managers and installation crews work with your on-site engineers to install custom engineered solar racking systems. Racking installation is essential for meeting project time and budget goals. Advantages of using RBI Solar for installation include:

- Company owned post driving equipment
- Highly skilled construction crews that specialize in solar racking
- Dedicated project managers

Technical Specifications

Description of product	Fixed tilt racking
Efficient designs	GM-I, GM-T and GM-B
Module configuration	Landscape or portrait ; designed to accomodate any module type
Tilt angle	0° to 45°
Array height	Project specific design
Ground cover ratio	Project specific design
Installation options	Posts, racking and module mounting
Geographical range	Nationwide
Grounding	Continuously bonded racking; tested by ETL to UL2703 standards (GM-I & GM-T)
Wire management	Built-in wire management options
Design criteria	Engineered to meet applicable structural codes
Warranty	20-year limited warranty

Contact Us 55_3 Vine Street Cincinnati, OH 45217 | www.rbisolar.com cell 513.242.2051 email info@rbisolar.com

SINGLE SOURCE PROVIDER

DESIGN

System classified to UL 2703, with in-house designers and engineers. Our focus is to deliver the most effective and efficient racking solution based upon the array layout and site conditions.

ENGINEERING

Our in-house engineers, licensed and registered in all states, provide structural calculations applying RBI proprietary wind tunnel analysis and focus on delivering appropriate racking and foundation design based on existing soil conditions.

MANUFACTURING

Multiple state-of-the-art manufacturing facilities, along with a vertically integrated procurement and manufacturing protocol, ensures overall quality of product with reduced lead times for material.

INSTALLATION

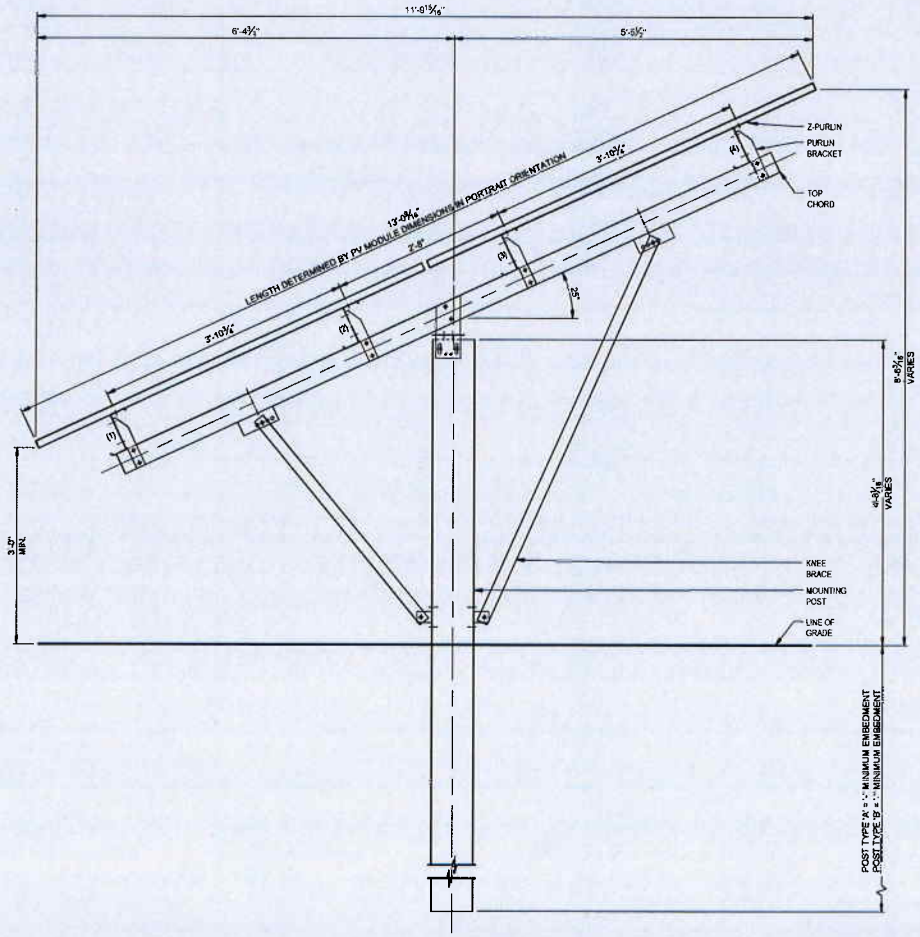
Single source responsibility, with in-house project management and installation crews. This approach reduces duplication of efforts throughout the enterprise, focused on delivering projects on time and within budget.

GROUND MOUNT • ROOF MOUNT • SPECIALTY STRUCTURES • LANDFILL

Racking questions? We are here to answer.
Contact us at info@rbisolar.com or call (513)242-2051

www.rbisolar.com

RBI SOLAR



RBI SOLAR
Total Solar Service: Design * Fabrication
Installation * Parts * Repair Service
5513 VINE STREET
CINCINNATI, OH 45217
513 242 2051
FAX: 513 242 0816

PROFESSIONAL SEAL

NOT FOR CONSTRUCTION

RBI SOLAR IS NOT RESPONSIBLE FOR CONSTRUCTION THAT IS BUILT FROM SET LABELED "NOT FOR CONSTRUCTION"

GROUND MOUNT
FOR

RELEASE RECORD

MARK	DATE	DESCRIPTION
1	06/15/15	REVIEW SET

PROJECT INFORMATION

TITLE & ADDRESS:

RBI SOLAR PROJECT No.:

DRAWN BY: EM
REVIEWED BY: AW

SHEET TITLE: SIDE ELEVATION

SHEET No.: S-601

Lodestar Energy

Canis Major Solar, Suffield, CT

Carbon Debt Analysis

June 29, 2015

Pursuant to a request made by the Connecticut Siting Council on Monday, June 22, 2015, Lodestar Energy performed an analysis to determine whether the proposed Canis Major Solar project (the "Project"), to be located on approximately 10 acres of an overall 26.47-acre lease area located at 1005 North Street in Suffield, CT ("Project Site"), has the ability to produce a net improvement in carbon reduction compared to the loss of approximately 9.8 acres of forested land. The Project is proposed to produce 2.88 MW DC of electrical power, through the use of an estimated 9,288 photovoltaic solar panels, 86 string inverters, and related equipment. The analysis that follows accounts for the loss of the trees, the carbon associated with the manufacture of the solar panels and related equipment, and the carbon associated with the installation activity. The Project will require the removal of approximately 225 trees within a primarily Red Maple and Grey Birch community. (Other species also include Eastern Cottonwood and Honey Locust in lesser amounts.)

Canis Major Solar – Carbon Debt Analysis	
Carbon footprint in product manufacture and project execution	CO_2e (Metric Tons)
Solar panels	4,112
Racking	253
Panel Interconnection	5
Junction Boxes	11
Conduits and Fittings	55
Wire and Grounding Devices	94
Inverters and Transformers	148
Grid Connections	13
Concrete	26
Trees Removed (Current Stock)	225
Trees (Future Lost Carbon Reduction)	519
Total CO_2e to Payback	5,461
Annual Photovoltaic Production Benefits (-CO_2e)	2,173
Carbon Payback of Project (Years)	2.51

Consider the accounting of "carbon debt" in the table above, which includes the energy used and CO_2 released in the manufacture and installation of the solar arrays, as well as the existing and future carbon

Adam Beal, Director of Land Development • Lodestar Energy

www.lodestarenergy.com • (970) 379-3937 • abeal@lodestarenergy.com • 3 Ellsworth Place, Suite 122, Avon, CT 06001

reduction derived from the trees to be displaced by the Project[1], and the subsequent CO_2e[2] payback analysis[3]. It is clear that the Project would result in a significant net improvement in overall carbon reduction over existing conditions at the Project Site.

---

[1] The calculations used in determining the amount of energy used and CO_2 created in the manufacture and installation of the solar arrays uses industry-standard data sourced from the Environmental Protection Agency CO_2 calculator, the Franklin Life Cycle Analysis Database, the National Renewable Energy Laboratory's U.S. Life Cycle Inventory, the Aluminum Association's Life Cycle Inventory, Ecoinvent Centre's Life Cycle Inventory, the U.S. Energy Information Administration's Annual Energy Review, and the Department of Energy's Life Cycle Inventory.

[2] CO_2e, or carbon dioxide equivalent, is a term for describing different greenhouse gases in a common unit. For any quantity and type of greenhouse gas, CO_2e signifies the amount of CO_2 which would have the equivalent global warming impact.

[3] Tree CO_2e calculations are based off of volumetric equations by McClure, J. and Cost, N. (2010) and the component ratio method by Heath, et al. (2009). This estimation method is adopted by the U.S. Forest Service Forest Inventory Analysis (FIA) Program and California's pre-compliance market (AB 32), is peer-reviewed, and is widely considered to be the standard methodology for calculating carbon sequestration. *Measurement Guidelines for the Sequestration of Forest Carbon*, U.S. Department of Agriculture, Forest Service, Northern Research Station; Pearson, Timothy R.H.; Brown, Sandra L.; Birdsey, Richard A. (2007).

Department of Economic and Community Development

Connecticut
still revolutionary

July 1, 2015

Dr. Michael S. Raber
81 Dayton Road, PO Box 46
South Glastonbury, CT 06073

Subject: Cultural Resources Investigations
Canis Major Solar Development
1005 North Street
Suffield, Connecticut

Dear Dr. Raber:

The State Historic Preservation Office (SHPO) has reviewed the Cultural Resources Investigations report prepared by Raber Associates (Raber) for the referenced project. The survey identified evidence of substantial prior subsurface disturbances. As a result, only limited subsurface testing was completed to confirm the depth and distribution of these disturbances. During the survey, a total of 12 auger tests were completed to provide sufficient coverage of the project area. Subsurface testing confirmed that Holocene epoch soils, those containing cultural deposits, had been removed entirely from the project area. The investigation meets the minimum standards set forth in the *Environmental Review Primer for Connecticut's Archaeological Resources.* SHPO concurs with Raber that no additional archeological investigation of the project area is warranted.

An architectural review resulted in the consideration of five structures dating from the early eighteenth through mid nineteenth centuries. All of the structures are located at more than 0.25 miles from the boundary of the proposed solar field. SHPO concurs with Raber that the proposed project is not likely to cause visual impacts to these historic structures. Based on the information provided to our office, it is SHPO's opinion that no historic properties will be affected by the proposed Canis Major Solar Development.

This office appreciates the opportunity to review and comment upon this project. These comments are provided in accordance with the Connecticut Environmental Policy Act. For additional information, please contact Catherine Labadia, Staff Archeologist, at (860) 256-2764 or catherine.labadia@ct.gov.

Sincerely,

Mary B. Dunne
Deputy State Historic Preservation Officer

RABER ASSOCIATES

CONSULTANTS IN THE HISTORICAL AND SOCIAL SCIENCES

June 11, 2015

Catherine Labadia, Staff Archaeologist
State Historic Preservation Office
Connecticut Commission on Culture and Tourism
One Constitution Plaza, Second Floor
Hartford, CT 06103

RE: Canis Major Solar Development
Town of Suffield, Connecticut

Dear Ms. Labadia:

Daniel Forrest sent a March 16, 2015 letter requesting reconnaissance investigations and consideration of visual effects for the Sullivan Solar Farm project. The project has since been re-named Canis Major Solar, and project proponents have filed a petition with the Connecticut Siting Council on May 21, 2015.

Attached for your review is my report in response to Mr. Forrest's letter. In brief, I found that all project areas subject to direct effects were not sensitive for any significant cultural resources due to either poorly-drained soils, or to widespread ground disturbance associated with sand-and-gravel mining and subsequent grading. The proposed 10 acres of solar panel arrays will rise only 8 feet above finished project area surfaces. To assess visual effects, I identified five historic homes in a town-wide architectural survey, located approximately 0.25-0.5 miles from proposed limits of solar panel arrays. One home at 827 North Street in Suffield is listed on the National Register of Historic Places. Analysis of terrain and tree cover between the project area and these structures indicated the completed project would not be visible from any of the historic properties.

No further cultural resource investigations, or protective measures to address indirect visual effects, appear necessary. Please contact me if you have any questions or concerns.

Sincerely,

Michael S. Raber

Attachment

xc: Adam Beal, Lodestar Energy LLC
Timothy Coon, J.R. Russo & Associates LLC

81 Dayton Road • P.O. Box 46
South Glastonbury • CT 06073
(860) 633-9026 voice/fax)/msraber@aol.com (e-mail)

RABER ASSOCIATES
CONSULTANTS IN THE HISTORICAL AND SOCIAL SCIENCES

CULTURAL RESOURCES INVESTIGATIONS

FOR PROPOSED CANIS MAJOR SOLAR DEVELOPMENT

1005 NORTH STREET, SUFFIELD, CONNECTICUT

Michael S. Raber

<u>prepared for:</u>

Lodestar Energy LLC
3 Ellsworth Place, Suite 122
Avon, CT 06001

<u>in support of:</u>

Petition to the Connecticut Siting Council
May 21, 2015

June 2015

81 Dayton Road • P.O. Box 46
South Glastonbury • CT 06073
(860) 633-9026/msraber@aol.com

CONTENTS

Table

Figures (following page 13)

I. INTRODUCTION

Lodestar Energy LLC (Lodestar), a developer of renewable energy Projects, is currently developing plans for a 2.0 MW AC/2.88 MW DC ground-mounted solar photovoltaic facility at 1005 North Street in Suffield Connecticut, to be known as the Canis Major Solar (Project). Lodestar submitted a petition to the Connecticut Siting Council (CSC) on May 21, 2015 for a declaratory ruling that no certificate of environmental compatibility and public need is required for the proposed Project. Among the issues to be addressed for approval of the Project's environmental compatibility, potential Project effects on cultural resources must be reviewed by the Connecticut State Historic Preservation Office (SHPO) under the Connecticut Environmental Policy Act (Connecticut General Statutes Chapter 439 Section 22a), Connecticut General Statutes Section 221-90 (1)(J), and under Section 16-50k(a) of the Public Utilities Environmental Standards Act (PUESA). Cultural resources subject to review under these acts include historic architectural properties, historic industrial or engineering resources, and pre-Contact or Euroamerican archaeological sites eligible for the state or national registers of historic places. SHPO has noted the potential sensitivity of any undisturbed Project areas for potential Native American archaeological resources, and requested that a professional cultural resources assessment and reconnaissance survey be completed prior to construction, including potential viewshed impacts on structures listed or eligible for listing on the National Register of Historic Places (letter, Daniel T. Forrest to Timothy A. Coon, March 16, 2015). To be eligible, cultural resources must possess physical integrity and meet at least one of the following criteria:

A. Association with important historic events or activities;
B. Association with important persons;
C. Distinctive design or physical characteristics, including representation of a significant entity whose individual components may lack distinction;
D. Potential to provide important information about prehistory or history.

Lodestar retained Raber Associates to conduct the investigations, which were completed to standards of the SHPO *Environmental Review Primer for Connecticut's Archaeological Resources*, and the Secretary of the Interior's "Standards for Archaeology and Historic Preservation" for Identification, Evaluation and Planning. Michael S. Raber acted as principal investigator. Background and field investigations were conducted in May 2015.

II. PROJECT AREA, PROJECT DESCRIPTION AND ENVIRONMENTAL CONTEXT

The Project area consists of 28.1 acres of undeveloped land, part of a larger 51.3-acre parcel owned by Kevin and Krist Sullivan at 1005 North Street in Suffield. Lodestar will enter into a lease agreement with the Sullivans to construct, operate and maintain the solar farm, to consist of approximately 10 acres of ground-mounted solar photovoltaic panels and improvements to an existing, approximately 1200-foot-long farm road to provide access to the site located approximately 1350 feet from North Street. The work will include clearing and grubbing, grading, construction of access roads, layout and placement of foundation systems, racking, and solar PV panels, installation of utility pads and associated electrical equipment, installation of electrical conduit, conduit supports, electrical poles, and overhead wire, and security fencing. No existing structures will be impacted by the proposed Project. Improvement to the access road will consist of widening the approximately 10-foot-wide existing gravel path to a 12-foot-wide gravel road with 3-foot-wide grass shoulders, with topsoil removal as needed and deposition of up to 10 inches of additional gravel or processed aggregate material.. Where the road crosses a wetland associated with the Clay Brook drainage, carried under the road in a concrete culvert, retaining walls will minimize wetland filling. The solar panels are expected to be supported on steel posts, and will extend approximately 8 feet above graded surfaces at the upper end of tilted panel surfaces. Views of the panels from nearby residential properties will be masked by plantings of Colorado blue spruce trees (Figures 1-2; J.R. Russo & Associates LLC 2015).

The proposed site is divided into two areas by an intermittent stream that flows from a pond and associated wetland in the northwest corner of the property towards the southeast to a wetland east of the Project area,. The southern area is mostly an open field with a scattering of mature trees, a wooded western edge, and existing surface elevations of approximately 150-170 feet above mean sea level. The northern area is densely wooded, with existing surface elevations of approximately 145-180 feet above mean sea level (Figure 2; GZA GeoEnvironmental, Inc. 2015).

The Project area lies within Connecticut's Central Valley or Central Lowlands (sometimes known as North-Central Lowlands physiographic province. The valley, known to geologists as the Hartford Basin, is predominantly a lowland with "red-bed" Triassic sedimentary sandstone and arkose bedrock which slopes down to the east. The lowland is generally characterized by broad level surfaces in which the Connecticut River and most tributaries meander with limited slope, except where the waters encounter higher bedrock deposits. The bedrock underlies the lowland at varying depths, below relatively small-sized glacial till which is well covered in most places north of Rocky Hill by level deposits associated with late-glacial Lake Hitchcock. The lake drowned the lowland along 150 miles of the present river course some 11-13,000 years ago. Lake deposits included fine silts and clays later exploited for brick manufacture, broad sandy deltaic fans or terrace deposits around larger tributary streams, and beach deposits of reddish brown sand, silt and gravel. Well-developed post-glacial sand dunes and other aeolian deposits are locally extensive above the lake and terrace deposits. After the lake drained, the river cut through the lake deposits, indifferent in most places to the erosible arkose, to create the gradual river slope seen in most of the lowland today. The Project area is drained by the Stony Brook sub-basin of the Connecticut River. Stony Brook tributary Clay Brook formerly flowed south through the center of the 51.3-acre Sullivan parcel, draining most of the Project area. Installation of a natural gas pipeline across the property has altered Clay Brook drainage patterns and eliminated the former stream channel within Project limits, but wetlands adjacent to the brook remain largely intact. Prior to mining on the property discussed below, the west end of the parcel was drained by the Philo Brook tributary of Stony Brook (Figure 1; Colton and Hartshorn 1966, 1970; Dowhan and Craig 1976; Rodgers, ed. 1985; Bell 1985; Stone *et al.* 1998; personal communications, Kevin S. Sullivan, Jr.).

Until the mid 20th century, the southeast half of the main Project area and the route of the access road consisted of glacial lake bottom deposits on which Holocene soil development included poorly-drained Scantic silt loam, moderately-well-drained Buxton silt loam, Elmwood very fine sandy loam and Ludlow loam, and well-drained Broadbrook silt loam. The Scantic silt loam characterized wetland areas along Clay Brook, and the eastern quarter to third of the northern solar panel array area. The northwestern half of the main Project area consisted of glacial lake beach and possibly glacial till deposits, at elevations of up to 190 feet above mean sea level, with well-drained Enfield silt loam and excessively-drained Manchester gravelly sandy loam soils. The latter area was mined for sand and gravel c1950-1970, with considerable alteration of topography and creation of the present intermittent stream to enhance drainage for mining operations. Much of the access road was evidently created for these operations. Mining spoils were deposited in the south half of the south solar array Project area, which was subsequently graded or filled by the Sullivan family c1995-2001 to create current conditions, with elevations similar to those of c1945. The Sullivans also did some excavation along part of the north side of the access road to enhance drainage. Project geotechnical borings indicated the main area landformed by the Sullivans is underlain by pre-cultural glacial lake bottom deposits beginning no lower than 3 feet below present surfaces, but did not provide data on the upper 3 feet of extant deposits, leaving open the question of whether any Holocene soil strata survive (Figures 2-3; Fairchild Aerial Survey 1934; U.S. Geological Survey 1945; Robinson Aerial Surveys 1951-52; U.S. Department of Agriculture 1962; Keystone Aerial Surveys, Inc. 1965; Colton and Hartshorn 1970; GZA GeoEnvironmental, Inc. 2015; personal communications, Kevin S. Sullivan, Jr.).

III. BACKGROUND DATA AND CULTURAL RESOURCE SENSITIVITY

A. Native American Resources

1. Summary of Regional Background Material

There are no reported Native American sites within at least several miles of the Project area, although this absence of data may reflect limited archaeological investigation rather than a lack of Native American activity in this vicinity. The nature and distribution of reported sites in central Connecticut probably reflects a wide variety of natural resources once available to Indian peoples, from shellfish, finfish, waterfowl and plants along the Connecticut River to seasonally-available mammals, birds, and fish on tributary drainages such as Stony Brook. These resources were probably used in several types of settlement pattern, revealed in archaeological research conducted primarily after the mid-20th century. Prior to the introduction of agriculture in southern New England late in the first millennium A.D., archaeological evidence suggests there was generally more seasonal movement and less semi-permanent settlement through periods extending back to the earliest Native Americans in this region in Paleoindian times (c12,000-10,000 B.P.). By Middle Archaic times, c6,000-8000 B.P., seasonal resource use was well established, and site types included spring fishing camps along major streams (Dincauze 1976; Barber 1981). During Late Archaic times, there may have been a shift from seasonal or task-specific occupation of knolls just above floodplain elevations to larger seasonal camps on terraces adjacent to the floodplain as well as knolls within floodplain areas. In Woodland and early historic/Contact times (c3,000-400 years ago), Native American settlement patterns in central Connecticut focused on semi-permanent villages near planting fields, with seasonal movements to hunting or sheltered winter camps, and continual short trips to hunt or collect mammals, fish, shellfish, and a wide variety of plant resources. The larger settlements in these periods were along the Connecticut River and its coves, with relatively level, well-drained areas along the upper river and its tributaries probably used for short-term or winter activities. Archaeological work during the past few decades also suggests that the Farmington River Valley, a short distance from the Project area, was a relatively self-contained region for Native American social geography beginning in Late Archaic times (McBride 1978, 1984; Feder 1981; Forrest 1999; Banks 2000; Jones and Forrest 2003; Forrest *et al.* 2006; Lavin 2013).

By the 1630s, when direct European contact was felt throughout Connecticut's coasts and larger rivers, Indians were organized in groups of small households which banded together along ethnic and territorial lines in larger villages during the spring and summer and dispersed during other seasons. These small groups engaged in hunting, fishing, and gathering of wild plant foods, and in the later prehistoric period were engaged in maize horticulture. During the Contact period, trapping of beaver and other fur-bearing animals was an important economic activity. In the late prehistoric and contact periods, settlement was focused on or adjacent to the flood plains of the major tributaries, reflecting the importance of agricultural activities, fishing, and access to transportation and communication routes. Planting in the spring and capture of anadromous fish at waterfalls and choke points brought together households. Upland areas were used for hunting, trapping, and gathering from the late summer through the winter by the component household groups of the larger ethnic divisions.

For reasons which remain unclear, there appears to be a strong correlation between the territorial boundaries of Indian ethnic groups and drainage boundaries by the 1630s. Social boundaries among the Algonquian-speaking Indians of southern New England were not rigid, and political organization for most purposes was loose, with male and occasionally female sachems recognized in limited spheres of authority. With fur trade, however, political and territorial boundaries hardened and the fortified villages observed by the Europeans may date to this era of inter-tribal conflicts. Competition for trapping grounds and access to fur markets became intense in the early seventeenth century, and some English adjudication of such matters in Connecticut during later decades used drainage boundaries as political boundaries. There is evidence from other parts of New England for at least a historic period pattern of territoriality based on drainages, and to some extent this pattern probably predates European contact. We can only surmise at this point that stream locations and water resources were always important in determining the movement of game animals and their human predators, while at the same time watercourses were often effective avenues of travel in upland areas. With competition for fur animals, both initial demands for trapping grounds and expansion of these grounds as downstream areas were depleted of furs may have resulted in attempts to control headwater areas for the first time.

In the early 17th century, there was a substantial population of Native Americans in the Connecticut River Valley. The Algonquian-speaking peoples who lived there had practiced agriculture for 500-700 years, but they also continued to hunt, gather, and fish to supplement the crops from their fields. River meadows were the primary areas of maize cultivation (Stiles 1891). The Enfield Rapids would have been an obvious location for seasonal fishing camps, and there were probably villages with cultivated fields in the nearby area as well. Smaller bands hunted in this area in the fall and winter. The earliest white explorer, Adriaen Block, saw an Indian fort along the river above Hartford in 1614. European explorers and colonists, confused about the organization of and identification of various tribes and bands, have left us with many conflicting accounts of tribal names and leadership. Historians, responding to this confusion, have often referred to the many groups on the Connecticut River as the River Tribes. From early sources we see references to the Tunxis who lived to the west on the Farmington River, the Poquonocks at present Windsor, the Massacos above the Poquonocks near Simsbury, and the Sicaogs in present West Hartford. The territory of the Agawam, centered at present Springfield, extended as far south as Stony Brook in Suffield and at about the present border of Enfield and East Windsor. One authority has estimated the pre-epidemic population of these five "sachemdoms" at 3200 (Cook 1976: 57, 61-65). There were also Mattabesecs, Wongunks, and Hammonassets south of Hartford. Some or all of present Enfield may also have been territory of the Podunks, who occupied lands on the east side of the Connecticut river south of the Agawam to about Keeney Cove in present Glastonbury, and from whom some sources say English settlers purchased land rights in Enfield (Spiess and Bidwell 1924; Ingersoll, ed., 1934). To the south and east, larger tribes such as the Niantics, Pequots, and Mohegans lived along the coast and in interior areas (Cook 1976; DeForest 1851).

The Dutch West India Company began a small trading post at later Hartford in 1623, stimulating a trade in furs which led to conflicts among Amerindian tribes. The Podunks and other River Tribes soon found themselves at odds with the larger Pequot and Mohegan groups of the Thames River drainage. The advent of English settlement around Hartford in the 1630s was in part a response to an invitation from a River Tribe sachem who may have been a Podunk. The Podunk sold land rights to English settlers of early Windsor in 1636, although there was no English settlement east of the river until the 1660s (Stiles 1891). The Mohegans, subservient to the Pequots until the Pequot War of 1637, claimed large areas of the Connecticut Valley and eastern highlands following the defeat of the Pequots. The Mohegans, under their leader Uncas, became the most important Indian political force in eastern Connecticut, using alliances with the English to subjugate or outmaneuver Indian opponents in the region. Uncas was involved in wars or serious quarrels with nearly every Indian group in the region between the Pequot War and King Philip's War of 1676. Many of these disputes originated over control of fur trade resources and markets. During this period of conflict, the English settled affairs between the Mohegan and the Podunk by defining a boundary between them running through Bolton Notch in 1666. This line corresponds approximately to the drainage divide between the Connecticut and Thames River basins. The Mohegan may have retained a later claim to Podunk lands near the Connecticut River through Uncas' son Joshua, whose wife was willed these areas c1672 by her father, a Podunk or Sicaog sachem (Stiles 1891).

The Podunk evidently survived a 1633-34 smallpox epidemic which devastated native populations on the west side of the river around Hartford, and retained a viable military presence until about the time of King Philip's War. By the 1670s, the hunting and trapping grounds of southern New England were probably depleted as sources of Indian income, and those groups which had survived the disease and warfare of the early Contact period had begun trading land rights or money, goods, or political security. Although they resisted being drawn into tributary relations with the Pequot or Mohegan, the Podunk suffered occasional attacks from the Iroquoian Mohawks from New York, who also tried to control trade networks. The decline of the Podunk in the late 17th century is not well documented, but has been associated with Mohawk attacks and the choice by many Podunk to side with the unsuccessful Indian alliance against the English during King

Philip's War. It is possible, though not documented, that the large Indian site in Enfield near Indian Run Road may in part represent a Podunk fort from this period. In 1678 and 1680, English settlers based primarily in Springfield purchased some land rights from the Podunk in present Enfield, but there is little published information on Contact-era Native American groups in this town. Small numbers of Podunk lived in East Windsor into the third quarter of the 18th century, and some were present in Manchester into the early 19th century (Stiles 1891; Speiss and Bidwell 1924; Bridge, ed. 1977: 5-7; Miller 1998).

2. Potential Issues in Project Area

In environments such as the Project area, Native American subsurface resources typically appear in well-drained soils, often in proximity to wetlands such as the borders of Clay Brook where seasonal plant and animal resources were available. The nature and depth of recent disturbance to any such soils in Project areas not known to have been mined remained undetermined in background information discussed in Section II above. Although construction and maintenance of the existing gravel access road likely disturbed most or all original soils within road boundaries, conditions in the adjacent area designated for road expansion were not known. The possible presence of well-drained soils in these areas left open the possibility of Native American archaeological sites, most likely representing short-term hunting and gathering episodes. Intact evidence of small seasonal Native American occupations might yield significant new information on Native American upland settlement in the central Connecticut lowland. In particular, the use of upland areas for small sites of seasonal, temporary, or specialized activities, and the relation of such sites to larger, more permanent encampments along major streams, remain issues of regional archaeological importance.

B. Euroamerican Resources

The Connecticut River was always an important travel corridor for early European settlers. Dutch explorer Adrien Block sailed upriver to the bottom of Enfield Rapids in 1614, the first serious obstacle for small sailing vessels, but no serious attempts at European settlement began on the river for almost another twenty years. The Dutch West India Company began a small trading post at later Hartford in 1623, completing a small fort a decade later on the eve of English settlement from the Plymouth and Massachusetts Bay colonies, which soon pushed out the Dutch. From subsequent English colonization along the Connecticut River, settlement developed from several directions. Suffield and Enfield began as part of Springfield's expansion in Massachusetts.

While the three first Connecticut river towns (Wethersfield, Hartford, and Windsor) were establishing a new government in 1636, William Pynchon established a settlement upriver at Agawam, later Springfield, with a party from Roxbury, Massachusetts. This was the first European settlement on the river above Enfield Rapids, and the basis for the later founding of Suffield and Enfield. Pynchon had to use canoes or wagons for any movement of goods beyond the rapids, and soon set up transhipment facilities at Warehouse Point, on the east side of the river below the rapids in present East Windsor. Massachusetts Bay authorized his monopoly on fur trade with the upper river basin's Native Americans in 1638, and, in 1648, gave Springfield rights on the east side of the river to a point just below Pynchon's warehouse (Winch 1886: 139). Windsor's prior claim to some of this land was one of many boundary issues requiring over a century of argument and adjustment, the most notable of which was Massachusett's 1642 Woodward and Saffery survey which overextended the colonial border to the south by several miles.

William Pynchon's son John took over the family's extensive business and political responsibilities in 1652, and sought new outposts between Springfield, Warehouse Point, and the Connecticut river towns within the disputed area. Following land purchases from local Native Americans, he spearheaded the settlement of Suffield in 1670. Suffield was abandoned during King Philip's War, but quickly resettled in 1677. Resolution of the inter-colony boundary issues c1713-49 put Enfield in Connecticut (Winch 1886; Stiles 1892; Lewis 1978).

Suffield's pre-Revolution economy was somewhat diversified by the exploitation of local bog iron resources for several water-powered bloomeries. The town had a long history of small paper, cider, gin, and textile mills, a few of which persisted into the early 20th century, and none of which appear to have been in or near Project areas. Tobacco cultivation remained the major local enterprise for at least 140 years, beginning c1810 after at least a half century of increasing importance. Family farms apparently remained relatively stable in number, size, and occupation for much of this period. Over 90% of Suffield farms grew at least some tobacco c1850-70, and probably for some decades thereafter. Late in the 19th century, Polish immigrants arrived and eventually established a significant Polish community which joined the tobacco-raising culture; many Poles achieved farm ownership. Suffield's largely agrarian cast, reflected in a landscape dominated by tobacco barns and farmer and merchant homes, contributed to a frequently conservative approach to obtrusive new developments. The initial rejection of a railroad line through the town, and opposition to interstate highway routing over a century later, are more obvious affirmations of self-conscious agrarian stability. Expanding suburban settlement, following on the heels of the decline of tobacco, has attenuated but not removed the town's rural character (Winch 1886; Sheldon 1879, 1886; Stiles 1892; Alcorn 1970; Raber and Malone 1991).

The geopolitical center of Suffield is approximately 1.5 miles south of the Project area, where many 18th-to-20th -century homes are recognized in the Suffield National Register District. More dispersed 18th-century homes survive along roads in the Project area vicinity, including one National Register property at 827 North Street. Within Project limits, however, available information including historical maps and aerial photographs do not indicate any known or possible Euroamerican resources, below or above ground (Warren and Gillet 1812; Woodford 1855; Baker and Tilden 1869; Fairchild Aerial Survey 1934; Clouette 1978; Ransome 1979; Capitol Region Council of Governments 1980).

IV. SUBSURFACE INVESTIGATION RESULTS AND INTERPRETATION

Background research indicated some potential for Native American archaeological resources in any surviving well-drained post-glacial soil strata in Project areas not severely disturbed by sand and gravel mining. To assess these conditions and determine if intact soils sensitive for Native American resources survived, six soil tests were completed in the proposed solar panel array areas presumed not mined, and six soil tests were completed immediately south of the existing access road in the principal area of proposed road expansion (personal communications, Kevin S. Sullivan, Jr.). Each test was made using a handpowered 3.5-inch-diameter hand-powered bucket auger, with recovered material compared with typical soils expected in test areas (Figure 2; U.S. Department of Agriculture 1962). Auger tests were taken to 10-27 in./25-68 cm. below the surface with unscreened material examined on a tarp in levels not exceeding 6 in./15 cm. Tests 7-12 along the access road were made at approximately 100-foot/30-meter intervals from the east end of the proposed improved road to the edge of the Clay Brook wetland. Tests 1-6 in the north and south solar panel array areas were made at intervals of 160-320 ft/49-98 m., for preliminary appraisal of conditions. As discussed below, results of tests 1-6 appeared sufficient to describe soil conditions relative to archaeological issues. None of the tests indicated any potential for archaeological resources.

Tests 1-3, in the area graded or filled by the Sullivan family after the period of sand and gravel mining, indicated that original post-glacial material was removed and/or re-deposited with stony fill material; no sand, gravel, or cobbles is expected in original soils above the C horizon silt or clay deposited during the era of Lake Hitchcock.

<u>Soil Test 1</u>

0 - 40 cm.:	yellow brown silt loam, some small cobbles (probably re-deposited B horizon)
40 - 45 cm.:	medium gray clayey silt (C horizon)

Soil Test 2

0 -	28 cm.:	yellow brown silt loam, some small cobbles (probably re-deposited B horizon)
28 -	33 cm.:	medium gray clayey silt (re-deposited C horizon)
33 -	40 cm.:	mottled medium gray clayey silt/yellow brown medium sand, pebbles (re-deposited B/C horizons with some additional fill); refusal on dense cobble/gravel fill

Soil Test 3

0 -	23 cm.:	dark brown sandy loam (fill)
23 -	30 cm.:	mottled medium gray clayey silt/yellow brown medium sand, pebbles (re-deposited B/C horizons with some additional fill)
30 -	38 cm.:	medium brown silty loam
38 -	48 cm.:	mottled medium gray clayey silt/yellow brown medium sand, pebbles (re-deposited B/C horizons with some additional fill); refusal on dense cobble/gravel fill

Soil tests 4-6, in the proposed northern solar panel array area east of mining operations, indicated intact poorly-drained Scantic loam soils in which no Native American resources would be expected.

Soil Test 4

0 -	25 cm.:	medium brown silty loam (A horizon)
25 -	35 cm.:	yellow brown clayey silt (B1 horizon)
35 -	63 cm.:	medium gray/yellow brown clayey silt (probable B2 horizon)

Soil Test 5

0 -	25 cm.:	medium brown silty loam (A horizon)
25 -	33 cm.:	olive brown silty clay (probable B1 horizon)
33 -	48 cm.:	mottled gray/yellow brown clayey silt (probable B2 horizon)
48 -	60 cm.:	olive brown very fine sand, silt (probable B2 horizon)
60 -	68 cm.:	medium gray silty clay, some yellow brown very fine sand (probable C horizon)

Soil Test 6

0 -	23 cm.:	medium brown silty loam (A horizon)
23 -	33 cm.:	olive gray silt (probable B1 horizon)
33 -	53 cm.:	olive brown clayey silty clay (probable B2 horizon)
53 -	63 cm.:	medium gray clay (probable C horizon)

Soil tests 7-12 generally indicated that most or all original Holocene strata within proposed vertical road construction limits of approximately 12 in./30 cm. was removed during mining operations, and replaced with subsoils most likely taken from mined areas with Manchester gravelly sandy loam. Soil test 9 had remnant subsoil from original Broadbrook silt loam below the fill.

Soil Tests 7-8

0 - 28/30 cm.:	dark brown/dark red brown medium-fine sand, gravel, some cobbles (fill); refusal on dense cobble/gravel fill

Soil Test 9

0 - 33 cm.:	light red brown medium-fine sand, gravel, some cobbles (fill)
33 - 48 cm.:	medium brown/yellow brown silty loam (probable B2 horizon)
48 - 55 cm.:	yellow brown fine silty loam (probable A1-2 horizon); refusal on dense stony material

Soil Test 10

0 - 30 cm.:	light red brown medium-fine sand, gravel, some cobbles (fill); refusal on dense stony material

Soil Test 11

0 - 12 cm.:	red brown/yellow brown medium sand, cobbles, macadam fragments (fill)
12 - 25 cm.:	red brown/yellow brown medium-fine sand, grit, gravel
25 - 33 cm.:	dark gray silty sand, gravel, some cobbles (probably re-deposited B horizon and fill material); refusal on dense stony material

Soil Test 12

0 - 30 cm.:	light red brown medium-coarse sand, gravel, some cobbles (fill); refusal on dense cobble/gravel fill

V. ASSESSMENT OF VISUAL EFFECTS

Available guidelines for SHPO assessment of visual effects on cultural resources appear in Section 16-50p(a)(4)(C) of PUESA, and in regulations of the federal Advisory Council on Historic Preservation (36CFR 800.5). Both sets of guidelines apply to properties listed, or eligible for listing, on the National Register of Historic Places. Based on Federal Power Commission guidelines to which it refers, PUESA mandates avoidance of National Register properties where possible, or, if avoidance is not possible, minimization of transmission structure visibility or effects on the character of National Register property environ. Advisory Council on Historic Preservation (ACHP) regulations, while not required in SHPO review of Projects subject to Connecticut Siting Council approval, provide *de facto* guidelines commonly used by SHPO. Criteria for findings of adverse effects on historic properties include change of the physical features within a property's setting which contribute to property significance, and introduction of visual elements which diminish the integrity of a property's significant features.

Previous studies by Raber Associates of visual effects on historic properties (e.g., Raber 2007), including consultations with SHPO, indicated that these guidelines provide no established or objective criteria for determining when a visual effect is adverse, leaving identification of adverse effects to the judgment of the reviewer. In general, visual effects will be diminished if new structures are as low as possible relative to existing structure heights, and/or if new structures are located further from historic properties. Most previous visual effects evaluations in Connecticut have addressed cell towers and electric transmission facilities, structures far taller than the 8-foot-high solar panels proposed for this Project. For electric transmission structures, SHPO has previously concurred that that adverse visual effects were highly unlikely at distances exceeding 0.25 mile.

For consistency of assessment despite the dramatically different heights of the facilities in question, this investigation applied standards and methods similar to those used in previous Raber Associates studies (e.g., Raber 2007), in which three categories of visibility were distinguished:

- Visibility with No Effect: the structure is too far from a historic property, and/or too masked by forest cover or built environments, to be perceived as a distinct landscape feature;

- Visibility with Non-Adverse Effect: the structure can be perceived as a distinct landscape feature, but because of distance, forest cover, or built environments there is no significant change to the visual environment of a historic property;

- Visibility with Adverse Effect: by virtue of proximity, size, or appearance, the structure degrades the existing visual environment of a historic property.

For historic architectural resources near the Project area, assessment objectives included:

- identifying all historic properties listed on, or previously determined as eligible for listing on, the state or national registers of historic places within approximately 0.25 mile of the nearest component of the proposed solar panel arrays at proposed elevations;

- providing graphic evidence of the extent of potential visual effects for each such historic property.

Historic property identification was based on a 1980 town-wide survey of architectural properties, currently being updated, and a list of Connecticut properties listed on the National Register of Historic Places. There are no readily-available lists of properties determined eligible for the National Register, or listed on the State Register of Historic Places, so for purposes of this study any property inventoried in the town-wide survey was assumed at least potentially eligible. Town of Suffield Geographic Information System data was used to confirm the continued survival and location of properties. For conservative visual assessment, five residential properties were identified with distances of between 0.25-0.5 mile to the nearest component of the proposed solar panel arrays, one of which is listed on the National Register of Historic Places, as shown in Table 1 (Clouette 1979; Capital Region Council of Governments 1980; Town of Suffield 2015; personal communication, Lester Smith).

Table 1. HISTORIC ARCHITECTURAL RESOURCES EVALUATED FOR VISUAL EFFECTS

ADDRESS	ORIGINAL DATE	STYLE	NATIONAL REGISTERED LISTED	CLOSEST DISTANCE TO PROPOSED SOLAR FARM ARRAY
311 HALLADAY AVENUE	c1830	Early Greek Revival	No	.38 MILE
542 RUSSELL AVENUE	1825	Federal	No	.44 MILE
969 NORTH MAIN STREET	1738	Georgian	No	.29 MILE
891 NORTH MAIN STREET	c1840	Greek Revival	No	.28 MILE
827 NORTH MAIN STREET	1722	Early Georgian	Yes – King's Field House	.47 MILE

Using topographic and recent aerial photograph data compiled by the Town of Suffield, transects were prepared from these five locations to the nearest component of the proposed solar panel arrays at proposed new elevations, assuming 8-foot panel heights and 30-foot-high average tree heights in tree-covered areas (Town of Suffield 2015; J.R. Russo & Associates LLC). The assumed tree height is probably lower than many of the trees in these areas. As shown on Figures 3-6, the solar panels would not be visible from these five properties, even with binoculars, because of terrain and/or tree-cover obstructions. None of the visibility categories outlined above apply.

VI. CONCLUSIONS AND RECOMMENDATIONS

The proposed Canis Major Solar will have no effects on any cultural resources listed, eligible, or potentially eligible for the national or state registers of historic places. No further investigations, or protective measures to address indirect visual effects, are recommended.

Lavin, Lucianne
2012 *Connecticut's Indigenous Peoples: What Archaeology, History, and Oral Traditions Teach Us About Their Communities and Cultures.* New Haven: Yale University Press.

Lewis, Thomas R.
1978 From Suffield to Saybrook: An Historical Geography of the Connecticut River Valley in Connecticut before 1800. Ph.D. dissertation, Rutgers University.

McBride, Kevin
1978 Subsistence and Settlement in the Lower Connecticut River Valley: An Example from Woodchuck Knoll. *Man in the Northeast* Nos. 15-16.

1984 *Prehistory of the Lower Connecticut River Valley*. Unpublished Ph.D. dissertation, University of Connecticut.

Miller, Michael
1998 *Images of America: Enfield, Connecticut*. Charleston, SC: Arcadia Press.

Raber, Michael
2007 Historical and Archaeological Assessment of Connecticut Sections of the Connecticut Light & Power Company Greater Springfield Reliability Project/Towns of Bloomfield, East Granby, Suffield & Enfield, Connecticut. Prepared for Burns & McDonnell Engineering Company, Inc. Report on file as CHPC #1628, Connecticut Historic Preservation Collection, Dodd Center, University of Connecticut, Storrs.

Raber, Michael S., and Patrick M. Malone
1989 Final Report/Historical Documentation/River Canal Center Feasibility Study and Master Plan/Windsor Locks Canal Heritage State Park. Report prepared for Bureau of Parks and Forests, Connecticut Department of Environmental Protection. South Glastonbury, CT: Raber Associates.

Ransom, David F.
1978 Suffield National Register District National Register of Historic Places Inventory - Nomination Form. On file, Connecticut State Historic Preservation Office.

Robinson Aerial Surveys, Inc.
1951-1952 Aerial survey of the State of Connecticut. Record Group 89, Records of the Department of Transportation. Connecticut State Archives. Available on World Wide Web at http://magic.lib.uconn.edu/connecticut_data.html#indexes

Rodgers, John, comp.
1982 Bedrock Geological Map of Connecticut. Hartford: Connecticut Department of Environmental Protection.

Sheldon, Hezekiah Spencer
1879 *Documentary History of Suffield...1660-1749*. Springfield: Clark W. Bryan.

1886 Suffield, in J. Hammond Trumbull, ed., *The Memorial History of Hartford County, Connecticut 1633-1884, Vol. II*, pp. 383-214. Boston: Edward L. Osgood.

Spiess, Mathias, and Percy W. Bidwell
1924 *History of Manchester, Connecticut*. Centennial Commitee of the Town of Manchester.

Stiles, Henry R.
1891 *The History and Genealogies of Ancient Windsor, Connecticut, including East Windsor, South Windsor, Bloomfield, Windsor Locks and Ellington. 1635-1891.* 2 vols. Hartford: Case, Lockwood & Brainard Co. [1976 facsimile, Somersworth, NH: New Hampshire Publishing Co.]

Stone, J.R., *et al.*
1998 Quaternary geologic map of Connecticut and Long Island Sound basin. U.S. Geological Survey Open-File Report 98-371.

Town of Suffield, Connecticut
2015 Geographic & Property Information Network. Available on World Wide Web at http://suffield.mapxpress.net

U.S. Department of Agriculture, Soil Conservation Service
1962 *Soil Survey of Hartford County, Connecticut.* Washington: Government Printing Office.

U.S. Geological Survey
1893 *Topographical Atlas of the State of Connecticut.*

1938,
1945,
1958,
1979 West Springfield, Mass.-Conn. 7.5-minute quadrangle sheet.

1984 Windsor Locks, Conn. 7.5-minute quadrangle sheet.

Warren, Moses, and George Gillet
1812 Connecticut, from Actual Survey, Made in 1811... East Windsor: Abner Reed.

Woodford, E.M.
1855 Smith's Map of Hartford County. Philadelphia: H. & C.T. Smith.

PERSONAL COMMUNICATIONS

Timothy A. Coon, J.R. Russo & Associates, LLC

Brian D. Jones, Connecticut State Archaeologist

Lester Smith, Curator and Historian, Suffield Historical Society

Kevin S. Sullivan, Jr., 1005 North Street, Suffield, CT

Jay Ussery, J.R. Russo & Associates, LLC

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Figure 1. CANIS MAJOR SOLAR LOCATION ON WINDSOR LOCKS & WEST SPRINGFIELD 7.5-MINUTE U.S.G.S. QUADRANGLES

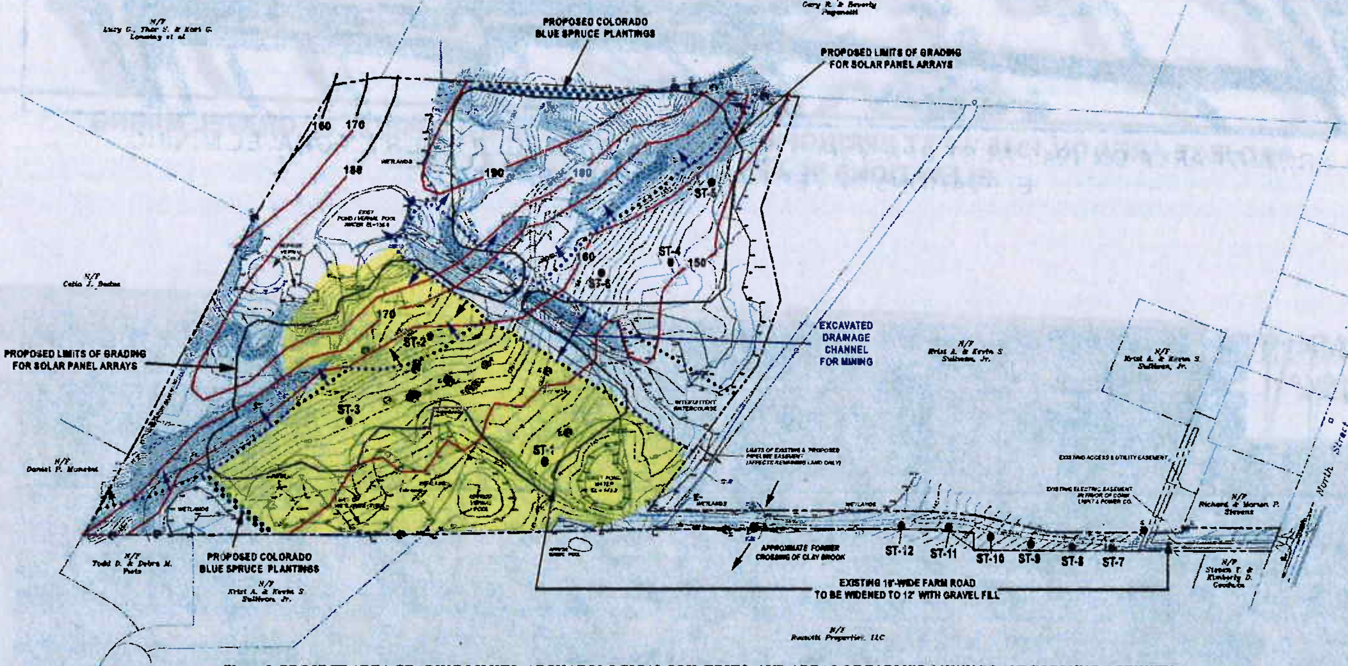


Figure 2. PROJECT AREA GRADING LIMITS, ARCHAEOLOGICAL SOIL TESTS, AND AREAS OF FORMER MINING/LANDFORMING ACTIVITY

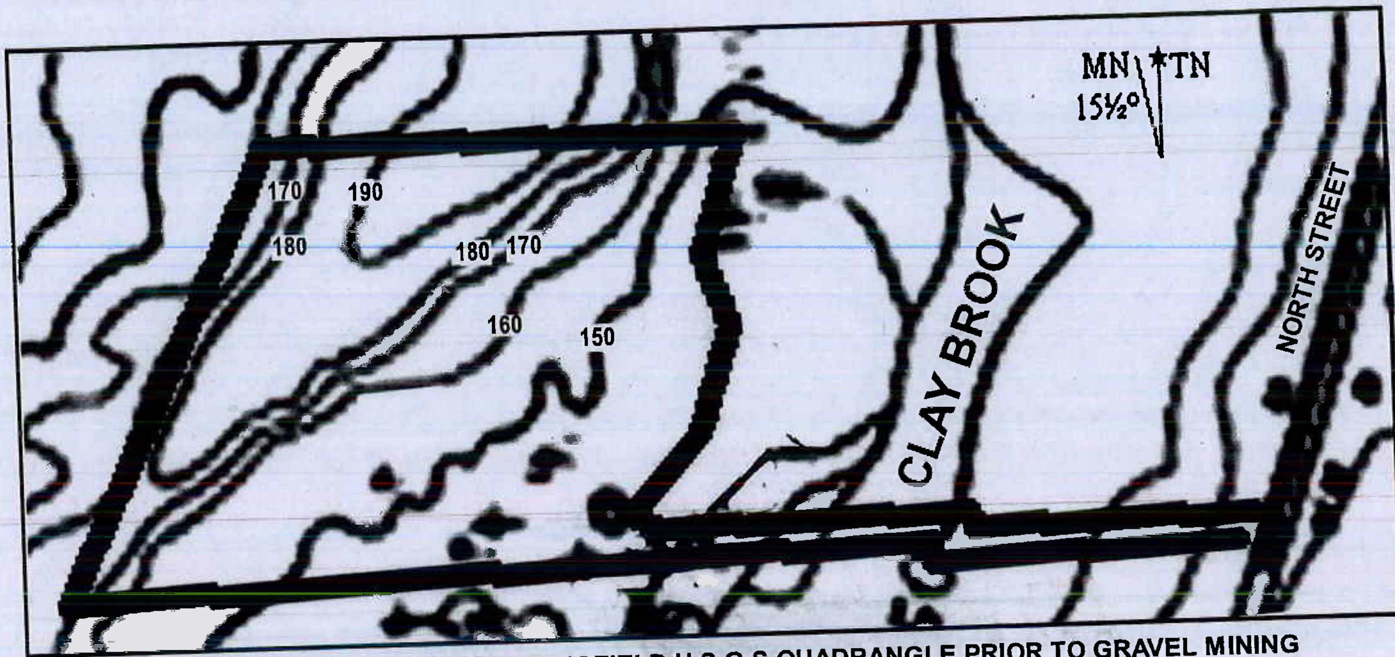
GRAPHIC SCALE

170 — APPROXIMATE 10-FOOT CONTOURS c1945 PRIOR TO GRAVEL MINING (U.S. Geological Survey 1945)

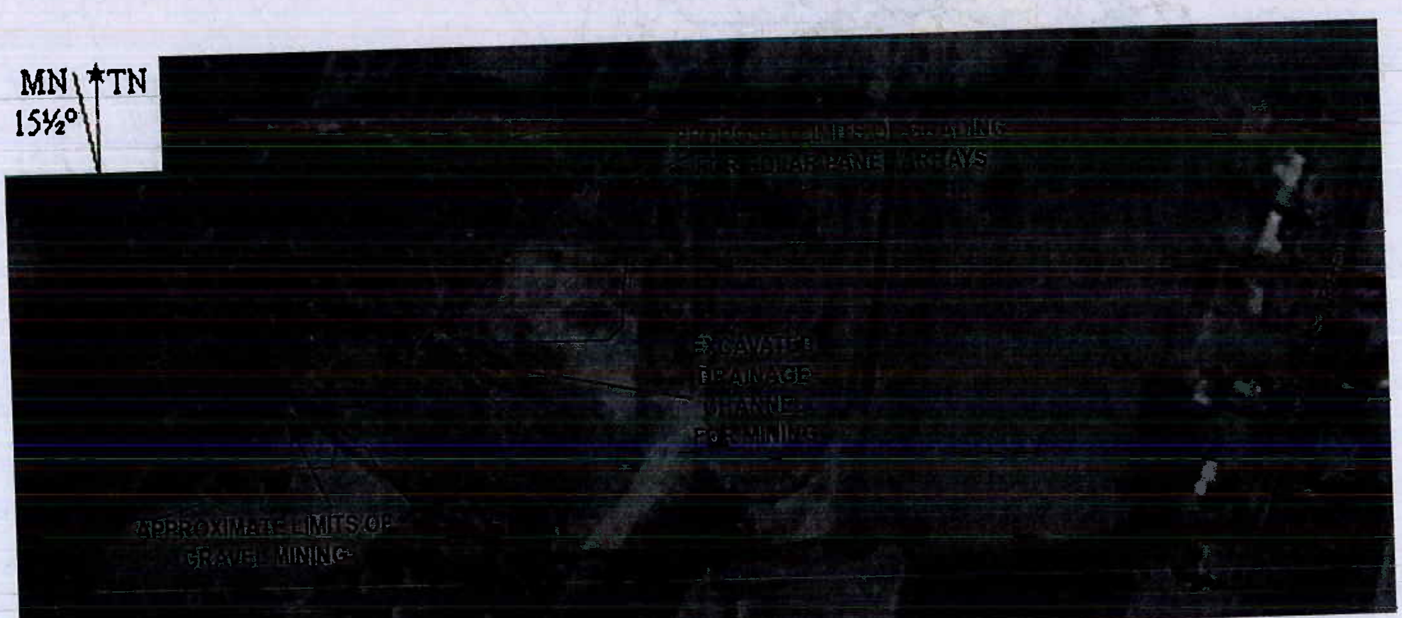
AREAS GRADED AND/OR FILLED BY SULLIVAN FAMILY c1995-2001 TO ENHANCE DRAINAGE OR CREATE FIELDS; SOME AREAS CONTAINED MINE WASTE PRIOR TO GRADING (personal communications, Kevin S. Sullivan)

APPROXIMATE LIMITS OF AREAS MINED FOR GRAVEL c1950-1965 (Keystone Aerial Surveys, Inc. 1965, Colton and Hartshorn 1971; ADDITIONAL AREAS POSSIBLY MINED INTO EARLY 1970s

ST-7 — ARCHAEOLOGICAL SOIL TEST TAKEN WITH 3.5-INCH DIA. BUCKET AUGER



PROJECT AREA ON 1945 WEST SPRINGFIELD U.S.G.S QUADRANGLE PRIOR TO GRAVEL MINING
ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL



PROPOSED GRADING LIMITS SUPERIMPOSED ON DETAIL FROM KEYSTONE AERIAL SURVEYS 1965
SHOWING APPROXIMATE MAXIMUM LIMITS OF GRAVEL MINING AND DRAINAGE CHANNEL EXCAVATION.
MINING SPOILS APPEAR TO BE SHOWN DEPOSITED SOUTH AND EAST OF MINING LIMITS, AND WERE
LATER REMOVED BY THE SULLIVAN FAMILY

Figure 3. PROJECT AREA CONDITIONS IN 1945 AND 1965

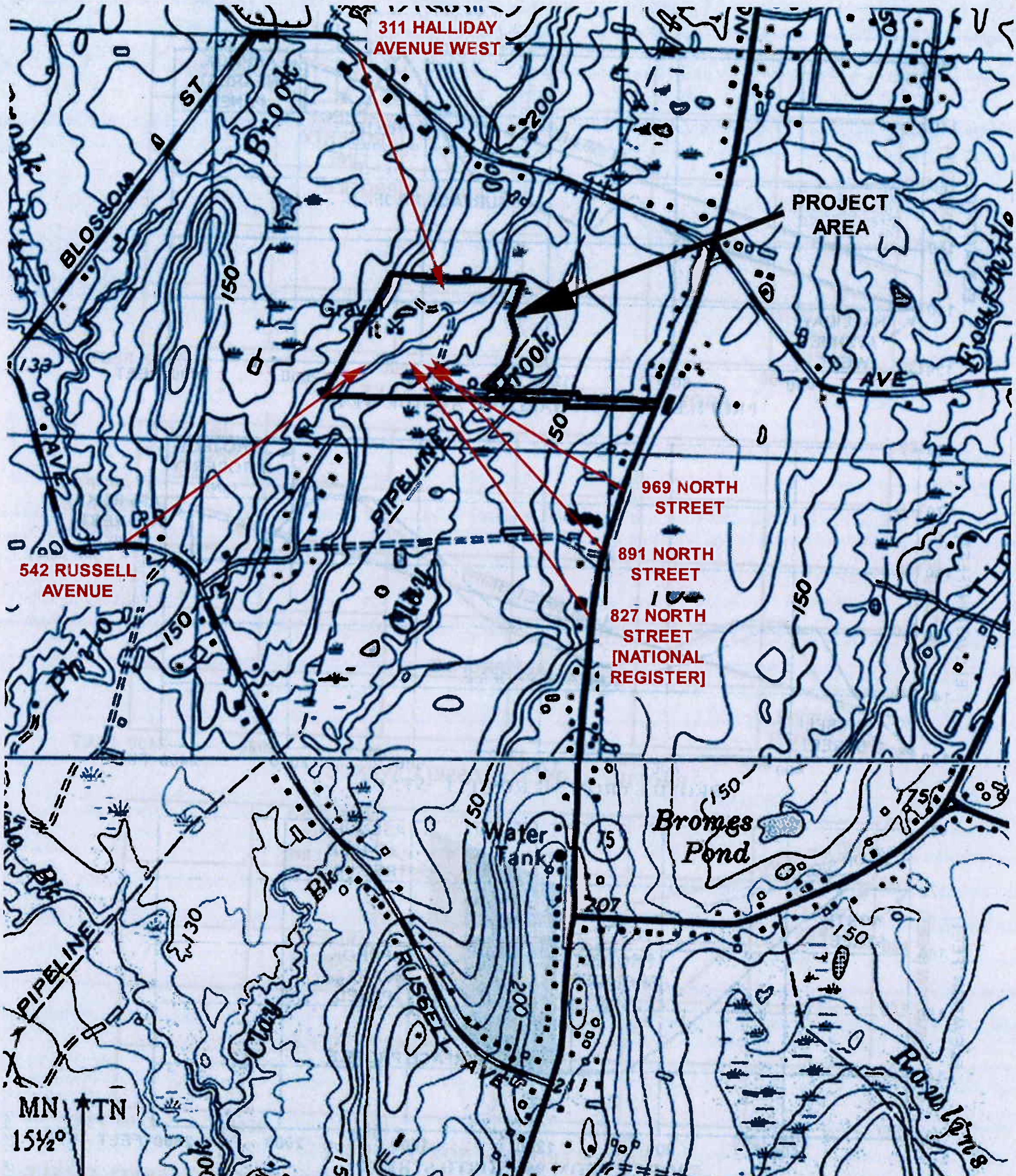


Figure 4. VIEW PROFILE LOCATIONS FROM NEAREST HISTORIC HOUSES TO CANIS MAJOR SOLAR ON WEST SPRINGFIELD & WINDSOR LOCKS 7.5-MINUTE U.S.G.S. QUADRANGLES

0 1/2 1 MILE

1000 0 1000 2000 3000 4000 FEET

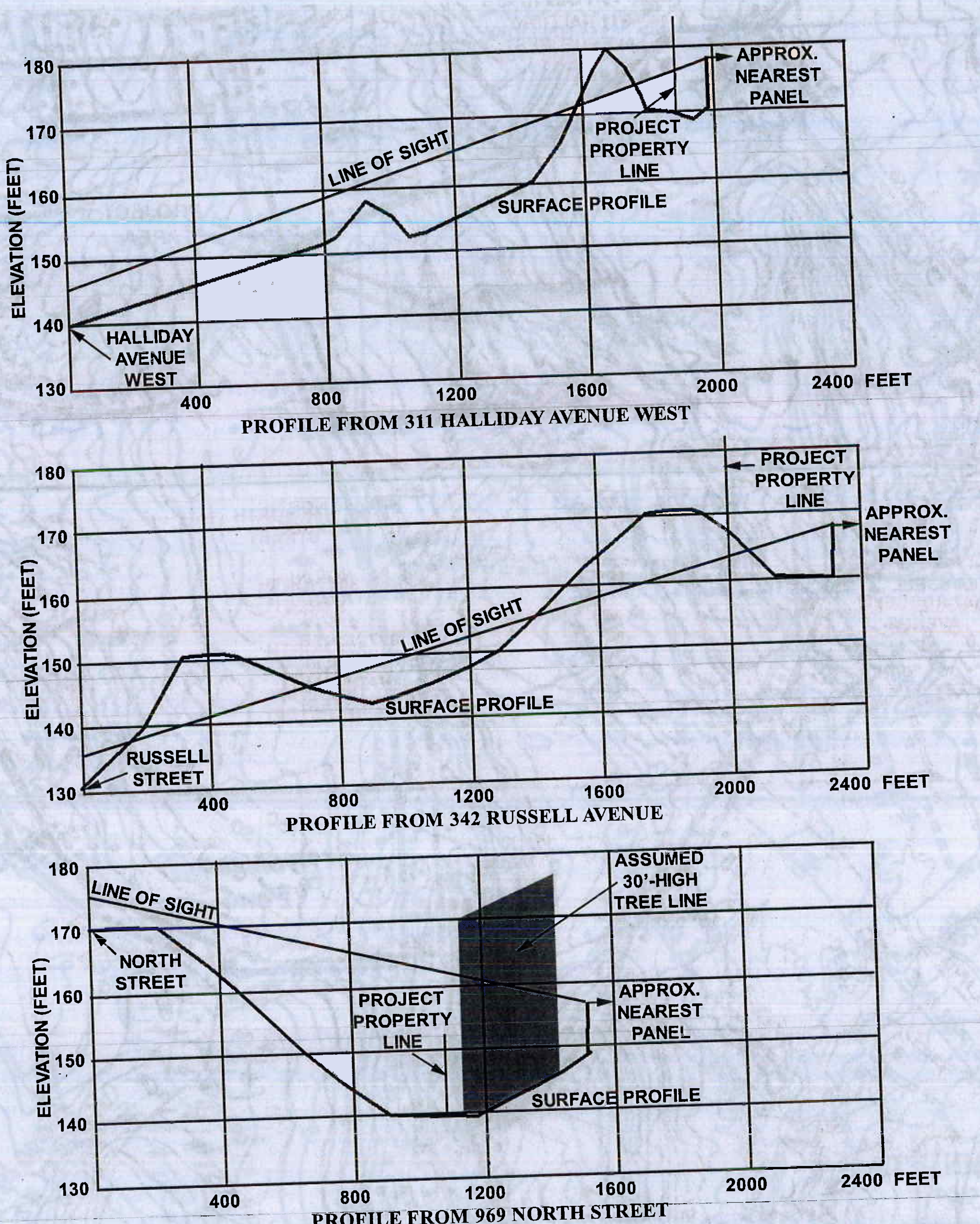
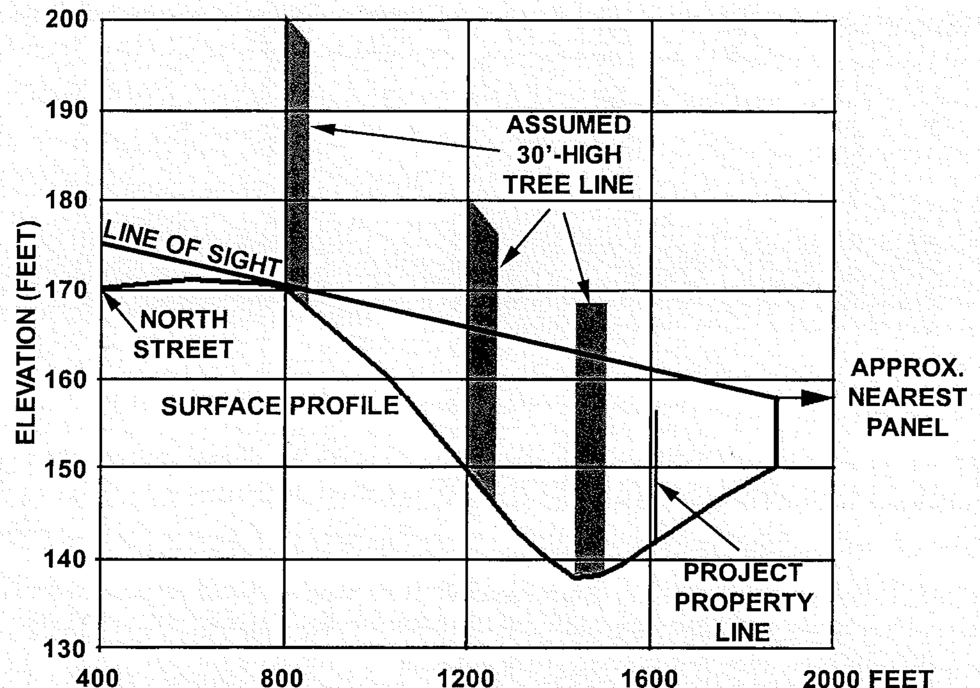
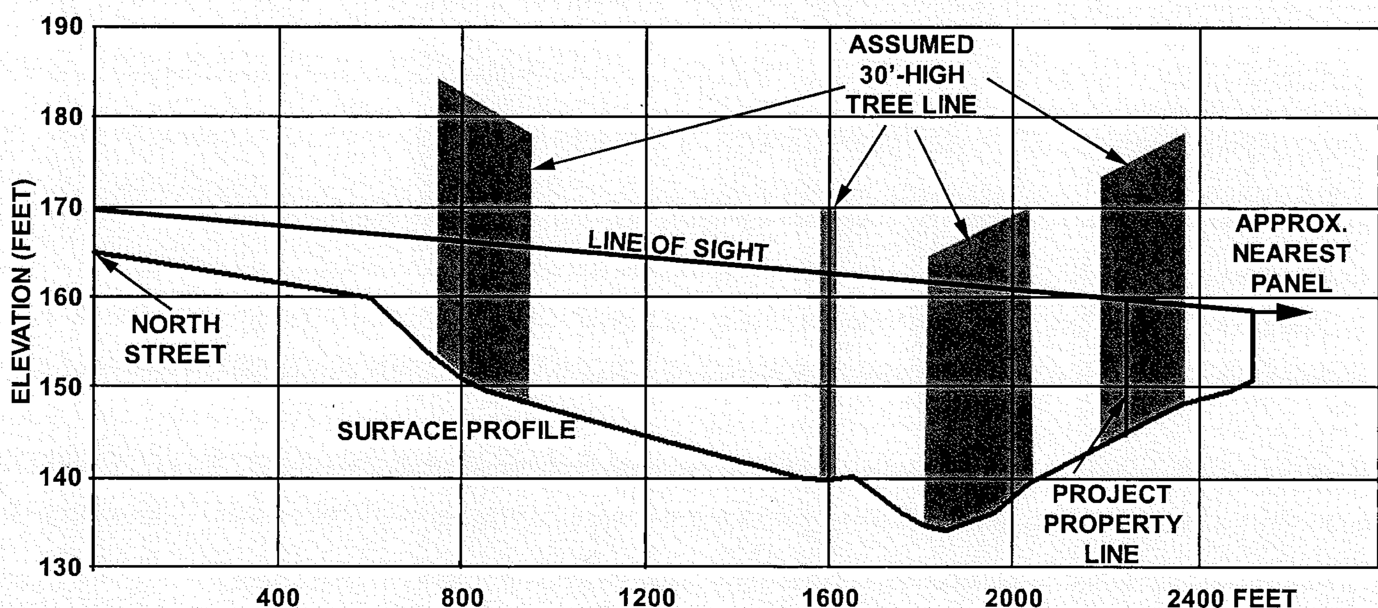


Figure 5. VIEW PROFILE LOCATIONS FROM 311 HALLIDAY AVENUE WEST, 342 RUSSELL AVENUE, AND 969 NORTH STREET

1"= 400 FEET HORIZONTAL, 20 FEET VERTICAL



PROFILE FROM 891 NORTH STREET



PROFILE FROM 827 NORTH STREET

Figure 6. VIEW PROFILE LOCATIONS FROM 891 AND 827 NORTH STREET

1"= 400 FEET HORIZONTAL, 20 FEET VERTICAL

LODESTAR ENERGY

Decommissioning Plan

Canis Major Solar Photovoltaic Project
1005 North Street, Suffield CT

Lodestar Energy

3 Ellsworth Place, Suite 122

Avon, CT 06001

Lodestar Energy

1.0 Facility Description

Canis Major Solar Photovoltaic Facility is a 2,879kW DC solar farm proposed at 1005 North Street, Suffield, CT 06078. The Solar array is to be constructed on approximately 20 acres located primarily on the western side of the property. The purpose of the facility is the generation of electricity. The facility will be interconnected to the existing 13.8kV overhead distribution circuit at pole #4125 of the utility distribution network.

The project is a ground mounted solar array. The solar panels are mounted on simple fixed tilt steel structures consisting posts, beams, rails and bracing. Vertical steel posts will be driven in the ground to a depth of approximately 8 feet to anchor the structures. The solar panels will be connected to the inverters mounted on the racking structure via copper wire. The inverters will connect to electric panels, transformers, and then switchgear at the array location via underground wire. Output from the switchgear will be connected overhead, along the access road to the utility owned poles and metering structure at North Street.

The estimated useful project life time is 20 year or more. The following list is a summary of the site features:

- 2,879kW Solar array consisting of 310W solar panels
- Driven post steel and aluminum racking system
- Chain link security fence surrounding the array perimeter.
- Up to 86 string inverters
- Up to 4 transformers
- Copper and aluminum wire
- Underground conduit at the array location
- Overhead poles and wires from the array location to utility poles off of North Street.
- Two concreate equipment pad areas
- Gravel access road
- Metal security gates at array location.

2.0 Decommissioning Plan

The project consists of numerous materials that can be recycled, including steel, aluminum, glass, copper and plastics. At the end of operational life of the project that system will be dismantled using conventional construction equipment. The project material will be removed from the site and recycled or disposed of safely.

2.1 Temporary Erosion Control

Temporary erosion and sedimentation control best management practices will be used during the decommissioning phase of the project. Control features will be regularly inspected during the decommissioning phase and removed at the end at the process.

2.2 Material Removal Process

The decommission process will consist of the following general steps:

2.2.1 Facility shall be disconnected safely from the power grid and all equipment shall be switched to off position.

2.2.2 PV modules shall be disconnected, packaged and returned to manufacturer or appropriate facility for recycling

2.2.3 Above and underground cabling shall be removed and sent to appropriate recycling facility.

2.2.4 Inverters will be disconnected from racking and shipped intact to an approved electrical equipment recycler.

2.2.5 Racking materials shall be dismantled, removed, and recycled off-site at an approved recycler.

2.2.6 Fencing will be dismantled, removed, and recycled off-site and an approved recycler.

2.2.7 Grade slabs will be broken and removed.

2.2.8 All remaining electrical and support equipment will be dismantled, decontaminated (if appropriate) and recycled or disposed of.

2.3 PV Module Removal

Solar photovoltaic modules used in the project are manufactured within regulatory requirements for toxicity based on Toxicity Characteristic Leaching Procedure (TCLP). The solar panels are not considered hazardous waste. The panels used in the project will contain silicon, glass, and aluminum which have value for recycling. Modules will be dismantled and packaged per manufacturer or approved recyclers specifications and shipped to an approved off-site approved recycler.

2.4 Electric Wire Removal

Electric wire made from copper or aluminum has value for recycling. DC wiring can be removed manually from the panels to the inverter. Underground wire in the array of the array will pulled and removed from the ground. Overhead cabling for the interconnection will be removed from poles. All wire will be sent to an approved recycling facility.

2.5 Electrical Equipment Removal

Inverters, panels, transformers, switchgear and other electrical equipment will be dismantled, packaged, and removed from the site per manufactures specifications for removal, decontamination, disposal or recycling. Any dielectric fluids present in transformer, or other electric equipment will be removed, packaged and set to an approved waste facility.

2.6 Racking and Fencing removal

All Racking and fencing material will be broken down into manageable units and removed from facility and sent to an approved recycler. All racking posts driven into the ground will be pulled and removed.

2.7 Concrete Slab Removal

Concreate slabs used as equipment pads will be broken and removed to a depth of one foot below grade. Clean concrete will be crushed and disposed of off-site and or recycled and reused either on or off-site.

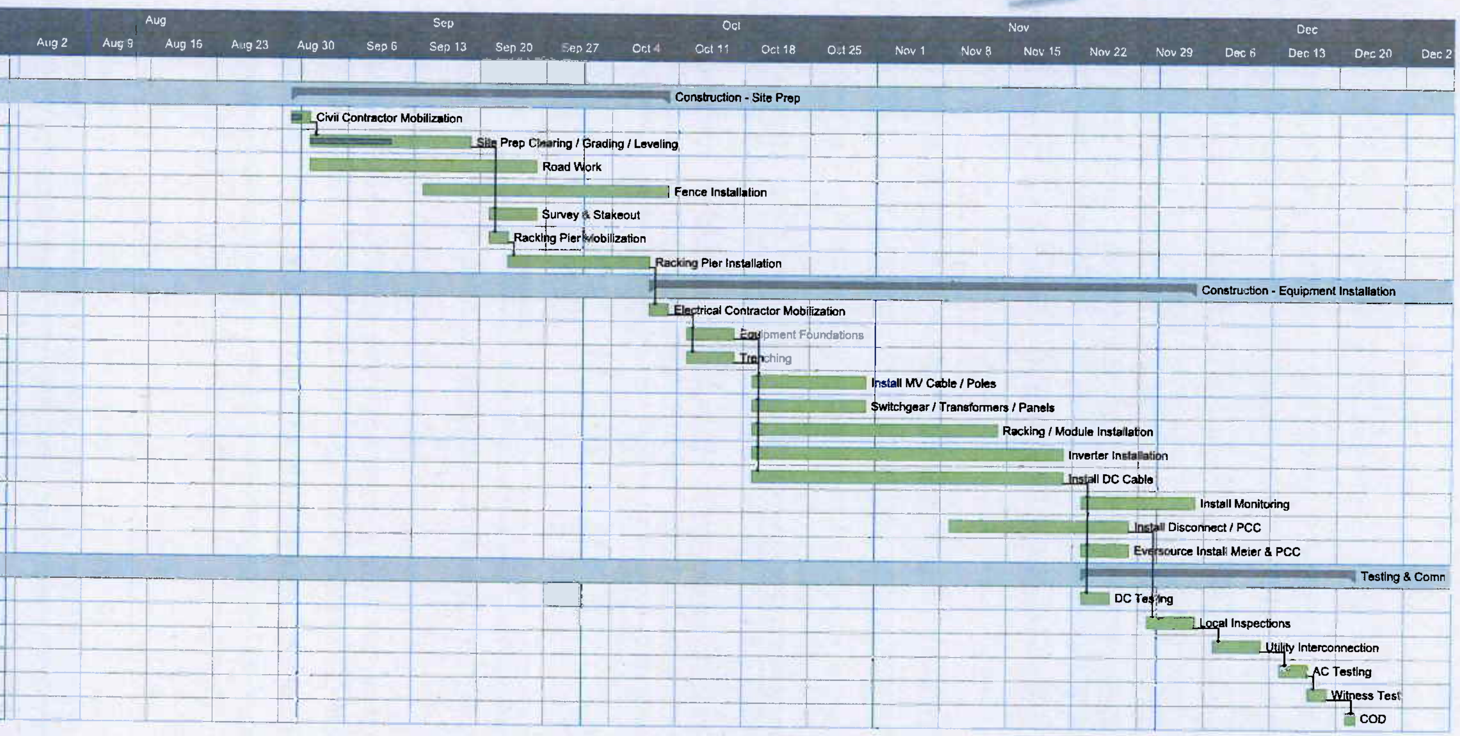
3.0 Decommissioning Terms

Project shall be decommissioned within 180 days of the end of the project's operational life. Areas disturbed during the decommissioning phase will be with seeded with a drought tolerant grass seed mix appropriate for the area. The gravel access road will remain intact. At completion of decommissioning phase as described in this document, and expiration of site lease, the land will be returned to the owner in its existing condition.

Canis Major Construction

smartsheet

	Task Name
1	CANIS MAJOR CONSTRUCTION SCHEDULE
2	− Construction - Site Prep
3	Civil Contractor Mobilization
4	Site Prep Clearing / Grading / Leveling
5	Road Work
6	Fence Installation
7	Survey & Stakeout
8	Racking Pier Mobilization
9	Racking Pier Installation
10	− Construction - Equipment Installation
11	Electrical Contractor Mobilization
12	Equipment Foundations
13	Trenching
14	Install MV Cable / Poles
15	Switchgear / Transformers / Panels
16	Racking / Module Installation
17	Inverter Installation
18	Install DC Cable
19	Install Monitoring
20	Install Disconnect / PCC
21	Eversource Install Meter & PCC
22	− Testing & Commissioning
23	DC Testing
24	Local Inspections
25	Utility Interconnection
26	AC Testing
27	Witness Test
28	COD



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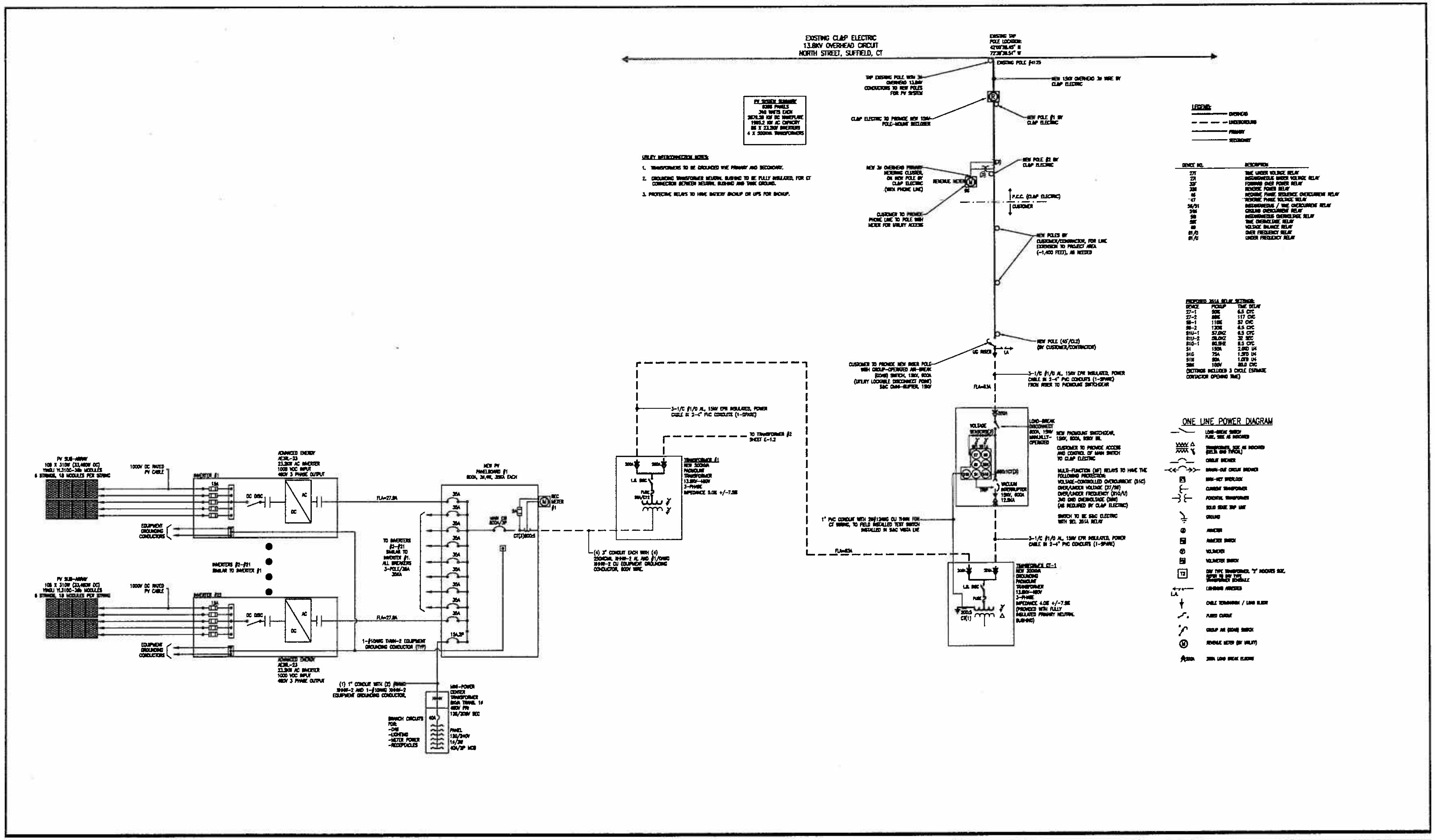
LODESTAR ENERGY

Canis Major Solar Photovoltaic Project - 1005 North Street Suffield, CT

Lodestar Energy is proposing a 1,995.2kW AC / 2,879kW DC solar photovoltaic facility in Suffield, CT. The facility will be interconnected to the existing 13.8kV overhead distribution circuit (pole #4125) of the utility distribution network on North Street.

Project Summary	
Project Name	Canis Major Solar
Project Address	1005 North Street, Suffield CT
Utility/Load Zone	Eversource
Number of Sites	1
Total Size (AC)	1,995.2kW
Total Size (DC)	2,879kW
Annual Production Estimate	3,572,000 kWh / Year
Capacity Factor (AC)	20.44%
Inverter	Advanced Energy 23kW TL
Panel	Yingli 310YL310C-35b
Racking	RBI Ground Fix Tilt
Switchgear	S&C Vista
Disconnects	S&C Omni-Rupter
Racking Slope	25 Degrees
Orientation	180 Degrees
Interconnection	Above ground 3-phase 15kVA to North St.

LODESTAR ENERGY



No.	DATE	DESCRIPTION
0	01/19/2015	ISSUED FOR REVIEW & INT APPLICATION

REVISIONS

No.	DATE	DESCRIPTION

REVISIONS

PROJ. MANAGER
CHIEF DESIGNER
REVIEWED BY | DATE

01-19-2015

SCALE
HORZ: NONE
VERT:
DATUM
HORZ:
VERT:
GRAPHIC SCALE

POWER ENGINEERS, LLC
37 Fox Den Road
Kingston, MA 02364-2150
(508) 612-0392
www.PowerEngineersLLC.com
Electrical Engineering, Power, Lighting, Technical Studies and Utility Consulting

LODESTAR ENERGY
1005 NORTH STREET - PV PROJECT
1995KW AC ONE-LINE DIAGRAM
SUFFIELD CONNECTICUT

PROJ. No. 3180
DATE: JAN 2015
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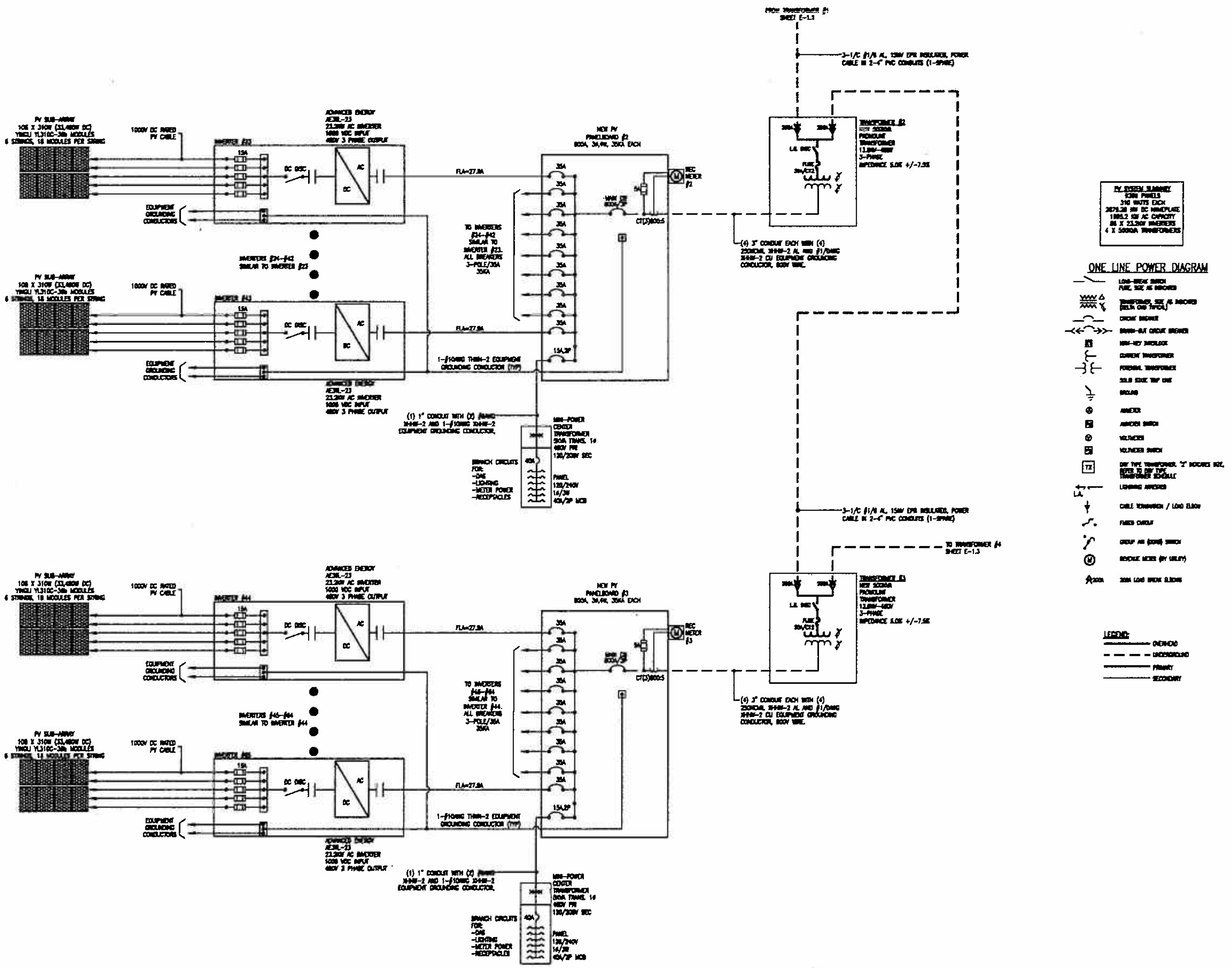

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REVISIONS

No	DATE	DESCRIPTION

REVISIONS

PROJ. MANAGER:
CHIEF DESIGNER:
REVIEWED BY: DATE

01-19-2015

SCALE
HORZ.: NONE
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GRAPHIC SCALE

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1005 NORTH STREET - PV PROJECT
1995KW AC ONE-LINE DIAGRAM
SUFFIELD CONNECTICUT

PROJ. No.: 316C
DATE: JAN 2015

E-1.2

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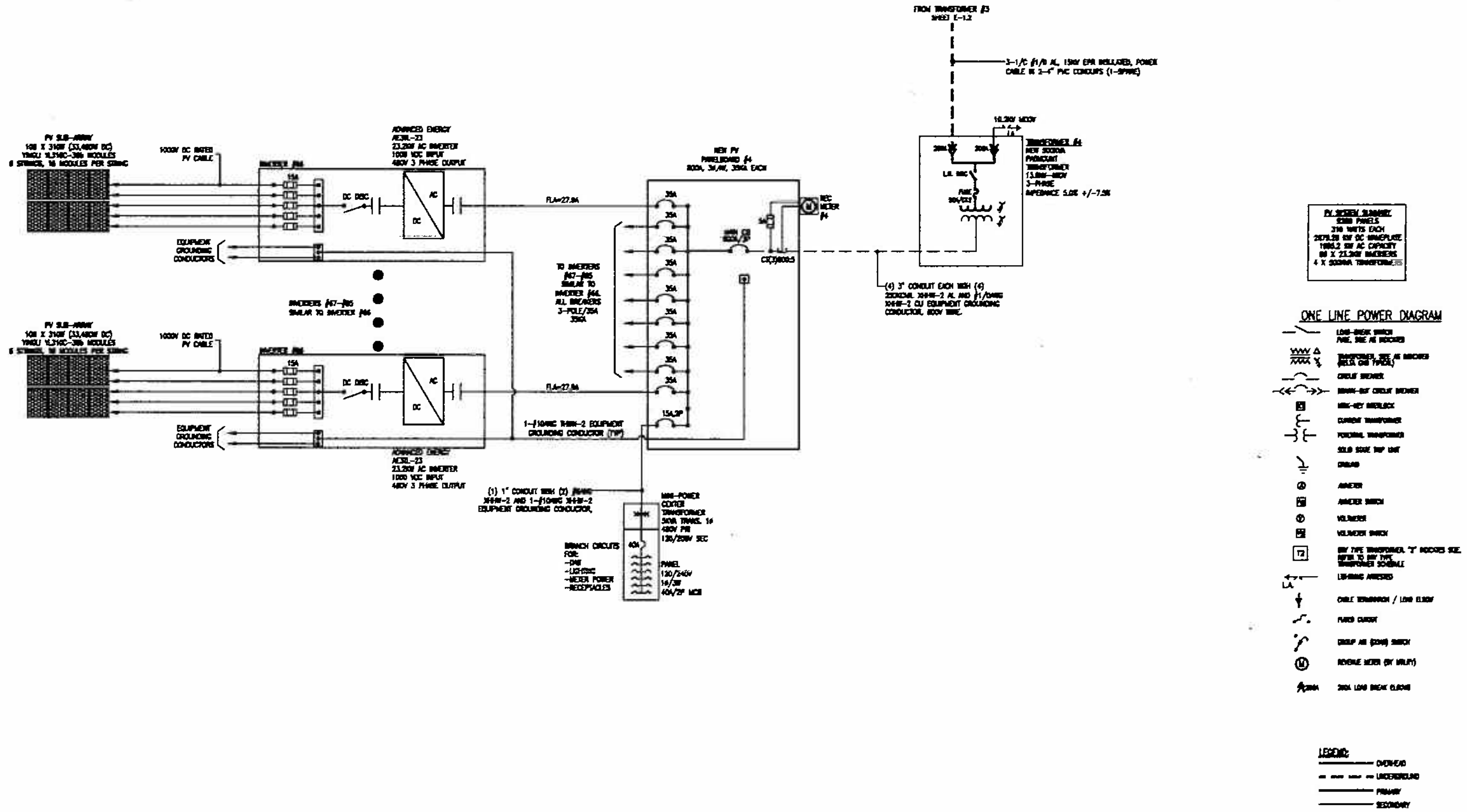

No	DATE	DESCRIPTION
0	01/19/2015	ISSUED FOR REVIEW & INT APPLICATION

REVISIONS

No	DATE	DESCRIPTION

REVISIONS

PROJ. MANAGER:
CHIEF DESIGNER:

REVIEWED BY	DATE

01-19-2015

SCALE: HORZ: NONE VERT
DATUM: HORZ VERT
GRAPHIC SCALE

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1995KW AC ONE-LINE DIAGRAM
SUFFIELD CONNECTICUT

PROJ. No. 319C
DATE: JAN 2015
E-1.3
SIZE: D REV: 0

LODESTAR ENERGY

July 2, 2015

VIA HAND DELIVERY

Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: Petition 1159: Petition of Lodestar Energy to the Connecticut Siting Council for a Declaratory Ruling for the Location and Construction of a 2.0 Megawatt Solar Electric Generating Facility at 1005 North Street, Suffield, Connecticut (the "Canis Major Solar Project" or the "Project")

Dear Council Members:

This letter provides a summary of Lodestar Energy's ("Lodestar") outreach to the Town of Suffield and the Town's responses regarding the above-referenced Petition. As noted below, Lodestar has had several meetings with the First Selectman, Edward McAnaney; the Town's Zoning & Planning Commission; and the Town's Conservation Commission starting with a preliminary site plan review on January 15, 2015, with the First Selectman and the Town Planner, Bill Hawkins. Additionally, Lodestar has provided copies of relevant reports and other documentation to Mr. Hawkins and to the Town's Wetlands Enforcement Officer, Keith Morris. Throughout these communications, the Town officials have been generally supportive of the Project.

Town of Suffield Zoning and Planning Commission

On March 16, 2015, Lodestar gave a presentation to the Town of Suffield's Zoning and Planning Commission regarding the Canis Major Solar Project. Additionally, Lodestar submitted preliminary plans for the project and responded to questions from members of the Commission. Members of the Zoning and Planning Commission "thanked [the Lodestar Energy team] for the presentation and stated that it looked like a good location for a project of that type." (See enclosed minutes from the Town of Suffield Zoning and Planning Commission, March 16, 2015.) On June 15, 2015, Lodestar presented the Zoning and Planning Commission with revised Site Plans.

Town of Suffield Conservation Commission & Wetlands Enforcement Officer

Lodestar presented the Canis Major Solar Project to the Town of Suffield Conservation Commission on March 24, 2015. Lodestar presented the Conservation Commission with Site Plans and provided information regarding site drainage and how wetlands may be affected. A copy of the minutes of this meeting with the Conservation Commission is enclosed.

Town of Suffield First Selectman and Other Officials

Lodestar has had several meetings and conversations with the Town of Suffield's First Selectman, Edward McAnaney, regarding the Project including an in-person meeting in April and scheduled calls in May and June. The First Selectman has indicated he supports the Project as proposed and has indicated that he will be providing a letter of support to the Connecticut Siting Council. Furthermore, the First Selectman joined the Siting Council members and Lodestar on the Site Walk that occurred on June 22, 2015 where he again indicated his support.

Finally, as noted in Lodestar's Petition to the Siting Council, Lodestar has provided copies of several documents and reports to Town officials. In particular, Lodestar has provided to the Town Planner, Bill Hawkins, by letters dated April 2, 2015, and May 21, 2015, the following documents and information: the Drainage Report for the Site; the Final Site Plans; an analysis of Federal Aviation Administration requirements and utility pole needs; and the Wetlands Report. Lodestar has not received any objections from Mr. Hawkins regarding these documents.

Very truly yours,

Jaime A. Smith

cc: Jeffrey J. Macel, Esq.
Tim Coon
Mark R. Sussman, Esq.