AGREEMENT FOR DESIGN, INSTALLATION, OPERATION AND OWNERSHIP OF
A MICROGRID DEMONSTRATION SYSTEM
AT THE SANTA ROSA LAGUNA TREATMENT PLANT

This Agreement for Design, Installation, Operation and Ownership of a Microgrid Demonstration System at the Santa Rosa Laguna Treatment Plant (Hereinafter "LTP Microgrid Agreement") is made and entered into by and between Trane U.S. Inc., a Delaware corporation ("Trane") and the City of Santa Rosa, a California municipal corporation (the "City"), as of _____, 2017 (the "Effective Date").

RECITALS

A. Trane is the successful recipient of a California Energy Commission (CEC) grant award, Grant Award Number: EPC-15-059 (the "Grant") for the design, installation, testing and operation of a Microgrid Controller and Automation System and a Photovoltaic System in accordance with the scope of work set forth in the Grant (the "Microgrid Project"), a true and correct copy of the Grant, dated as of August 27, 2015, (excluding Exhibit B thereto) is attached hereto as Exhibit A.

B. The Grant identifies the Laguna Treatment Plant (the "LTP"), a regional wastewater treatment plant owned and operated by the City as the site for the Microgrid Project to be located and installed.

C. The City desires to work with Trane for the purpose of facilitating the successful completion of the Microgrid Project at the LTP, with the mutual understanding that the LTP is first and foremost dedicated to providing wastewater treatment services to the City and its subregional partners and upon the terms and conditions set forth in this LTP Microgrid Agreement.

NOW THEREFORE, for good and valuable consideration the receipt of which is hereby acknowledged and agreed, the parties hereby agree as follows:

1. Generally

A. Condition Precedent. This Agreement and Trane's obligations hereunder shall be contingent upon receipt of an extension by Trane from the CEC for the completion of the Microgrid Project under the Grant. Trane shall apply and pursue in good faith such extension following the execution of this LTP Microgrid Agreement. In the event Trane is unable to secure an extension satisfactory to Trane in its reasonable discretion (or waive, at its sole discretion, this condition precedent) within one hundred and twenty (120) days following the Effective Date of this LTP Microgrid Agreement, either Party may terminate this Agreement upon written notice to the other Party. Trane shall provide prompt written notice to the City upon receipt of an extension from the CEC, as well as a representation as to whether the extension is satisfactory to Trane pursuant to this Section of the Agreement.

B. License to Access the LTP. The City hereby agrees, subject to all of the terms, conditions and requirements of this LTP Microgrid Agreement, that Trane, its consultants, contractors and agents under the supervision of Trane, shall have a non-exclusive license to

access the LTP for purposes of its work on the Microgrid Project in accordance with the Grant including but not limited to, any due diligence, site review, testing or other investigation, installation, construction and operations work as may be anticipated hereunder, provided, however that (i) access during normal business hours, which for purposes of this LTP Microgrid Agreement shall mean Monday through Friday, 7am to 5pm, will not require prior notice, but will require that Trane and any users of this license check in with the main office upon arrival so that the key personnel for the City at the LTP are aware of their presence, (ii) Trane shall coordinate with the City point of contract (to be determined) any and all physical work to take place at the LTP prior to the commencement of any such work, (iii) the exact location of any installation or construction shall be only as set forth in the design drawings and submittals, which for purposes of this LTP Microgrid Agreement shall mean plans sufficient for City of Santa Rosa Building Department review, for the Microgrid Project as approved by the City in accordance with the terms of this LTP Microgrid Agreement, (iv) there shall be no non-business hours access until and unless Trane has coordinated same ahead of time with the City's point of contact for the Microgrid Project, (v) all access and any work done at the LTP shall at all times be in compliance with any applicable terms of this LTP Microgrid Agreement and all applicable local, state and federal law, and (vi) Trane and any consultants and contractors (including subcontractors) shall be in compliance with the City's insurance coverage requirements prior to access the LTP. Trane, its consultants, contractors and agents shall at all times cooperate fully with City staff at the LTP with respect to this license and shall at no times be allowed to access locations at the LTP that do not relate to ongoing work in connection with the Microgrid Project unless accompanied by City staff. Trane shall provide a written list of any representatives, consultants, contractors and subcontractors needing access to the LTP in conjunction with the Microgrid Project, and shall keep such list updated with the City as necessary throughout the Term of this Agreement.

2. Design of the Microgrid System.

A. Trane will be solely responsible for preparing design drawings and submittals for the Microgrid System (the "Design Work"), which shall include three functional areas for the design package: (i) the installation of new selective Catalytic Reduction (SCR) devices into two existing Cummins combined heat and power (CHP) engines along with appropriate supporting equipment and appurtenances; (ii) the installation of approximately 125-kW solar photovoltaic panels to be located in the main parking lot area of the LTP as canopy panels; and (iii) the installation of new electric batteries and supporting controls, including the microgrid controller. Each of the components may also include site preparation, installation of electrical conductors and conduits, installation of associated instrumentation and control conductors and conduit, and associated trades, all as required under the Grant. Trane shall use Brown and Caldwell for the design of the SCR systems and any air permitting requirements, so long as Brown and Caldwell abide by their subcontract with Trane.

B. Trane shall perform engineering and design services, using qualified architects, engineers and other design professionals selected by Trane as reasonably necessary to complete the Design Work (the "Design Team"). During the Design Work process, Trane and the City shall coordinate the design work and cooperate with each other so as to minimize comments or delays. Trane shall provide to City for review hereunder, ninety percent (90%) complete Design Work for the Microgrid Project in accordance with the Project Schedule, attached hereto as Exhibit B and incorporated herein, as may be adjusted from time to time with agreement by the parties. Trane shall provide to the City, as soon as such agreements become available, all agreements that will be required to be executed by the City in connection with the Microgrid Project, including the interconnection agreement with the local utility and the demand response agreement with the California Independent System Operator. The Parties shall

cooperate in good faith in the review and execution of such agreements by the City. Notwithstanding the foregoing, the City shall have the right to prior review and approval of any such agreements, which shall not be unreasonably withheld, conditioned or delayed.

C. Trane agrees to work with Cummins as the manufacturer of the CHP engines on which the two (2) SCR units will be installed to assure that whatever SCR components are utilized for the Microgrid Project are determined by Cummins to be acceptable and not inconsistent with any existing warranty or maintenance plans with the City. Trane understands that the City may need to renegotiate the warranty with Cummins based on change in engine use rotation and run hours, and Trane agrees to provide City with any data or project specifications available to Trane to determine the scope of any proposed changes. The City agrees to undertake such discussions with Cummins in a timely manner and so as not to disrupt the progress of the Design Work or the installation and construction of the Microgrid Project. In the event changes to the warranty are required, such changes shall be at the City's sole cost and expense.

D. All materials, devices, and components incidental to the installation and construction of the Microgrid Project will be of industrial grade as set forth in the Design Work and shall carry the relevant manufacturer's warranties. Notwithstanding anything to the contrary herein, the Parties agree that the major system components and/or incidental components listed in Exhibit C, attached hereto and incorporated herein, are acceptable to the City and no substitution thereof shall be required. In addition, any materials, devices or components specified in the Design Submittal to the extent approved by the City shall be deemed acceptable to the City and no substitution thereof shall be required.

E. At such time as Trane has 90% Design Work for any one of the three major components of the Microgrid System, Trane shall provide as many copies of submittals as the City shall deem necessary (not to exceed five) for the City's review. The City shall have not more than fourteen (14) business days from receipt of the design submittal for 90% design to review and provide any objections, comments or questions regarding the current design submittal. Design submittals shall include: (i) mechanical and electrical drawings, (ii) product description information, (iii) detailed project schedule, (iv) permit package and related documents, and (v) any other documents submitted in connection with the Work. If requested by the City, in an effort to facilitate the City's approval of the 90% design submittal, appropriate members of the Trane Design Team shall be made available to attend a meeting with the City to address any objections, comments or questions. Trane shall assure that the Trane Design Team incorporates changes into the Design Work as necessary to address the City's concerns. The City shall have the right to review all changes to any submittal before providing final approval. The City shall make diligent efforts to review and respond to any such changes towards final approval within three (3) business days.

F. While Trane and the City understand that other agencies will need to review and approve the Design Work, including but not limited to the CEC to assure compliance with the Grant, Trane and the City hereby agree that the City shall have final approval over the design of the Microgrid Project. The City hereby agrees that it intends to exercise this approval for the sole purpose of assuring that the interface, operation and longevity of the Microgrid Project is consistent with the primary mission of the LTP, and further agrees that it shall not unreasonably withhold its consent to changes requested by third party reviewing agencies, so long as the City has first had the opportunity to advocate directly regarding any concerns or reservations the City may have with respect to any such requested changes.

G. Notwithstanding the foregoing or anything else in this LTP Microgrid Agreement, the City understands that the Microgrid Project is funded solely by the Grant and the matching funds and that no additional budget is available to meet requirements that are not part of the Microgrid Project as outlined in the Grant. Consequently, in the event that the City requires additional work in connection with the Microgrid Project that exceeds the requirements of the Grant (the "Additional Requirements"), Trane will notify the City thereof prior to commencement of construction and installation work at the site with respect to the Microgrid Project and will provide to the City the cost of such Additional Requirements. If the City elects to implement and pay for such Additional Requirements, this Agreement shall be amended to include such Additional Requirements and the cost thereof shall become additional City Matching Funds. Those requirements set forth in Section 2(D) above, shall not be construed as Additional Requirements hereunder. In the event, prior to the commencement of the construction and installation of the Microgrid Project, the City elects not to pay for such Additional Requirements, Trane shall have the option to either proceed with the installation of the Microgrid Project without the City's additional Matching Funds or to terminate the LTP Microgrid Agreement pursuant to Section 8 below.

3. Required Permits and Approvals.

A. Trane shall be solely responsible to coordinate, prepare applications for and obtain all necessary approvals and permits for the Microgrid Project, including but not limited to, air quality permits or amendments to the City's current air permits from the Bay Area Air Quality Management District ("BAAQMD"), building permits to be issued by the City's Building Department, approvals from Cal-ISO necessary for function of the Microgrid Project as anticipated under the Grant, and any interconnection to Pacific, Gas & Electric (PG&E), if any is required by PG&E. Trane hereby acknowledges and agrees that coordination with Cal-ISO, BAAQMD and if any with PG&E may require significant effort and time. Notwithstanding the foregoing, the City shall be consulted and shall have the right of approval over any permit or conditions of approval that may affect the LTP. Trane shall be solely responsible for all costs and fees associated with obtaining all necessary permits for the Microgrid Project.

B. Santa Rosa agrees to assist Trane in obtaining necessary permits, licenses and approvals in connection with the installation, operation and maintenance of the Microgrid System, including the submission of applications for interconnection of the Microgrid System with the PG&E, provided that same shall not interfere with the City's interface with the Geysers. To the extent that interconnection to PG&E requires execution of any agreements by the City, the City shall have the right to prior review and approval of same in its reasonable discretion. Trane shall be solely responsible for any additional equipment on Santa Rosa's side of the interconnection point in addition to the equipment provided by Trane under the Grant Agreement, as may be required for the interconnection of the Microgrid System to PG&E and/or the CAL ISO.

C. The City and Trane agree that upon completion of the final design submittals for the Microgrid Project and approval thereof by the City, Trane shall submit a building permit application to the City's Building Department for review of the proposed plans. The City agrees to facilitate the review process towards obtaining a building permit for the Microgrid Project. In the event that the City's Building Department declines review, the City shall have the right, at its sole cost and expense, to seek consultant review for compliance of the Design Work with building code requirements. No work shall be commenced at the LTP until such time as the City has approved the final design drawings and submittals for the Microgrid Project, and Trane shall have obtained the City building permit. Work on the SCR portion of the Microgrid Project shall be limited to any civil related activity until permit for "BAAQMD" has been issued upon which all

other construction related to SCR may commence, provided that any civil or related work activities commenced prior to obtaining the BAAQMD permit for the Microgrid Project shall be done at Trane's sole risk and expense in the event the permit requires modifications of same.

D. Trane shall cause the Work to be performed in compliance with all applicable federal, state and local laws and any design and engineering or other professional services to be performed pursuant to this LTP Microgrid Agreement, and to the extent required shall assure that the Work is performed by licensed personnel. Trane shall also require that all consultants performing any part of the design Work hereunder shall name the City as an additional indemnitee in any contract with Trane, as well as require such consultants to provide Professional Liability insurance coverage as set forth in Attachment One.

4. Construction and Completion. Upon obtaining City's final approval of the Design Work and any required permits for the performance of the specific portion of the Work in question, Trane shall have the right to move forward with construction of the Microgrid Project at the LTP in compliance with the City approved design drawings and submittals, all permit and approval conditions as well as local, state and federal law, including but not limited to, California Labor Code Section 1720 et seq. Trane shall be solely responsible for construction of the Microgrid Project, including appropriate project management and oversight of the construction and installation work (the "Work"), provided, however, that the City shall have the right at all times to inspect the progress and quality of the Work.

A. Trane shall assure that any construction contract for the Work shall require the contractor to (1) indemnify the City for any and all work performed at the LTP, (2) agree to adhere to Trane's safety protocols and to acknowledge and fully comply with Cal-OSHA multi-employer work site safety regulations, which require that the City intervene for purposes of correcting or stopping work as may be determined necessary by City staff at any time during the construction/installation of the Work if an unsafe condition is noticed, (3) supply evidence of insurance as required herein and to assure that its subcontractors carry the coverage required hereunder, and (4) posting of Performance and payment bonds by any construction contractor hired by Trane for the portion of the Work with respect to the Microgrid Project which involved construction or installation activities at the LTP site. The City shall not be responsible for ensuring Trane's nor any Trane contractor or consultant compliance with OSHA regulations.

B. At all times during the construction and installation of the Work, Trane shall coordinate the schedule with the City's designated point of contact. The City shall at all times have a designated point of contact for the Microgrid Project construction and installation, who shall coordinate and designate staging, deliveries, inspections and the Work schedule. The parties agree that at all times during construction (until Completion and acceptance of the Work by the City), the parties shall participate in construction coordination meetings on a not less than bi-weekly basis. Trane shall make the appropriate members of the construction team available to attend (in person or by telephone) including but not limited to key representatives of the general contractor and any subcontractors. The purpose of the coordination meetings will be to provide updates on the status of the Work, identify and coordinate areas of interface with the LTP so as to avoid disruption to the operation of the LTP, review a current three-week "look ahead" schedule provided by Trane and critical path for the Work, identify any access and safety issues, and provide for schedule of inspections by the City for both the Building Department and LTP staff.

C. Trane shall submit a written request for any proposed LTP system outages at least seven (7) business days (Monday through Friday) prior to any outage dates, and same

shall be coordinated with LTP staff. The City shall have sole discretion, exercised reasonably, as to the timing and duration of any planned outages at the LTP.

D. Trane shall supervise and direct all Work performed hereunder, and shall be solely responsible for the means, methods, techniques, sequences and procedures employed, consistent with the requirements of this LTP Microgrid Agreement. Trane shall ensure that all persons performing work hereunder are skilled in the tasks assigned to them. Trane shall keep the construction and staging areas reasonably free of materials and accumulation of waste caused by the Work. Upon completion of the Work Trane shall remove from the LTP all waste, tools and equipment introduced by or through Trane.

E. Upon completion of the Work, Trane shall obtain final inspection of the Work by the City's Building Department as well as LTP staff to assure that the Work is done in compliance with the approved design drawings and submittals. Trane hereby agrees that it shall promptly address any areas of noncompliance identified during City's inspections. Upon acceptance of the Work by the City, Trane shall file a notice of completion for same.

F. Trane hereby agrees that all of the Work shall proceed concurrently and that Trane shall use its commercially reasonable efforts to complete the Work in accordance with the Project Schedule, as may be adjusted from time to time by mutual agreement of the parties not to be unreasonably withheld, subject to delays caused by force majeure events, acts or omissions of the City, the local electric utility or any other governmental authority or the CEC. Trane may, in its discretion, re-organize activities, events, or milestones set forth in the Project Schedule from time to time with prior notice to and approval of the City, which shall not be unreasonably withheld, conditioned or delayed.

5. Microgrid System Startup and Testing. Prior to any startup or testing of the Microgrid Project, Trane shall circulate for review and approval a testing procedure and protocol. The protocol shall identify at a minimum the key steps to startup, the key personnel on site during startup and testing which shall include key LTP staff, any testing parameters, and any mechanisms for abort of any startup or test. Startup of the Microgrid Project shall not commence until such time as Trane has received acceptance and approval of all of the Work and all required permits and outside agency approvals are in place.

A. City staff at the LTP shall at all times during start up, testing and operation of the Microgrid System have the right to immediately cease operations of the Microgrid System if City staff determines, in its sole and absolute discretion, that doing so is necessary for the function of the LTP, whether due to the operation of the Microgrid Project or for any other reason. Trane shall provide advance written notice and a proposed schedule of the Microgrid Project startup and testing. City staff shall be present during startup and testing of the Microgrid Project.

B. Trane shall be solely responsible for any and all required or necessary maintenance of the Microgrid System following completion of the Work, through testing up to and until the end of the Term, as herein described.

C. Trane shall provide training on each of the main components of the Microgrid System as well as the operation of the System as a whole to City staff at no cost or charge. Such training shall be scheduled at reasonable times with the City at the LTP and shall be geared towards the City's independent operation of the Microgrid System to include written manuals and materials and any interface with the LTP and programming associated with the operation of the Microgrid System. Trane shall provide follow up or additional training at the

City's reasonable request, provided, however, that the cost of any such additional training shall be borne by the City.

6. Liability; Indemnity and Insurance.

A. Trane shall bear all costs of design, construction, testing and operation up to the transfer of the Microgrid System to the City, with the sole exception of City's contribution. City hereby agrees to contribute a total amount of $750,000, subject to adjustment pursuant to Section 2.G. hereof (the "City Matching Funds"). The City Matching Funds shall be payable by the City to Trane fifty percent (50%) upon delivery of two BAAQMD approved SCRs to the LTP, and the other fifty percent (50%) at commencement of the programming and start up. Once the SCR for which the City paid the City Matching Funds is installed and operational, Trane will provide all of the documents necessary to transfer title of the SCR to the City along with any warranty from the manufacturer.

B. Subject to the provisions of Section 6(E) below, Trane shall be liable for and shall indemnify the City, its officers, agents, employees, successors and assigns, from and against any and all actions, claims, lawsuits, administrative proceedings, arbitration proceedings, regulatory proceedings, damages, disabilities, liabilities and expenses, including all cost of litigation incurred in the defense of claims as to which this indemnity applies and including any claims or liability asserted pursuant to California Labor Code Section 1720 et. seq.to the extent caused by or arising out of Trane's negligent acts or omissions, or willful misconduct in connection with Trane's design, installation or construction of the Microgrid Project. but excluding liability due to the negligence or willful misconduct of the City, its employees, agents or contractors.

C. If there is an obligation to indemnify, Trane's duty to defend the City exists, regardless of whether it is ultimately determined that there is not a duty to indemnify. Where it is ultimately determined that the events or circumstances giving rise to the obligation to indemnify were the result of the negligence or willful misconduct of the City, its employees, agents or subcontractors, there shall be an apportionment of the defense costs based on the relative fault of the parties following final resolution of any claim. Trane shall have the right to select legal counsel at the expense of Trane, subject to the City's approval, which shall not be unreasonably withheld.

D. Subject to Section 6.E below, this indemnification obligation is not limited in any way by any limitation on the amount or type of damages or compensation payable to Trane or its agents under any workers' compensation acts, disability benefits acts, or other employee benefit acts.

E. LIMITATION OF LIABILITY. IN NO EVENT WILL TRANE OR THE CITY BE LIABLE TO THE OTHER OR ANY OF ITS AFFILIATES OR ANY OF THEIR EMPLOYEES, OFFICERS, DIRECTORS, AGENT, CUSTOMERS OR REPRESENTATIVES UNDER THIS AGREEMENT OR OTHERWISE FOR INDIRECT, INCIDENTAL, SPECIAL, CONSEQUENTIAL OR EXEMPLARY DAMAGES ARISING OUT OF OR RELATED TO THIS AGREEMENT, INCLUDING BUT NOT LIMITED TO LOST PROFITS, COSTS OF PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, BUSINESS INTERRUPTION, EVEN IF THE PARTIES HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN ADDITION, WHETHER ANY ACTION OR CLAIM IS BASED ON WARRANTY, CONTRACT, AND TORT OR OTHERWISE, UNDER NO CIRCUMSTANCES SHALL TRANE'S TOTAL LIABILITY ARISING OUT OF OR RELATED TO THIS AGREEMENT EXCEED THE TOTAL AMOUNT OF FIVE MILLION DOLLARS ($5,000,000).

F. Each of Trane and the City shall maintain in full force and effect all of the insurance coverage or equivalent insurance coverage to that described in, and in accordance with, Attachment One, “Insurance Requirements”, which is attached hereto and hereby incorporated and made part of this LTP Microgrid Agreement by this reference.

G. Maintenance of the insurance coverage required herein is a material element of this LTP Microgrid Agreement. Failure by Trane or the City to (i) maintain or renew coverage, (ii) provide notice of any changes, modifications, or reductions in coverage, (iii) with respect to Trane, assure that all of its contractors and consultants have the required insurance and that the City, its officers, agents and employees are named as additional insured in any such coverage, or (iv) provide evidence of renewal, may be treated by the other party as a material breach of this Agreement, whereas the non- defaulting party shall be entitled to all rights and remedies in accordance with Section 8. Notwithstanding the foregoing, any failure by a party to maintain required insurance coverage shall not excuse or alleviate such party from any of its other duties or obligations under this Agreement.

7. Hazardous Materials. Trane shall have no responsibility for detection, abatement, remediation, removal or disposal of any Hazardous Material, except Hazardous Materials introduced onto the Premises by Trane, its employees, subcontractors, agents, or other parties acting on behalf of Trane. In the event that Trane becomes aware of the presence of, or exposure of persons to, any Hazardous Material at the Premises, Trane shall inform the City by notice as soon as practicable, and shall immediately cease work so as to avoid the any release or further disruption. Notwithstanding anything to the contrary herein, but excepting any negligent act or omission, or willful misconduct by Trane, its employees, agents, or contractors, upon the discovery of any Hazardous Materials hereunder, Trane shall not be responsible for, and the City shall bear full responsibility and remediation costs relating to any Hazardous Materials uncovered, removed or disturbed by Trane on the Premises resulting from Trane’s performance of the Work hereunder.

8. Transfer of Ownership. Trane shall complete the Microgrid Project, design, construction, installation, testing and operation within the Term set forth in the Grant, as may be amended, supplemented or modified from time to time, provided that Trane shall notify the City of any extension or material change in terms of the Grant. Within thirty (30) days prior to the expiration of the Term, Trane shall provide the City with all warranty and other information for all component parts of the Microgrid System, as well as draft title documents for a full and complete transfer of ownership of the Microgrid System to the City, and the City shall review and provide comments to same. Upon expiration of the Term, it is the intent and understanding of the parties that Trane shall transfer, convey and assign any and all rights and interests in and to the Microgrid System to the City free of any cost, charge or expense, except for payment by the City of the City Matching Funds, as amended pursuant to Section 2.G, including but not limited to all warranty, all plans and specification (subject to Trane’s rights to intellectual property as herein provided), and any other rights Trane may have to convey in connection with the Microgrid System, including the right to operate the Microgrid System and any revenue, credits, or other derivatives generated therefrom. Prior to the expiration of the Term, Trane shall deliver to Santa Rosa a copy of the final record drawings for the Work and all operation and maintenance manuals with respect to the Work. The Microgrid Project shall be transferred to the City “AS-IS”, “WHERE-IS” with no warranties or guaranties of any kind by Trane, express or implied. Trane shall use its commercially reasonable efforts to assign to the City any remaining and applicable third party manufacturers warranties relating to the Work which were originally provided in connection with the equipment and materials incorporated into the Work and are available to, and assignable by, Trane.

9. TERM.

A. This Agreement shall commence on the Effective Date and shall continue for a period co-terminus with the Grant Agreement, which is currently March 30, 2018, unless sooner terminated pursuant to this Agreement. This Agreement may be renewed upon mutual written agreement between the Parties. The initial term and each renewal term, if any, are collectively referred herein as the "Term."

B. Termination Prior to commencement of the Work. Subject to the terms and conditions of the Grant, Trane shall have the right to terminate this LTP Microgrid Agreement without liability prior to commencement of the installation Work at the site. In the event of termination of this Agreement by Trane, neither party shall bear any cost or expense of the other party, except for any amounts payable by the City with respect to the SCR subject to the City Matching Funds so long as Trane completes the Work with respect to such SCR.

C. Termination For Material Breach of the LTP Microgrid Agreement. Either party may terminate this LTP Microgrid Agreement in the event of a material breach under this LTP Microgrid Agreement where such breach continues uncured for thirty (30) days following written Notice thereof from other party, provided that if the relevant breach cannot be reasonably remedied within such thirty (30) days and the party receiving notice works diligently to remedy such breach, the such party shall have such longer period as may be reasonably required to remedy the relevant breach. In the event of termination for material breach of the LTP Microgrid Agreement, either party may be liable to other party for the actual costs incurred by the non-breaching party prior to said termination and have all rights and remedies available in law or equity.

10. Responsibilities for Delays.

A. Responsibility for Delays. The City and Trane agree to use their commercially reasonable efforts to abide by the Project Schedule. If Trane is delayed in the commencement or completion of any part of the Work due the negligence or intentional misconduct, including the failure by the City to abide by the terms and conditions of this Agreement by the City or any of its officers, agents or employees, then Trane will notify the City in writing of the existence, extent of, and reason(s) for such delay(s) and City will use its commercially reasonable efforts to remedy any issues identified by Trane. In the event, after notice and an opportunity to remedy the issue as stated above, it is determined that Trane was delayed by any of the causes set forth in the previous sentence, Trane shall be entitled to the reasonable, incremental and documented out of pocket costs actually incurred by Trane for furnishing the Work to the extent caused by such delays.

B. Compliance with Grant. The City represents and warrants that it has reviewed the Grant and agrees to comply with the terms and conditions thereof as such terms and conditions may apply to the City, and further subject to the terms and conditions of this LTP Microgrid Agreement.

C. Provision of Information/Concealed or Unknown Underground Conditions. Trane requested that the City provide certain information available to the City with respect to the LTP. The City represents and warrants that it delivered to Trane all information and materials requested by Trane to the extent known and available to City, provided that the City shall have the duty to investigate (the “Diligence Documentation”). In the event Trane encounters unknown, concealed or unforeseen underground conditions in the performance of its Work, Trane shall be

entitled to the reasonable, incremental and documented out of pocket costs actually incurred by Trane for furnishing the Work to the extent resulting from the concealed or unknown underground conditions, provided that upon discovery of any such conditions, Trane shall first inform the City of same in writing and the City shall have the option of remedying any issue at the City's sole cost and expense.

11. Miscellaneous.

A. Notices. All notices required or permitted hereunder shall be in writing and shall be deemed given: (a) when delivered in person; (b) the next business day after deposit with a commercial overnight delivery service for next day delivery; or (c) upon receipt if sent by United States mail, postage prepaid, registered or certified mail, return receipt requested. All notices shall be addressed to the recipient party at the following addresses or other address a party may designate in writing from time to time:

To the City:
Attn: Mike Prinz,
City of Santa Rosa – Water Department
Laguna Treatment Plant
4300 Llano Road
Santa Rosa, CA 95407

With copy to:
Attn: Molly Dillon
City Attorney's Office
100 Santa Rosa Ave., Room 8
Santa Rosa, CA 95404

To Trane:
Richard Swank
Microgrid Program Manager
TRANE U.S. – Serving California & Northern Nevada
4145 Del Mar
Rocklin Ca 95677
PH: (916) 577-1126; Fax: (916) 577-1175
Email: Richard.swank@trane.com

With copy to:
Mikhael Vitenson
Associate General Counsel
Ingersoll Rand, Climate
Office: +1.704.990-3399
Mobile: +1.704.574.6708
E-mail: mvitenson@irco.com

B. Independent Contractor. Trane shall at all times be and remain an independent contractor and not an agent of Santa Rosa for any purpose whatsoever and shall have no authority to create or assume any obligation, express or implied, in the name of or on behalf of Santa Rosa or to bind Santa Rosa in any manner whatsoever.

C. Subcontractors. Trane may from time to time retain third party subcontractors and suppliers in connection with the Work provided hereunder.

D. Authorized Representatives. Each party shall designate one or more representatives authorized to act on behalf of the designating party. If a party designates more

than one authorized representative, it shall specify the nature of the communications for which each representative is authorized to act on the designating party's behalf.

E. Entire Agreement; Amendment. With the sole exception of the Nondisclosure Agreement entered into by and between Trane and the City as of February 23, 2016, which shall continue to apply to the parties hereunder except where the terms of such Nondisclosure Agreement are in conflict or interfere with the terms, conditions and requirements of this LTP Microgrid Agreement, this LTP Microgrid Agreement including the Exhibits hereto, represents the entire and integrated agreement between the parties hereto with respect to the subject matter hereof and supersedes all prior negotiations, representations or agreements, either written or oral. No amendment, modification or waiver in respect of this Agreement will be effective unless in writing and executed by both parties. In the event of any conflict between the Nondisclosure Agreement and this LTP Microgrid Agreement, the terms and conditions of this LTP Microgrid Agreement shall control and prevail.

F. Assignment. Neither party shall assign or delegate its rights or obligations under this Agreement without the written consent of the other party. In determining whether to consent to any assignment, each party shall be entitled to consider the experience, reputation and creditworthiness of the proposed assignee or other transferee. Subject to the foregoing, this Agreement shall be binding on and shall inure to the benefit of the Parties and their respective successors and assigns.

G. No Waiver. No failure on the part of either party to exercise or enforce any term hereof or any right hereunder shall operate as a waiver, release or relinquishment of any right or power conferred under this Agreement.

H. Force Majeure. Neither the City nor Trane shall be considered to be in default hereunder when a failure of performance is due to an Event of Force Majeure. An "Event of Force Majeure" shall mean any cause or event beyond the control of the parties. Without limiting the foregoing, "Event of Force Majeure" includes: acts of God; acts of terrorism, war or the public enemy; flood; earthquake; tornado; storm; fire; civil disobedience; pandemic; insurrections; riots; labor disputes; labor or material shortages; sabotage; restraint by court order or public authority (whether valid or invalid), and action or non-action by any governmental authority or utility or the inability to obtain or keep in force the necessary governmental authorizations, permits, licenses, certificates or approvals, in each case if not caused by the fault of the affected party. If Trane or City is rendered unable to fulfill any of its obligations under this Agreement by reason of an Event of Force Majeure it shall give prompt written notice of such fact to the other party and obligations shall be suspended during the pendency of the Event of Force Majeure.

I. Survival. Cancellation, expiration, or earlier termination of this Agreement shall not relieve the Parties of obligations that by their nature should survive such cancellation, expiration, or termination (including, without limitation, any representations or warranties).

J. Governing Law; Venue. This Agreement shall be governed by, interpreted and enforced in accordance with, the laws of the State of California, and any action in connection with this Agreement shall be filed and heard in Sonoma County, California.

K. Execution in Counterparts. This Agreement may be executed in counterparts, each of which shall be deemed an original, but all of which shall constitute one and the same instrument.

L. Ownership of Designs. All drawings, specifications, calculations, data, notes and other materials and documents, including electronic data furnished by Trane to Santa Rosa under this Agreement ("Work Product") are the instruments of service of Trane and Trane will retain all common law, statutory and other reserved rights, including copyrights. No license to the Work Product is hereby granted to Santa Rosa in connection with this Agreement or Trane's performance hereunder.

M. Intellectual Property. No license in the Work Product is granted pursuant to this Agreement. Any intellectual property rights (including, without limitation, any patents, inventions and any copyrights), including all data collected (with the exception of data collected at the LTP regarding electrical costs savings at the LTP as a result of the operation of the Microgrid Project), processed or administered by Trane in connection with the Work, the Grant or otherwise, shall remain the property of Trane and shall not be transferred to Santa Rosa under this Agreement or otherwise. Santa Rosa agrees to abide by all terms and conditions relating to intellectual property, rights to data, patents and inventions set forth in Article 12 of the Grant Agreement.

IN WITNESS WHEREOF, in consideration for the mutual promises set forth in this Agreement and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the undersigned have executed this Agreement by their duly authorized representatives as of the date first written above.

TRANE U.S. INC.,
a Delaware corporation

By: _____
Name: _____
Title: _____

By: _____
Name: _____
Title: _____

CITY OF SANTA ROSA,
a municipal corporation

By: _____
Daniel Galvin
Chair of the Board of Public Utilities

APPROVED AS TO FORM:

By: _____
City Attorney's Office

Attachments:

ATTACHMENT ONE – INSURANCE REQUIREMENTS
Exhibit A – CEC Grant
Exhibit B – Project Schedule
Exhibit C – List of Equipment

ATTACHMENT ONE
INSURANCE REQUIREMENTS FOR
TRANE MICROGRID AGREEMENT

A. Insurance Policies: Trane shall, at all times during the terms of this Agreement, maintain and keep in full force and effect, the following policies of insurance with minimum coverage as indicated below and issued by insurers with AM Best ratings of no less than A-:VI or otherwise acceptable to the City.

	Insurance	Minimum Coverage Limits	Additional Coverage Requirements
1.	Commercial general liability	$ 5 million per occurrence $ 5 million aggregate	Coverage must be at least as broad as ISO CG 00 01 and must include completed operations coverage. If insurance applies separately to a project/location, aggregate may be equal to per occurrence amount. **Coverage may be met by a combination of primary and umbrella or excess insurance but umbrella and excess shall provide coverage at least as broad as specified for underlying coverage. Coverage shall not exclude subsidence**.
2.	Business auto coverage	$ 2 million	ISO Form Number CA 00 01 covering any auto (Code 1), or if Consultant has no owned autos, hired, (Code 8) and non-owned autos (Code 9), with limit no less than $ 1 million per accident for bodily injury and property damage.
3.	Professional liability (E&O)	$ 1 million per claim $ 1 million aggregate	All of Trane's design and engineering consultants shall provide on a policy form appropriate to profession. If on a claims made basis, Insurance must show coverage date prior to start of work and it must be maintained for three years after completion of work.
4.	Workers' compensation and employer's liability	$ 1 million	As required by the State of California, with Statutory Limits and Employer's Liability Insurance with limit of no less than $ 1 million per accident for bodily injury or disease. The Workers' Compensation policy shall be endorsed with a waiver of subrogation in favor of the City for all work performed by the Consultant, its employees, agents and subcontractors.

5. Installation Floater. Trane shall maintain from the Commencment of the Work and through the commissioning date of the Microgrid Project, installation floater insurance coverage insuring physical loss or damage to

materials, equipment, machinery and supplies designed for use in the construction or performance of the Work at the LTP, offsite, while in transit to the site prior to the transfer of the risk of loss to the City. The risk of loss for the materials and equipment comprising the Work shall pass to the City in the course of construction upon acceptance in writing of the applicable portion of the Work by the City.

B. Endorsements:

1. All policies shall provide or be endorsed to provide that coverage shall not be canceled, except after prior written notice has been provided to the City in accordance with the policy provisions.

2. Liability, umbrella and excess policies shall provide or be endorsed to provide the following:

   a. For any claims related to this project, insurance coverage provided for the benefit of the City hereunder shall be primary and any insurance or self-insurance maintained by City shall be excess of the and shall not contribute with it; and,

   b. **The City of Santa Rosa, its officers, agents, employees and volunteers are to be covered as additional insureds on the CGL policy**. General liability coverage can be provided in the form of an endorsement to Trane's insurance at least as broad as ISO Form CG 20 10 11 85 or if not available, through the addition of both CG 20 10 and CG 20 37 if a later edition is used.

C. Verification of Coverage and Certificates of Insurance: Trane shall furnish City with original certificates and endorsements effecting coverage required above. Certificates and endorsements shall make reference to policy numbers. All certificates and endorsements are to be received and approved by the City before work commences and must be in effect for the duration of the Agreement. The City reserves the right to require complete copies of all required policies and endorsements.

D. Other Insurance Provisions:

1. No policy required by this Agreement shall prohibit Trane from waiving any right of recovery prior to loss. Trane hereby waives such right with regard to the indemnitees, except to the extent expressly stated in the Microgrid Agreement or this Attachment One.

2. All insurance coverage amounts provided hereuber and available or applicable to this Agreement are intended to apply to the full extent of the policies. Nothing contained in this Agreement limits the application of such insurance coverage. Defense costs must be paid in addition to coverage amounts, subject to applicable limits.

3. City reserves the right to require reasonable modifications to these insurance requirements during the Term of the Microgrid Agreement, due to special circumstances that might arise during the Term, with not less then thirty (30)

days prior written notice to Trane.

E. The City has property insurance for the LTP, which shall cover the Work once it is completed and accepted by the City. The City's property casualty insurance includes coverage for loss of use and business interruption. Upon request, the City will provide evidence of such coverage to Trane. Tha City agrees to waive subrogation against Trane for any damage covered by its casualty or business interruption policies.

STATE OF CALIFORNIA
GRANT AGREEMENT
CEC-146 (Revised 1/2014)

CALIFORNIA ENERGY COMMISSION

RECIPIENT	AGREEMENT NUMBER
Trane U.S., Inc.	EPC-14-059
ADDRESS	**AGREEMENT TERM**
4145 Del Mar Avenue Rocklin, CA 95677	05/08/2015 to 03/30/2018 The effective date of this Agreement is either the start date or the approval date by the California Energy Commission, whichever is later. The California Energy Commission shall be the last party to sign. No work is authorized, nor shall any work begin, until on or after the effective date.

PROJECT DESCRIPTION

The parties agree to comply with the terms and conditions of the following Exhibits which are by this reference made a part of the agreement.

Exhibit A – Scope of Work	Page(s): 19
Exhibit A – Attachments	Page(s): 05
Exhibit B – Budget	Page(s): 12
Exhibit B – Attachments	Page(s): -
Exhibit C – General Terms and Conditions	Page(s): 31
Exhibit C – Attachments	Page(s): 05
Exhibit D – Special Terms and Conditions	Page(s): 01
Exhibit E - Contacts	Page(s): 01

REIMBURSABLE AMOUNT	$ 4,999,804.00
MATCH SHARE	$ 2,210,000.00
TOTAL	$ 7,209,804.00

The undersigned parties have read the attachments to this agreement and will comply with the standards and requirements contained therein.

CALIFORNIA ENERGY COMMISSION		RECIPIENT	
AUTHORIZED SIGNATURE	DATE	AUTHORIZED SIGNATURE	DATE
Rachel L. Grant Kiley	8/27/15		8-25-15
NAME		NAME	
Rachel L. Grant Kiley		Dale J. White	
TITLE		TITLE	
Contracts, Grants and Loans Office Manager		Area Sales Manager	
CALIFORNIA ENERGY COMMISSION ADDRESS			
1516 9th Street, MS 1, Sacramento, CA 95814			

EXHIBIT A
Scope of Work

A. Task List

Task	CPR[1]	Task Name
1		General Project Tasks
2		Install Selective Catalytic Reduction Equipment
3	X	Install and Integrate Microgrid Controller and Automation
4		Install Energy Storage
5	X	Install Photovoltaic System
6		Evaluation of Project Benefits
7		Technology/Knowledge Transfer Activities

B. Acronym/Term List

Acronym/Term	Meaning
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CPR	Critical Project Review
CPUC	California Public Utilities Commission
DOE	United States Department of Energy
DSM	Demand-Side Management
MGC	Microgrid Controller
PV	Solar Photovoltaic
SCR	Selective Catalytic Reduction emissions control technology
TAC	Technical Advisory Committee
WWTP	Wastewater Treatment Plant

I. PURPOSE OF AGREEMENT, PROBLEM/SOLUTION STATEMENT, AND GOALS AND OBJECTIVES

A. Purpose of Agreement

The purpose of this Agreement is to fund the deployment and testing of an integrated advanced microgrid at a wastewater treatment plant (WWTP).

B. Problem/ Solution Statement

Problem

California's electric grid must become more resilient and adaptable to climate change impacts, such as increased fires, severe storms, and heat waves. Microgrids can assist with overall grid capacity and reliability issues by being able to automatically disconnect ("island"), supply their own loads, and synchronize and reconnect. Advanced microgrid systems can also provide ancillary services to the electricity grid. The problem is that little real-world experience on the

[1] Please see subtask 1.3 in Part III of the Scope of Work (General Project Tasks) for a description of Critical Project Review (CPR) Meetings.

operation of these systems has been developed, particularly at critical wastewater treatment facilities.

Solution

The Recipient will upgrade an existing wastewater plant to act as an advanced microgrid with the ability to provide ancillary services to the grid. The Recipient will then monitor the plant as it operates, gathering data from both standard and advanced microgrid operational capabilities.

C. Goals and Objectives of the Agreement

Agreement Goals

The goals of this Agreement are to demonstrate that a microgrid at a WWTP can:

- Operate without compromising water quality guidelines
- Perform to microgrid standards
- Deliver reliable ancillary services to the grid

Ratepayer Benefits:[2] This Agreement will result in the ratepayer benefits of greater electricity reliability, and lower costs by:

- Reducing the need for new transmission and distribution capital upgrades by reducing peak demand
- Reducing the need for new "peaker" or load following generation resources by providing a load balancing ancillary service in the form of curtailable loads
- Improving grid reliability.

Technological Advancement and Breakthroughs:[3] This Agreement will lead to technological advancement and breakthroughs to overcome barriers to the achievement of the State of California's statutory energy goals by demonstrating the ability of targeted advanced demand-side management (DSM) projects to meet specific grid needs, and further by demonstrating that an advanced microgrid can operate in a fashion that delivers substantial benefits to the grid without negatively affecting WWTP operation.

Advanced DSM projects to meet specific targeted applications and grid needs have been relatively rare, despite being first in California's loading order. There are a few notable exceptions, such as the Southern California Edison Local Capacity Requirements program. Despite the fact that targeted advanced DSM practices such as advanced microgrids can be faster and lower in price than other options for applications ranging from resource adequacy to providing critical ancillary services to solving local capacity constraints, advanced DSM practices are often not even considered as an option due to a lack of perceived reliability.

[2] California Public Resources Code, Section 25711.5(a) requires projects funded by the Electric Program Investment Charge (EPIC) to result in ratepayer benefits. The California Public Utilities Commission, which established the EPIC in 2011, defines ratepayer benefits as greater reliability, lower costs, and increased safety (See CPUC "Phase 2" Decision 12-05-037 at page 19, May 24, 2012, http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF).

[3] California Public Resources Code, Section 25711.5(a) also requires EPIC-funded projects to lead to technological advancement and breakthroughs to overcome barriers that prevent the achievement of the state's statutory and energy goals.

EXHIBIT A
Scope of Work

WWTPs, while being large loads that are often perfectly located to meet specific local needs with an advanced microgrid approach, are reluctant to participate due to a perception of risk to critical processes associated with ceding some level of plant control to outsiders. This project proposes to act as a positive example to both domains. It will endeavor to show that concerns regarding the application of advanced DSM in general, and advanced microgrids in particular, while not unfounded, can be reliably mitigated through proper system design.

Agreement Objectives

The objectives of this Agreement are to:

- Demonstrate the ability of an advanced microgrid and its associated subsystems, such as man-in-the-loop day-ahead load nomination systems, to operate at a WWTP without negatively affecting plant operation
- Demonstrate the ability of a microgrid operating at a WWTP to meet the design objectives of the US Department of Energy (DOE) microgrid standard
- Demonstrate the ability of an advanced microgrid to reliably deliver ancillary services to the grid as predicted, offered, and dispatched.

EXHIBIT A
Scope of Work

II. TASK 1 GENERAL PROJECT TASKS

PRODUCTS

Subtask 1.1 Products
The goal of this subtask is to establish the requirements for submitting project products (e.g., reports, summaries, plans, and presentation materials). Unless otherwise specified by the Commission Agreement Manager (CAM), the Recipient must deliver products as required below by the dates listed in the **Project Schedule (Part V).** Products that require a draft version are indicated by marking **"(draft and final)"** after the product name in the "Products" section of the task/subtask. If "(draft and final)" does not appear after the product name, only a final version of the product is required. With respect to due dates within this Scope of Work, **"days"** means working days.

The Recipient shall:

For products that require a draft version

- Submit all draft products to the CAM for review and comment in accordance with the Project Schedule (Part V). The CAM will provide written comments to the Recipient on the draft product within 15 days of receipt, unless otherwise specified in the task/subtask for which the product is required.
- Submit the final product to the CAM once agreement has been reached on the draft. The CAM will provide written approval of the final product within 15 days of receipt, unless otherwise specified in the task/subtask for which the product is required.
- If the CAM determines that the final product does not sufficiently incorporate his/her comments, submit the revised product to the CAM within 10 days of notice by the CAM, unless the CAM specifies a longer time period.

For products that require a final version only

- Submit the product to the CAM for approval.
- If the CAM determines that the product requires revision, submit the revised product to the CAM within 10 days of notice by the CAM, unless the CAM specifies a longer time period.

For all products

- Submit all data and documents required as products in accordance with the following Instructions for Submitting Electronic Files and Developing Software:

    - **Electronic File Format**
      Submit all data and documents required as products under this Agreement in an electronic file format that is fully editable and compatible with the Energy Commission's software and Microsoft (MS)-operating computing platforms, or with any other format approved by the CAM. Deliver an electronic copy of the full text of any Agreement data and documents in a format specified by the CAM, such as memory stick or CD-ROM.

      The following describes the accepted formats for electronic data and documents provided to the Energy Commission as products under this Agreement, and establishes the software versions that will be required to review and approve all software products:
        - Data sets will be in MS Access or MS Excel file format

(version 2007 or later), or any other format approved by the CAM.
- Text documents will be in MS Word file format, version 2007 or later.
- Documents intended for public distribution will be in PDF file format. The Recipient must also provide the native Microsoft file format.
- Project management documents will be in Microsoft Project file format, version 2007 or later.

- ***Software Application Development***
  Use the following standard Application Architecture components in compatible versions for any software application development required by this Agreement (e.g., databases, models, modeling tools), unless the CAM approves other software applications such as open source programs:
  - Microsoft ASP.NET framework (version 3.5 and up). Recommend 4.0.
  - Microsoft Internet Information Services (IIS), (version 6 and up) Recommend 7.5.
  - Visual Studio.NET (version 2008 and up). Recommend 2010.
  - C# Programming Language with Presentation (UI), Business Object and Data Layers.
  - SQL (Structured Query Language).
  - Microsoft SQL Server 2008, Stored Procedures. Recommend 2008 R2.
  - Microsoft SQL Reporting Services. Recommend 2008 R2.
  - XML (external interfaces).

Any exceptions to the Electronic File Format requirements above must be approved in writing by the CAM. The CAM will consult with the Energy Commission's Information Technology Services Branch to determine whether the exceptions are allowable.

MEETINGS

Subtask 1.2 Kick-off Meeting
The goal of this subtask is to establish the lines of communication and procedures for implementing this Agreement.

The Recipient shall:
- Attend a "Kick-off" meeting with the CAM, the Commission Agreement Officer (CAO), and any other Energy Commission staff relevant to the Agreement. The Recipient will bring its Project Manager and any other individuals designated by the CAM to this meeting. The administrative and technical aspects of the Agreement will be discussed at the meeting. Prior to the meeting, the CAM will provide an agenda to all potential meeting participants. The meeting may take place in person or by electronic conferencing (e.g., WebEx), with approval of the CAM.

  The administrative portion of the meeting will include discussion of the following:
  - Terms and conditions of the Agreement;
  - Administrative products (subtask 1.1);

- CPR meetings (subtask 1.3);
- Match fund documentation (subtask 1.7);
- Permit documentation (subtask 1.8);
- Subcontracts (subtask 1.9); and
- Any other relevant topics.

The technical portion of the meeting will include discussion of the following:

- The CAM's expectations for accomplishing tasks described in the Scope of Work;
- An updated Project Schedule;
- Technical products (subtask 1.1);
- Progress reports and invoices (subtask 1.5);
- Final Report (subtask 1.6);
- Technical Advisory Committee meetings (subtasks 1.10 and 1.11); and
- Any other relevant topics.

- Provide an *Updated Project Schedule, List of Match Funds,* and *List of Permits*, as needed to reflect any changes in the documents.

The CAM shall:

- Designate the date and location of the meeting.
- Send the Recipient a *Kick-off Meeting Agenda*.

Recipient Products:

- Updated Project Schedule *(if applicable)*
- Updated List of Match Funds *(if applicable)*
- Updated List of Permits *(if applicable)*

CAM Product:

- Kick-off Meeting Agenda

Subtask 1.3 Critical Project Review (CPR) Meetings

The goal of this subtask is to determine if the project should continue to receive Energy Commission funding, and if so whether any modifications must be made to the tasks, products, schedule, or budget. CPR meetings provide the opportunity for frank discussions between the Energy Commission and the Recipient. As determined by the CAM, discussions may include project status, challenges, successes, advisory group findings and recommendations, final report preparation, and progress on technical transfer and production readiness activities (if applicable). Participants will include the CAM and the Recipient, and may include the CAO and any other individuals selected by the CAM to provide support to the Energy Commission.

CPR meetings generally take place at key, predetermined points in the Agreement, as determined by the CAM and as shown in the Task List on page 1 of this Exhibit. However, the CAM may schedule additional CPR meetings as necessary. The budget will be reallocated to cover the additional costs borne by the Recipient, but the overall Agreement amount will not increase. CPR meetings generally take place at the Energy Commission, but they may take place at another location, or may be conducted via electronic conferencing (e.g., WebEx) as determined by the CAM.

EXHIBIT A
Scope of Work

The Recipient shall:

- Prepare a *CPR Report* for each CPR meeting that: (1) discusses the progress of the Agreement toward achieving its goals and objectives; and (2) includes recommendations and conclusions regarding continued work on the project.
- Submit the CPR Report along with any other *Task Products* that correspond to the technical task for which the CPR meeting is required (i.e., if a CPR meeting is required for Task 2, submit the Task 2 products along with the CPR Report).
- Attend the CPR meeting.
- Present the CPR Report and any other required information at each CPR meeting.

The CAM shall:

- Determine the location, date, and time of each CPR meeting with the Recipient's input.
- Send the Recipient a *CPR Agenda* and a *List of Expected CPR Participants* in advance of the CPR meeting. If applicable, the agenda will include a discussion of match funding and permits.
- Conduct and make a record of each CPR meeting. Provide the Recipient with a *Schedule for Providing a Progress Determination* on continuation of the project.
- Determine whether to continue the project, and if so whether modifications are needed to the tasks, schedule, products, or budget for the remainder of the Agreement. If the CAM concludes that satisfactory progress is not being made, this conclusion will be referred to the Deputy Director of the Energy Research and Development Division.
- Provide the Recipient with a *Progress Determination* on continuation of the project, in accordance with the schedule. The Progress Determination may include a requirement that the Recipient revise one or more products.

Recipient Products:

- CPR Report(s)
- Task Products (draft and/or final as specified in the task)

CAM Products:

- CPR Agenda
- List of Expected CPR Participants
- Schedule for Providing a Progress Determination
- Progress Determination

Subtask 1.4 Final Meeting

The goal of this subtask is to complete the closeout of this Agreement.

The Recipient shall:

- Meet with Energy Commission staff to present project findings, conclusions, and recommendations. The final meeting must be completed during the closeout of this Agreement. This meeting will be attended by the Recipient and CAM, at a minimum. The meeting may occur in person or by electronic conferencing (e.g., WebEx), with approval of the CAM.

The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be divided into two separate meetings at the CAM's discretion.

- The technical portion of the meeting will involve the presentation of findings, conclusions, and recommended next steps (if any) for the Agreement. The CAM will determine the appropriate meeting participants.
- The administrative portion of the meeting will involve a discussion with the CAM and the CAO of the following Agreement closeout items:
    - Disposition of any state-owned equipment.
    - Need to file a Uniform Commercial Code Financing Statement (Form UCC-1) regarding the Energy Commission's interest in patented technology.
    - The Energy Commission's request for specific "generated" data (not already provided in Agreement products).
    - Need to document the Recipient's disclosure of "subject inventions" developed under the Agreement.
    - "Surviving" Agreement provisions such as repayment provisions and confidential products.
    - Final invoicing and release of retention.

- Prepare a *Final Meeting Agreement Summary* that documents any agreement made between the Recipient and Commission staff during the meeting.
- Prepare a *Schedule for Completing Agreement Closeout Activities*.
- Provide *All Draft and Final Written Products* on a CD-ROM or USB memory stick, organized by the tasks in the Agreement.

Products:

- Final Meeting Agreement Summary *(if applicable)*
- Schedule for Completing Agreement Closeout Activities
- All Draft and Final Written Products

REPORTS AND INVOICES

Subtask 1.5 Progress Reports and Invoices

The goals of this subtask are to: (1) periodically verify that satisfactory and continued progress is made towards achieving the project objectives of this Agreement; and (2) ensure that invoices contain all required information and are submitted in the appropriate format.

The Recipient shall:

- Submit a monthly *Progress Report* to the CAM. Each progress report must:
    - Summarize all Agreement activities conducted by the Recipient for the preceding month, including an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. See the Progress Report Format Attachment for the recommended specifications.
    - Provide a synopsis of the project progress, including accomplishments, problems, milestones, products, schedule, fiscal status, and any evidence of progress such as photographs.
- Submit a monthly or quarterly *Invoice* that follows the instructions in the "Payment of

Funds" section of the terms and conditions. In addition, each invoice must document and verify:

- Energy Commission funds received by California-based entities;
- Energy Commission funds spent in California *(if applicable)*; and
- Match fund expenditures.

Products:

- Progress Reports
- Invoices

Subtask 1.6 Final Report

The goal of this subtask is to prepare a comprehensive Final Report that describes the original purpose, approach, results, and conclusions of the work performed under this Agreement. The CAM will review and approve the Final Report, which will be due at least **two months** before the Agreement end date. When creating the Final Report Outline and the Final Report, the Recipient must use a Style Manual provided by the CAM.

Subtask 1.6.1 Final Report Outline

The Recipient shall:

- Prepare a *Final Report Outline* in accordance with the *Style Manual* provided by the CAM.
- Submit a draft of the outline to the CAM for review and comment.
- Once agreement has been reached on the draft, submit the final outline to the CAM. The CAM will provide written approval of the final outline within 10 days of receipt.

Recipient Products:

- Final Report Outline (draft and final)

CAM Products:

- Style Manual
- Comments on Draft Final Report Outline
- Approval of Final Report Outline

Subtask 1.6.2 Final Report

The Recipient shall:

- Prepare a *Final Report* for this Agreement in accordance with the approved Final Report Outline and the Style Manual provided by the CAM.
- Submit a draft of the report to the CAM for review and comment. Once agreement on the draft report has been reached, the CAM will forward the electronic version for Energy Commission internal approval. Once the CAM receives approval, he/she will provide written approval to the Recipient.
- Submit one bound copy of the Final Report to the CAM.

Products:

- Final Report (draft and final)

CAM Products:

- Comments on Draft Final Report

MATCH FUNDS, PERMITS, AND SUBCONTRACTS

Subtask 1.7 Match Funds

The goal of this subtask is to ensure that the Recipient obtains any match funds planned for this Agreement and applies them to the Agreement during the Agreement term.

While the costs to obtain and document match funds are not reimbursable under this Agreement, the Recipient may spend match funds for this task. The Recipient may only spend match funds during the Agreement term, either concurrently or prior to the use of Energy Commission funds. Match funds must be identified in writing, and the Recipient must obtain any associated commitments before incurring any costs for which the Recipient will request reimbursement.

The Recipient shall:

- Prepare a *Match Funds Status Letter* that documents the match funds committed to this Agreement. If no match funds were part of the proposal that led to the Energy Commission awarding this Agreement and none have been identified at the time this Agreement starts, then state this in the letter.

  If match funds were a part of the proposal that led to the Energy Commission awarding this Agreement, then provide in the letter:
  - A list of the match funds that identifies:
    - The amount of cash match funds, their source(s) (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied.
    - The amount of each in-kind contribution, a description of the contribution type (e.g., property, services), the documented market or book value, the source (including a contact name, address, and telephone number), and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Recipient must identify its owner and provide a contact name, address, telephone number, and the address where the property is located.
  - A copy of a letter of commitment from an authorized representative of each source of match funding that the funds or contributions have been secured.
- At the Kick-off meeting, discuss match funds and the impact on the project if they are significantly reduced or not obtained as committed. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide a *Supplemental Match Funds Notification Letter* to the CAM of receipt of additional match funds.
- Provide a *Match Funds Reduction Notification Letter* to the CAM if existing match funds are reduced during the course of the Agreement. Reduction of match funds may trigger a CPR meeting.

Products:

- Match Funds Status Letter

- Supplemental Match Funds Notification Letter *(if applicable)*
- Match Funds Reduction Notification Letter *(if applicable)*

Subtask 1.8 Permits
The goal of this subtask is to obtain all permits required for work completed under this Agreement in advance of the date they are needed to keep the Agreement schedule on track. Permit costs and the expenses associated with obtaining permits are not reimbursable under this Agreement, with the exception of costs incurred by University of California recipients. Permits must be identified and obtained before the Recipient may incur any costs related to the use of the permit(s) for which the Recipient will request reimbursement.

The Recipient shall:

- Prepare a *Permit Status Letter* that documents the permits required to conduct this Agreement. If no permits are required at the start of this Agreement, then state this in the letter. If permits will be required during the course of the Agreement, provide in the letter:
    - A list of the permits that identifies: (1) the type of permit; and (2) the name, address, and telephone number of the permitting jurisdictions or lead agencies.
    - The schedule the Recipient will follow in applying for and obtaining the permits.

  The list of permits and the schedule for obtaining them will be discussed at the Kick-off meeting (subtask 1.2), and a timetable for submitting the updated list, schedule, and copies of the permits will be developed. The impact on the project if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in progress reports and will be a topic at CPR meetings.
- If during the course of the Agreement additional permits become necessary, then provide the CAM with an *Updated List of Permits* (including the appropriate information on each permit) and an *Updated Schedule for Acquiring Permits*.
- Send the CAM a *Copy of Each Approved Permit*.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the CAM within 5 days. Either of these events may trigger a CPR meeting.

Products:

- Permit Status Letter
- Updated List of Permits *(if applicable)*
- Updated Schedule for Acquiring Permits *(if applicable)*
- Copy of each Approved Permit *(if applicable)*

Subtask 1.9 Subcontracts
The goals of this subtask are to: (1) procure subcontracts required to carry out the tasks under this Agreement; and (2) ensure that the subcontracts are consistent with the terms and conditions of this Agreement.

The Recipient shall:

- Manage and coordinate subcontractor activities in accordance with the requirements of this Agreement.
- Incorporate this Agreement by reference into each subcontract.
- Include any required Energy Commission flow-down provisions in each subcontract, in addition to a statement that the terms of this Agreement will prevail if they conflict with the subcontract terms.

- If required by the CAM, submit a draft of each *Subcontract* required to conduct the work under this Agreement.
- Submit a final copy of the executed subcontract.
- Notify and receive written approval from the CAM prior to adding any new subcontractors (see the discussion of subcontractor additions in the terms and conditions).

Products:

- Subcontracts *(draft if required by the CAM)*

TECHNICAL ADVISORY COMMITTEE

Subtask 1.10 Technical Advisory Committee (TAC)

The goal of this subtask is to create an advisory committee for this Agreement. The TAC should be composed of diverse professionals. The composition will vary depending on interest, availability, and need. TAC members will serve at the CAM's discretion. The purpose of the TAC is to:

- Provide guidance in project direction. The guidance may include scope and methodologies, timing, and coordination with other projects. The guidance may be based on:
  - Technical area expertise;
  - Knowledge of market applications; or
  - Linkages between the agreement work and other past, present, or future projects (both public and private sectors) that TAC members are aware of in a particular area.
- Review products and provide recommendations for needed product adjustments, refinements, or enhancements.
- Evaluate the tangible benefits of the project to the state of California, and provide recommendations as needed to enhance the benefits.
- Provide recommendations regarding information dissemination, market pathways, or commercialization strategies relevant to the project products.

The TAC may be composed of qualified professionals spanning the following types of disciplines:

- Researchers knowledgeable about the project subject matter;
- Members of trades that will apply the results of the project (e.g., designers, engineers, architects, contractors, and trade representatives);
- Public interest market transformation implementers;
- Product developers relevant to the project;
- U.S. Department of Energy research managers, or experts from other federal or state agencies relevant to the project;
- Public interest environmental groups;
- Utility representatives;
- Air district staff; and
- Members of relevant technical society committees.

The Recipient shall:

- Prepare a *List of Potential TAC Members* that includes the names, companies, physical and electronic addresses, and phone numbers of potential members. The list will be

discussed at the Kick-off meeting, and a schedule for recruiting members and holding the first TAC meeting will be developed.
- Recruit TAC members. Ensure that each individual understands member obligations and the TAC meeting schedule developed in subtask 1.11.
- Prepare a *List of TAC Members* once all TAC members have committed to serving on the TAC.
- Submit *Documentation of TAC Member Commitment* (such as Letters of Acceptance) from each TAC member.

Products:
- List of Potential TAC Members
- List of TAC Members
- Documentation of TAC Member Commitment

Subtask 1.11 TAC Meetings
The goal of this subtask is for the TAC to provide strategic guidance for the project by participating in regular meetings, which may be held via teleconference.

The Recipient shall:
- Discuss the TAC meeting schedule with the CAM at the Kick-off meeting. Determine the number and location of meetings (in-person and via teleconference) in consultation with the CAM.
- Prepare a *TAC Meeting Schedule* that will be presented to the TAC members during recruiting. Revise the schedule after the first TAC meeting to incorporate meeting comments.
- Prepare a *TAC Meeting Agenda* and *TAC Meeting Back-up Materials* for each TAC meeting.
- Organize and lead TAC meetings in accordance with the TAC Meeting Schedule. Changes to the schedule must be pre-approved in writing by the CAM.
- Prepare *TAC Meeting Summaries* that include any recommended resolutions of major TAC issues.

Products:
- TAC Meeting Schedule (draft and final)
- TAC Meeting Agendas (draft and final)
- TAC Meeting Back-up Materials
- TAC Meeting Summaries

III. TECHNICAL TASKS
The equipment installation and demonstration will occur at the Laguna Wastewater Treatment Plant in Santa Rosa.

TASK 2: INSTALL SELECTIVE CATALYTIC REDUCTION EQUIPMENT
The goal of this task is to install, commission and operate selective catalytic reduction (SCR) emissions control equipment on two gas-fired electrical generators.

EXHIBIT A
Scope of Work

The Recipient shall:

- Produce a final design for the installation of the SCR units, and submit a *Construction-Ready Plan Set for SCR Equipment* to the CAM.
- Prepare and submit Bay Area Air Quality Management District applications for increased annual run time on upgraded units, and obtain permits for the same. Provide a *copy of the Bay Area Air Quality Management District application and permit* to the CAM.
- Install and commission operation of the SCR units, and prepare and provide a *Report on SCR Installation and Commissioning*.
- Conduct training with Laguna WWTP personnel to review operational requirements of new equipment. Prepare and provide *SCR Equipment Training Materials*.

Products:

- Copy of the Bay Area Air Quality Management District application and permit
- Construction-Ready Plan Set for SCR Equipment
- Report on SCR Installation and Commissioning
- SCR Equipment Training Materials

TASK 3: INSTALL AND INTEGRATE MICROGRID CONTROLLER AND AUTOMATION

The goal of this task is to install, commission, and operate a microgrid controller (MGC) to actively coordinate the activities of the plant loads, gas fired generators, photovoltaic system, and battery. Tasks 2, 4 and 5 will largely be completed when Task 3 begins. Task 3 will integrate the components installed in Tasks 2, 4 and 5, and provide the demonstration of the integrated system. All elements controlled by the MGC are mature technologies that are well understood, but operation of these individual elements as an integrated system is novel. Tasks 2, 4 and 5 simply procure and install the components but do not include the analysis and research for the integrated system, which will take place in Task 3. At least 12 months of operational data will be collected.

The Recipient shall:

- Produce a final design for the installation of the MGC, and submit a *Design and Installation Plan for the MGC* to the CAM.
- Prepare and submit a *Measurement and Verification Plan* covering:
    - Basic microgrid functionality in accordance with the DOE microgrid test standards promulgated as part of DE-FOA-0000997 “Microgrid Research, Development, and System Design”. Specifically, microgrid controllers developed under the referenced DOE funding opportunity announcement must at a minimum satisfy the technical functional requirements regarding the following attributes for operating and managing a microgrid system:
        - Disconnection
        - Resynchronization and reconnection
        - Steady-state frequency range, voltage range, and power quality
        - Protection
        - Dispatch
        - Enhanced resilience
    - Advanced microgrid functionality: Overall operation of the plant and of the MGC will be continuously logged at 4-second intervals throughout the test period. This periodicity was chosen to facilitate comparison with traditional generation assets responding to Automated Generation Signal controls typically in use by balancing

authorities. In addition to the overall load that the plant is presenting to the grid, the MGC will also log data on:

- Power output from the PV system
- Power output from each of the gas fired generating sets
- Total motor load of the plant
- Current dispatched demand response
- Battery data including charge, discharge, and state of charge

This aggregated data will be able to be compared to the interval meter data for the meter for the entire facility for validation.

- Prepare and submit applications for MGC, and obtain permits for the same. Provide a *copy of the City of Santa Rosa building permit for the MGC* to the CAM.
- Design a man-in-the-loop interface for plant loads and prepare and provide a *Report on Load Nomination System*. The report should include and is not limited to the following:
  - Graphical presentations of the estimated flows the plant expects to receive over the next day
  - Minimum flows that are needed to maintain proper plant operation, and maximum flows that can be accommodated at any time
  - Documentation of the MGC's ability to use a combination of adaptive database algorithms and known plant load response to convert hour-by-hour load nomination offers into an hour-by-hour available load shed schedules, which will take into account the time lag between flow diversion and load reductions
  - Availability of distributed electrical generation and storage, and their scheduling and coordination by the MGC.
- Install and commission the MGC.
- Conduct testing to the above DOE microgrid test standards for basic MGC operation, and to the above description for advanced MGC operation, per the Measurement and Verification Plan.
- Demonstrate ability of the MGC to communicate with and control all loads and generation assets.
- Prepare and provide a *Report on MGC Integration and Operation* that will include details about MGC integration with grid operational control and with each plant component, including but not limited to the plant loads, gas fired generators, photovoltaic system, and battery.
- Demonstrate the ability of the adaptive logic functions of the MGC to reliably convert load elections to hour by hour load shedding/power operating bands.
- Collect at least 12 months of operational data from the integrated microgrid system. The partial and full data and results will be presented in meetings as appropriate, and will be presented in the Final Report per Task 1.6.
- Participate in a CPR meeting per Task 1.3

Products:

- Copy of the City of Santa Rosa building permit for the MGC
- Measurement and Verification Plan
- Design and Installation Plan for the MGC
- Report on Load Nomination System
- Report on MGC Integration and Operation
- CPR Report

EXHIBIT A
Scope of Work

TASK 4: INSTALL ENERGY STORAGE

The goal of this task is to design, install, commission, and operate an electrical energy storage system. The planned capacity of the energy storage system is 2 megawatts.

The Recipient shall:

- Produce a final design for the installation of the energy storage system, and submit a *Construction-Ready Plan Set for the Energy Storage System* to the CAM.
- Prepare and submit applications for energy storage system, and obtain permits for the same. Submit a *copy of the City of Santa Rosa building permit for electrical energy storage system* to the CAM.
- Install and commission operation of the energy storage system. Prepare and provide a *Report on Energy Storage System Commissioning* and submit to the CAM. The report shall include and is not limited to the following:
    - Documentation of energy storage integration into the microgrid to allow the load of the plant as a whole to respond quickly to regulation up or regulation down signals from the system operator, while still accommodating the slower response capabilities of the remainder of the plant.
- Conduct training with Laguna WWTP personnel to review operational requirements of new equipment, and provide *Energy Storage Training Materials* to the CAM.

Products:

- Construction-Ready Plan Set for the Energy Storage System
- Copy of the City of Santa Rosa Building Permit for the Electrical Energy Storage System
- Report on Energy Storage System Commissioning
- Energy Storage System Training Materials

TASK 5: INSTALL PHOTOVOLTAIC SYSTEM

The goal of this task is to install, commission and operate a solar photovoltaic (PV) system at the WWTP.

The Recipient shall:

- Produce a final design for the installation of the PV system, and submit a *Construction-Ready Plan Set for the PV System* to the CAM.
- Prepare and submit applications for the PV system, and obtain permits for the same. Submit a *copy of the City of Santa Rosa Building Permit for the PV System* to the CAM.
- Install and commission operation of the PV system. Prepare and provide a *Report on PV System Commissioning* and submit to the CAM. The report should include and is not limited to the following:
    - Documentation of the PV system's integration with the smart inverter and other plant microgrid components.
- Conduct training with Laguna WWTP personnel to review operational requirements of new equipment, and provide *PV System Training Materials* to the CAM.
- Participate in a CPR meeting per Task 1.3

Products:

- Construction-Ready Plan Set for the PV System
- Copy of City of Santa Rosa Building Permit for the PV System
- Report on PV System Commissioning

- PV System Training Materials
- CPR Report

TASK 6 EVALUATION OF PROJECT BENEFITS
The goal of this task is to report the benefits resulting from this project.

The Recipient shall:

- Complete three Project Benefits Questionnaires that correspond to three main intervals in the Agreement: (1) *Kick-off Meeting Benefits Questionnaire*; (2) *Mid-term Benefits Questionnaire*; and (3) *Final Meeting Benefits Questionnaire*.
- Provide all key assumptions used to estimate projected benefits, including targeted market sector (e.g., population and geographic location), projected market penetration, baseline and projected energy use and cost, operating conditions, and emission reduction calculations. Examples of information that may be requested in the questionnaires include:

    - For Product Development Projects and Project Demonstrations:
        - Published documents, including date, title, and periodical name.
        - Estimated or actual energy and cost savings, and estimated statewide energy savings once market potential has been realized. Identify all assumptions used in the estimates.
        - Greenhouse gas and criteria emissions reductions.
        - Other non-energy benefits such as reliability, public safety, lower operational cost, environmental improvement, indoor environmental quality, and societal benefits.
        - Data on potential job creation, market potential, economic development, and increased state revenue as a result of the project.
        - A discussion of project product downloads from websites, and publications in technical journals.
        - A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.
        - Additional Information for Product Development Projects:
            - Outcome of product development efforts, such copyrights and license agreements.
            - Units sold or projected to be sold in California and outside of California.
            - Total annual sales or projected annual sales (in dollars) of products developed under the Agreement.
            - Investment dollars/follow-on private funding as a result of Energy Commission funding.
            - Patent numbers and applications, along with dates and brief descriptions.
        - Additional Information for Product Demonstrations:
            - Outcome of demonstrations and status of technology.
            - Number of similar installations.
            - Jobs created/retained as a result of the Agreement.

    - For Information/Tools and Other Research Studies:
        - Outcome of project.

- Published documents, including date, title, and periodical name.
- A discussion of policy development. State if the project has been cited in government policy publications or technical journals, or has been used to inform regulatory bodies.
- The number of website downloads.
- An estimate of how the project information has affected energy use and cost, or have resulted in other non-energy benefits.
- An estimate of energy and non-energy benefits.
- Data on potential job creation, market potential, economic development, and increased state revenue as a result of project.
- A discussion of project product downloads from websites, and publications in technical journals.
- A comparison of project expectations and performance. Discuss whether the goals and objectives of the Agreement have been met and what improvements are needed, if any.

- Respond to CAM questions regarding responses to the questionnaires.

The Energy Commission may send the Recipient similar questionnaires after the Agreement term ends. Responses to these questionnaires will be voluntary.

Products:

- Kick-off Meeting Benefits Questionnaire
- Mid-term Benefits Questionnaire
- Final Meeting Benefits Questionnaire

TASK 7 TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES

The goal of this task is to develop a plan to make the knowledge gained, experimental results, and lessons learned available to the public and key decision makers.

The Recipient shall:

- Prepare an *Initial Fact Sheet* at start of the project that describes the project. Use the format provided by the CAM.
- Prepare a *Final Project Fact Sheet* at the project's conclusion that discusses results. Use the format provided by the CAM.
- Prepare a *Technology/Knowledge Transfer Plan* that includes:
  - An explanation of how the knowledge gained from the project will be made available to the public, including the targeted market sector and potential outreach to end users, utilities, regulatory agencies, and others.
  - A description of the intended use(s) for and users of the project results.
  - Published documents, including date, title, and periodical name.
  - Copies of documents, fact sheets, journal articles, press releases, and other documents prepared for public dissemination. These documents must include the Legal Notice required in the terms and conditions. Indicate where and when the documents were disseminated.
  - A discussion of policy development. State if project has been or will be cited in government policy publications, or used to inform regulatory bodies.
  - The number of website downloads or public requests for project results.

- Additional areas as determined by the CAM.

- Conduct technology transfer activities in accordance with the Technology/Knowledge Transfer Plan. These activities will be reported in the Progress Reports.
- When directed by the CAM, develop *Presentation Materials* for an Energy Commission-sponsored conference/workshop on the results of the project.
- Prepare a *Technology/Knowledge Transfer Report* on technology transfer activities conducted during the project.

Products:

- Initial Fact Sheet (draft and final)
- Final Project Fact Sheet (draft and final)
- Presentation Materials (draft and final)
- Technology/Knowledge Transfer Plan (draft and final)
- Technology/Knowledge Transfer Report (draft and final)

EXHIBIT C

ELECTRIC PROGRAM INVESTMENT CHARGE (EPIC) STANDARD GRANT TERMS AND CONDITIONS

TABLE OF CONTENTS

EXHIBIT C
TERMS AND CONDITIONS

1. Introduction

This grant agreement (Agreement) between the California Energy Commission (Energy Commission, or Commission) and the Recipient is funded by the Electric Program Investment Charge (EPIC), an electricity ratepayer surcharge authorized by the California Public Utilities Commission (CPUC).

This Agreement includes: (1) the Agreement signature page **(form CEC-146)**; (2) the scope of work **(Exhibit A)**; (3) the budget **(Exhibit B)**; (4) these terms and conditions **(Exhibit C)**; (5) any special terms and conditions that address the unique circumstances of the funded project **(Exhibit D)**; (6) a contacts list **(Exhibit E)**; (7) all attachments; and (8) all documents incorporated by reference.

All work and expenditure of funds (Commission-reimbursed and/or match share) must occur within the Agreement term specified on the CEC-146 form.

2. Documents Incorporated by Reference

The documents below are incorporated by reference into this Agreement. These terms and conditions will govern in the event of a conflict with the documents below, with the exception of the documents in subsection (f). Where this Agreement or California laws and regulations are silent or do not apply, the Energy Commission will use the federal cost principles and acquisition regulations listed below as guidance in determining whether reimbursement of claimed costs is allowable. Documents incorporated by reference include:

Solicitation Documents ***(if applicable)***

a. The funding solicitation for the project supported by this Agreement

b. The Recipient's proposal submitted in response to the solicitation

CPUC Decision

c. Decision 13-11-025 (Decision Addressing Applications of the California Energy Commission, Pacific Gas and Electric Company, San Diego Gas & Electric Company and Southern California Edison Company for Approval of their Triennial Investment Plans for the Electric Program Investment Charge Program for the Years 2012 through 2014) http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M081/K773/81773445.PDF

Federal Cost Principles ***(applicable to state and local governments, Indian tribes, institutions of higher education, and nonprofit organizations)***

d. 2 Code of Federal Regulations (CFR) Part 200, Subpart E (Sections 200.400 et seq.)

Federal Acquisition Regulations ***(applicable to commercial organizations)***

e. 48 CFR, Ch.1, Subchapter E, Part 31, Subpart 31.2: Contracts with Commercial Organizations (supplemented by 48 CFR, Ch. 9, Subchapter E, Part 931, Subpart 931.2 for Department of Energy grants)

Nondiscrimination

f. 2 California Code of Regulations, Section 8101 et seq.: Contractor Nondiscrimination and Compliance

General Laws

g. Any federal, state, or local laws or regulations applicable to the project that are not expressly listed in this Agreement

3. Standard of Performance

In performing work under the Agreement, the Recipient, its subcontractors, and their employees are responsible for exercising the degree of skill and care required by customarily accepted good professional practices and procedures for the type of work performed.

4. Due Diligence

The Recipient must take timely actions that, taken collectively, move this project to completion. The Commission Agreement Manager will periodically evaluate the project schedule for completion of Scope of Work tasks. If the Commission Agreement Manager determines that: (1) the Recipient is not diligently completing the tasks in the Scope of Work; or (2) the time remaining in this Agreement is insufficient to complete all project tasks by the Agreement end date, the Commission Agreement Manager may recommend that this Agreement be terminated, and the Commission may terminate this Agreement without prejudice to any of its other remedies.

5. Products

a. **"Products"** are any tangible item specified for delivery to the Energy Commission in the Scope of Work, such as reports and summaries.

- The Recipient will submit all products identified in the Scope of Work to the Commission Agreement Manager, in the manner and form specified in the Scope of Work.
- The Recipient will also submit all products prepared during the invoicing period to the Accounting Office along with the invoice, as specified in subsection (c) of Section 8 (Payment of Funds).

If the Commission Agreement Manager determines that a product is substandard given its description and intended use as described in the Scope of Work, the Commission Agreement Manager may refuse to authorize payment for the product and any subsequent products that rely on or are based upon the product under this Agreement.

b. Confidential Products

Please see Section 19 (Confidentiality) for instructions regarding confidential products.

c. Rights in Products

The Energy Commission owns all products identified in the Scope of Work, with the exception of products that fall within the definition of "intellectual property." The Recipient owns all intellectual property developed under this Agreement (please see the "Intellectual Property" section).

The Recipient has a non-exclusive, non-transferable, irrevocable, worldwide, perpetual license to use, publish, translate, modify, and reproduce products that do not fall within the definition of "intellectual property."

d. Failure to Submit Products

Failure to submit a product required in the Scope of Work will be considered material noncompliance with the Agreement terms, unless the Commission Agreement Manager waives the failure in writing. Noncompliance may result in actions such as the withholding of future payments or awards, or the suspension or termination of the Agreement.

e. Final Report and Payment

The Recipient may only submit a request for the final payment (including any retention) after the final report is completed and the Commission Agreement Manager has verified satisfactory completion of work.

f. Legal Statements on Products

1) All documents that result from work funded by this Agreement and are released to the public must include the following statement to ensure no Commission endorsement of documents:

LEGAL NOTICE

This document was prepared as a result of work sponsored by the California Energy Commission. It does not necessarily represent the views of the Energy Commission, its employees, or the State of California. Neither the Commission, the State of California, nor the Commission's employees, contractors, or subcontractors makes any warranty, express or implied, or assumes any legal liability for the information in this document nor does any party represent that the use of this information will not infringe upon privately owned rights. This document has not been approved or disapproved by the Commission, nor has the Commission passed upon the accuracy of the information in this document.

2) The Recipient will apply copyright notices to all documents prepared for this Agreement that are released to the public (including reports, articles submitted for publication, and all reprints) using the following form or any other form that may be reasonably specified by the Energy Commission.

"©[Year of first publication of product] [the Copyright Holder's name]. All Rights Reserved."

6. Amendments

a. Procedure for Requesting Changes

The Recipient must submit a written request to the Commission Agreement Manager for any change to the Agreement. The request must include:

- A brief summary of the proposed change;
- A brief summary of the reason(s) for the change; and
- The revised section(s) of the Agreement, with changes made in underline/ strikethrough format.

b. Approval of Changes

Certain changes to the Agreement (e.g., changes that increase the Agreement amount or substitute one Recipient for another) must be approved at a Commission business meeting or by the Executive Director (or his/her designee). Generally, changes that are not significant to the Agreement may be documented in a Letter of Agreement signed by both parties (electronic signatures are acceptable). See Attachment 2 for a sample Letter of Agreement.

The Commission Agreement Manager or Commission Agreement Officer will provide the Recipient with guidance regarding the level of Commission approval required for a proposed change.

c. Personnel or Subcontractor Changes

All changes below require advance written approval by the Commission Agreement Manager, in addition to the appropriate level of Commission approval as described in subsection (b).

1) Replacement of Key Personnel, Subcontractors, and Vendors

The Commission Agreement Manager must provide advance written approval of the replacement of personnel, subcontractors, and vendors who are identified in the Agreement and are critical to the outcome of the project, such as the Project Manager.

2) Assignment of New Personnel to an Existing Job Classification

If the Recipient or a subcontractor seeks to assign new personnel to a job classification identified in Exhibit B, the Recipient or subcontractor must submit the individual's resume and proposed job classification and rate to the Commission Agreement Manager for approval. The proposed rate may not exceed the maximum rate identified for the job classification. Neither the Recipient nor any subcontractor may use the job classifications or rates of their subcontractors for personnel.

If the individual performs any work prior to the effective date of the amendment documenting the change, the Recipient will bear the expense of the work.

3) Promotion of Existing Personnel to an Existing Job Classification

Recipient or subcontractor personnel that are identified in Exhibit B may be assigned to a higher-paying job classification identified in Exhibit B. If the Recipient performs any work under the new rate prior to the effective date of the amendment documenting the change, the Recipient will bear the expense of the difference between the new and old rates.

4) Addition of Subcontractors

In order to add subcontractors to Exhibit B, the Commission Agreement Manager must submit a "Subcontractor Addition" form to the Commission Agreement Officer. The form identifies the new subcontractor, bidding method used (competitive or non-competitive), and the tasks the new subcontractor will perform.

5) Addition of Job Classifications and Changes in Hours

6) Increased Direct Operating Expenses and Rates that Exceed the Expenses and Rates Identified in Exhibit B

7. Contracting and Procurement Procedures

This section provides general requirements for agreements entered into between the Recipient and subcontractors for the performance of this Agreement.

a. Contractor's Obligations to Subcontractors

1) The Recipient is responsible for handling all contractual and administrative issues arising out of or related to any subcontracts it enters into for the performance of this Agreement.

2) Nothing contained in this Agreement or otherwise creates any contractual relation between the Commission and any subcontractors, and no subcontract may relieve the Recipient of its responsibilities under this Agreement. The Recipient agrees to be as fully responsible to the Commission for the acts and omissions of its subcontractors or persons directly or indirectly employed by any of them as it is for the acts and omissions of persons directly employed by the Recipient.

The Recipient's obligation to pay its subcontractors is an independent obligation from the Commission's obligation to make payments to the Recipient. As a result, the Commission has no obligation to pay or enforce the payment of any funds to any subcontractor.

3) The Recipient is responsible for establishing and maintaining contractual agreements with and reimbursing each subcontractor for work performed in accordance with the terms of this Agreement.

b. Flow-Down Provisions

Subcontracts funded in whole or in part by this Agreement must include language conforming to the provisions below, unless the subcontracts are entered into by the University of California (UC) or the U.S. Department of Energy (DOE) national laboratories. UC may use the terms and conditions negotiated by the Energy Commission with UC for its subcontracts. DOE national laboratories may use the terms and conditions negotiated with DOE (please contact the Commission Grants Officer for these terms).

- Standard of Performance (Section 3)
- Legal Statements on Products (included in Section 5, "Products")
- Travel and Per Diem (Section 9)
- Prevailing Wage (Section 10)
- Recordkeeping, Cost Accounting, and Auditing (Section 11)
- Equipment (Section 14)
- Disputes (Section 15)
- Indemnification (Section 18)
- Confidentiality (Section 19)
- Pre-Existing and Independently Funded Intellectual Property (Section 20)
- Intellectual Property (Section 21)
- Royalty Payments to the Commission (Section 22)
- Access to Sites and Records (included in Section 23, "General Provisions")
- Nondiscrimination (included in Section 24, "Certifications and Compliance")

- Survival of the following sections:
  - Equipment (Section 14)
  - Recordkeeping, Cost Accounting, and Auditing (Section 11)
  - Pre-Existing and Independently Funded Intellectual Property (Section 20)
  - Intellectual Property (Section 21)
  - Royalty Payments to the Commission (Section 22)
  - Access to Sites and Records (included in Section 23, "General Provisions")

Subcontracts funded in whole or in part by this Agreement must also include the following:

- A clear and accurate description of the material, products, or services to be procured.
- A detailed budget and timeline.
- Provisions that allow for administrative, contractual, or legal remedies in instances where subcontractors breach contract terms, in addition to sanctions and penalties as may be appropriate.
- Provisions for termination by the Recipient, including termination procedures and the basis for settlement.
- A statement that further assignments will not be made to any third or subsequent tier subcontractor without additional advance written consent of the Commission.

c. Audits

All subcontracts entered into for the performance of this Agreement are subject to examination and audit by the Energy Commission and/or Bureau of State Audits for a period of three (3) years after payment of the Recipient's final invoice under this Agreement. The Energy Commission may audit subcontracts that are relevant to the Recipient's royalty payment obligations (see Section 22) for a period of ten (10) years after the Agreement's end date.

d. Copies of Subcontracts

The Recipient must provide a copy of its subcontracts upon request by the Energy Commission.

e. Conflicting Subcontract Terms

Prior to the execution of this Agreement, the Recipient will notify the Commission Agreement Manager of any known or reasonably foreseeable conflicts between this Agreement and its agreements with any subcontractors (e.g., conflicting intellectual property or payment terms). If the Recipient discovers any such conflicts after the execution of this Agreement, it will notify the Commission Agreement Manager of the conflict within fifteen (15) days of discovery. The Energy Commission may terminate this Agreement if any conflict impairs or diminishes its value.

f. Penalties for Noncompliance

Without limiting the Commission's other remedies, failure to comply with the above requirements may result in the termination of this Agreement.

8. Payment of Funds

The Energy Commission will reimburse the Recipient for actual allowable expenditures incurred during the Agreement term specified on the Agreement signature page (form CEC-146), provided that the expenditures are made in accordance with the Agreement. The rates in the budget are caps, or the maximum amount allowed to be billed. All work and expenditure of funds (Commission-reimbursed and/or match share) must occur within the Agreement term.

a. Conditions for Payment

1) **Actual, allowable expenses:** The Recipient may only bill for actual expenses incurred at its actual direct labor, fringe benefit, and indirect rates, not to exceed the maximum rates specified in the budget. See subsection (b) for a discussion of allowable and unallowable costs.

2) **Advance payment:** No payment will be made in advance of services rendered unless prior written approval has been obtained by the Contracts, Grants, and Loans Office, which may impose conditions on such payments. In the absence of this approval, payments will be made on a reimbursement basis for the Recipient's expenditures (i.e., after the Recipient has paid for a service, product, supplies, or other approved budget item).

3) **Frequency of payment requests:** Unless otherwise specified in the Agreement, the Recipient may request payment from the Energy Commission at any time during the Agreement term, but no more frequently than monthly. However, it is preferred that payment requests be submitted with the progress reports.

4) **Invoice Approval and Disputes:** Each request for payment is subject to the Commission Agreement Manager's approval. Payments will be made to the Recipient for undisputed invoices. An undisputed invoice is an invoice submitted by the Recipient for work performed, for which project expenditures and products meet all Agreement conditions, and for which additional evidence is not required to determine its validity.

   The invoice will be disputed if all products due for the billing period have not been received and approved, if the invoice is inaccurate, or if it does not comply with the terms of this Agreement. If the invoice is disputed, the Recipient will be notified via a Dispute Notification Form within fifteen (15) working days of receipt of the Commission Agreement Manager's invoice.

5) **Recipient's headquarters:** For purposes of payment, the Recipient's headquarters is the location of the Recipient's office where the majority of its employees assigned responsibilities for this Agreement are permanently assigned.

6) **Deadlines:** The final invoice must be received by the Energy Commission no later than thirty (30) calendar days after the Agreement end date.

7) **Expiration of Fiscal Year Funding:** If a funding source for this Agreement expires prior to the end date of the Agreement, the Recipient must submit all products and invoices to the Commission at least two months prior to the expiration date in order to receive payment from the source. For example, if the funding source expires on June 30, 2020, the Recipient must submit all products and invoices to the Energy Commission by April 30, 2020 to receive payment from the source.

8) **Multiple Non-Energy Commission Funding Sources:** No payment will be made for costs identified in recipient invoices that have been or will be reimbursed by another source, including but not limited to an agreement with another government entity.

"Government Entity" means: (1) a state governmental agency; (2) a state college or university; (3) a local government entity or agency, including those created as a Joint Powers Authority; (4) an auxiliary organization of the California State University or a California community college; (5) the federal government; (6) a foundation organized to support the Board of Governors of the California Community Colleges; and (7) an auxiliary organization of the Student Aid Commission established under California Education Code Section 69522.

9) **Reduced funding:** If the Energy Commission does not receive sufficient funds under the Budget Act or from the investor-owned utility administrators of the EPIC program to fully fund the work identified in Exhibit A (Scope of Work), the following will occur:

a) If the Energy Commission has received a reduced amount of funds for the work, it may: (1) offer an Agreement amendment to the Recipient to reflect the reduced amount; or (2) cancel this Agreement (with no liability occurring to the State).

b) If the Energy Commission has received no funds for the work identified in Exhibit A: (1) this Agreement will be of no force and effect; (2) the State will have no obligation to pay any funds to the Recipient; and (3) the Recipient will have no obligation to perform any work under this Agreement.

b. Allowability of Costs

1) Allowable Costs

The costs for which the Recipient will be reimbursed under this Agreement include all costs, direct and indirect, incurred in the performance of the work identified in the Scope of Work. Costs must be incurred within the Agreement term. Factors to be considered in determining whether an individual item of cost is allowable include: (i) reasonableness of the item, including necessity of the item for the work; (ii) applicable federal cost principles or acquisition regulations incorporated by reference in Section 2 of this Agreement; and (iii) the terms and conditions of this Agreement.

2) Unallowable Costs

Below are examples of unallowable costs. Details concerning the allowability of costs are available from the Energy Commission's Accounting Office.

a) Profit of the Recipient or fees (this restriction does not apply to subcontractors);
b) Contingency costs;
c) Imputed costs (e.g., cost of money);
d) Fines and penalties;
e) Losses;
f) Excess profit taxes; and
g) Unapproved, increased rates and fees for this Agreement

3) Except as provided for in this Agreement or applicable California law or regulations, the Recipient will use the federal cost principles and/or acquisition regulations incorporated by reference in Section 2 of this Agreement when determining allowable and unallowable costs. In the event of a conflict, this Agreement takes precedence over the federal cost principles and/or acquisition regulations.

c. Payment Request Format

Each request for payment will consist of, but not be limited to, the following:

1) An invoice that includes a list of actual expenses incurred during the billing period, up to any budget rate caps. The Recipient may only bill the lower of actual rates or budget rate caps. Backup documentation is required at the time of invoice submittal. Unless otherwise specified in Exhibit B or the invoice template, the invoice must include the following:

   a) Agreement number;
   b) Date prepared;
   c) Recipient's Federal tax ID number;
   d) Billing period;
   e) Recipient's actual labor expenditures, including hourly unloaded labor rates by individual name and classification, hours worked, and benefits (fully loaded rates may only be used if they are included in the grant budget);
   f) Non-labor expenses, including fringe benefits, indirect overhead, and general/administrative expenses;
   g) Operating expenses, including travel, equipment, materials, and other;
   h) By budget line item (cost component) category, the budgeted amount, amount billed to date, currently billed amount, and balance of funds;
   i) Match fund expenditures (if applicable);
   j) Receipts for travel (including departure and return times), equipment, materials, and miscellaneous; and
   k) Subcontractor invoices that include all items above, for correspondence with the budget (e.g., if the budget lists hourly labor rates, the subcontractor's invoice should include hourly labor rates).

2) A progress report that documents evidence of progress, as described in the Scope of Work.

3) Products prepared by the Recipient during the invoicing period, as described in the Scope of Work.

The Commission will accept computer-generated or electronically transmitted invoices without backup documentation provided that the Recipient mails a hard copy the same day.

The Recipient must submit all invoices to the following address:

California Energy Commission
Accounting Office
1516 Ninth Street, MS-2
Sacramento, CA 95814

d. Certification

The following certification will be included on each payment request form and signed by the Recipient's authorized officer:

The documents included in this request for payment are true and correct to the best of my knowledge and I, as an agent of [Company Name] have authority to submit this request. I certify that reimbursement for these costs has not and will not be received from any other sources, including but not limited to a government entity contract, subcontract, or other procurement method. For projects considered to be a public work, prevailing wages were paid to eligible workers who provided labor for the work covered by this invoice; the Recipient and all subcontractors have complied with prevailing wage laws.

e. Fringe Benefit, Indirect Overhead, General and Administrative (G&A), and Facilities and Administration (F&A) Rates

Indirect cost rates must be developed in accordance with generally accepted accounting principles and the applicable federal cost principles or acquisition regulations (see the provisions incorporated by reference in Section 2). If the Recipient has an approved fringe benefits or indirect cost rate (indirect overhead, G&A, or F&A) from its cognizant federal agency, the Recipient may bill at the federal rate up to the budget rate caps if the following conditions are met:

- The Recipient may bill at the federal provisional rate but must adjust annually to reflect its actual final rates for the year in accordance with the Labor, Fringe, and Indirect Invoicing Instructions contained in the budget (Exhibit B, Attachment 1).
- The cost pools used to develop the federal rates must be allocable to the Agreement, and the rates must be representative of the portion of costs benefiting the Agreement. For example, if the federal rate is for manufacturing overhead at the Recipient's manufacturing facility and the Agreement is for research and development at the Recipient's research facility, the federal indirect overhead rate would not be applicable to the Agreement.
- The federal rate must be adjusted to exclude any costs that are specifically prohibited in the Agreement.
- The Recipient may only bill up to the Agreement budget rate caps, unless and until an amendment to the budget is approved.

f. Retention

It is the Commission's policy to retain ten percent (10%) of any payment request or of the total Commission award at the end of the project. After the project is complete, the Recipient must submit a completed payment request form requesting release of the retention. The Commission Agreement Manager will review the project file and authorize release of the retention when satisfied that the terms of the Agreement have been fulfilled.

Retention may be released upon completion of tasks that are considered separate and distinct (i.e., the task is a stand-alone piece of work and could be completed without the other tasks). Tasks for administration or management of the Agreement and/or subcontractors are not considered separate and distinct tasks. The tasks for which retention may be released prior to the end of the Agreement must be identified in Exhibit B (budget).

9. Travel and Per Diem

a. Travel not listed in the budget requires prior written authorization from the Commission Agreement Manager.

b. No reimbursement for food or beverages will be made other than for allowable per diem charges.

c. The Recipient will be reimbursed for authorized travel and per diem up to, but not to exceed, the rates allowed nonrepresented state employees. Current allowable travel reimbursement rates can be obtained from the Commission's web site at http://www.energy.ca.gov/contracts/TRAVEL_PER_DIEM.PDF.

d. Travel expense claims must detail expenses using the allowable rates, and the Recipient must sign and date each travel expense claim before submitting it to the Commission for payment. Expenses must be listed by trip, including dates and times of departure and return. Travel expense claims supporting receipts and expense documentation must be attached to the Recipient's Payment Request. A vehicle license number is required when claiming mileage, parking, or toll charges. Questions regarding allowable travel expenses or per diem should be addressed to the Commission Agreement Manager.

10. Prevailing Wage

a. Requirement

Projects funded by the Energy Commission often involve construction, alteration, demolition, installation, repair, or maintenance work over $1,000. Such projects might be considered "public works" under the California Labor Code (See California Labor Code Section 1720 et seq. and Title 8 California Code of Regulations, Section 16000 et seq.). Public works projects require the payment of prevailing wages. Prevailing wage rates can be significantly higher than non-prevailing wage rates.

b. Determination of Project's Status

Only the California Department of Industrial Relations (DIR) and courts of competent jurisdiction may issue legally binding determinations that a particular project is or is not a public work. If the Recipient is unsure whether the project funded by the Agreement is a "public work" as defined in the California Labor Code, it may wish to seek a timely determination from DIR or an appropriate court. As such processes can be time consuming, it may not be possible to obtain a timely determination before the date for performance of the Agreement.

By accepting this grant, the Recipient is fully responsible for complying with all California public works requirements, including but not limited to payment of prevailing wage. As a material term of this grant, the Recipient must either:

1) Timely obtain a legally binding determination from DIR or a court of competent jurisdiction before work begins on the project that the proposed project is not a public work; or
2) Assume that the project is a public work and ensure that:
   - Prevailing wages are paid unless and until DIR or a court of competent jurisdiction determines that the project is not a public work;
   - The project budget for labor reflects these prevailing wage requirements; and
   - The project complies with all other requirements of prevailing wage law, including but not limited to keeping accurate payroll records and complying with all working hour requirements and apprenticeship obligations.

California Prevailing Wage law provides for substantial damages and financial penalties for failure to pay prevailing wages when such payment is required.

c. Subcontractors and Flow-down Requirements

The Recipient will ensure that its subcontractors also comply with the public works/prevailing wage requirements above. The Recipient will ensure that all agreements with its subcontractors to perform work related to this Project contain the above terms regarding payment of prevailing wages on public works projects. The Recipient is responsible for any failure of its subcontractors to comply with California prevailing wage and public works laws.

d. Indemnification and Breach

Any failure of the Recipient or its subcontractors to comply with the above requirements will constitute breach of this Agreement which excuses the Commission's performance of this Agreement at the Commission's option, and will be at the Recipient's sole risk. In such a case, the Commission will refuse payment to the Recipient of any amount under this award and the Commission will be released, at its option, from any further performance of this Agreement or any portion thereof. The Recipient will indemnify the Energy Commission and hold it harmless for any and all financial consequences arising out of or resulting from the failure of the Recipient and/or any of its subcontractors to pay prevailing wages or to otherwise comply with the requirements of prevailing wage law.

e. Budget

The Recipient's budget on public works projects must indicate which job classifications are subject to prevailing wage. For detailed information about prevailing wage and the process to determine if the proposed project is a public work, the Recipient may wish to contact DIR or a qualified labor attorney for guidance.

f. Covered Trades

For public works projects, the Recipient may contact DIR for a list of covered trades and the applicable prevailing wage.

g. Questions

If the Recipient has any questions about this contractual requirement or the wage, record keeping, apprenticeship, or other significant requirements of California prevailing wage law, the Recipient should consult DIR and/or a qualified labor attorney before entering into this Agreement.

h. Certification

The Recipient will certify to the Energy Commission on each payment request form either that: (a) prevailing wages were paid to eligible workers who provided labor for work covered by the payment request and the Recipient and all contractors and subcontractors otherwise complied with all California prevailing wage laws; or (b) the project is not a public work requiring the payment of prevailing wages. In the latter case, the Recipient will provide competent proof of a DIR or court determination that the project is not a public work requiring the payment of prevailing wages.

Prior to the release of any retained funds under this Agreement, the Recipient will submit to the Energy Commission the above-described certificate signed by the Recipient and all contractors and subcontractors performing public works activities on the project. Absent this certificate, the Recipient will have no right to any funds under this Agreement, and Commission will be relieved of any obligation to pay any funds.

11. Recordkeeping, Cost Accounting, and Auditing

a. Cost Accounting

The Recipient will keep separate, complete, and correct accounting of the costs involved in completing the project and any match-funded portion of the project. The Commission or its agent will have the right to examine the Recipient's books of accounts at all reasonable times, to the extent necessary to verify the accuracy of the Recipient's reports.

b. Accounting Procedures

The Recipient's costs will be determined on the basis of its accounting system procedures and practices employed as of the effective date of this Agreement, provided that the Recipient uses generally accepted accounting principles and cost reimbursement practices. The Recipient's cost accounting practices used in accumulating and reporting costs during the performance of this Agreement will be consistent with the practices used in estimating costs for any proposal to which this Agreement relates; provided that such practices are consistent with the other terms of this Agreement and that such costs may be accumulated and reported in greater detail during performance of this Agreement.

The Recipient's accounting system will distinguish between direct and indirect costs. All costs incurred for the same purpose, in like circumstances, are either direct costs only or indirect costs only with respect to costs incurred under this Agreement.

c. Audit Rights

The Recipient will maintain books, records, documents, and other evidence, based on the procedures set forth above, sufficient to reflect properly all costs claimed to have been incurred in the performance of this Agreement. The Energy Commission, another state agency, and/or a public accounting firm designated by the Energy Commission may audit the Recipient's accounting records at all reasonable times, with prior notice by the Energy Commission.

It is the intent of the parties that the audits will ordinarily be performed not more frequently than once every twelve (12) months during the performance of the work and once at any time within three (3) years after payment by the Energy Commission of the Recipient's final invoice. However, performance of any such interim audits by the Energy Commission does not preclude further audit. The Energy Commission may audit books, records, documents, and other evidence relevant to the Recipient's royalty payment obligations (see Section 22) for a period of ten (10) years after payment of the Recipient's final invoice.

The Recipient will allow the auditor(s) to access such records during normal business hours, and will allow interviews of any employees who might reasonably have information related to such records. The Recipient will include a similar right of the state to audit records and interview staff in any subcontract related to the performance of this Agreement.

d. Refund to the Energy Commission

If the Energy Commission determines that any invoiced and paid amounts exceed the actual allowable incurred costs, the Recipient will repay the amounts to the Energy Commission within thirty (30) days of request or as otherwise agreed by the Energy Commission and the Recipient. If the Energy Commission does not receive such repayments, it will be entitled to take actions such as withholding further payments to the Recipient and seeking repayment from the Recipient.

e. Audit Cost

The Recipient will bear its cost of participating in any audit (e.g., mailing or travel expenses). The Energy Commission will bear the cost of conducting the audit unless the audit reveals an error detrimental to the Energy Commission that exceeds more than ten percent (10%) or $5,000 (whichever is greater) of: (1) the amount audited; or (2) if a royalty audit, the total royalties due in the period audited. The Recipient will pay the refund as specified in subsection (d), and will reimburse the Energy Commission for reasonable costs and expenses incurred by the Commission in conducting the audit.

f. Match or Cost Share

If the budget includes a match share requirement, the Recipient's commitment of resources, as described in this Agreement, is a required expenditure for receipt of Energy Commission funds. The funds will be released only if the required match percentages are expended. The Recipient must maintain accounting records detailing the expenditure of the match (actual cash and in-kind, non-cash services), and report on match share expenditures on its request for payment.

12. Workers' Compensation Insurance

a. The Recipient warrants that it carries Worker's Compensation Insurance for all of its employees who will be engaged in the performance of this Agreement, and agrees to furnish to the Commission Agreement Manager satisfactory evidence of this insurance upon the Commission Agreement Manager's request.

b. If the Recipient is self-insured for worker's compensation, it warrants that the self-insurance is permissible under the laws of the State of California and agrees to furnish to the Commission Agreement Manager satisfactory evidence of the insurance upon the Commission Agreement Manager's request.

13. Permits and Clearances

The Recipient is responsible for ensuring that all necessary permits and environmental documents are prepared and that clearances are obtained from the appropriate agencies.

14. Equipment

Title to equipment acquired by the Recipient with grant funds will vest in the Recipient. The Recipient may use the equipment in the project or program for which it was acquired as long as needed, regardless of whether the project or program continues to be supported by grant funds. However, the Recipient may not sell, lease, or encumber the property (i.e., place a legal burden on the property such as a lien) during the Agreement term without the Commission Agreement Manager's prior written approval.

The Recipient may refer to the applicable federal regulations incorporated by reference in this Agreement for guidance regarding additional equipment requirements.

15. Disputes

In the event of an Agreement dispute or grievance between the Recipient and the Energy Commission, both parties may follow the procedure detailed below. The Recipient will continue with its responsibilities under this Agreement during any dispute.

a. Commission Agreement Manager/Commission Agreement Officer

- The Recipient must first discuss the problem informally with the Commission Agreement Manager.
- If the problem cannot be resolved at this stage, the Recipient must submit a Contractor Dispute Statement, along with any evidence, to the Commission Agreement Officer. The statement must include: (1) a summary of the issues in dispute; (2) the legal authority or other basis for the Recipient's position; and (3) the remedy sought.

b. Commission Agreement Officer/ Program Office Manager

- The Commission Agreement Officer and the Program Office Manager must make a determination on the problem within ten (10) working days of receipt of the Recipient's Dispute Statement.
- The Commission Agreement Officer will submit a Dispute Finding to the Recipient that includes: (1) a decision; and (2) an explanation of the decision.
- The Recipient may appeal to the Commission's Executive Director if it disagrees with the Commission Agreement Officer's decision.

c. Executive Director

- The Recipient must submit an Appeal to the Commission's Executive Director within ten (10) working days of receipt of the Commission Agreement Officer's Dispute Finding. The Appeal must explain why the Commission Agreement Officer's decision is unacceptable. The Recipient must include the following as attachments to the Appeal: (1) the Recipient Dispute Statement; (2) any supporting documents; and (3) the Dispute Finding.
- The Executive Director or his/her designee will meet with the Recipient to review the issues raised.
- A written decision signed by the Executive Director or his/her designee will be sent to the Recipient within twenty (20) working days of receipt of the Appeal. The Executive Director may exercise the option of presenting the decision to the Commission at a business meeting.
- If the Recipient disagrees with the Executive Director's decision, it may appeal to the Commission at a regularly scheduled business meeting. The Commission Agreement Officer will inform the Recipient of the procedure for placing the appeal on a Commission Business Meeting Agenda.

16. Stop Work

The Commission Agreement Officer may, at any time by written notice to the Recipient, require the Recipient to stop all or any part of the work tasks in this Agreement. Stop work orders may be issued for reasons such as a project exceeding budget, noncompliance with the standard of performance, out of scope work, project delays, and misrepresentations.

a. Compliance. Upon receipt of a stop work order, the Recipient must immediately take all necessary steps to comply with the order and to minimize the incurrence of costs allocable to the work stopped.

b. Equitable Adjustment. The Energy Commission will make an equitable adjustment based upon a written request from the Recipient. The Recipient must make the adjustment request within thirty (30) days from the date of the stop work order.

c. Canceling a Stop Work Order. The Recipient may resume the work only upon receipt of written instructions from the Commission Agreement Officer.

17. Termination

a. Purpose

Because the Energy Commission is a state entity and provides funding on behalf of all California ratepayers, it must be able to terminate the Agreement upon the default of the Recipient and to proceed with the work required under the Agreement in any manner it deems proper. The Recipient agrees that upon any of the events triggering the termination of the Agreement by the Energy Commission, the Energy Commission has the right to terminate the Agreement, and it would constitute bad faith of the Recipient to interfere with the immediate termination of the Agreement by the Energy Commission.

b. Breach

The Energy Commission will provide the Recipient written notice of intent to terminate due to the Recipient's breach. The Recipient will have fifteen (15) calendar days to fully perform or cure the breach. If the Recipient does not cure the breach within fifteen (15) days, the Energy Commission may, without prejudice to any of its other remedies, terminate this Agreement upon five (5) calendar days written notice to the Recipient. In this event, the Energy Commission will pay the Recipient only the reasonable value of the services performed satisfactorily by the Recipient before the notice of termination, as may be agreed upon by the parties or determined by a court of law, but not to exceed the maximum payable Agreement amount.

c. For Cause

The Energy Commission may, for cause, terminate this Agreement upon giving thirty (30) calendar days advance written notice to the Recipient. In this event, the Recipient will use all reasonable efforts to mitigate its expenses and obligations. The Energy Commission will pay the Recipient for any services rendered and expenses incurred within thirty (30) days after notice of termination that the Recipient could not have avoided by reasonable efforts, in an amount not to exceed the maximum payable Agreement amount. The Recipient will relinquish possession of equipment purchased for this Agreement with Energy Commission funds to the Commission, or the Recipient may purchase the equipment as provided by the terms of this Agreement, with approval of the Energy Commission.

The term "for cause" includes but is not limited to the following:

- Partial or complete loss of match funds;
- Reorganization to a business entity unsatisfactory to the Energy Commission;
- Retention or hiring of subcontractors, or replacement or addition of personnel, that fail to perform to the standards and requirements of this Agreement;
- The Recipient's inability to pay its debts as they become due and/or the Recipient's default of an obligation that impacts its ability to perform under this Agreement; or
- Significant change in state or Energy Commission policy such that the work or product being funded would not be supported by the Commission.

d. Without Cause

The Energy Commission may terminate this Agreement without cause in whole or in part, upon giving thirty (30) days advance written notice to the Recipient. In this event, the Recipient will use all reasonable efforts to mitigate its expenses and obligations. Also, the Energy Commission will pay the Recipient for all satisfactory services rendered and expenses incurred within thirty (30) calendar days after notice of termination that the Recipient could not avoid by reasonable efforts, in an amount not to exceed the maximum payable under this Agreement.

18. Indemnification

To the extent allowed under California law, the Recipient will indemnify, defend, and hold harmless the state (including the Energy Commission) and state officers, agents, and employees from any and all claims and losses in connection with the performance of this Agreement.

19. Confidentiality

a. Identification of Confidential Information

1) Prior to the effective date of this Agreement, the Recipient will identify all products (or information contained within products) that it considers to be confidential, in addition to the legal basis for confidentiality, in Attachment 2 to this Exhibit. If the Energy Commission agrees that the information is confidential, it will not disclose it except as provided in subsection (b).

2) During the Agreement, if the Recipient develops additional products (or information contained within products) not originally anticipated as confidential, it will follow the procedures for a request for designation of confidential information specified in Title 20 California Code of Regulations (CCR) Section 2505.

The Energy Commission's Executive Director will make the confidentiality determination. Following this determination, the confidential information may be added to Attachment 2 through a Letter of Agreement (see the "Amendments" section). The Energy Commission will not disclose information subject to an application for confidential designation except as provided in subsection (b).

3) When submitting products containing confidential information, the Recipient will mark each page of any document containing confidential information as "confidential", and present it in a sealed package to the Contracts, Grants, and Loans Office.

The Commission Agreement Manager may require the Recipient to submit a non-confidential version of the product, if it is feasible to separate the confidential information from the non-confidential information. The Recipient is not required to submit such products in a sealed package.

b. Disclosure of Confidential Information

The Energy Commission will only disclose confidential information under the circumstances specified in Title 20 CCR Sections 2506, 2507, and 2508. All confidential information that is legally disclosed by the Recipient or any other entity will become a public record and will no longer be subject to the Energy Commission's confidentiality designation.

c. Waiver of Consequential Damages

In no event will the Energy Commission, the California Public Utilities Commission, or the state of California be liable for any special, incidental, or consequential damages based on breach of warranty, breach of contract, negligence, strict tort, or any other legal theory for the disclosure of the Recipient's confidential information, even if the Commission has been advised of the possibility of such damages.

Damages that the Energy Commission, the California Public Utilities Commission, and the state of California will not be responsible for include but are not limited to: lost profit; lost savings or revenue; lost goodwill; lost use of the product or any associated equipment; cost of capital; cost of any substitute equipment, facilities, or services; downtime; the claims of third parties including customers; and injury to property.

d. Limitations on the Recipient's Disclosure of Products

1) During the Agreement, the Recipient must receive approval from the Commission Agreement Manager prior to disclosing the contents of any draft product to a third party. However, if the Energy Commission makes a public statement about the content of any product provided by the Recipient and the Recipient believes the statement is incorrect, the Recipient may state publicly what it believes is correct.

2) After any document submitted has become a part of the public records of the state, the Recipient may publish or use it at its own expense.

3) Except as provided in Title 20 CCR Sections 2506, 2507, and 2508, the Recipient may not disclose any information provided to it by the Energy Commission for the performance of this Agreement if the information has been designated as confidential or is the subject of a pending application for confidential designation. At the election of the Commission Agreement Manager, the Recipient, its employees, and its subcontractors must execute a confidentiality agreement provided by the Commission Agreement Manager.

4) The Recipient will ensure that each of its officers, employees, and subcontractors who are involved in the performance of this Agreement are informed about these disclosure limitations and will abide by them.

20. Pre-Existing and Independently Funded Intellectual Property

a. Ownership

The Energy Commission makes no ownership, license, or royalty claims to pre-existing intellectual property, independently funded intellectual property, or project-relevant pre-existing or independently funded intellectual property. **"Ownership"** means exclusive possession and control of all rights to property, including the right to use and transfer property. Intellectual property licenses and royalties are discussed in Sections 21 and 22.

1) **"Pre-existing intellectual property"** means: (a) inventions, technologies, designs, drawings, data, software, formulas, compositions, processes, techniques, works of authorship, trademarks, service marks, and logos that the Recipient or a third party owned or possessed prior to the effective date of this Agreement and that have not been developed, altered, or reduced to practice with Energy Commission or match funds; and (b) associated proprietary rights to these items that are obtained without Energy Commission or match funds, such as patent and copyright.

2) **"Independently funded intellectual property"** means: (a) inventions, technologies, designs, drawings, data, software, formulas, compositions, processes, techniques, works of authorship, trademarks, service marks, and logos that are created, conceived, discovered, made, developed,

altered, or reduced to practice by the Recipient or a third party during or after the Agreement term without Energy Commission or match funds; and (b) associated proprietary rights to these items that are obtained without Energy Commission or match funds, such as patent and copyright.

"Works of authorship" does not include written products created for Agreement reporting and management purposes, such as reports, summaries, lists, letters, agendas, schedules, and invoices. The Commission owns such products regardless of their funding source.

3) **"Project-relevant pre-existing intellectual property" and "project-relevant independently funded intellectual property"** mean pre-existing and independently funded intellectual property used to support a premise, postulate, or conclusion referred to or expressed in any product under this Agreement.

b. Project-Relevant Pre-Existing and Independently Funded Intellectual Property

1) Identification of Property

a) The Recipient will identify all project-relevant pre-existing intellectual property in Attachment 2 to this Exhibit prior to the effective date of the Agreement, or within sixty (60) days of becoming aware that the property has been or will be used to support a premise, postulate, or conclusion referred to or expressed in any product under this Agreement. Attachment 2 may be amended by a Letter of Agreement (see the "Amendments" section).

b) The Recipient will identify all project-relevant independently funded intellectual property and the source of funding for the property in Attachment 2 to this Exhibit within sixty (60) days of becoming aware that the property has been or will be used to support a premise, postulate, or conclusion referred to or expressed in any product under this Agreement.

c) Failure to identify project-relevant pre-existing or independently funded intellectual property in Attachment 2 to this Exhibit may result in the property's designation as "intellectual property" that is subject to licenses and royalties, as described in Sections 21 and

2) Access to Property

The extent of Energy Commission and California Public Utilities Commission access to project-relevant pre-existing and independently funded intellectual property is limited to that reasonably necessary to: (a) demonstrate the validity of any premise, postulate, or conclusion referred to or expressed in any product; or (b) establish a baseline for repayment purposes.

Upon the Commission Agreement Manager's request, the Recipient will provide the Commission Agreement Manager and any reviewers designated by the Energy Commission or the California Public Utilities Commission with access to review the Recipient's project-relevant pre-existing and independently funded intellectual property. If the property has been designated as confidential as specified in Section 19, the Energy Commission will only disclose it under the circumstances specified in Title 20 CCR Sections 2506, 2507, and 2508.

3) Preservation of Property

The Recipient will preserve any project-relevant pre-existing or independently funded intellectual property at its own expense for at least ten (10) years from the Agreement's end date, unless the Recipient agrees to a longer retention period.

The Energy Commission and the California Public Utilities Commission will have reasonable access to the project-relevant pre-existing or independently funded property throughout the retention period.

21. Intellectual Property

a. Ownership

1) The Recipient owns all intellectual property, subject to the licenses described in subsection b.

"Intellectual property" means: (a) inventions, technologies, designs, drawings, data, software, formulas, compositions, processes, techniques, works of authorship, trademarks, service marks, and logos that are created, conceived, discovered, made, developed, altered, or reduced to practice with Agreement or match funds during or after the Agreement term; (b) any associated proprietary rights to these items, such as patent and copyright; and (c) any upgrades or revisions to these items.

"Works of authorship" does not include written products created for Agreement reporting and management purposes, such as reports, summaries, lists, letters, agendas, schedules, and invoices.

2) The Energy Commission owns all products identified in the Scope of Work, with the exception of products that fall within the definition of "intellectual property."

"Product" means any tangible item specified for delivery to the Energy Commission in the Scope of Work.

b. Intellectual Property Licenses

1) Both the Energy Commission and the California Public Utilities Commission have a no-cost, non-exclusive, transferable, irrevocable, royalty-free, worldwide, perpetual license to use, publish, translate, modify, and reproduce intellectual property for governmental purposes. The licenses are transferable only to load-serving entities for the purpose described below.

2) Both the Energy Commission and the California Public Utilities Commission may grant load-serving entities a no-cost, non-exclusive, transferable, irrevocable, royalty-free, worldwide, perpetual license to use, publish, translate, modify, and reproduce intellectual property to enhance the entities' service to EPIC ratepayers. **"Load-serving entity"** means a company or other organization that provides electricity to EPIC ratepayers.

The licenses are transferable to third parties only for the purpose of facilitating the load-serving entity's enhancement of service to EPIC ratepayers. Load-serving entities must obtain prior written approval from the Energy Commission or California Public Utilities Commission (whichever agency granted the load-serving entity the license) in order to transfer the license to a third party.

3) The Recipient has a non-exclusive, non-transferable, irrevocable, worldwide, perpetual license to use, publish, translate, modify, and reproduce written products created for Agreement reporting and management purposes, such as reports and summaries.

4) If any intellectual property that is subject to the licenses above has been designated as confidential as specified in Section 19, all license holders will only disclose the intellectual property under the circumstances specified in Title 20 CCR Sections 2506, 2507, and 2508.

All license holders will ensure that their officers, employees, and subcontractors who have access to the intellectual property are informed of and abide by the disclosure limitations in Section 19.

c. Energy Commission's Rights to Inventions

"Invention" means intellectual property that is patentable.

1) March-In Rights

At the Energy Commission's request, the Recipient will forfeit and assign to the Energy Commission all rights to any invention (with the exception of U.S. Department of Energy reserved rights) if the Recipient or assignee has not taken, or is not expected to take within a reasonable time, effective steps to achieve practical application of the invention. The Energy Commission will have the unfettered right to use and/or dispose of the rights in whatever manner it deems most suitable to help transfer the invention into the marketplace, including but not limited to seeking patent protection or licensing the invention.

2) Notice of Patent

If any patent is issued for an invention, the Recipient will send the Commission Agreement Manager written notice of the issuance within three (3) months of the issuance date. The notice must include the patent title, issuance number, and a general description of the invention.

3) Legal Notice

The Recipient and all persons and/or entities obtaining an ownership interest in patentable intellectual property must include the following statement within the specification of any United States patent application, and any subsequently issued patent for the invention:

"This invention was made with State of California support under California Energy Commission grant number EPC-14-053. The Energy Commission has certain rights to this invention."

d. Access to and Preservation of Intellectual Property

1) Access to Intellectual Property

Upon the Commission Agreement Manager's request, the Recipient will provide the Commission Agreement Manager and any individuals designated by the Energy Commission or the California Public Utilities Commission with access to the Recipient's intellectual property in order to exercise the license and march-in rights described above, and to determine any royalty payments due under the Agreement.

2) Preservation of Intellectual Property

The Recipient will preserve intellectual property at its own expense for at least ten (10) years from the Agreement's end date, unless the Recipient agrees to a longer retention period.

e. Intellectual Property Indemnity

The Recipient may not, in supplying work under this Agreement, knowingly infringe or misappropriate any intellectual property right of a third party, and will take reasonable actions to avoid infringement.

The Recipient will defend and indemnify the Energy Commission and the California Public Utilities Commission from and against any claim, lawsuit, or other proceeding, loss, cost, liability, or expense (including court costs and reasonable fees of attorneys and other professionals) to the extent arising out of: (i) any third party claim that a product infringes any patent, copyright, trade secret, or other intellectual property right of any third party; or (ii) any third party claim arising out of the negligent or other tortious acts or omissions by the Recipient or its employees, subcontractors, or agents in connection with or related to the products or the Recipient's performance under this Agreement.

22. Royalty Payments to the Commission

"Sale," "sales," and ***"sold"*** mean the sale, license, lease, or other transfer of intellectual property. ***"Sales Price"*** means the price at which intellectual property is sold, excluding sales tax.

a. The Recipient will pay the Energy Commission a royalty of one and one-half percent (1.5%) of the sales price of all sales for which the Recipient receives a payment, beginning on the Agreement's effective date and extending for ten (10) years from the Agreement's end date.

b. The Recipient will make payments in annual installments due on the first day of March in the calendar year immediately following the year during which the Recipient received any payment for sales.

c. The Recipient is not required to make a royalty payment for any calendar year in which payments for sales are less than $1000. Total royalty payments will be limited to three (3) times the amount of funds paid by the Energy Commission under the Agreement.

d. If intellectual property was developed in part with match funds during the Agreement term, the royalty payment will be reduced in accordance with the percentage of intellectual property development activities that were funded with

match funds. For example, if 10% of the development activities were funded with match funds during the Agreement and payments for sales totaled $100,000 in one year, the Recipient would owe the Energy Commission $1350 for the year (1.5% of $100,000 = $1500; 10% of $1500 = $150; $1500 - $150 = $1350).

If the Energy Commission is providing funds to the Recipient under this Agreement as a project match partner and Energy Commission funds are used in part to develop intellectual property, the royalty payments will be reduced in accordance with the percentage of intellectual property development activities that were funded with non-Energy Commission funds during the Agreement term. For example, if 80% of the development activities were funded with Recipient and/or third party funds during the Agreement and payments for sales totaled $100,000 in one year, the Recipient would owe the Energy Commission $300 for the year (1.5% of $100,000 = $1500; 80% of $1500 = $1200; $1500 - $1200 = $300).

e. The Recipient may make an early buyout payment to the Energy Commission without a pre-payment penalty, as an alternative to making annual royalty payments for ten (10) years following the Agreement's end date. The payment must be in a lump sum amount equal to one and a half (1.5) times the amount of funds paid by the Energy Commission under the Agreement and made within five (5) years of the Agreement's end date. The payment amount due under the early buyout option will not be reduced by the percentage of match funds as described above.

f. The Recipient may not make any sale of intellectual property for consideration other than fair market value. Such activity constitutes breach of this Agreement, and will obligate the Recipient to repay within sixty (60) days the early buyout amount due. In the event of breach, the Energy Commission may exercise all rights and remedies available to it under law and at equity.

g. Royalty payments not made within fifteen (15) days of the due date will constitute breach of this Agreement. The payments will become debt obligations of the Recipient to the Energy Commission, due upon demand and bearing interest at the maximum interest rate allowed by law.

h. The Recipient will maintain separate accounts within its financial and other records for the purpose of tracking components of sales and royalties due to the Energy Commission under this Agreement.

i. Payments to the Energy Commission are subject to audit as provided for under the Recordkeeping, Cost Accounting, and Auditing section.

j. The Recipient will include these royalty provisions in its agreements with all subcontractors who develop or assist with the development of intellectual property.

23. General Provisions

a. Governing Law

This Agreement is governed by the laws of the State of California as to interpretation and performance.

b. Independent Capacity

In the performance of this Agreement, the Recipient and its agents, subcontractors, and employees will act in an independent capacity and not as officers, employees, or agents of the State of California.

c. Assignment

This Agreement is not assignable or transferable by the Recipient either in whole or in part without the consent of the Energy Commission in the form of an amendment.

d. Timeliness

Time is of the essence in this Agreement.

e. Severability

If any provision of this Agreement is unenforceable or held to be unenforceable, all other provisions of this Agreement will remain in full force and effect.

f. Waiver

No waiver of any breach of this Agreement constitutes waiver of any other breach. All remedies in this Agreement will be taken and construed as cumulative, meaning in addition to every other remedy provided in the Agreement or by law.

g. Assurances

The Commission reserves the right to seek further written assurances from the Recipient and its team that the work under this Agreement will be performed in accordance with the terms of the Agreement.

h. Change in Business

1) The Recipient will promptly notify the Energy Commission of the occurrence of any of the following:

   a) A change of address.

   b) A change in business name or ownership.

   c) The existence of any litigation or other legal proceeding affecting the project or Agreement.

   d) The occurrence of any casualty or other loss to project personnel, equipment, or third parties.

   e) Receipt of notice of any claim or potential claim against the Recipient for patent, copyright, trademark, service mark, and/or trade secret infringement that could affect the Energy Commission's rights.

2) The Recipient must provide the Commission Agreement Manager with written notice of a planned change or reorganization of the type of business entity under which it does business. A change of business entity or name change requires an amendment assigning or novating the Agreement to the changed entity. If the Energy Commission does not seek to amend this Agreement or enter into a new agreement with the changed or new entity for any reason (including that the Commission is not satisfied that the new entity can perform in the same manner as the Recipient), it may terminate this Agreement as provided in the "Termination" section.

i. Access to Sites and Records

Energy Commission and California Public Utilities Commission staff and representatives will have reasonable access to all project sites and to all records related to this Agreement.

j. Prior Dealings, Custom, or Trade Usage

These terms and conditions may not be modified or supplemented by prior dealings, custom, or trade usage.

k. Survival of Terms

Certain provisions will survive the completion or termination date of this Agreement for any reason. The provisions include but are not limited to:

- Legal Statements on Products (included in Section 5, "Products")
- Payment of Funds (Section 8)
- Recordkeeping, Cost Accounting, and Auditing (Section 11)
- Equipment (Section 14)
- Disputes (Section 15)
- Termination (Section 17)
- Indemnification (Section 18)
- Pre-Existing and Independently Funded Intellectual Property (Section 20)
- Intellectual Property (Section 21)
- Royalty Payments to the Commission (Section 22)
- Change in Business (see this section)
- Access to Sites and Records (see this section)

24. Certifications and Compliance

a. Federal, State, and Local Laws

The Recipient will comply with all applicable federal, state and local laws, rules and regulations.

b. Nondiscrimination Statement of Compliance

During the performance of this Agreement, the Recipient and its subcontractors will not unlawfully discriminate, harass, or allow harassment against any employee or applicant for employment because of sex, sexual orientation, race, color, ancestry, religious creed, national origin, physical disability (including HIV and AIDS), mental disability, medical condition, age, marital status, or denial of family care leave. The Recipient and its subcontractors will ensure that the evaluation and treatment of their employees and applicants for employment are free from such discrimination and harassment.

The Recipient and its subcontractors will comply with the provisions of the Fair Employment and Housing Act (Government Code Sections 12990 et seq.) and the applicable regulations promulgated thereunder (California Code of Regulations, Title 2, Section 7285 et seq.). The applicable regulations of the Fair Employment and Housing Commission implementing Government Code Section 12990 (a-f), set forth in Chapter 5 of Division 4 of Title 2 of the California Code of Regulations, are incorporated into this Agreement by reference and made a part of it as if set forth in full. The Recipient and its subcontractors will give written notice of their obligations under this section to labor organizations with which they have a collective bargaining or other Agreement.

The Recipient will include the nondiscrimination and compliance provisions of this section in all subcontracts to perform work under this Agreement.

c. Drug-Free Workplace Certification

By signing this Agreement, the Recipient certifies under penalty of perjury under the laws of the State of California that it will comply with the requirements of the Drug-Free Workplace Act of 1990 (Government Code Section 8350 et seq.) and will provide a drug-free workplace by taking the following actions:

1) Publish a statement notifying employees that unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance is prohibited, and specifying actions to be taken against employees for violations as required by Government Code Section 8355(a).

2) Establish a Drug-Free Awareness Program as required by Government Code Section 8355(b) to inform employees about all of the following:

- The dangers of drug abuse in the workplace;
- The person's or organization's policy of maintaining a drug-free workplace;
- Any available counseling, rehabilitation, and employee assistance programs; and
- Penalties that may be imposed upon employees for drug abuse violations.

3) Provide, as required by Government Code Section 8355(c), that every employee who works on the proposed project:

- Will receive a copy of the company's drug-free policy statement; and
- Will agree to abide by the terms of the company's statement as a condition of employment on the project.

Failure to comply with these requirements may result in suspension of payments under the Agreement or termination of the Agreement or both, and the Recipient may be ineligible for any future state awards if the Commission determines that any of the following has occurred: (1) the Recipient has made false certification, or (2) violates the certification by failing to carry out the requirements as noted above.

d. National Labor Relations Board Certification (Not applicable to public entities)

The Recipient, by signing this Agreement, swears under penalty of perjury that no more than one final unappealable finding of contempt of court by a federal court has been issued against the Recipient within the immediately preceding two year period because of the Recipient's failure to comply with an order of a federal court that orders the Recipient to comply with an order of the National Labor Relations Board.

e. Child Support Compliance Act (Applicable to California Employers)

For any agreement in excess of $100,000, the Recipient acknowledges that:

1) It recognizes the importance of child and family support obligations and will fully comply with all applicable state and federal laws relating to child and family support enforcement, including but not limited to disclosure of information and compliance with earnings assignment orders, as provided in Chapter 8 (commencing with section 5200) of Part 5 of Division 9 of the Family Code; and

2) To the best of its knowledge is fully complying with the earnings assignment orders of all employees and is providing the names of all new employees to the New Hire Registry maintained by the California Employment Development Department.

f. Air or Water Pollution Violation

Under state laws, the Recipient will not be:

1) In violation of any order or resolution not subject to review promulgated by the State Air Resources Board or an air pollution control district;

2) Subject to a cease and desist order not subject to review issued pursuant to Section 13301 of the Water Code for violation of waste discharge requirements or discharge prohibitions; or

3) Finally determined to be in violation of provisions of federal law relating to air or water pollution.

g. Americans With Disabilities Act

By signing this Agreement, the Recipient assures the State that it complies with the Americans with Disabilities Act (ADA) of 1990 (42 U.S.C. Section 12101, et seq.), which prohibits discrimination on the basis of disability, as well as applicable regulations and guidelines issued pursuant to the ADA.

25. Definitions

- ***Agreement Term*** means the length of this Agreement, as specified on the Agreement signature page (form CEC-146).
- ***Budget Reallocation*** means the movement of funds between tasks identified in the budget (Exhibit B).
- ***Confidential Information*** means information that the Recipient has satisfactorily identified as confidential in Attachment 2 to this Exhibit and that the Energy Commission has agreed to designate as confidential under Title 20 California Code of Regulations Section 2505.
- ***Data*** means any recorded information that relates to the project funded by the Agreement, whether created or collected before or after the Agreement's effective date.
- ***Effective Date*** means the date on which this Agreement is signed by the last party required to sign, provided that signature occurs after the Agreement has been approved by the Energy Commission at a business meeting or by the Executive Director or his/her designee.
- ***EPIC*** means the Electric Program Investment Charge, an electricity ratepayer-funded surcharge authorized by the California Public Utilities Commission in December 2011.
- ***Equipment*** means products, objects, machinery, apparatus, implements, or tools that are purchased or constructed with Energy Commission funds for the project, and that have a useful life of at least one year and an acquisition unit cost of at least $5,000. "Equipment" includes products, objects, machinery, apparatus, implements, or tools that are composed by over thirty percent (30%) of materials purchased for the project. For purposes of determining depreciated value of equipment used in the Agreement, the project will terminate at the end of the normal useful life of the equipment purchased and/or developed with Energy

Commission funds. The Energy Commission may determine the normal useful life of the equipment.

- ***Independently Funded Intellectual Property*** means: (a) inventions, technologies, designs, drawings, data, software, formulas, compositions, processes, techniques, works of authorship, trademarks, service marks, and logos that are created, conceived, discovered, made, developed, altered, or reduced to practice by the Recipient or a third party during or after the Agreement term without Energy Commission or match funds; and (b) associated proprietary rights to these items that are obtained without Energy Commission or match funds, such as patent and copyright.

  "Works of authorship" does not include written products created for Agreement reporting and management purposes, such as reports, summaries, lists, letters, agendas, schedules, and invoices. The Commission owns such products regardless of their funding source.

- ***Intellectual Property*** means: (a) inventions, technologies, designs, drawings, data, software, formulas, compositions, processes, techniques, works of authorship, trademarks, service marks, and logos that are created, conceived, discovered, made, developed, altered, or reduced to practice with Agreement or match funds during or after the Agreement term; (b) any associated proprietary rights to these items, such as patent and copyright; and (c) any upgrades or revisions to these items.

  "Works of authorship" does not include written products created for Agreement reporting and management purposes, such as reports, summaries, lists, letters, agendas, schedules, and invoices.

- ***Invention*** means intellectual property that is patentable.

- ***Load-serving entity*** means a company or other organization that provides electricity to EPIC ratepayers.

- ***Match Funds*** means cash or in-kind (i.e., non-cash) contributions provided by the Recipient or a third party for a project funded by the Energy Commission. If this Agreement resulted from a solicitation, refer to the solicitation's discussion of match funding for guidelines specific to the project.

- ***Materials*** means the substances used to construct a finished object, commodity, device, article, or product, such as equipment.

- ***Ownership*** means exclusive possession of all rights to property, including the right to use and transfer property.

- ***Pre-existing intellectual property*** means: (a) inventions, technologies, designs, drawings, data, software, formulas, compositions, processes, techniques, works of authorship, trademarks, service marks, and logos that the Recipient or a third party owned or possessed prior to the effective date of this Agreement and that have not been developed, altered, or reduced to practice with Energy Commission or match funds; and (b) associated proprietary rights to these items that are obtained without Energy Commission or match funds, such as patent and copyright.

- ***Product*** means any tangible item specified for delivery to the Energy Commission in the Scope of Work.

- ***Project*** means the entire effort undertaken and planned by the Recipient and consisting of the work funded by the Energy Commission. The project may coincide with or extend beyond the Agreement term.
- ***Project-relevant pre-existing intellectual property and project-relevant independently funded intellectual property*** mean pre-existing and independently funded intellectual property used to support a premise, postulate, or conclusion referred to or expressed in any product under this Agreement.
- ***Sale, Sales,*** and ***Sold*** mean the sale, license, lease, or other transfer of intellectual property.
- ***Sales Price*** means the price at which intellectual property is sold, excluding normal returns and allowances such as sales tax.
- ***State*** means the state of California and all California state agencies within it, including but not limited to commissions, boards, offices, and departments.

ATTACHMENT 1
Confidential Products and Project-Relevant Pre-Existing and Independently Funded Intellectual Property

1. Instructions

Identification of Confidential Information

- **Prior to the effective date of the Agreement,** the Recipient must identify in Section 2 of this attachment any products (or information contained within products) that it considers to be confidential. If the Energy Commission agrees that the information is confidential, it will not disclose it except as provided in Section 19 (Confidentiality) of these terms and conditions.
- **During the Agreement,** if the Recipient develops additional information not originally anticipated as confidential, it must follow the procedures for a request for designation of confidential information specified in Title 20 California Code of Regulations (CCR) Section 2505.

  The Energy Commission's Executive Director will make the confidentiality determination. Following this determination, the confidential information may be added to this attachment through a Letter of Agreement (see Section 6 (Amendments) and Attachment 2 (Sample Letter of Agreement)). The Energy Commission will not disclose information subject to an application for confidential designation except as provided in Section 19.
- **When submitting products containing confidential information,** the Recipient must mark each page of any document containing confidential information as "confidential" and present it in a sealed package to the Contracts, Grants, and Loans Office.

  The Commission Agreement Manager may require the Recipient to submit a non-confidential version of the product, if it is feasible to separate the confidential information from the non-confidential information.

Identification of Project-Relevant Independently Funded and Pre-Existing Intellectual Property

- The Recipient must identify all project-relevant pre-existing intellectual property and project-relevant independently funded intellectual property in Section 3 of this attachment prior to the effective date of the Agreement, or within sixty (60) days of becoming aware that the property has been or will be used to support a premise, postulate, or conclusion referred to or expressed in any product under the Agreement. This attachment may be amended by a Letter of Agreement (see Section 6 (Amendments) and Attachment 2 (Sample Letter of Agreement)).
  - **"Project-relevant pre-existing intellectual property" and "project-relevant independently funded intellectual property"** mean pre-existing and independently funded intellectual property used to support a premise, postulate, or conclusion referred to or expressed in any product under the Agreement.
  - **"Pre-existing intellectual property"** means: (a) inventions, technologies, designs, drawings, data, software, formulas, compositions, processes, techniques, works of authorship, trademarks, service marks, and logos that the Recipient or a third party owned or possessed prior to the effective date of this Agreement and that have not been developed, altered, or reduced to practice with Energy Commission or match funds; and (b) associated proprietary rights to these items that are obtained without Energy Commission or match funds, such as patent and copyright.

- **"Independently funded intellectual property"** means: (a) inventions, technologies, designs, drawings, data, software, formulas, compositions, processes, techniques, works of authorship, trademarks, service marks, and logos that are created, conceived, discovered, made, developed, altered, or reduced to practice by the Recipient or a third party during or after the Agreement term without Energy Commission or match funds; and (b) associated proprietary rights to these items that are obtained without Energy Commission or match funds, such as patent and copyright.

  "Works of authorship" does not include written products created for Agreement reporting and management purposes, such as reports, summaries, lists, letters, agendas, schedules, and invoices. The Commission owns such products regardless of their funding source.

- **Failure to identify project-relevant pre-existing or independently funded intellectual property** in this attachment may result in the property's designation as "intellectual property" that is subject to licenses and royalties, as described in Sections 21 (Intellectual Property) and 22 (Royalty Payments to the Commission).

2. Confidential Products and/or Confidential Information Contained within Products

The Energy Commission designates the following products (or information contained within products) as confidential, in accordance with Title 20 California Code of Regulations Section 2505(c)(2)(B).

None

3. Project-Relevant Pre-Existing Intellectual Property and Project-Relevant Independently Funded Intellectual Property

The Recipient has identified the following items as "project-relevant pre-existing intellectual property" and/or "project-relevant independently funded intellectual property," as defined in Sections 20 (Pre-Existing and Independently Funded Intellectual Property) and 25 (Definitions) of these terms and conditions. The Commission makes no ownership, license, or royalty claims to this property, and may only access it for the purposes described in Section 20.

Name/Title of Intellectual Property	**"Man-in-the-loop" Day Ahead Nomination System**
Type of Intellectual Property	☒ Project-relevant pre-existing intellectual property ☒ Project-relevant independently funded intellectual property
	☒ Invention ☒ Process ☒ Technology ☒ Technique ☐ Design ☐ Work of Authorship ☐ Drawing ☐ Trademark/ Service mark ☐ Data ☐ Logo ☒ Software ☒ Formula
Registered or Pending Intellectual Property (i.e., copyrights, patents, or trademarks that are registered or pending with the U.S. Copyright Office or the U.S. Patent and Trademark Office)	☐ Copyright ☒ Patent ☐ Trademark/ Service mark Name of owner: Trane International Inc. Number and date:
	For pending applications Name of applicant: Trane International Inc. Application number and date: 62/157,310. May 5, 2015 This is currently filed as a provisional patent application, and is not listed on the U.S. Patent & Trademark Office database as of the effective date of this Agreement.
Unregistered Intellectual Property	☐ Copyright ☐ Trademark/ Service mark ☐ Trade Secret
Description of how the property will be or has been used to support a premise, postulate, or conclusion referred to or expressed in any product under the Agreement	The "Man-in-the-Loop" Day-Ahead Load Nomination system comprises a suite of software applications and graphic user interfaces that provides load shedding capability. The bid system for Independent System Operator and/or Regional Transmission Operator and the nominated for call prevents disruption of critical functions at a host site. This application is already under active development by Trane U.S. Inc. and affiliated entities is described in a pending patent application. Development of this system is self-funded by Trane U.S. Inc. The novel capabilities of this system are of extremely high importance to Waste Water Treatment plant Operators, as it provides the ability to nominate on a day-ahead basis what load they are comfortable shedding.

Name/Title of Intellectual Property	ALSTOM Grid DAPserver
Type of Intellectual Property	☒ Project-relevant pre-existing intellectual property ☒ Project-relevant independently funded intellectual property
	☒ Invention ☐ Process ☒ Technology ☐ Technique ☐ Design ☐ Work of Authorship ☐ Drawing ☐ Trademark/ Service mark ☒ Data ☐ Logo ☒ Software ☒ Formula
Registered or Pending Intellectual Property (i.e., copyrights, patents, or trademarks that are registered or pending with the U.S. Copyright Office or the U.S. Patent and Trademark Office)	☐ Copyright ☐ Patent ☐ Trademark/ Service mark Name of owner: Number and date:
	For pending applications Name of applicant: Application number and date:
Unregistered Intellectual Property	☒ Copyright ☐ Trademark/ Service mark ☒ Trade Secret Alstom Grid provides goods and software services needed to connect energy service providers with utilities and the energy market. Alstom Grid provides these services for a fee using software developed specifically for this purpose. If other firms were to obtain access to the source code of the software, they would avoid development costs and would be able to compete directly with Alstom Grid to provide the service, potentially reducing revenue. To maintain the trade secret, Alstom Grid provides the services without disclosing the source code. Name of owner: ALSTOM Grid
Description of how the property will be or has been used to support a premise, postulate, or conclusion referred to or expressed in any product under the Agreement	The Alstom Grid DAPserver is an existing combination hardware/software application solution that provides multiple capabilities and services needed for the operation of the microgrid and its integration with the larger grid.

Name/Title of Intellectual Property	Dispatchable Efficiency Storage Hybrid
Type of Intellectual Property	☒ Project-relevant pre-existing intellectual property ☒ Project-relevant independently funded intellectual property
	☒ Invention ☒ Process ☒ Technology ☒ Technique ☐ Design ☐ Work of Authorship ☐ Drawing ☐ Trademark/ Service mark ☐ Data ☐ Logo ☒ Software ☐ Formula
Registered or Pending Intellectual Property (i.e., copyrights, patents, or trademarks that are registered or pending with the U.S. Copyright Office or the U.S. Patent and Trademark Office)	☐ Copyright ☒ Patent ☐ Trademark/ Service mark Name of owner: Number and date:
	For pending applications Name of applicant: Michael S. Day, Name of assignee: **Negawatt Assets LLC** Application number and date: 62096423, 23-DEC-2014 This is currently filed as a provisional patent application, and is not listed on the U.S. Patent & Trademark Office database as of the effective date of this Agreement.
Unregistered Intellectual Property	☐ Copyright ☐ Trademark/ Service mark ☐ Trade Secret
Description of how the property will be or has been used to support a premise, postulate, or conclusion referred to or expressed in any product under the Agreement	Storage Integrated Dispatchable efficiency (SIDE) is a method of incorporating cost-effective, slow responding bulk energy assets (such as VFDs or thermal energy storage assets) with more expensive fast-responding assets (like batteries or capacitors) to provide critical ancillary services. The hybrid approach provides a cost effective delivery of critical load balancing/power quality goals as compared to single-source electrical storage components alone while providing improvements in response as compared to traditional energy delivery assets and systems.

EXHIBIT D

Special Terms and Conditions

1. The Energy Commission does not own, use, or have license or access rights to:

a) Preexisting or independently-funded confidential/proprietary source code belonging to Recipient or subcontractors.

b) Source code written by Recipient or subcontractors under this Agreement.

This information must not be included in products, deliverables or other information provided by the Recipient to the Energy Commission. Recipient retains possession of the source code.

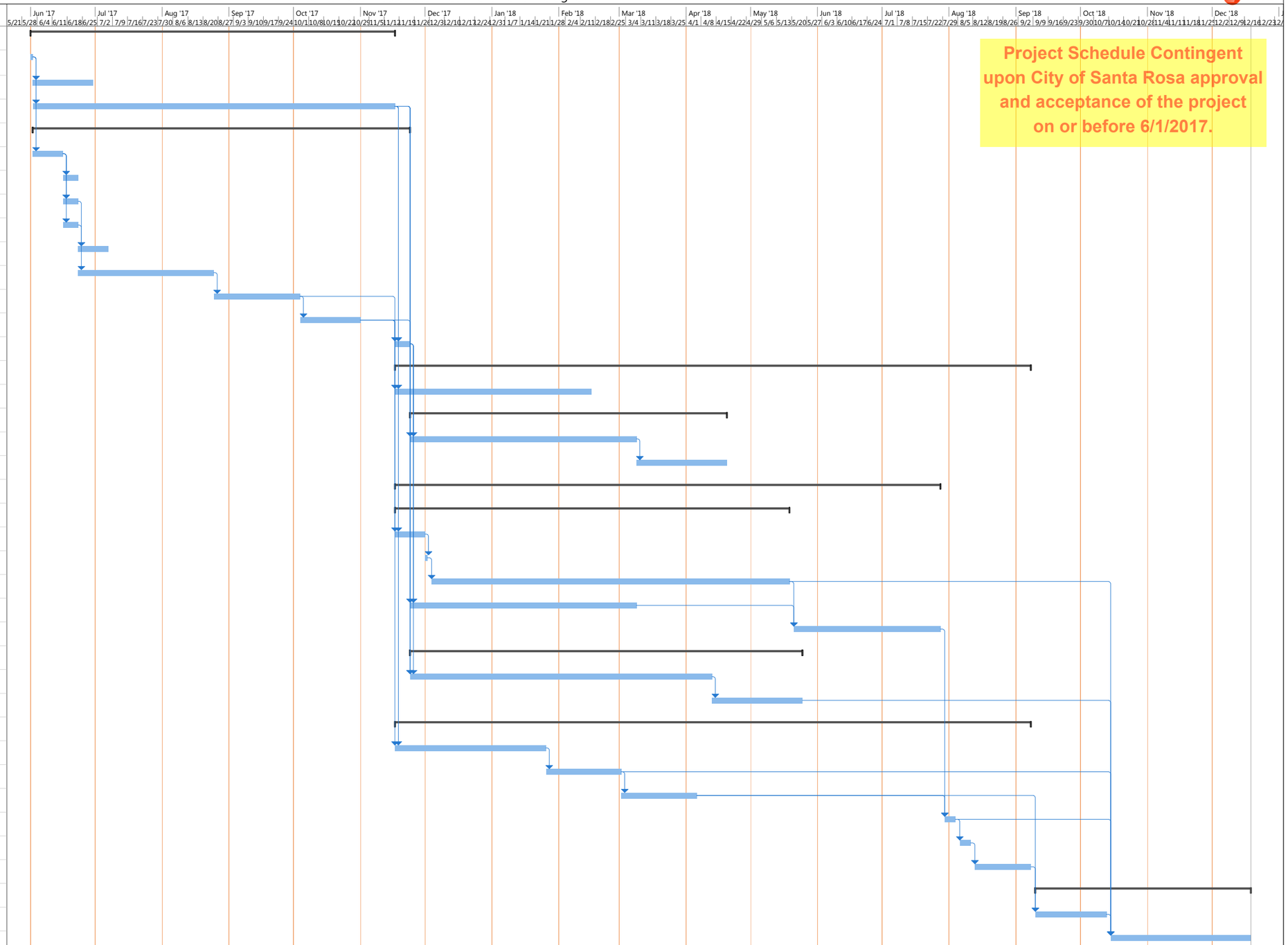
EXHIBIT E
Contact List

California Energy Commission	Recipient
Commission Agreement Manager: Kiel Pratt California Energy Commission 1516 Ninth Street, MS-51 Sacramento, CA 95814 Phone: (916) 327-1412 Fax: (916) 327-1717 e-mail: kpratt@energy.ca.gov	**Project Manager:** Richard Swank TRANE 4145 Del Mar Avenue, Rocklin, CA 95677 Phone: (916) 577-1126 Fax: (916) 577-1175 e-mail: richard.swank@trane.com
Commission Agreement Officer: Cory Irish California Energy Commission 1516 Ninth Street, MS-1 Sacramento, CA 95814 Phone: (916) 654-4739 Fax: (916) 654-1435 e-mail: cory.irish@energy.ca.gov	**Administrator:** TBD / Richard Swank TRANE 4145 Del Mar Avenue, Rocklin, CA 95677 Phone: (916) 577-1126 Fax: (916) 577-1175 e-mail: richard.swank@trane.com
Accounting Officer: Eyob Zeleke PIER Grants Payable, MS-2 California Energy Commission 1516 Ninth Street Sacramento, CA 95814 Phone: 916-653-4871 Fax: 916-653-1435 E-mail: eyob.zeleke@energy.ca.gov	**Accounting Officer:** Cora De Jesus TRANE 4145 Del Mar Avenue, Rocklin, CA 95677 Phone: (916) 577-1100 Fax: (916) 577-1175 e-mail: cora.dejesus@trane.com
Legal Notices: Tatyana Yakshina Grants Manager 1516 9th Street, MS-1 Sacramento, CA 95814 Phone: (916) 654-4204 Fax: (916) 654-4076 e-mail: tatyana.yakshina@energy.ca.gov	**Legal Notices:** Richard Swank TRANE 4145 Del Mar Avenue Rocklin, CA 95677 Phone: (916) 577-1126 Fax: (916) 577-1175 Email: richard.swank@trane.com

EXHIBIT B - PROJECT SCHEDULE

Santa Rosa Wastewater Treatment Plant Microgrid

ID	Task Mode	Task Name	Start
1		**City Agreement for Construction**	**Thu 6/1/17**
2		Final Agreement approval - all parties	Thu 6/1/17
3		City Order for 2nd SCR	Fri 6/2/17
4		Request Grant Extension	Fri 6/2/17
5		**Pre-construction**	**Fri 6/2/17**
6		Prepare Subcontracts (Major and Minor)	Fri 6/2/17
7		Issue Construction Subcontracts	Fri 6/16/17
8		Issue & Authorize Engineering contracts	Fri 6/16/17
9		Finalize Equipment and major compoents list	Fri 6/16/17
10		Prepare Equipment and major component Orders	Fri 6/23/17
11		Prepare Detailed Installation Drawings	Fri 6/23/17
12		City Review and approval of engineering	Fri 8/25/17
13		City Construction Permits	Wed 10/4/17
14		Issue Equipment/Component Orders	Fri 11/17/17
15		**Construction**	**Fri 11/17/17**
16		Rough-in (Pads, trenching, Power)	Fri 11/17/17
17		**Solar**	**Fri 11/24/17**
18		Solar Lead-time, Delivery	Fri 11/24/17
19		Solar Install	Fri 3/9/18
20		**SCR**	**Fri 11/17/17**
21		**BAAQMD**	**Fri 11/17/17**
22		Prepare BAAQMD Application	Fri 11/17/17
23		Submit BAAQMD Application	Fri 12/1/17
24		BAAQMD Approval	Mon 12/4/17
25		SCR Lead-time, Delivery	Fri 11/24/17
26		SCR Install	Mon 5/21/18
27		**Battery & Inverter installation**	**Fri 11/24/17**
28		Battery & Inverter, Lead-time, Delivery	Fri 11/24/17
29		Battery & Inverter Install	Fri 4/13/18
30		**Controls - Automation**	**Fri 11/17/17**
31		LV Wiring, Controls rough in	Fri 11/17/17
32		Scada Controls tie in (Non-SCR)	Fri 1/26/18
33		Scada Controls Programming	Fri 3/2/18
34		Scada SCR Controls	Mon 7/30/18
35		Microgrid Controller tie in	Mon 8/6/18
36		Micogrid Programming	Mon 8/13/18
37		**Programming and Startup**	**Mon 9/10/18**
38		DR Sequence Programming	Mon 9/10/18
39		Startup, Testing and Debug	Mon 10/15/18



Santa Rosa Wastewater Treatment Plant Microgrid Project
City of Santa Rosa Agreement
Major Equipment
Exhibit
March 8, 2017

Contents

Miratech SCR

SCR/Oxidation Base System Content

	QTY
Selective Catalytic Reduction Housing – *SP-EM25.120-20-UR-TBD*	2
EM, 4-Track SCR Housing with Removable Catalyst Blocks, Carbon Steel, Vertical Installation	
Oxidation Housing & Catalyst – *SP-IQ2-36-TBD-EH2*	2
IQ, NSCR Catalyst-Only Housing with Removable Catalyst(s), Carbon Steel	
Mixing Section – *20" Mixing Section (2 Mixer)*	2
20" Pre-Fabricated Mixing Section with 2 Mixers	
SCR Control System – *ACIS II*	2
Closed Loop NOx Control, HMI Operation Screen, NO Monitoring, Temperature Monitoring, Wire Labeling	
Maintenance Pack – *ACIS II Maintenance Pack*	1
Spare Parts – *ACIS II Recommended Spare Parts*	1
SCR Reactant Tank – *DW1050.st*	1
Double-Wall Reactant Tank with 1000 US Gallons Nominal Capacity	
Reactant Tank Level Indicator – *TLI*	1
Ultra-Sonic Level Indication System for Reactant Tank	
Dual Ply Bellow – *BEL-2-20*	2
20" Dual Ply Bellow	
Parts and Accessories – *Rain Cap, Stack, and Bolt Nut Gasket Kits*	2
RC-2000, STK-20PF1-0400-2, BNFFG-18, BNFFG-20	
SCR/Oxidation Base System Price	**2**

TBD in the part number is a temporary place holder. Unique part number will be assigned upon receipt of order.

Application & Performance Warranty Data

Project Information

Site Location:	Santa Rosa CA
Project Name:	WWTP Retrofit
Application:	Prime Power
Number Of Engines:	2
Operating Hours per Year:	8000

Engine Specifications

Engine Manufacturer:	Cummins
Model Number:	C1100 N6C 1 gm
Rated Speed:	1200 RPM
Type of Fuel:	Natural Gas
Type of Lube Oil:	0.6 wt% sulfated ash or less
Lube Oil Consumption:	0.1 % Fuel Consumption
Number of Exhaust Manifolds:	2

Engine Cycle Data

Load	Speed	Power	Exhaust Flow	Exhaust Temp.	Fuel Cons.	NO_x	CO	O_2	H_2O
%		*kW*	*acfm (cfm)*	*F*	*btu/bhp-hr*	*g/bhp-hr*	*g/bhp-hr*	*%*	*%*
100	Rated	1,132	7,350	779	5,000	0.5	1.5	9	15

Emission Data (100% Load)

Emission	Raw Engine Emissions						Target Outlet Emissions						Calculated Reduction
	g/bhp-hr	*tons/yr*	*ppmvd @ 15% O_2*	*ppmvd*	*lb/MW-hr*	*g/kW-hr*	*g/bhp-hr*	*tons/yr*	*ppmvd @ 15% O_2*	*ppmvd*	*lb/MW-hr*	*g/kW-hr*	
NO_x*	0.5	6.69	43	88	1.48	0.671	0.07	0.94	6	12	0.21	0.094	86%
CO	1.5	20.08	214	432	4.43	2.012	0.1	1.34	14	29	0.3	0.134	93.3%
NH_3							0.06	0.85	15	30	0.19	0.086	N/A

* MW referenced as NO_2

System Specifications

SCR/Oxidation System Specifications (SP-EM25.120-20-UR-TBD, ACIS II, SP-IQ2-36-TBD-EH2, 20" Mixing Section (2 Mixer), BEL-2-20)

Design Exhaust Flow Rate:	7,350 acfm (cfm)
Design Exhaust Temperature[1]:	779°F
Housing Model Number:	SP-IQ2-36-TBD-HSG
Element Model Number:	IQ-RE-36EH, ROM.1300.46.C3.C5.S150.045.255, SCRC-084-150-300
Number of Catalyst Layers:	2
Number of Spare Catalyst Layers:	0
Total Catalyst Volume:	18 cubic feet
SCR Catalyst Volume:	13.0 cubic feet
SCR Catalyst Space Velocity:	15,494 1/hr
Ammonia Reduction Catalyst Volume:	6 cubic feet
Ammonia Reduction Catalyst Space Velocity:	30,987 1/hr
System Pressure Loss:	12.0 inches of WC (Clean)
Sound Attenuation:	25-30 dBA insertion loss
Exhaust Temperature Limits:	572 – 977°F
Reactant:	Urea
Percent Concentration:	32.5%
System Dosing Capacity:	3 L/hr
Estimated Reactant Consumption:	0.4 gal/hr (1.6 L/hr) / Per Engine

MIRATECH Scope of Supply & Equipment Details

	Model Number	Quantity
Selective Catalytic Reduction Housing	**SP-EM25.120-20-UR-TBD**	**1 / engine**
SCR Housing	SP-EM25.120-20-UR-TBD	1 / engine
• Number of Catalyst Layers	3.0	
• Number of Spare Catalyst Layers	1.0	
• Number of Catalyst Blocks per Layer	25	
• Material	Carbon Steel	
• Paint	None	
• Inlet Pipe Size & Connection	20 inch FF Flange, 150# ANSI standard bolt pattern	
• Outlet Pipe Size & Connection	20 inch FF Flange, 150# ANSI standard bolt pattern	
• Door Location	Top	
• Dimensions	43.500" H x 57.500" W x 132" L	
• Weight Without Catalyst	1,698 lbs	
• Weight Fully Loaded With Catalyst	2,580 lbs	
• Insulation	None	
Tray Set	Tray Set-EM25-300mm	3 / engine
SCR Catalyst	SCRC-084-150-300	50 / engine
Redox Catalyst	ROM.1300.46.C3.C5.S150.045.255	25 / engine
Oxidation Housing & Catalyst	**SP-IQ2-36-TBD-EH2**	**1 / engine**
NSCR Housing	SP-IQ2-36-TBD-HSG	1 / engine
• Material	Carbon Steel	
• Paint	Standard High Temperature Black Paint	
• Approximate Diameter	34 inches	
• Inlet Pipe Size & Connection	18 inch FF Flange, 150# ANSI standard bolt pattern	
• Outlet Pipe Size & Connection	20 inch FF Flange, 150# ANSI standard bolt pattern	
• Overall Length	61 inches	
• Weight Without Catalyst	468 lbs	
• Weight Including Catalyst	756 lbs	
• Instrumentation Ports	2 inlet/2 outlet (1/2" NPT)	
• Oxygen Sensor Ports	1 inlet/1 outlet (18mm)	
Oxidation Catalyst	IQ-RE-36EH	2 / engine
Nut, Bolt, and Gasket Set	NBG-IQ36-2	1 / engine
Mixing Section	**20" Mixing Section (2 Mixer)**	**1 / engine**
Pre-Fabricated Mixing Section	20" Mixing Section (2 Mixer)	1 / engine
• Material	Carbon Steel w/ 304 SS Hydrolysis Section	
• Overall Length	103 inches	
• Weight	383 lbs	
Flow Dresser	20" Flow Dresser	1 / engine

	Model Number	Quantity
• Weight	39 lbs	
Dosing Mixer	20" Dosing Mixer	1 / engine
• Weight	10 lbs	
Static Mixer	20" Static Mixer	1 / engine
• Weight	11 lbs	
Mixing Section Injector Flange	20" Mixing Section Injector Flange	1 / engine
• Weight	4 lbs	
SCR Control System	**ACIS II**	**1 / engine**
SCR Controller	SNQ20.lab.ops.no0100	1 / engine
Dosing Box	SEN3.lab	1 / engine
• Overall Dimensions	15.75 W x 15.75 H x 6.562 D	
• Weight	27 lbs	
Reactant Pump	VPN20.lab	1 / engine
• Overall Dimensions	19.685 W x 15.906 H x 23.031 D	
• Weight	62 lbs	
Reactant Filter	FILTER20	1 / engine
Injector	DEN20.500	1 / engine
• Weight	7 lbs	
Natural Gas Sample Probe	LS400	1 / engine
• Weight	0.59 lbs	
Temperature Sensor	TT.12.32.1112	2 / engine
Air Compressor	CA20.lab	1 / engine
• Overall Dimensions	9.842 W x 26.772 H x 15.748 D	
• Weight	26 lbs	
Maintenance Pack	**ACIS II Maintenance Pack**	**1 / project**
Maintenance Pack	VPN20 Maintenance Pack	1 / project
Spare Part	Urea Pump Kit SE27	1 / project
Maintenance Pack	SEN3 Maintenance Pack	1 / project
Spare Part	Air Pressure Switch	1 / project
Spare Part	Dosing Valve 3..20	1 / project
Maintenance Pack	CA20 Maintenance Pack	1 / project
Spare Part	Compressor Vane Kit DT4.8	1 / project
Spare Part	Air Suction Filter CA20	1 / project
Maintenance Pack	DEX20.XXX Maintenance Pack	1 / project
Spare Part	Injector O-Ring DEN20 - Large	1 / engine
Spare Part	Injector O-Ring DEN20 - Small	1 / engine
Spare Part	Nozzle Gasket - DEN20	1 / engine
Spare Part	Injector Nozzle - DEN20	1 / engine
Spare Part	Air Adjustment Cap - DEN20	1 / engine

	Model Number	Quantity
Spare Part	Air Adjustment Ring 20L	1 / engine
Spare Parts	**ACIS II Recommended Spare Parts**	**1 / project**
Recommended Spare Parts	VPN20 Recommended Spare Parts	1 / project
Spare Part	Urea Booster Pump 27 Liter	1 / project
Recommended Spare Parts	SEN3 Recommended Spare Parts	1 / project
Spare Part	Dosing Valve 3..20	1 / project
Recommended Spare Parts	CA20 Recommended Spare Parts	1 / project
Spare Part	Compressor DT4.8	1 / project
SCR Reactant Tank	**DW1050.st**	**1 / project**
Reactant Tank	DW1050.st	1 / project
• Material	Cross-Linked Polyethylene	
• Tank Dimensions	74.5 D x 87 H	
• Capacity	1000 US Gallons	
• Weight	205 lbs	
• Wall Construction	Double	
• Insulation	None	
• Heat Trace	None	
• Seismic Tie Downs	Zone 4	
Reactant Tank Level Indicator	**TLI**	**1 / project**
Reactant Tank Level Indicator	TLI	1 / project
Level Transmitter	LU20	1 / project
Level Controller	LI55	1 / project
Level Controller Enclosure	LM92	1 / project
Dual Ply Bellow	**BEL-2-20**	**1 / engine**
Dual Ply Bellow	BEL-2-20	1 / engine
Parts and Accessories	**Rain Cap, Stack, and Bolt Nut Gasket Kits**	**1 / engine**
Flange Nut, Bolt, and Full Face Gasket Set	BNFFG-20	4 / engine
Flange Nut, Bolt, and Full Face Gasket Set	BNFFG-18	1 / engine
Rain Cap	RC-2000	1 / engine
Stack	STK-20PF1-0400-2	1 / engine

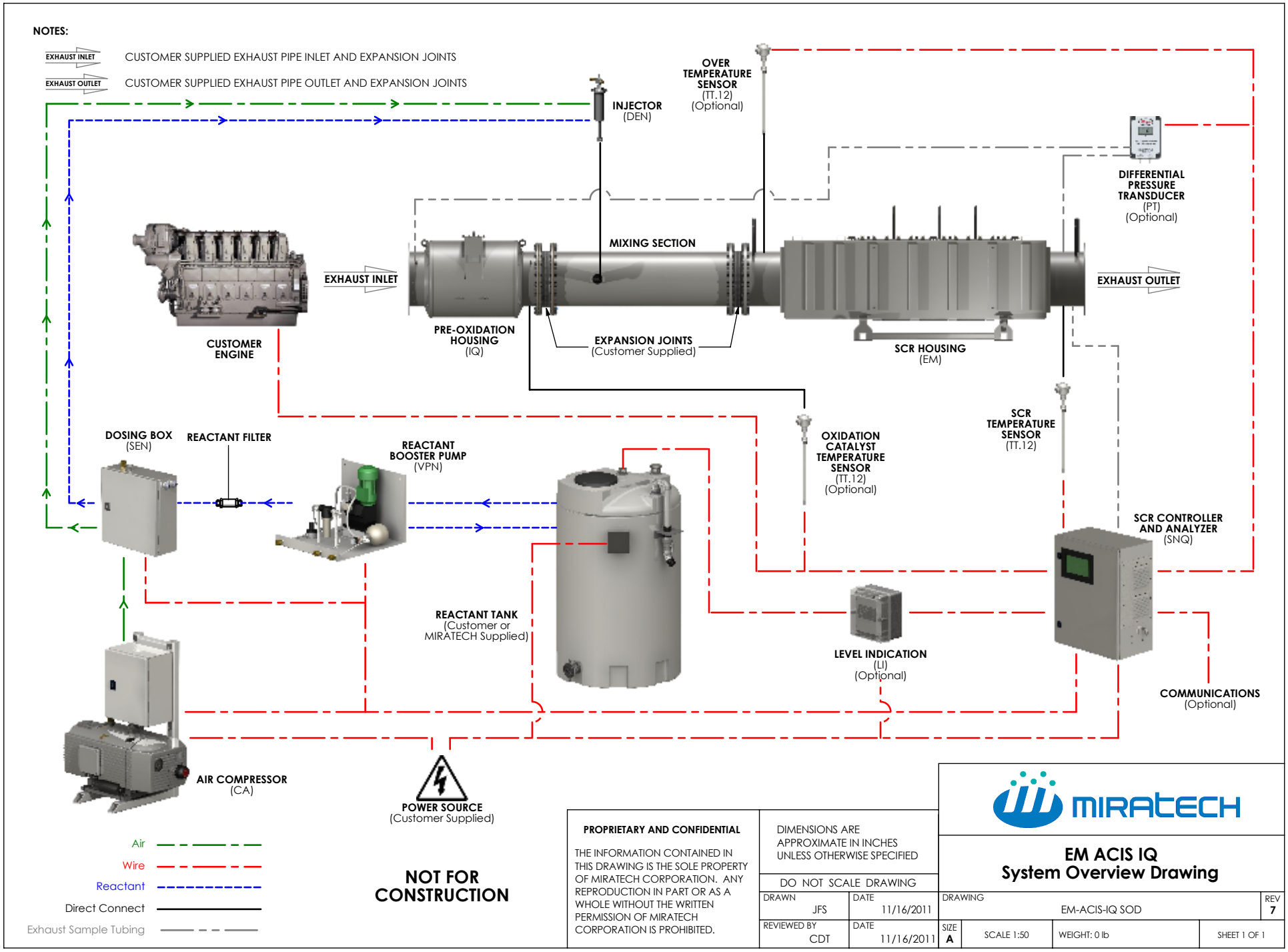
Customer Scope Of Supply

- Support Structure
- Attachment to Support Structure (Bolts, Nuts, Levels, etc.)
- Expansion Joints
- Exhaust Piping
- Inlet Pipe Bolts, Nuts, & Gasket
- Outlet Pipe Bolts, Nuts, & Gasket
- Insulation for Exhaust Piping
- Power Input (230 VAC, 60 Hz, Single Phase)
- Component Installation Including External Tubing and Wiring
- Isolated Engine Load Signal to MIRATECH Equipment (4-20 mA)
- Dry Contact (N.O.) for Engine Run Signal to MIRATECH Equipment
- Heat Tracing of Reactant Lines (Required when Ambient Temperatures are Below 40 °F)
- Heat Tracing of Sample Lines (Required when Ambient Temperatures are Below 32 °F)
- Design for Structural Support and Thermal Expansion

Special Notes & Conditions

1. For housings and exhaust components that are insulated, internally or externally, please refer to Section 7.1 of the General Terms and Conditions of Sale to prevent voiding MIRATECH product warranty.
   - Carbon steel is suitable for temperatures up to 900° F / 482° C continuously, when covered with external insulation or a heat shield. For continuous operation above 900° F / 482° C, where the equipment is externally insulated or has a heat shield, stainless steel should be used.

- A packed silencer installed upstream of the MIRATECH catalyst system will void MIRATECH's limited warranty.
- Final catalyst housings are dependent on engine output and required emission reductions. Changes may be made to optimize the system design at the time of order.
- Any drawings included with this document are preliminary in nature and could change depending on final product selection.
- Any sound attenuation listed in this document is based on housing with catalyst elements installed.
- Any emission reductions listed in this document are based on housing with catalyst elements installed.
- MIRATECH will confirm shipping location upon placement of order.


NOTES:
EXHAUST INLET
CUSTOMER SUPPLIED EXHAUST PIPE INLET AND EXPANSION JOINTS
EXHAUST OUTLET
CUSTOMER SUPPLIED EXHAUST PIPE OUTLET AND EXPANSION JOINTS
INJECTOR
(DEN)
OVER TEMPERATURE SENSOR
(TT.12)
(Optional)
DIFFERENTIAL PRESSURE TRANSDUCER
(PT)
(Optional)
MIXING SECTION
EXHAUST INLET
EXHAUST OUTLET
CUSTOMER ENGINE
PRE-OXIDATION HOUSING
(IQ)
EXPANSION JOINTS
(Customer Supplied)
SCR HOUSING
(EM)
OXIDATION CATALYST TEMPERATURE SENSOR
(TT.12)
(Optional)
SCR TEMPERATURE SENSOR
(TT.12)
DOSING BOX
(SEN)
REACTANT FILTER
REACTANT BOOSTER PUMP
(VPN)
SCR CONTROLLER AND ANALYZER
(SNQ)
REACTANT TANK
(Customer or MIRATECH Supplied)
LEVEL INDICATION
(LI)
(Optional)
COMMUNICATIONS
(Optional)
AIR COMPRESSOR
(CA)
POWER SOURCE
(Customer Supplied)
Air
Wire
Reactant
Direct Connect
Exhaust Sample Tubing
NOT FOR CONSTRUCTION
PROPRIETARY AND CONFIDENTIAL
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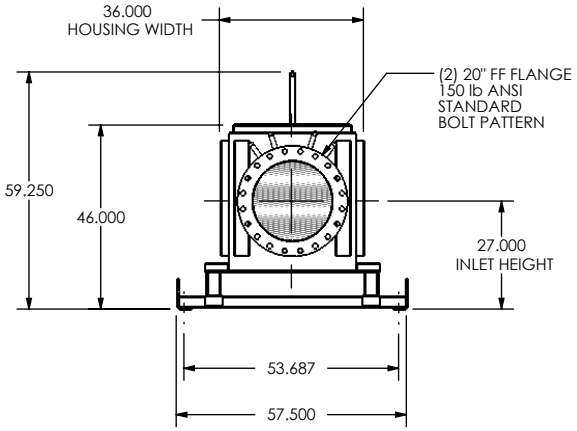
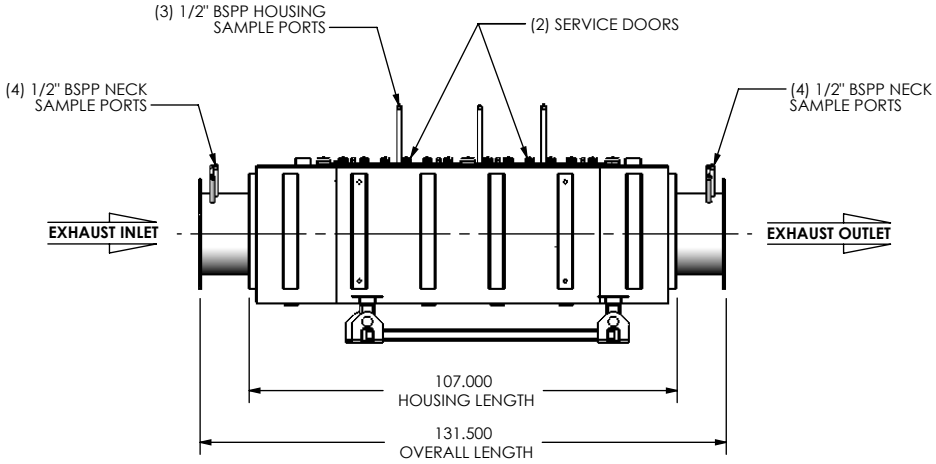
DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED
DO NOT SCALE DRAWING
DRAWN JFS
DATE 11/16/2011
REVIEWED BY CDT
DATE 11/16/2011
MIRATECH
EM ACIS IQ
System Overview Drawing
DRAWING EM-ACIS-IQ SOD
REV 7
SIZE A
SCALE 1:50
WEIGHT: 0 lb
SHEET 1 OF 1

HOUSING WEIGHTS (APPROXIMATE)	
EMPTY HOUSING	1730 lb
ONE (1) FULL SCR CATALYST LAYER	212 lb
FULLY LOADED HOUSING	2578 lb
• HOUSING HAS CAPACITY FOR (4) FULL CATALYST LAYERS	



FRONT VIEW



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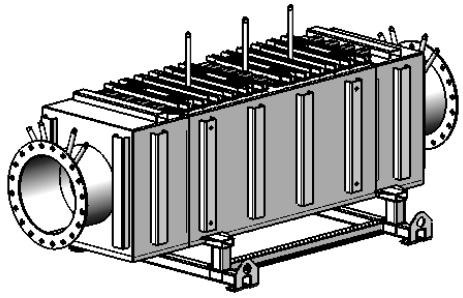

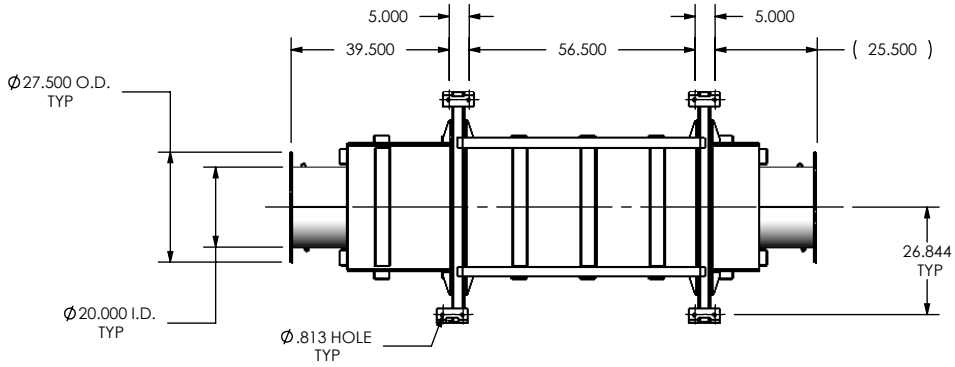

BOTTOM VIEW

NOTES:

- ONLY USE MOUNTING FEET TO LIFT ASSEMBLED HOUSING
- MUST BE MOUNTED HORIZONTALLY
- NO FORCES OR MOMENTS MAY BE APPLIED TO THE FLANGES
- ALLOW MINIMUM 40" CLEARANCE FROM SERVICE DOOR FOR LOADING AND MAINTENANCE

MATERIAL CONSTRUCTION:

- CARBON STEEL

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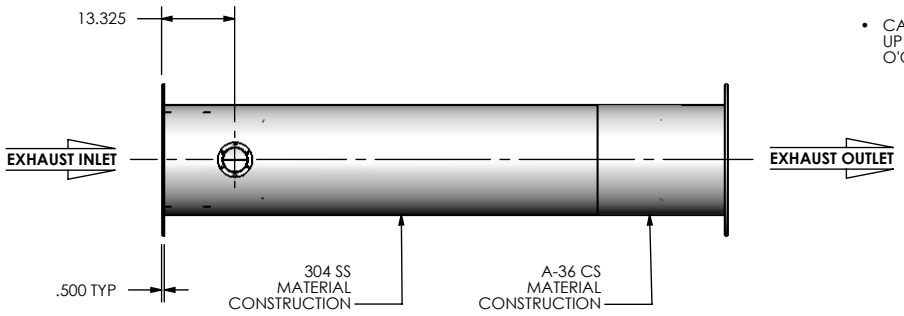
SALES ORDER NO.		DRAWN JCU — DATE 3/12/2010
CUSTOMER P.O.		REVIEWED BY AJM — DATE 3/12/2010

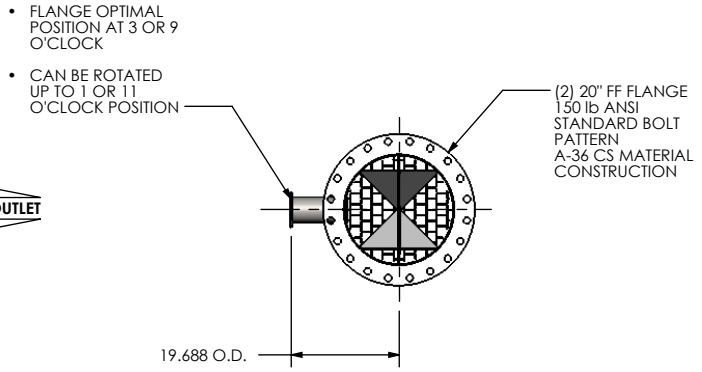
MIRATECH

EM25.120-20
Sales Drawing

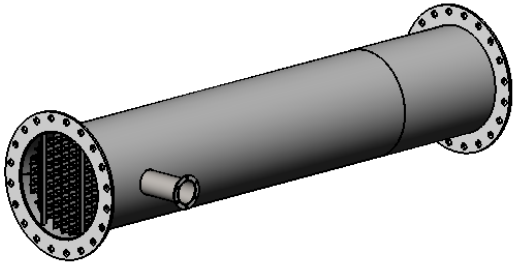
DRAWING	REV	SIZE	SCALE	WEIGHT	SHEET
EM25.120-20	0	A	SCALE 1:48	WEIGHT: 1869 lb	SHEET 1 OF 1

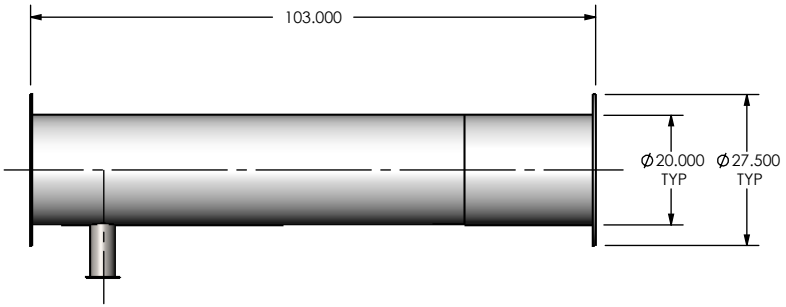


FRONT VIEW



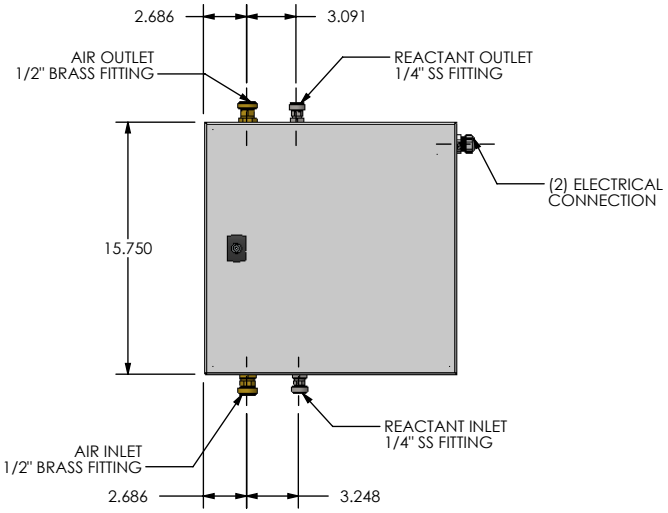
RIGHT VIEW



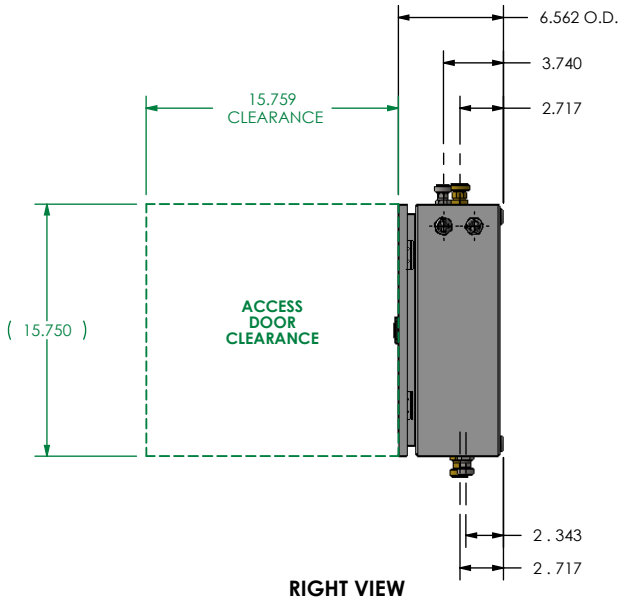


TOP VIEW

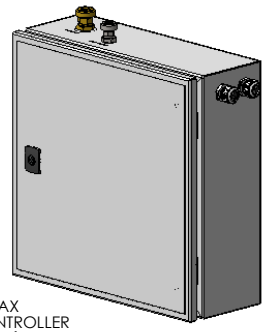
PROJECT NAME	**PROPRIETARY AND CONFIDENTIAL**	DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED	MIRATECH			
DOCUMENT NUMBER	THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MIRATECH CORPORATION. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MIRATECH CORPORATION IS PROHIBITED.	DO NOT SCALE DRAWING	**20" Mixing Section (2 Mixer) Sales Drawing**			
SALES ORDER NO.		DRAWN AJM / DATE 1/5/2010	DRAWING 20 Mixing Section (2 Mixer) SD	REV **5**		
CUSTOMER P.O.		REVIEWED BY JWS / DATE 1/5/2010	SIZE **A**	SCALE 1:35	WEIGHT: 381 lb	SHEET 1 OF 1

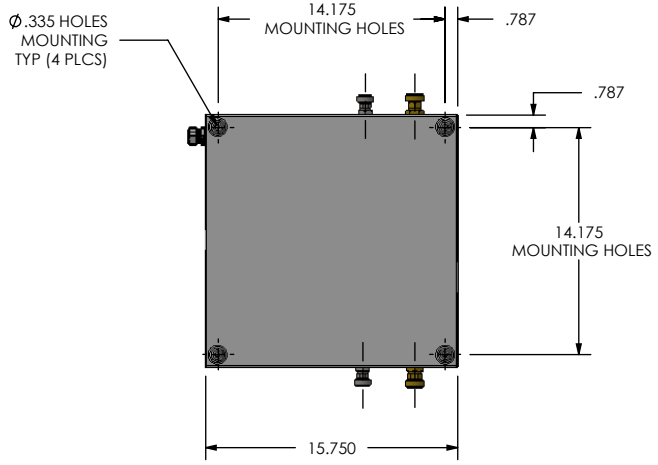


FRONT VIEW



RIGHT VIEW





BACK VIEW

NOTES:

- *POWER CONSUMPTION:* 5.75 W MAX
- *POWER:* SUPPLIED FROM SNQ CONTROLLER
- *OPERATION TEMPERATURE:* 40-104°F
  14-104°F (WITH .WT OPTION)
- NO DEW DROPS ALLOWED
- OPERATING PRESSURE: REACTANT - 3 BAR (43.50 PSI)
  AIR - 1 BAR (14.50 PSI)

INSTALLATION INSTRUCTIONS:

- IF UNIT IS INSTALLED IN AN ENCLOSURE, THE ENCLOSURE MUST BE VENTILATED AND TEMPERATURE CONTROLLED TO MAINTAIN PROPER OPERATION TEMPERATURE.
- UNIT TO BE MOUNTED SO THAT IT IS ACCESSIBLE WHILE ENGINE IS IN OPERATION AND NO MORE THAN 6.5 FEET FROM DOSING INJECTOR.
- UREA LINES SHOULD BE HEAT TRACED IF AMBIENT CONDITIONS FALL BELOW 40°F

PROJECT NAME	
DOCUMENT NUMBER	
SALES ORDER NO.	
CUSTOMER P.O.	

DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED

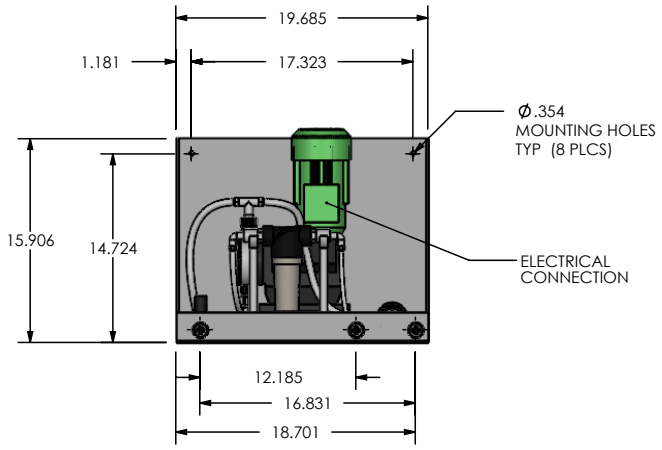
DO NOT SCALE DRAWING

DRAWN	JFS	DATE	08/22/2011
REVIEWED BY	AJM	DATE	08/22/2011

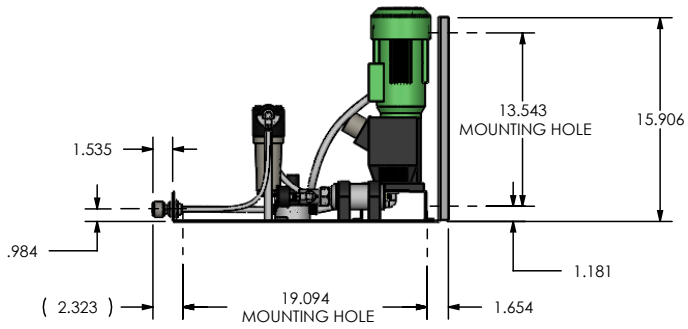
MIRATECH

SEN3 Dosing Box
Sales Drawing

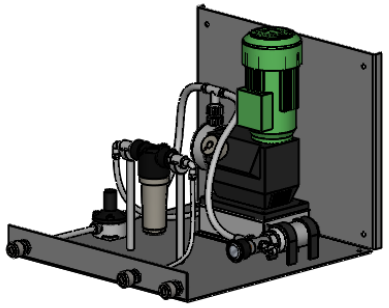
DRAWING	SEN3 SD				REV 6
SIZE A	SCALE 1:12	WEIGHT: 27 lb	SHEET 1 OF 1		

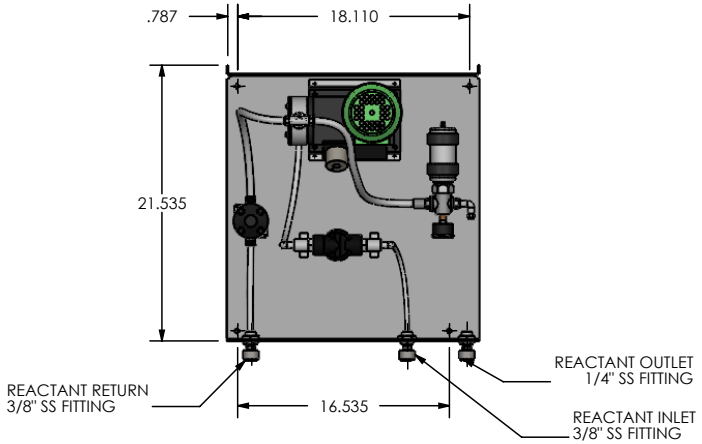


FRONT VIEW



RIGHT VIEW





TOP VIEW

NOTES:

- *POWER CONSUMPTION:* 250 W MAX SUPPLIED BY SNQ CONTROLLER
- *OPERATION TEMPERATURE:* 40°F - 104°F

INSTALLATION INSTRUCTIONS:

- UNIT TO BE MOUNTED SO THAT THE MAXIMUM SUCTION HEIGHT IS LESS THAN 5 FEET
- UREA LINES SHOULD BE HEAT TRACED IF AMBIENT CONDITIONS FALL BELOW 40° F

PROJECT NAME	
DOCUMENT NUMBER	
SALES ORDER NO.	
CUSTOMER P.O.	

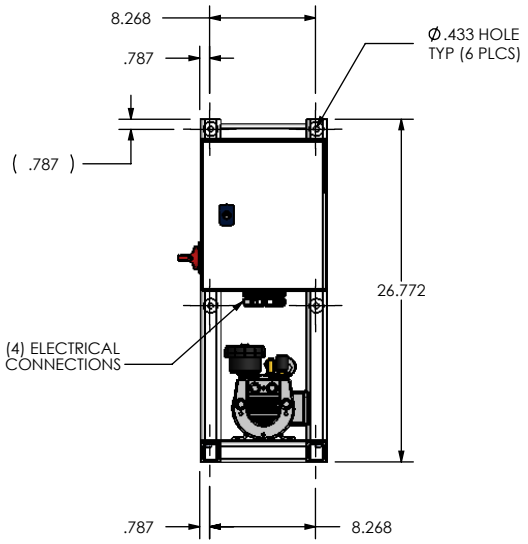
DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED

DO NOT SCALE DRAWING

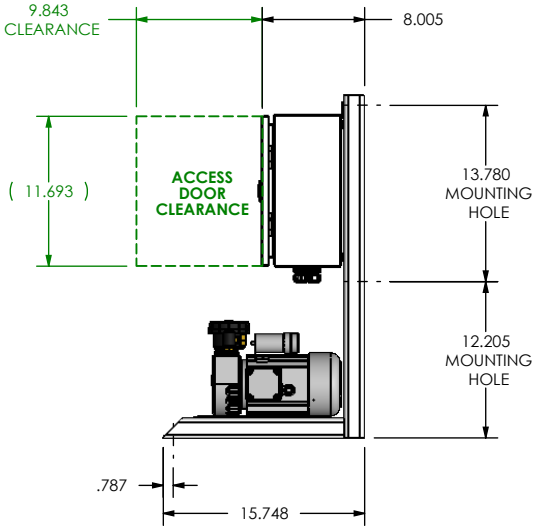
DRAWN	CLV	DATE	11/11/2015	DRAWING	VPN20 SD	REV 8
REVIEWED BY	EQJ	DATE	11/11/2015	SIZE A	SCALE 1:15	WEIGHT: 101 lb	SHEET 1 OF 1

MIRATECH

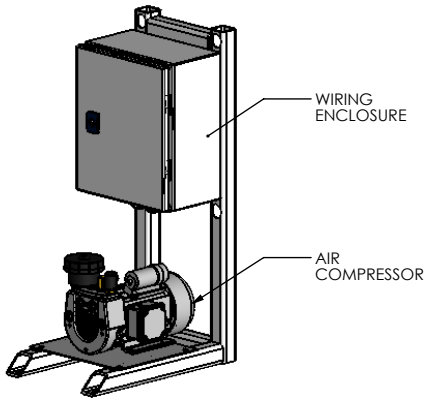
VPN20 Booster Pump Sales Drawing

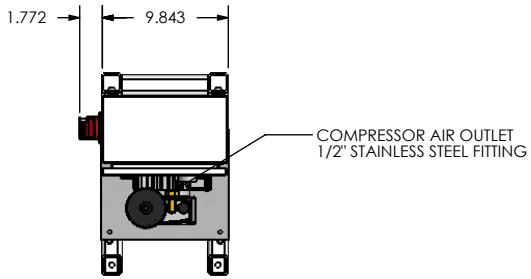


FRONT VIEW



RIGHT VIEW





TOP VIEW

NOTES:

- *POWER CONSUMPTION:* 420 W MAX
- *VOLTAGE:* 230 VAC +/- 10%, SINGLE Φ, 60 Hz
- *CURRENT DRAW:* 3.40 A
- OPERATION TEMPERATURE: 32°F - 104°F

INSTALLATION INSTRUCTIONS:

- IF UNIT IS INSTALLED IN AN ENCLOSURE, THE ENCLOSURE MUST BE VENTILATED AND TEMPERATURE CONTROLLED TO MAINTAIN PROPER OPERATION TEMPERATURE

PROJECT NAME	
DOCUMENT NUMBER	
SALES ORDER NO.	
CUSTOMER P.O.	

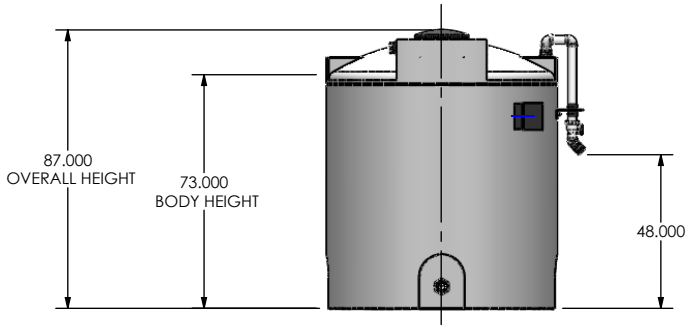
DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED

DO NOT SCALE DRAWING

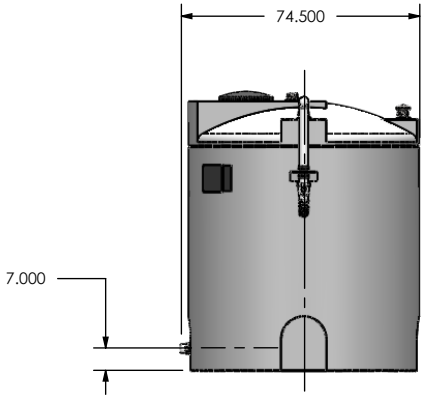
MIRATECH

CA20 Air Compressor Sales Drawing

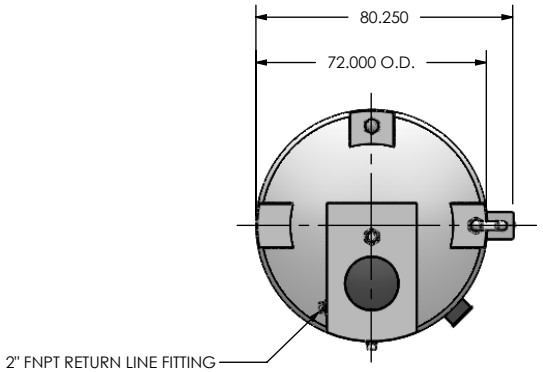
DRAWN	JFS	DATE	08/22/2011	DRAWING	CA20 SD	REV 6
REVIEWED BY	AJM	DATE	08/22/2011	SIZE A	SCALE 1:15	WEIGHT: 64 lb	SHEET 1 OF 1



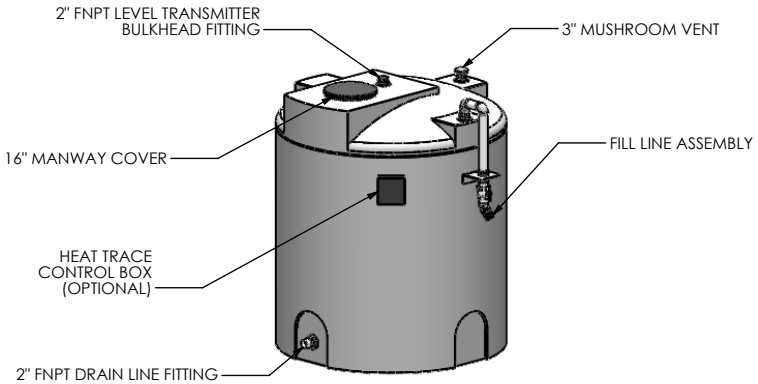
FRONT VIEW



RIGHT VIEW



TOP VIEW



NOTES:

- CAPACITY: 1000 (US GALLONS)
- INSULATION NOT SHOWN - NOMINAL 2" THICKNESS W/ GRAY MASTIC COATING
- (OPTIONAL) SEISMIC TIE DOWNS ARE RATED UBC ZONE 4
- *MATERIAL CONSTRUCTION:* CROSSLINK POLYETHYLENE
- HEAT TRACE ELECTRICAL REQUIREMENTS
  - POWER CONSUMPTION: 420W
  - CURRENT DRAW: 3.5A
  - SUPPLY VOLTAGE: 120 VAC, 1 Ø

PROJECT NAME	**PROPRIETARY AND CONFIDENTIAL**	DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED	MIRATECH				
DOCUMENT NUMBER	THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MIRATECH CORPORATION. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MIRATECH CORPORATION IS PROHIBITED.	DO NOT SCALE DRAWING	**DW1050 Reactant Tank Sales Drawing**				
SALES ORDER NO.		DRAWN: JFS	DATE: 08/28/2012	DRAWING: DW1050 SD			REV: 7
CUSTOMER P.O.		REVIEWED BY: AJM	DATE: 08/28/2012	SIZE: A	SCALE 1:60	WEIGHT: 205 lb	SHEET 1 OF 1

Nuvation

B□□□□□ H□□□□□, L□□□□ □□□□□□□□ B□□□□□ M□□□□□ □□□S□□□□

NUVATION ENGINEERING
ELECTRONIC PRODUCT DESIGN AND MANUFACTURING

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151 GIBRALTAR CT
SUNNYVALE, CA 94089 USA
408.228.5580

WATERLOO DESIGN CENTER
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WATERLOO, ON N2J 3Z1 CANADA
519.746.2304

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SANTA ROSA WASTEWATER TREATMENT PLANT MICROGRID

ENERGY STORAGE SYSTEM

PREPARED FOR

TRANE
4145 Delmar Ave.
Rocklin, CA 95677
Tel: 916.577.1114

-

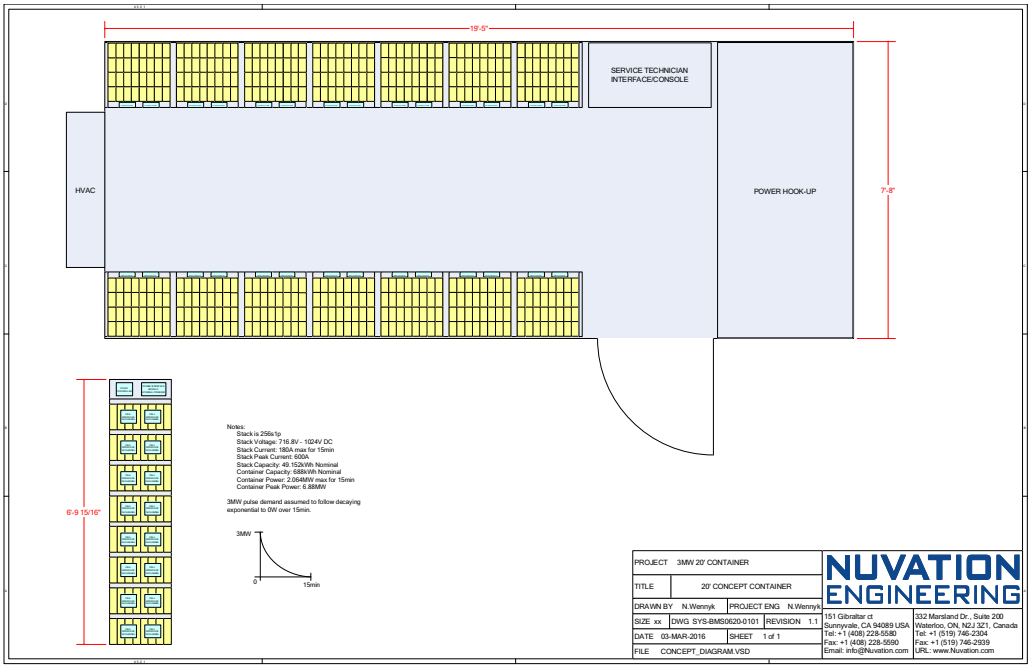
SERVICES

PROGRAM UNDERSTANDING

Nuvation and Parker Energy Storage System for the Santa Rosa program which requires 15 minutes of power, starting with a 2MW peak and reducing to 0 over 15 minutes.

THE FOLLOWING SCOPE OF SERVICES WILL BE PERFORMED UNDER THIS SOW:

- Design, integrate and prepare for delivery a 2MW peak, Energy Storage System built around Nuvation's Battery Management System (BMS) and Grid Battery Controller (GBC)
- To achieve 2MW peak, system shall be approximately 688kWhr, consisting of 14 stacks where each stack is 256 series cells.
- Source Li-Ion cells, install in racks, and integrate with BMS
- Source 20' container and install battery racks in container
- Interface Nuvation's Grid Battery Controller with external site controller
- Program Nuvation's Grid Battery Controller to receive commands from external site controller and control Parker's PCS
- Note: Parker PCS should be purchased directly from Parker, we have solicited a quote from Parker on Trane's behalf. The plan is a 20' battery container installed beside the Parker PCS, which already comes in an external container. This solution of having the batteries in a separate enclosure from the PCS is the same configuration we are using with an existing ESS. The 20' battery container will ship from Nuvation's office in Sunnyvale. The PCS will ship from Parker. Integration with Parker PCS shall occur onsite in Santa Rosa. We already have an ESS today with Nuvation's BMS, GBC and the same model Parker PCS 890GTB.



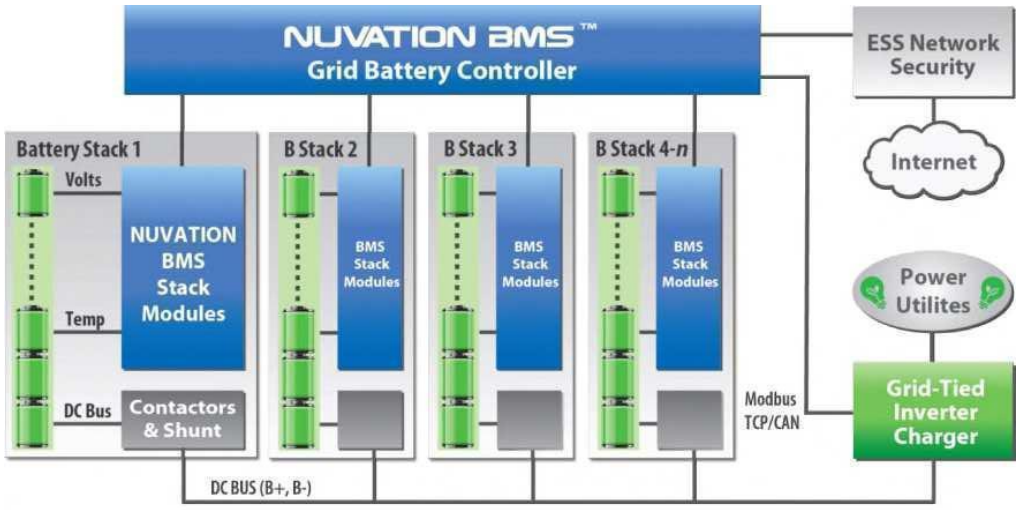
ASSUMPTIONS / SCOPE CONSTRAINTS

- Requirements do not change significantly or branch out into research
- Level concrete pad or enclosure shimming and leveling by Trane
- 2MW demand is once or twice a day, giving adequate time for the cells to cool back down.
- Source of power to recharge cells after the 2MW demand is available (whether that is grid, solar, generators, etc so long as it is present).
- No significant schedule delays due to time required to setup NDAs and receiving support from key vendors.
- External site controller interface is unknown. Nuvation assumes external site controller connects to the ESS via Modbus-TCP/IP and implements MESA-compliant protocol (an ESS-specific form of SunSpec)
- Features not explicitly mentioned in Client's product requirements or in this SOW are not included in the scope of Services.
- All materials supplied by Client to Nuvation for prototype or other build will be at no cost to Nuvation.
- Project management procedures shall be according to Nuvation's standards.
- All shipping, customs, and brokerage fees for shipping of equipment between Client and Nuvation shall be at Client's expense and are not included in any estimate

DELIVERABLES

This project will generate the following deliverables:

- Energy Storage System battery container ready to ship from Sunnyvale to Santa Rosa
- Nuvation BMS for 14 stacks of 256s1p Li-Ion cells
- Li-Ion cells installed into the stacks
- Support with Nuvation BMS integration to external site controller
- 20' Lithium Energy Storage System Enclosure
- Rack Integration, Integrated HVAC and Control System, Fire Suppression and Ancillary Lighting / Miscellaneous Loads
- Required internal cabling installed for ESS



Multi-Stack View: Grid ESS Managed by Nuvation BMS

THE Grid Battery Controller (GBC)

- Management system for multi-stack batteries
- Gateway for data analytics
- Displays system-wide statistics for voltages, temperatures, and currents
- ESS level SoC, SoH, current-limiting algorithms for multi-stack batteries
- Web-based configuration software

THE STACK CONTROLLER (SC)

- Master controller for one battery stack
- Safety monitoring and control, state of charge and state of health
- Communicates to the Power Interface via the Stack Bus
- Provides link bus interface to Cell Interface(s)
- Communicates with system components via:
    - Ethernet (Modbus TCP or HTTP)
    - Can
    - Modbus RS485
    - Includes USB service port with optional link to tablets or laptops

THE POWER INTERFACE (PI)

- Provides power for the system
- Monitors battery stack voltage
- Connects directly to high-voltage and high-current components
- Accepts Stack and auxiliary power inputs, provides power
- conditioning for all Nuvation BMS modules and power for the contactors
- Power is sourced either from the battery stack or from a 24 VDC input, allowing full functionality at zero charge
- Monitors battery stack current via an inline current shunt with external temperature compensation

THE CELL INTERFACE (CI)

- Connects to the battery cells and temperature sensors to monitor and balance the cells and prevent overheating or overcharging
- Stackable architecture supports using multiple cell interfaces to manage hundreds of cells in series
- Monitors voltage of each cell, one module manages up to 12 or 16 cells
- Communication and power are provided over the link bus
- Provides passive balancing up to 300ma / 60VDC per cell interface
- Includes temperature monitoring of the module plus eight (8) external sensor inputs for the cells

Parker Hannifin

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ENGINEERING YOUR SUCCESS.

Battery Energy Storage, Inverter and Transformer
2MW Microgrid
Laguna Wastewater Treatment Plant
Santa Rosa, California

June 15, 2016

Reference Number: TSY16061401

PCS and Transformers for 2MW Battery Energy Storage System (BESS)

PARKER REFERENCE NUMBER:	TSY16061401
DATE	June 15, 2016
PROJECT LOCATION	Santa Rosa, California
CUSTOMER NAME:	Trane
End User:	Santa Rosa - Laguna Wastewater Treatment Plant
CUSTOMER CONTACT / (PHONE NUMBER):	Richard Swank Microgrid Program Manager Trane 4145 Delmar Ave, Rocklin, CA 95677 PH: (916) 577-1126; Fax: (916) 577-1175 Richard.swank@trane.com
PARKER SALES CONTACT:	Steven R. Schwartz sschwartz@parker.com (317) 652-7488

ENGINEERING YOUR SUCCESS.

June 15, 2016

Richard Swank
Microgrid Program Manager

Trane
4145 Delmar Ave, Rocklin, CA 95677
PH: (916) 577-1126; Fax: (916) 577-1175
Richard.swank@trane.com

Subject: Santa Rosa – Laguna Wastewater Treatment Microgrid

Dear Mr. Swank,

Parker Hannifin appreciates the opportunity to submit this information to you for one (2.2MVA) Energy Storage System inverter and transformer. Please review the materials included and let me know what questions you may have and what additional information you need..

The Parker team is looking forward to working with you, and any partners you may be working with on this project. Please let me know if you have any questions as you go through this document.

Best Regards,

Steve Schwartz
Industry Market Manager

Parker Hannifin Company
Energy Grid Tie Division
9225 Forsyth Park Dr.
Charlotte, NC 28273
(317) 652-7488
sschwartz@parker.com
www.parker.com/gridtie

TABLE OF CONTENTS

A. Parker Energy Grid-Tie Division

Parker Hannifin is a leader in the delivery of high- performance, high efficiency power conversion systems and integration support for grid storage technology. Since 2007, Parker has contributed to many innovative storage deployments including projects with LG Chem, Mitsubishi/GS Yuasa, AES Energy Storage, FIAMM, SAFT, UET, A123/NEC, Primus, Greensmith, Altairnano, Power Secure, SAIC, Toshiba, Duke Energy, EPRI, UNCC, Tesla, 1Energy Systems, Temporal Power, XP/Younicos, Desert Power and EnerDel. In 2008, Parker was a key partner with AES Energy Storage in the first large scale lithium-ion storage system in commercial power service in the world (http://www.b2i.cc/Document/546/KEMA_Report.pdf).

Parker SSD Drives/Parker Energy Grid Tie North American Headquarters Charlotte, North Carolina USA

Leveraging 40 years of power electronics and systems expertise, Parker has successfully delivered several of the largest grid storage systems in the world, working on deployments in the US including California, Pennsylvania, Indiana, Texas, West Virginia, New York, Ohio, Hawaii, New Jersey, Washington, and Oregon. Parker was recently announced as one of two qualified partners for the AES Energy Storage Advancion™ offering. Parker has deployed over **245MVA** of bi-directional power conversion systems achieving a position as one of the clear leaders in real projects in service. Of these projects **approximately 50% are for Frequency Regulation** applications.

Installed Site	Equipment Power (MW)	Equipment Type
Laurel Mountain, West Virginia	32	DC-AC 890 Grid Tie Inverters
Cochrane, Chile	20	DC-AC 890 Grid Tie Inverters
Netherlands	20	DC-AC 890 Series GTI
Ireland	20	DC-AC 890 Series GTI
Dayton, Ohio (DP&L)	20	DC-AC 890 Grid Tie Inverters
Indiana	20	DC-AC 890 Series GTI
Pennsylvania	18	DC-AC 890 Grid Tie Inverters
Korea (Undisclosed)	16	DC-AC 890 Grid Tie Inverters
Los Andes, Chile	16	DC-AC 890 Grid Tie Inverters
Ohio (under construction)	10	DC-AC 890 Grid Tie Inverters
Pennsylvania (under construction)	10	DC-AC 890 Grid Tie Inverters
Maryland	10	DC-AC 890 Series GTI
Johnson City, NY	8	DC-AC 890 Grid Tie Inverters
Hamilton, OH	6	DC-AC 890 Grid Tie Inverters
Grand Ridge, IL	3	DC-AC 890 Grid Tie Inverters
New Jersey (city not disclosed)	3	DC-AC 890 Grid Tie Inverters
Hawaii (multiple, cities not disclosed)	3	DC-AC 890 Grid Tie Inverters
San Fermin, Puerto Rico	3	DC-AC 890 Grid Tie Inverters
New Richmond, OH	2	DC-AC 890 Grid Tie Inverters
Glen Valley, IN	2	DC-AC 890 Grid Tie Inverters
Huntington Beach, CA	2	DC-AC 890 Grid Tie Inverters
Blythe. CA	2	DC-AC 890 Grid Tie Inverters
Washington State	2	DC-AC 890 Grid Tie Inverters
Grand Prairie, TX	1	DC-AC 890 Grid Tie Inverters

Table 1: A sample listing of Parker Hannifin PCS customer installed projects

In 2013, Parker increased its commitment to the energy storage market with the launch of the global Energy Grid Tie Division. Headquartered in Charlotte, North Carolina, the Energy Grid Tie Division increased investment in new product development, manufacturing, testing, and containerization of PCS and battery systems.

From its earliest days, Parker has continued to demonstrate ongoing improvements to standby power consumption, cooling, controls, and footprint. Its most recent 890GT products provide self-contained outdoor duty power conversion systems that can be quickly mated with fully integrated Parker or third party battery containers for use in a variety of applications and at scales ranging from 2 to over 100 megawatts.

These achievements would not have been possible without Parker's ongoing commitment to product development, quality operations of our equipment, and great partnering in the success of our customers. Parker is a long-standing member of ESA, CESA, APPA, and other reputable organizations, and is one of the true leaders in the grid scale energy storage industry with industry leading qualifications from successful projects, a demonstrated commitment of ongoing investment, and an established global presence.

Capabilities

With over 245MW of energy (lithium ion battery) storage projects operating or being installed, Parker is the leading provider of grid connected energy storage implementations.

The Parker Energy Grid-Tie Division of Parker Hannifin operates as a global enterprise with a presence in a large portion of the world. In our US offices, we coordinate system commissioning and field service for North and South America. For large scale projects with an extended life, we strive to establish local points of contact for Parker to use for service and/or warranty issues. For any integrated systems installed outside of our US base we use local engineers in our commissioning, or if they are not available, third party agencies that we have established an agreement with.

By using our local partners, and local field service personnel, Parker is able to provide shorter response times and reduce costs associated with breakdowns or emergencies. Our capabilities extend beyond our domestic borders and even the areas mentioned here. By taking a long term global approach, Parker has been able to commission and help maintain systems throughout the world.

B. Request for Informatio *(As presented by Trane to Parker w/comments)*

Battery Energy Storage, Inverter with Step-up Transformer
Equipment / Materials and Start-up Support
Laguna Wastewater Treatment Plant
Santa Rosa, California

PART 1 GENERAL

1 General

A. Trane developed and presented an integrated advanced microgrid at Laguna Wastewater Treatment Plant (LWWTP). The CEC selected the Trane proposal and will fund the Deployment and Testing of the advanced microgrid.

B. The Project includes several elements (tasks):
- Task 1: General Project Tasks
- Task 2: Install Selective Catalytic Reduction (SCR) Equipment
- Task 3: Install and Integrate Microgrid Controller and Automation
- Task 4: Install Energy Storage System
- Task 5: Install 125 kW Photovoltaic System
- Task 6: Evaluation of Project Benefits
- Task 7: Technology / Knowledge Transfer Activities
- Operational Strategy Adjustments
- Upgraded SCADA / Controls

C. Schematic Scope was received for this element April 2016. The scope of this work was approved for inclusion in the overall project.

D. The scope of work for this RFI includes Tasks 1, 4, 6 ,& 7, the supply of Grid tied battery storage, inverter(s), and transformer(s) necessary to construct an Energy Storage System of 2 MW for 15 minutes to be installed at the LWWTP. Trane is soliciting updated information for this scope of work with the noted changes listed in this RFI.

E. The work will proceed in a phased approach as follows:
- Phase I Submittal of Equipment and Material Specifications and Schematic Design for use in the required Microgrid Controller Integration and Operation Report
- Phase II Supply of Equipment and Design Engineering Support
- Phase III Startup and Commissioning Services
- Phase IV Maintenance and Operations

F. It is Trane's desire to select a vendor based on this RFI. The information provided will be utilized to obtain final approval from the CEC. The successful Supplier will work with Trane to develop GMP Pricing. However, Trane also reserves the right to solicit alternate bids should the updated pricing and scope be unreasonable.

G. The general scope of work includes these items; refer to Exhibit A for the detailed Scope of Work.

1. Division of Responsibility
   - Parker Hannifin
     - Power Conversion System / Outdoor Enclosure
     - Transformer(s)
     - Inverter(s)
     - Ground Fault Detector
     - Onsite Testing / Commissioning
     - Factory Acceptance Test
     - Shipping of system to site
   - Nuvation
     - 2 MW Energy Storage System
     - Battery Management System (BMS)
     - Grid Battery Controller (GBC)
     - Li-Ion Cell Type
     - Racking System
     - Outdoor Enclosure
     - GBC Interface to Microgrid Controller
     - GBC Interface to Parker Power Conversion System
     - Onsite Testing / Commissioning
     - Factory Acceptance Test
     - Shipping of system to site

PART 2 SCOPE OF WORK

The scope of work includes a Nuvation / Parker Energy Storage System which will provide 15 minutes of power, starting with 2.0 MW and decreasing to 0 MW in 15 minutes.

Base Information is for output of 2.0 MW steady for 5 minutes, then decreasing linearly to 0 MW over the subsequent 10 minutes. Operation of the battery storage system will be designed to cycle a maximum of two times per day as described above. Source power for re-charging will be provided by others. **(Parker: The Parker PCS will provide the designated power (up to 2.2MVA) require based on a request from the controller, and the battery energy available.)**

Deductive Alternate #1 is an Energy Storage System that will provide 15 minutes of power starting at 2 MW and decreasing linearly to 0 MW over 15 minutes (no steady power output). **(Parker: The Parker PCS will provide the designated power (up to 2.2MVA) require based on a request from the controller, and the battery energy available.)**

This request calls for a complete system which is a combination of Nuvation and Parker products. The following will be provided by others (under this contract):

- Level concrete pad – (Nuvation / Parker to provide design criteria and coordination including mounting bolt pattern or tie downs, location of convenience outlet, and any other design consideration specific to the packages to be delivered and installed).
- Source of power for re-charge
- 120 V convenience power outlet
- Microgrid Controller and connections
- Power for HVAC cooling and ventilation for batteries and inverters
- Dedicated power for control of inverter and Battery Management System (BMS)
- and Grid Battery Controller (GBC)
- Pricing to include all applicable taxes and duties
- Pricing will include FOB to job site

2.1 Battery Storage System

2.1.1 Products

Design, integrate and deliver a 2 MW Energy Storage System built around Nuvation's Battery Management System (BMS) and Grid Battery Controller (GBC).

Source Li-Ion cells, install in racks, and integrate with BMS. **(Parker: 750-1100Vdc required)**

Interface Nuvation's GBC with external controller (microgrid controller), program GBC to receive commands from external site controller and control Parker's Power Conversion System (PCS).

Integrate with the Parker PCS which includes all interconnection wiring, shipped loose and installed on site. **(Parker: Parker's pricing does not include wiring outside of the PCS)**

Provide factory and onsite testing plan and report format for use by Trane for review and submittal to CEC (Tasks 1, 6, & 7) as part of the Phase I submittal. Perform factory and onsite testing during Phase II and Phase III. **(Parker: Parker is to provide Factory Acceptance Testing, and onsite commissioning)**

2.1.2 Packaging

Source 20' enclosure and install battery rack inside the enclosure. Provide plans and elevations for enclosure including mounting details such as bolt pattern, location for 120 V power and condensate drainage (if required). Include container weight and lifting instructions.

2.2 Inverter System

2.2.1 Products

Design, integrate and deliver a high efficiency power conversion system and integration support for grid storage technology. The system will be integrated with a 2 MW Energy Storage System built around Nuvation's Battery Management System (BMS) and Grid Battery Controller (GBC).

Power Conversion System (PCS) 890GTB or equivalent including

- PCS Ground Fault Detector(s)
- 12kv / 480v transformer(s)
- Transformer throat with flex bus connection(s)
- Engineering
- All taxes and duties
- Shipping FOB to job site

Bi-direction conversion; enable grid power to charge batteries or convert battery power to AC to feed the grid.

Invertor Design Voltage shall be 480 V.

Parker AC890PX Inverter (or equivalent) including Pulse-Width-Modulated (PWM) switching technology, automatically synchronizing to the AC power grid. Integral Harmonic filters to deliver power to IEEE519 guidelines for Total Harmonic Distortion.
(Parker: Parker will provide an 890GTB-2200 system with a rating of 2.2MVA not an AC890PX)

All components including battery, inverter, and transformer, shall be pad mounted on concrete pads provided by others, as described previously.

Interface Parker's PCS system to Nuvation's GBC with external controller (microgrid controller), program GBC.

Integrate the PCS and GBC systems to the integral Micogrid Control system provided by Trane. **(Parker: Parker's system will meet MESA standards for interfacing with other energy storage systems)**

2.2.2 Packaging

Source and provide an outdoor enclosure for inverter(s), step-up transformer(s). Provide plans and elevations for enclosure and transformer(s) including mounting details such as bolt pattern, location for 120 V power, HVAC Power, and condensate drainage (if required). Include container dimensions, weight and lifting instructions. **(Parker: Parker's 890GTB is designed for outdoor use. It will require Aux power. Dimensions are included in the product sheet later in this document. Weight is approximately 8400 lbs.)**

2.3 Project Phasing

2.3.1 Phase I

Phase I shall include submittals of all technical data for the Energy Storage and Inverter System(s), including at a minimum:

- Enclosure Elevations, Dimensions, Weights and Details
- Equipment Specifications
- System Performance profile
- System Pricing
- Electrical Interconnection wiring Schematics
- Summary equipment and performance narrative for use in the operations
- Report required by the CEC.
- Lead-time for delivery or equipment to the job site
- Startup and commissioning plan

2.3.2 Phase II

Upon approval of Phase I by the CEC and the LWWTP, the final design of the project will commence. Deliverables during this phase include support of the final design. There may be changes during this phase regarding storage capacity and location. When the configuration is solidified, an order will be placed for the system.

2.3.3 Phase III

Phase III is the construction support phase. Provide onsite integration, construction review and system testing required to complete the project. Assume at least two field visits during construction, one visit during startup & commissioning, and one turn over meeting with the CEC and LWWTP at project closeout.

2.3.4 Phase IV

Phase IV is system operations and maintenance. All warranties shall start upon final acceptance of the operating system by Trane, the CEC and the LWWTP. The base system warranty (excludes batteries, inverter, and transformer) shall include full parts and labor for a period of 1 year.

Battery Warranty: 1 year parts and labor plus, manufacturer's 7 year battery warranty.

Inverter Warranty: 3 year parts and labor

Transformer Warranty: 3 year parts and labor **(Parker: Transformers come with a standard 1 year warranty. A 3 year warranty is available for a 2% adder in cost)**

For all equipment and systems provided, provide 6 hard copies and 1 electronic copy of:

1. Warranty Certificates
2. Operations and Maintenance manuals
3. Startup reports

At final completion of startup and testing, provide a final report that, for a complete battery storage and inverter system installed in a microgrid at a waste water treatment facility, as per Tasks 1, 6, & 7, which describes the original purpose, approach, results, benefits, and conclusions of the work performed.

2.6 Tentative Schedule (Subject to Change, based on CEC and City of Santa Rosa approval)

Job Walk	5/25/2016
Request Issued	6/8/2016
Response Due	6/15/2016
CEC & Trane Negotiations	9/23/2016
Probable Order	10/1/2016
Final Design and Permits	2/1/2017
Delivery of Equipment	3/1/2017
Construction	1/1/2017
Start Up Commissioning	4/1/2017
Commercial Operations	4/30/2017

2.7 Submit information to:

Richard Swank
Richard Swank
Microgrid Program Manager
PH: (916) 577-1126; Fax: (916) 577-1175
Email: Richard.swank@trane.com

Battery Energy Storage, Inverter with Step-up Transformer
Equipment / Materials and Start-up Support
Laguna Wastewater Treatment Plant
Santa Rosa, California

Provide information for the project included below:

Description	Responsibility
Inverter mounted in an enclosure	Parker
Ground Fault Detector	Parker
Transformer	Parker
Reports	Parker
All Taxes, duties	Parker
Engineering	Parker
Shipping FOB to job site	Parker
Site visits as described in the scope of work	Parker
Site testing, Startup, and commissioning	Parker
Final Report	Parker
Grid Battery Controller (GBC)	Nuvation
Stack Controller (SC)	Nuvation
Power Interface (PI)	Nuvation
Cell Interface (CI)	Nuvation
Batteries with enclosure	Nuvation
All Taxes, duties	Nuvation
Engineering	Nuvation
Reports	Nuvation
Shipping FOB to job site	Nuvation
Site visits as described in the scope of work	Nuvation
Site testing, Startup, and commissioning	Nuvation
Final Report	Nuvation

- List Exclusions and Clarifications

C. Scope of Work

Parker Hannifin would like to respond to this RFI with the following Scope of Work:

Table 2: Scope of Work

Scope of Work/Deliverables	Parker	Partners
PCS System		
890GTB 2200 (2.2MVA) – 2MW PCS for Battery Energy Storage System	X	
2.2 MVA 480V/12.47KVac - Closed Coupled Transformers w/electrostatic shielding and flex cabling. *(This transformer meets Parker's Specifications)*	X	
Startup and Commissioning	X	
PCS testing at Parker (FAT)	X	
Shipping	X	
Aftermarket Services	TBD	
Battery Systems		
Battery Container		X
Batteries		X
Racks and BMS Controller		X
Cooling System, Calculation and Installation		X
Fire Extinguisher Media/Spec for the Battery Container		X
Fire System sizing, supply, and installation		X
EPC and Site Work		
Energy Management Software		X
Building and Site Construction		X
Equipment Layout		X
Local Code and regulation (OSHA)		X
Equipment and interconnect schematics and wiring list		X
Power Control and communication cable (Material, labor, conduit, trays, etc.)		X
Installation of Parker Equipment		X
Sizing Cables		X
Acquire and install cabling		X

*Installation supervision is not included in current pricing and can be provided as an adder.

D. Equipment Specifications

Part Number: 890GTB-2206-0CSG2-S450S00

Table 3: Standard 890 GTB Energy Storage Inverter

Example Product Code:		890GT	B	-	220	6	-	OC	S	G	2	-	S	4	5	0	S	0	0
Application:	Energy Storage		B																
Power Rating:	2200kVA, 480Vac, 720-1200Vdc				220														
Frequency:	60 Hz					6													
DC Connection:	Contactor							OC											
AC Connection	Close Coupled								S										
Ground	Ungrounded w/ GF Detector									G									
Enclosure	White (IP65) - Harsh Environment										2								
Power Meter	Standard												S						
Communications	Modbus TCP - Cu													4					
External Control Power	UPS: None, Aux (3ph): 480V														5				
Build Standard	UL/CSA															0			
Temperature	Standard (-20C to 55C)																S		
Advanced Controls & I/O	Standard																	0	
Other	Standard																		0

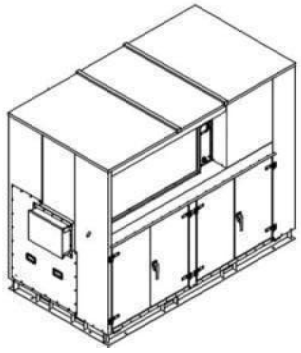


Figure 1: For Closed Coupled Connection to Transformer

Power Rating:

- **B220 – 2.2MVA, 480Vac, 720-1200Vdc** – This Inverter is capable of 2200kVA at 480Vac nominal line output provided the input voltage range is within 720-1200Vdc. Output power capability de-rates slightly if the input dc voltage exceeds 1000Vdc. Output power capability de-rates if the AC line voltage is lower than 480Vac. Output power capability de-rates if the ambient temperature is >40C. P-Q capability curve (real/reactive power) varies with DC voltage and actual AC line voltage.

Frequency:

- **6 - 60Hz** – Inverter is designed for connection with a nominal 60Hz grid. Consult manual or factory for details on frequency ride-through capability. (See Section K)

DC Connection:

- **OC - Contactor:** This Inverter is supplied with input contactors for both DC (+) and DC (-) inputs. These contactors are not designed with high current breaking capability (circuit breaker option available). A protection coordination study must be undertaken by the system integrator or customer to ensure all equipment is properly protected.

AC Connection:

- **S - Close Coupled** - Inverter is designed for close coupling to a co-located step-up transformer in order to minimize installation cost and time. This option includes the "flex braid" and the "shroud" required for close coupling. This option requires that the customer purchase a transformer designed for close coupling. His option is designed to save space and costs as not underground trench is needed between the Inverter and the transformer, and both the inverter and transformer can sit on a single pad. (See Section N)

Ground:

- **G - Ungrounded w/ GF Detector** - Inverter is supplied for ungrounded battery connection and includes a ground fault detector (Note: Ground fault detectors are typically included in the battery container, not the inverter. Also placing a GFD in both the Battery container and Inverter is not recommended.)

Enclosure:

- **2 - White (IP65) – Hazardous Environment** - Enclosure has an environmental rating of IP65 and is provided in standard white color RAL 9003. All enclosures have a black coating on the heat exchanger for corrosion prevention. If system will be located in a coastal environment, please consult factory.

Power Meter:

- **S - Standard** - Inverter includes the standard power meter. Please consult manual for details on the power meter provided.

Communications:

- **4 - Modbus TCP/Cu** - Inverter is designed to accept RG45 – CAT 5 connections as the primary communications medium. Modbus TCP as the communication protocol.

External Control Power: UPS Derived / Aux 480V 3ph

- **5 - UPS: None, Aux (3ph): 480V**
  - Single phase provided by an internal transformer connected to the 3 ph 480V supply.
  - Three phase provided by an external 480V feeding an internal transformer.
  - This configuration is not designed for an external UPS input. PCS is not designed to export any power to other equipment for auxiliary usage (requires additional transformer).

Build Standard:

- **0 - UL/CSA** - Inverter is designed (and set points programmed) to comply with UL/CSA standards.

Temperature:

- **S - Standard Range (-20 to 55C)** – Inverter has a standard operating temperature range of -20^{o} to 55^{o}C. Inverter will de-rate power capability at ambient temperatures exceeding 40^{o}C. Inverter does not include a heater.

Advanced controls & I/O:

- **0 - Standard** - No additional control modes or I/O are provided

Other: Standard

- **0 - Standard** - No other special changes, modifications or

E. Key Product Features / Competitive Advantages

DC Input (Built into each 890 GTB Inverter) (Optional for DC connections)

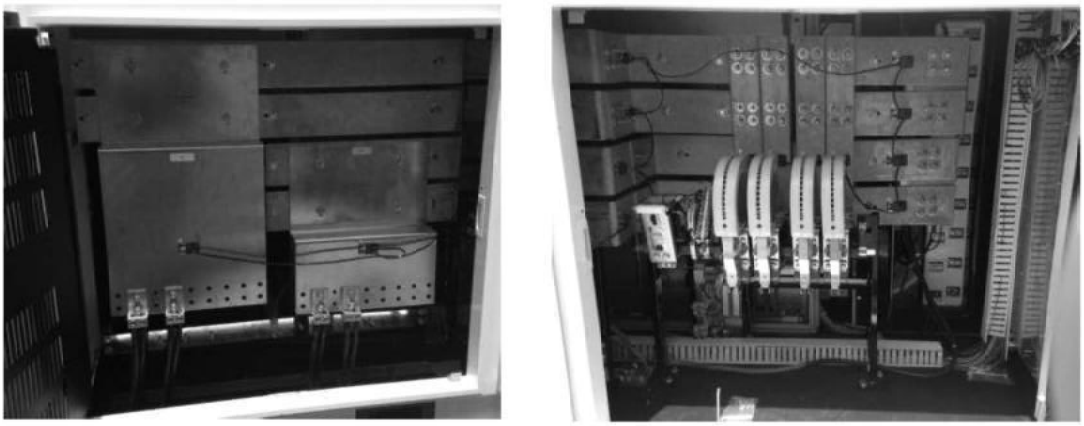


Figure 2: Built in cabinet is for Battery connections, the right side is the DC Input Contactors

Temperature Sensing

Temperature sensing is offered using a network of thermistor cards daisy chained together. These Thermocouple I/P Modules are placed in the following areas of the system and can all be monitored remotely.

AC Busbar temperatures (6), Capacitor busbar temperatures in the Tuned Filter (15), Inverter Stack DC Busbar Temperatures (4), Inverter Stack Phase Module Temperatures (9), Capacitor temperatures in the Tuned Filter (15), DC customer connection temperatures (16), DC fuse connection temperatures (16), DC contactor connection temperatures (16), Main Breaker Line connection temperature (3), Main Breaker Load connection temperature (3), each of the chokes in the Tuned Filter (9), the DC Power supplies (1), internal ambient temperature (1), external ambient temperature (1), the Aux Power CB (1), the Aux Power Transformer (1), Refrigerant Condenser inlet (1), Refrigerant Condenser outlet (1).

Figure 3: Temp Sensor

Temperature Sensing (continued)

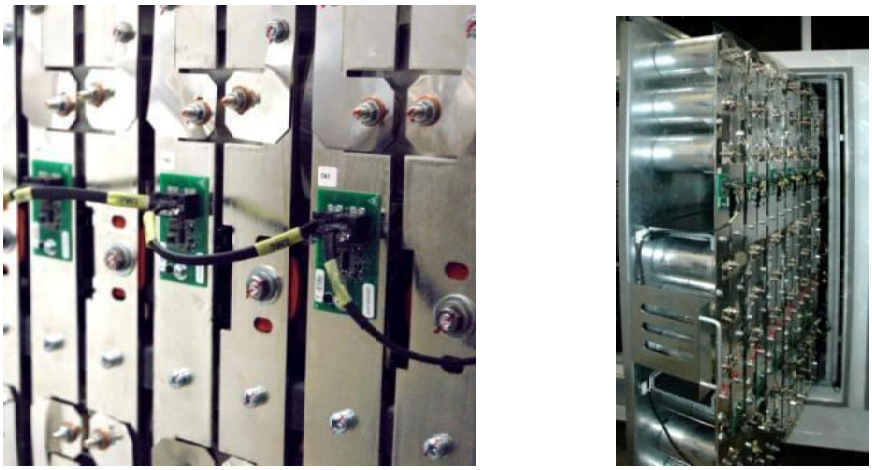


Figure 4: Temperature sensors are on all critical components and on the bus bar.

Cooling

The 890 GTX inverter features an Advanced cooling system using a two phase refrigerant system which is designed to remove thermal energy losses from the inverter system and reject them to the ambient surroundings outside of the sealed enclosure. The system uses three positive displacement pump modules to circulate a vaporizable dielectric fluid, refrigerant R134a, through a closed loop circuit. The fluid is in a sub-cooled liquid state as it enters and exits the pump module.

Liquid out of the pump module flows thru 19 parallel paths. Nine of these flow paths each contain three cold plates which are in contact with IGBTs. They are used to transfer heat from the IGBTs to the fluid. Nine more of the parallel flow paths each contain three cooling coils which are in contact with inductor coils. The cooling coils transfer heat from the inductors to the fluid. The last flow path contains an air cooling coil to manage internally generated heat.

Other thermal losses in the inverter system are transferred to the air inside of the enclosure via convection. The air is forced across the cooling coil where the heat is transferred to the fluid. As the fluid travels through each flow path it boils as it absorbs heat. The fluid exits each parallel branch and enters a mixed phase manifold. The flow travels from this manifold to an air cooled condenser where the fluid is condensed back to the sub-cooled state before it returns back to the pump module. High heat transfer coefficients, low flow rates and low thermal gradients are achieved by utilizing the two phase cooling cycle.

Coolant Pumps

The pump module will consist of three positive displacement pumps in parallel which are capable of providing fluid flow at 1800LPH. The 24-volt Coolant Pumps are controlled by a Parker Pump Controller part number LA471775U001 with RTD feedback from a Refrigerant Temperature Sensor. The Pump Controllers are connected Control Power (24V DC) from power supply PS3 through a 20 amp fuse.

Figure 5: Coolant Pump

Competitive Advantages of the 890GTB design:

Advanced Cooling system

- Improved thermal management for Power Electronic reducing mechanical stress
- Higher Density, as the 890GTB takes up less space
- Lower ambient noise levels as there is no high volume external air or liquid coolant recovery systems required.
- Higher efficiencies as there is better temperature control, and less power used.
- The result is longer life of the system

Modular Design

- Easy access to all vital components
- Simple, easy, and fast replacement of component subsystems

Temperature sensors

- Means to enable improvements in preventative maintenance

Closed Coupled Transformer Connection

- Offers space-savings
- Saves money – no trenching between the PCS and Transformer, no additional cabling (Flex Cable included), no separate slab or skid, labor savings, etc.

G. Factory Acceptance Testing

Standard Customer witness Factory Acceptance Test (FAT)

1. Connection of equipment to test infrastructure
2. Functional Test of the PCS
   a. Verification of the control supply
   b. Start and Stop Equipment
   c. Verification of Power (Active/reactive) output
   d. Internal communication check
   e. Protection Settings
   f. Parameter settings
   g. Verify Cooling system
3. Visual Inspection of the provided Equipment
4. Power test up to rated power (load test)
5. Overview of the operator features such as HMI, switches, buttons, etc.
6. Overview of major components such as filter, AC circuit breaker, DC Section, etc.
7. Overview/summary of the Cooling concept
8. Communication Interface Overview (optional test with customer provided equipment)
9. Generate Customer FAT report

H. Commissioning

Onsite Equipment Commissioning for each Unit

1. Travel, Lodging, meal expenses
2. Pre-Startup Inspection
   a. Inspect equipment for shipping damage
   b. Verify correct installation (mechanically/electrically)
   c. Verify presence of coolant (If equipped)
3. Startup Inspection
   a. Energize auxiliary power circuits
   b. Verify the correct operation of control system
   c. Verify the correct interface signals
   d. Confirm software updates are installed
   e. Verify interface with energy storage
   f. Verify interface with grid connection
4. Startup
   a. Verify the start and stop of equipment
   b. Emergency Power Off (EPO) Test
   c. Verify local power commands
   d. Verify metering and feedback
   e. Tune system as necessary
   f. Run system in remote/customer control mode
   g. Monitor system for any abnormality such as high temperature, system alarm, etc. and adjust accordingly
5. Generate Customer Report

I. Gird Event Capabilities

1) General

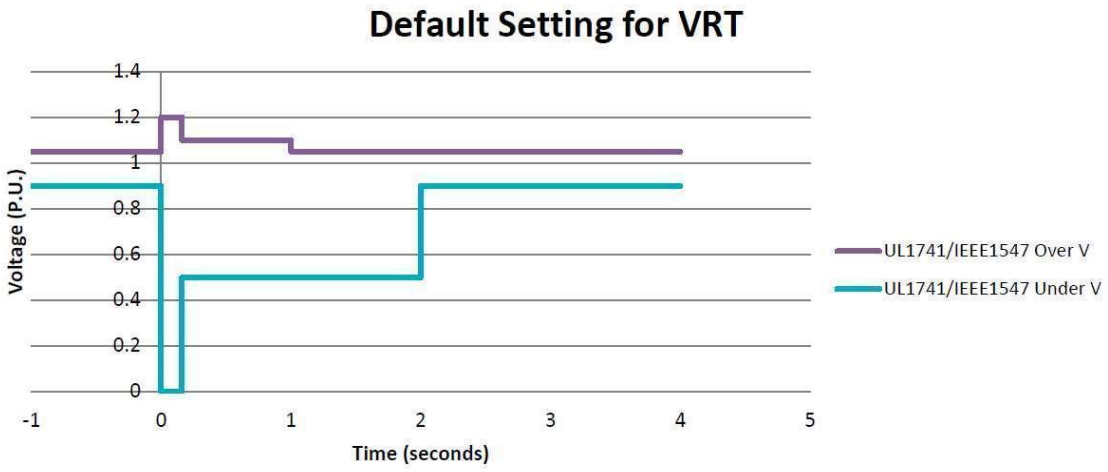
This document describes the capabilities of the standard 890 Series PCS during abnormal grid events including over/under voltage events as well as over/under frequency events. Data provided has in most cases been validated through actual testing on a representative system in a power laboratory.

2) High and low voltage ride through capabilities

By norm, Grid-tie inverters are required to remain operational during both symmetric (balanced supply) and asymmetric (un-balanced supply) grid faults for a given time before tripping. In the case of a symmetric grid fault, the Inverter remains synchronized to the grid while supplying reactive energy to support the grid voltage. In the case of an asymmetric grid faults, the inverter is set to an idle mode while the event occurs, and return seamlessly to normal operation once the asymmetric fault is cleared.

In the presence of grid voltage fluctuations, the inverter seeks to correct the voltage fluctuations by automatically modulating the reactive power output. In the case of transient and resolvable conditions, this function can allow the inverter to continue operation through a fault as well as assist in suppressing an over voltage event.

As typically delivered, the 890GT complies with UL1741/IEEE1547 requirements for Voltage Ride Through. The following graph shows the pre-programmed trip times for the 890GT:



3) Frequency ride through capabilities

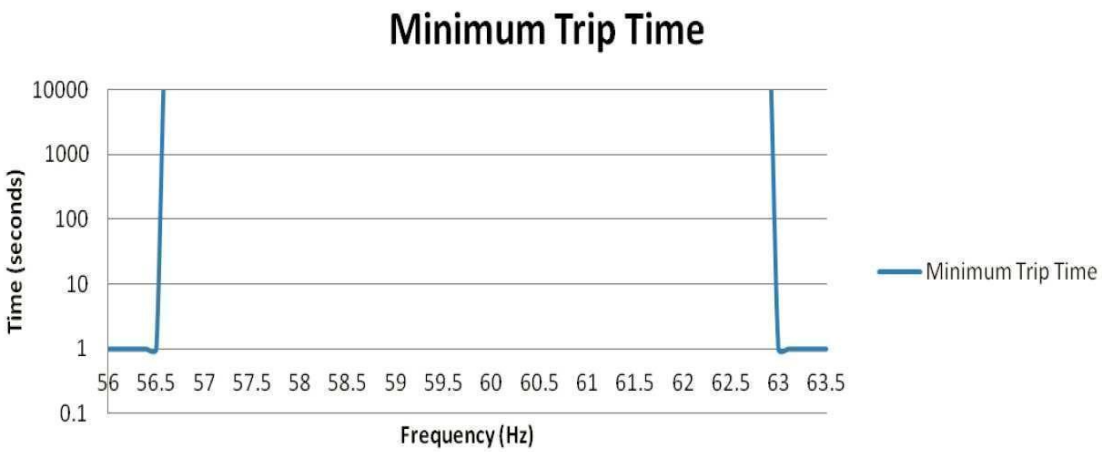
The 890GT can maintain grid connection through grid frequency shifts that exceed the requirements of WECC and PRC-024-1. The 890GTB comes pre-programmed to meet the requirements of IEEE 1547 and UL1741. The frequency trip points are:

- Frequency > 60.5 Hz, disconnection within 0.16 seconds
- Frequency < 57.0 Hz, disconnection within 0.16 seconds
- Frequency < 57.5Hz, disconnection within 300 seconds

The above settings and parameters are factory adjustable to meet local grid fault codes, application demands, and 50Hz installations.

Depending on protection adjustments, the 890GT can maintain connection without dropping out when the frequency is in the range of 56.5Hz to 63Hz (on a 60 Hz network).

Here is a plot of the responses:



4) System Protection settings

The default grid protection settings have been set to meet IEEE1547 requirements for LVRT and frequency as noted. All grid protection settings are shown in the table below:

Type	Level	Time
Under frequency	<57 Hz	0.16s
Under frequency	57.5-57.0 Hz	300s
Over frequency	>60.5 Hz	0.16s
Under voltage	<0.5 p.u.	0.16s
Under voltage	<0.8-0.5 p.u.	2s
Over voltage	1.1-1.2 p.u.	1s
Over voltage	>1.2 p.u.	0.16s

J. Maintenance Schedule (890GTB) Inverter

Table 4: Maintenance Schedule

Action	Component	Frequency
Inspect	Check and Clean AC Units	6 Months
Inspect	Check Cable Connections	6 Months
Inspect	Backup Software	6 Months
Inspect	Data Log Retrieval and Maintenance	6 Months
Test	EPO Operation	Annually
Inspect	CB2 Main Disconnect Circuit Breaker	Annually
Inspect	Coolant System for Damage	Annually
Inspect	Enclosure for Leaks/Damages/Corrosion	Annually
Inspect	Inspect AC Connections (enclosure to Isolation Transformer)	Annually
Inspect	Inspect DC Connections (Solar Arrays to Enclosure)	Annually
Inspect	Enclosure Internal Damage, Corrosion, Cleanliness	Annually
Review	Coolant System Level (Via SCADA)	Annually
Review	SCADA Temperature Data Trends	Annually
Inspect	Enclosure Damage, Corrosion	6 Months
Test	GFI Duplex Receptacles	6 Months
Test	Ground Fault	6 Months
Clean	Heat Exchanger Fins	6 Months
Replace	Pumps, and Fans	7 Year
Replace	Power Supplies, Capacitors, etc.	10 Year

Planned Replacement Parts (PM Period)				
Part Number	Description		Year 7 Replacements	Year 10 Replacements
DY473558U040	Power Supply 24Vdc 40A			1
DY473558U020	Power Supply 24Vdc 20A			2
DY473380	Power Supply 15Vdc 1A			1
DY473379	Power Supply 15Vdc 3.4A			1
LB473568U003	Refrigerant Pump Assy		1	
DL473633U001	Condenser Fan		2	
LA473347U550	Cool Door and stirring Fans		9	
LB473272U002	HMI			1
DB471832U500	Precharge Contactors			2
CY473567U080	Ride through capacitors			2
CY473740	AC Filter Capacitors			54
DB473541U125	AC Filter Contactor			1

Option Spares				
Part Number	**Description**		**Year 7 Replacements**	**Year 10 Replacements**
DB473722U400	DC Contactor			
010S115	Main Contacts			4

K. Transformer Configuration

1. Pad Mount Transformer Configuration

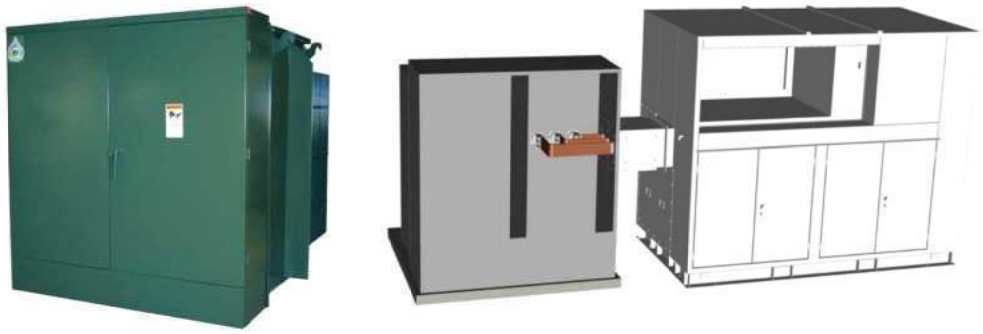
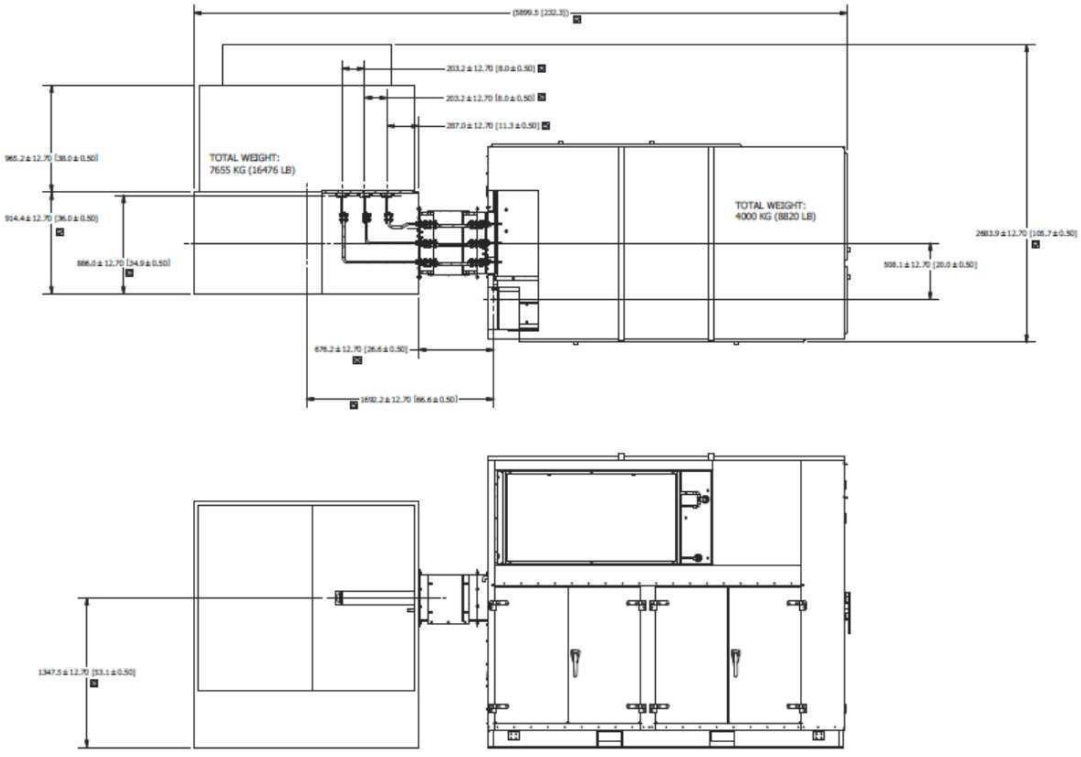


Figure 6: An illustration of a closed coupled connection between transformer and inverter. This can sit on a single pad, no trenching.



2. MV Transformer Specification

The 480Vac / 13.8kV step-up transformer shall be paired with the Parker 890GTB inverter using a "Closed Coupled" design that includes a Flex Cable and Shroud.

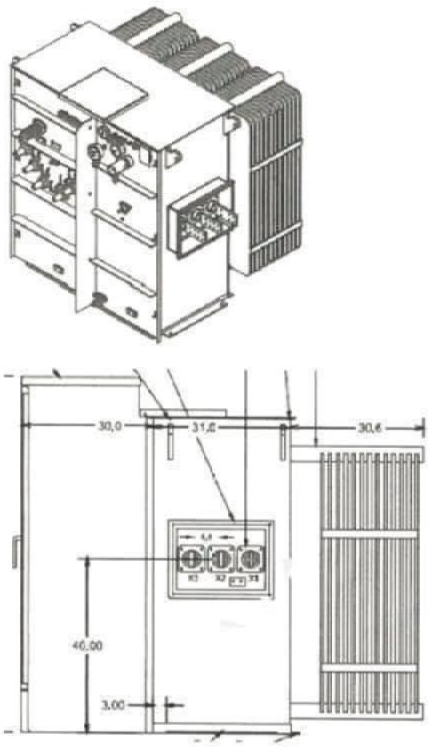


Figure 7: Closed Coupled Transformer Illustration

3. Integration of Transformer and Inverter

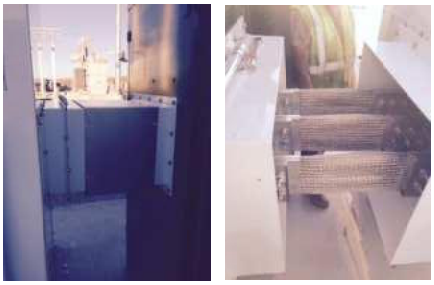


Figure 8: An illustration flex cable connecting the transformer to the inverter

*E*XHIBIT A – 890GTB Product Brochure

890GT-B Outdoor rated PCS

Power Conversion Systems for Energy Storage

Parker's Energy Grid Tie Division

With close to 10 years of experience in the Energy Storage Market, Parker's Energy Grid Tie Division (EGT) is committed to being a leading diversified solution provider, designing, manufacturing and servicing Power Conversion Systems across the globe. Headquartered in Charlotte, NC, EGT is a global center of excellence for power conversion systems, with local technology centers in Europe and Asia, providing project execution and support of Energy Storage and Power Generation projects on a global basis. To date, EGT has deployed more than 225MW of Power Conversion Systems around the world.

Drawing from over 40 years of experience in electric power conversion and integrating technologies from other Parker divisions, such as advanced cooling technologies, chillers, advanced controls and HMI's, EGT can provide a truly optimized Energy Storage solution.

Complementing our design and manufacturing capabilities is a team of field service engineers who are available to see projects through successful commissioning and maintenance to maximize system uptime.

225+ MW
ON-GRID

40 YRS
DESIGN EVOLUTION

8 YRS
ACTIVE IN ENERGY STORAGE

Parker's Power Conversion Products

Parker EGT provides a wide range of Power Conversion products for Battery Energy Storage and PV Solar applications, from low kW ratings up to 2MW. Inverters and balance of PCS are manufactured at our ISO9001:2008 certified facilities in Charlotte, NC, and Littlehampton UK.

Parker battery energy storage systems enable advanced functionalities including:

- frequency regulation
- ramp rate control
- peak shaving
- renewables capacity firming
- black start
- microgrid
- power factor control
- deferred T&D upgrade investment

For more information about Parker's Power Conversion Products visit : www.parker.com/egt

Outdoor Energy Storage PCS

890GT-B Series

Description

A critical component of any successful energy storage system is the Power Conditioning System, or "PCS". The PCS is used in a variety of storage systems, and is the intermediary device between the storage element, typically large banks of (DC) batteries of various chemistries, and the (AC) power grid.

The Parker 890GT-B series PCS is a bidirectional power conversion device, enabling grid power to be converted to DC, charging the batteries in a controlled manner, or enabling battery power to be "inverted" to AC to feed the grid. Given the nature of the semiconductor devices that rapidly switch on and off to create alternating current, a big part of the design includes measures to reduce harmonics, producing as close to a pure sine wave output as possible. The PCS must be able to synchronize with the grid frequency and provide a stable output – appearing to the grid to be a synchronous generator. It responds to changing conditions, providing energy at a controlled ramp rate, but also injects power quickly to correct short term frequency fluctuations. And the 890GT-B has the capability of dynamically control power factor by supplying the grid with the requested amount of real or reactive power on demand, over a wide range.

The heart of the 809GT-B is a proven bidirectional grid tie inverter, containing an array of power semiconductors called IGBTs (Insulated Gate Bipolar Transistors), capable of switching high power at high speeds. Inside the inverter, the power semiconductors are told when to switch on and off by sequenced gate drivers which are coordinated by an internal algorithm, driven by inputs from a supervisory system. Other items that comprise a PCS are responsible for physically connecting to the grid and storage element, as well as for protection, detection, power quality, and safety. Given that the PCS is usually operational 24/7, and in a range of potentially extreme environmental conditions, a good thermal management system is included – both for the inverters and for the ancillary components.

The 890GT-B is available in ratings to 2200 kVA, and for storage arrays up to 1200 volts DC. It is designed for direct outdoor installation. No air conditioner is required, as the power semiconductors, inductor, and internal ambient air are cooled by Parker's two-phase advanced cooling system. The cooling system is self-contained and requires no chilled water or external condenser. Multiple lockable access panels make installation and scheduled inspections and maintenance a breeze, with no need for personnel to enter the enclosure. The small footprint and integrated transformer connection results in a space saving installation.

Specifications	Units	890GTB-1200	890GTB-1450	890GTB-1800	890GTB-2200
DC Input					
Input Voltage Range	VDC	400 - 1200			
Input DC Bus Voltage (Max)	VDC	820	1200	820	1200
Overvoltage Protection		Included - Type 2 surge arrestor			
DC Disconnection Method		Contactor or Circuit Breaker Options			
Surge Protection		Type 2 surge			
AC Output					
Rated Output at up to 40°C	kVA	1200 (1)	1450 (2)	1800 (1)	2200 (2)
Rated Output at 50°C	kVA	1080 (1)	1305 (2)	1620 (1)	1980 (2)
Output Voltage Range	VAC	270 - 480			
Nominal Output Frequency	Hz	50/60			
Power Factor Range		+/- 1.0			
Current Distortion	%	< 33			
Overvoltage Protection		Included - Type 2 surge arrestor			
AC Circuit Breaker		65kA Interrupt Rating			

(1) Based on AC Voltage of 400V at 800 VDC (2) Based on AC Voltage of 480V at 1000 VDC

Performance Data	
Efficiency (Max, estimated)	98.7%
Auxiliary and Cooling System Losses	< 6 kVA typical, 9kVA maximum
Sensors and User Interface	
User Interface	10.4" TFT LCD Touch-screen
Communications Options	Modbus TCP (Optional: Ethernet IP, CANopen, DNP3, EtherCAT, PROFIBUS),
Control and Monitoring System	Included
Stored Data History	31 days
Monitored Internal Temperatures	Up to 112 - Including busbars, ambient, choke, IGBTs
External Auxiliary Supply	120/230V single phase or 380-480V three phase
Control Power Breaker	65kA Interrupt Rating
Auxiliary Power Breaker	65kA Interrupt Rating
Mechanical User Interface	EPO Button, On/Off Switch, Local/Remote Switch, Light Switch
Humidity Sensor	Included
Anti-Condensation Heaters	Included
Ground Fault Monitoring/Protection	Optional
Specifications are subject to change	
Compliance and Certification to Standards	
European Certifications	CE: LVD,EMC, G5/4 & G59/1 (pending)
North American Certifications	UL1741 Second Edition, 2010, NFPA70
Grid Interconnection and Power Quality	IEEE1547 (2003), IEEE1547.1 (2005) and IEEE1547a -2014 Amendment to IEEE1547 (2003), IEEE 519
EMC	EN61000-6-2, EN 61000-6-4

Outdoor Energy Storage PCS

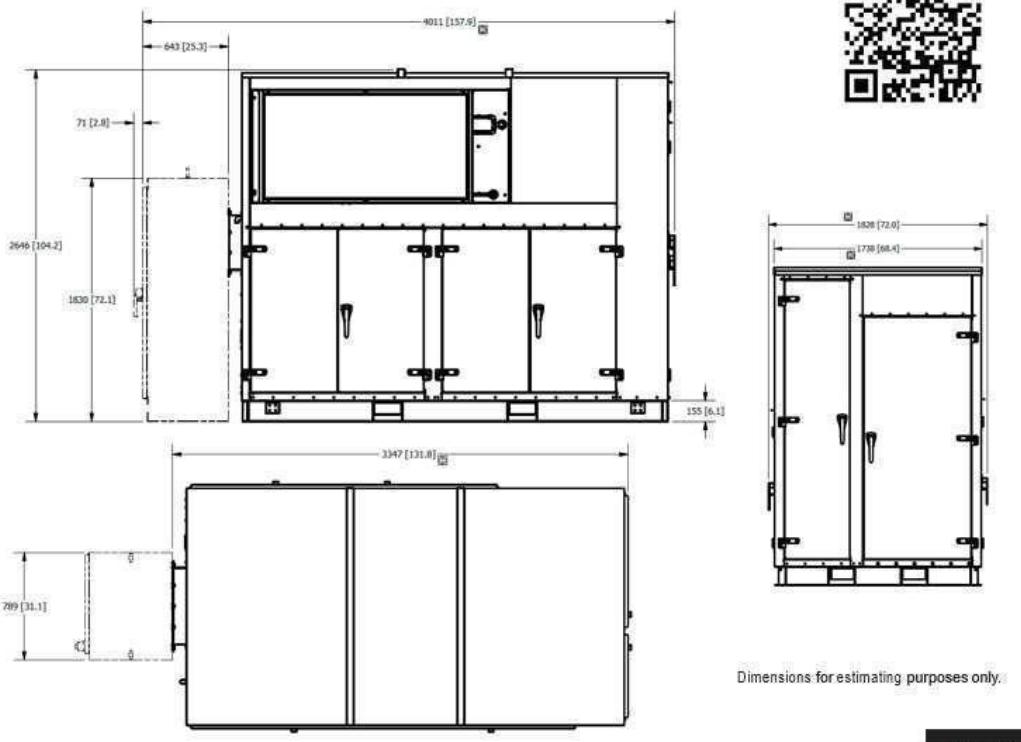
890GT-B Series

Environmental Ratings	
Ambient Temperature Range	-20° to +55°C, -40°C option available (See AC output specifications)
Relative Humidity	0-100% condensing
Max. Altitude Without Derating	1000 meters/3281 feet
Corrosion Resistance Option	>600 hrs salt fog per ASTM B117-11
Mechanical Data	
Environmental Protection Rating	IP65, EN60529
Size (W x D x H) mm (in)	3395 (133.7) x 1710 (67.3) x 2648 (104.3) See detail below
Weight (approximate)	4000 kg/8820 lb
Cooling System	2-phase Parker advanced cooling (R134A refrigerant)

For more information including an animated look inside the 890GT-B, please visit **http://solutions.parker.com/890GT-B**

Or scan this QR code

Dimensions - mm [in]



Dimensions for estimating purposes only.

Outdoor Energy Storage PCS

890GT-B Series

Features

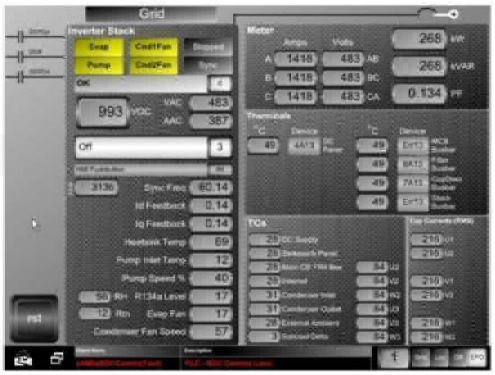
Control and Diagnostics

A touchscreen HMI is accessible from outside the enclosure, covered by a protective door. The HMI provides useful operating data on a real-time basis. Data includes basic electrical overview, operating mode, inverter output kW or VARs, critical voltages and currents, thermal overview with operating temperatures at over 100 internal monitoring points, operating time, and faults. Also provided are switches for inverter on/off, local/remote, lighting, and control power, an Emergency Power Off button, and a local communication port. Display screens can be customized, allowing visualization of virtually any operating parameter. Typical screen templates will include the following:

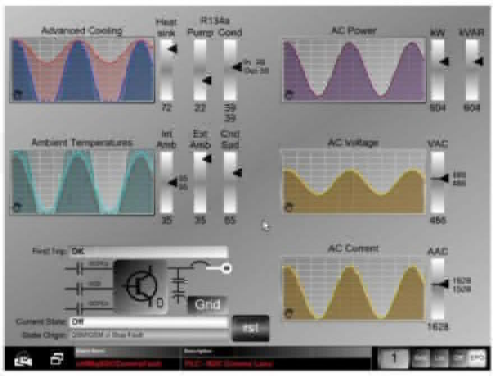
Field Diagnostics
- Battery SOC
- Ground current

Basic Parameters
- Grid voltage
- DC bus voltage and current
- Power factor

Performance
- Actual kilowatt output
- Actual kVAR output
- Target and actual power factor
- Power output ramp rates
- Efficiency
- Cumulative energy output



Climate Control Diagnostics
- Coolant levels
- Fan speeds
- Pump and fan status
- Over 100 internal temperature points
- Coolant temperature
- IGBT temperature
- Contactor temperatures
- Choke temperatures
- Busbar temperatures
- Air temperature and humidity



Digital chart recorder
- Customizable SCADA interface
- SQL database with solid state drive
- Displays and records any parameter
- Displays real time or log

Outdoor Energy Storage PCS

890GT-B Series

Features

VAR Control

In addition to its primary purpose of feeding active power (P, measured in watts) from the battery modules to the grid, the Parker outdoor energy storage PCS is capable of providing reactive power (Q, measured in VARs) when called upon. Within the obvious limitations of rated current and power factor, a reactive power component can be produced on demand. This serves to regulate system voltage, enhancing the stability of a weak grid. Solid state VAR control provides a response time measured in milliseconds, ensuring that momentary fluctuations on the grid are minimized. Real or reactive power can be regulated.

Power Quality

The core of the 890GT-B PCS, Parker's AC890PX inverter technology, provides quality power by incorporating an advanced Pulse-Width-Modulated (PWM) switching technology, automatically synchronizing to the AC power grid. Integral harmonic filters deliver sine wave power well within IEEE519 guidelines for Total Harmonic Distortion. The Parker system provides automated sequenced shutdown and disconnection under power loss events, in compliance with IEEE 1547 guidelines.

Protection

The core of the 890GT-B PCS, Parker's AC890PX inverter technology, provides quality power by incorporating an advanced The Parker Outdoor Energy Storage PCS is equipped with a comprehensive list of protective devices for safe and reliable operation.

DC Inputs: Contactor or circuit breaker disconnect, ground fault sensor, and surge suppression
AC Output: Circuit breaker, phase current sensors (2), and surge suppression

Transformer Coupling Provision

The 890GT-B is designed to be easily pad mounted/skid mounted with a transformer, and includes a connection chute to protect the three phase output lugs. This configuration reduces installation cost by requiring less cabling and can result in a smaller installed footprint.

Outdoor Energy Storage PCS

890GT-B Series

Features

Easily Transportable

Integral forklift tubes allow the 890GT-B to be moved into position or relocated with minimal equipment. Heavy gauge steel housing is rugged and rigid, providing protection before, during, and for years after installation.

Accessible Capacitors

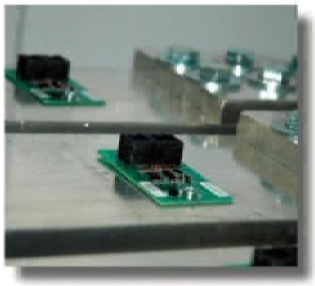
Servicing and maintaining the 890GT-B is easy, with accessible filter capacitor assemblies mounted in a swing-out panel. The design makes it possible to access critical components from the outside of the 890GT-B enclosure, eliminating confined space protocols, and enhancing technician safety.

Replaceable Inductor Modules

With the capacitor door opened, the inductors are externally accessible and easily serviced in the field. Refrigerant cooled inductor modules have a slide-out design to expedite replacement.

Internal Temperature Sensing

Parker's unique **heat seeking technology** allows monitoring of over 100 crucial internal points like bus bars. Networked temperature sensors are located throughout the inner workings of the 890GT-B. There is no need to open the access panels or use IR ports to perform temperature readings since all data is collected and available to the user through SCADA or HMI device. By continuously monitoring temperature at these points, anomalies can be detected early on.



Outdoor Energy Storage PCS

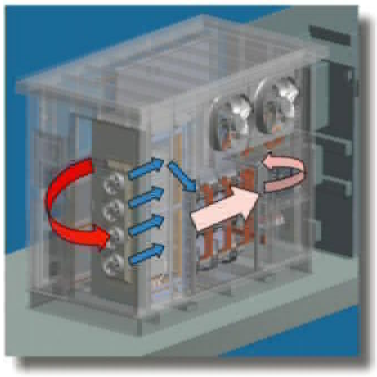
890GT-B Series

Inverter Technology

At the heart of every grid tied system is a reliable and efficient inverter. With over three decades of experience in power conversion, Parker meets these requirements. While the concept of the inverter may seem simple, the design and functionality is critical. Renewable energy sources are valuable, so high efficiency and maximum uptime are desirable attributes The core of the system, Parker's AC890PX Inverter technology, provides quality power by incorporating an advanced Pulse-Width-Modulated (PWM) switching technology, automatically synchronizing to the AC power grid. Integral harmonic filters deliver pure sine wave power well within IEEE519 guidelines for Total Harmonic Distortion. Maximum uptime is achieved first by a robust and reliable design, but also by a design that makes maintenance and service quick and easy. By virtue of modular design, power components are provided in modular, lightweight, easily replaceable assemblies that can be swapped out by one person, with no ramps, rigging, or major disassembly required. Inverters are manufactured at our ISO9001:2008 quality system certified facility in Charlotte, NC, and satisfy ARRA "Buy American" provision.

Modular Design

The Parker 890GT-B Energy Storage PCS employs a unique modular inverter design for ease of maintenance and service. Output power is handled by replaceable phase modules, which are cooled by Parker's advanced 2-phase cooling system. Each module contains IGBT power semiconductors, DC bus capacitors, and gate drive circuitry. The easily removable modules weigh only 16 kg (about 35 pounds), and average time to swap is under 15 minutes. Cooling and AC power connections are quick disconnect type, with connections made as module is installed. AC output filters also utilize a modular tray design for easy maintenance. This unique modular construction offers an extremely low MTTR for high system availability.



Advanced Cooled

The small footprint and high reliability of the Parker 890GT-B series outdoor energy storage PCS is made possible by an advanced cooling system. Parker's exclusive coolant-based system uses a non-conductive, non-corrosive liquid to cool critical components. The refrigerant used in this two phase system requires only 13% of the flow rate of an equivalent water/glycol based system. By capitalizing on the tremendous amount of heat that is transferred as the refrigerant vaporizes, then releasing the heat through a condenser, the cooling system runs efficiently and effectively, without the need for a compressor. Redundant system components will allow inverter operation even after loss of a pump or a fan. (Output may be reduced under certain operating conditions) Compared to air cooling, IGBT temperatures are kept more constant, with less excursions over time.

Outdoor Energy Storage PCS

890GT-B Series

Product Code

Example Product Code:	890GT	B	-	220	6	-	0C	S	G	2	-	S	5	0	0	S	1	0

Application	Energy Storage	B
Power Rating:	B2200kVA (480AC)	220
	B1800kVA (400AC)	180
	B1450kVA (480AC)	145
	B1200kVA (400AC)	120
Frequency:	50 Hz	5
	60 Hz	6
DC Connection:	Contactor	0C
	DC Breaker	0B
AC Connection	Close Coupled	S
	Bottom Entry	B
Ground	Negative Bus Grounded	N
	Positive Bus Grounded	P
	Ungrounded w/ GF Detector	G
	Ungrounded w/o GF Detector	U
Enclosure	White (IP65)	0
	Gray (IP65)	1
	White (IP65) - Harsh Environment	2
	Gray (IP65) - Harsh Environment	3
	Custom	9
Power Meter	Standard	S
	With Harmonics	H
	with Waveform Capture	W
Communications	None	0
	Ethernet IP - Cu	1
	DNP3 - Cu	2
	EtherCAT - Cu	3
	Modbus TCP - Cu	4
	CanOpen	5
	PROFIBUS	6
	Ethernet IP - Optical	A
	DNP3 - Optical	B
	EtherCAT - Optical	C
	Modbus TCP - Optical	D
Aux Power	Internally Generated	0
	External 230V single phase	1
	External 400-480Vac 3 phase	2
	External 120/230V and 400-480Vac	3
Build Standard	UL	0
	IEC	1
	Custom	9
Temperature	Standard (-20C to 55C)	S
	Extended Range (-40 to 55C)	E
Advanced Controls & I/O	Standard	0
	Standard w/analog P/Q	1
	Dynamic controls	2
	Custom	9

Parker EGT Services

With a global reach, Parker EGT's Aftermarket and Service team support our Grid Tie Projects across the world for all your Aftermarket and Service related needs.

Commissioning Assistance

Parker EGT's experienced Field Service Engineers assist with the on site commissioning of your Grid Tie equipment to ensure a smooth and timely start up.

Training

Parker EGT can provide you with on-site or class room style training for any aspect of our equipment. Whether it is training on how to operate the equipment and perform troubleshooting or training on how to maintain the equipment, we can provide you with our standard training package, or a training that is customized to your specific needs.

Preventative Maintenance

Regular maintenance of your Grid Tie equipment will ensure maximized uptime. Parker EGT offers different levels of Preventative Maintenance service packages as well as training on Preventative Maintenance of our equipment should you want your local staff service the equipment.

Spare Parts and Warranty Support

Parker EGT Inverters use advanced technologies with high quality components that are critical for optimal performance in each and every PV and Energy Storage installation. Should anything need urgent support, Parker EGT offers readily available Spare Part packages as well as on-site engineering support.

Remote Diagnostics and Troubleshooting

Parker's equipment has built in remote access capabilities which allows Parker to collect and analyze data remotely to perform troubleshooting or predictive failure analysis.

For more information about any of our Parker EGT products, solutions or services, please contact us at:

Email: info.us.egt@parker.com
Web: www.parker.com/egt

MESA
Open Standards for Energy Storage

ESA Energy Storage Association

CESA
CALIFORNIA ENERGY STORAGE ALLIANCE

ENGINEERING YOUR SUCCESS.

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Schweitzer

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RTAC SEL-3555 Real-Time Automation Controller

The SEL-3555 Real-Time Automation Controller (RTAC) is a powerful automation platform that combines the best features of the high-performance x86-64 architecture, embedded microcomputer, embedded real-time operating system, and secure communications framework with IEC 61131-3 PLC programmability.

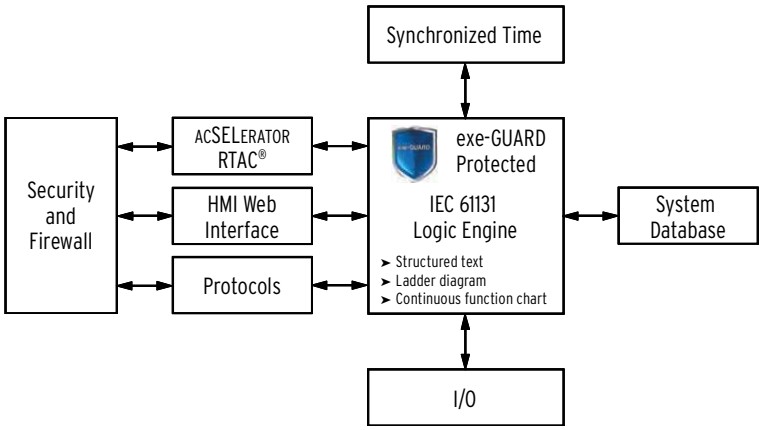
Major Features and Benefits

- **Multiple Device Functions.** Use a single SEL-3555 RTAC as a protocol gateway, RTU, logic processor, PAC, engineering port server, event processor, and system-wide SER logger/viewer.
- **Proven Reliability.** Rely on the robust hardware of the SEL-3555 RTAC, designed and tested to withstand vibration, electrical surges, fast transients, and extreme temperatures that meet or exceed protective relay standards and IEEE 1613, Standard Environmental and Testing Requirements for Communications Networking Devices in Electric Power Substations.
- **Integrated Local Display.** Build custom human-machine interface (HMI) displays quickly and easily without the need for mapping data tags. Because the HMI uses the local video port and is also web-based, no special software is needed for viewing HMI displays.
- **Protection Against Malware and Other Cybersecurity Threats.** Protect your RTAC system with exe-GUARD®, which uses advanced cryptographic algorithms to authorize the execution of any program or service on the system. Any tasks not approved by the whitelist are blocked from operation.
- **Standard IEC 61131-3 Logic Design.** Create innovative logic solutions directly in ACSELERATOR RTAC using any of the editor tools: Tag Processor, Structured Text, Ladder Logic, or Continuous Function Chart.
- **Single-Point Engineering Access.** Gain engineering access to station IEDs through a single serial port, external modem, or high-speed network connection.
- **User Security.** Assign individual user and role-based account authentication and strong passwords. Use Lightweight Directory Access Protocol (LDAP) for central user authentication.
- **Integrated Security Management.** Comply with NERC/CIP user authentication, logging, and port control requirements.
- **IEC 61850.** Integrate high-speed control schemes between the RTAC and relays with IEC 61850 GOOSE peer-to-peer messaging. Poll and send data sets and reports from other IEDs with IEC 61850 MMS client/server.
- **Redundant Power Supply.** Apply redundant power support with two load-sharing, hot-swappable power supply modules, enabling you to power the SEL-3555 RTAC from two independent power sources for maximum availability and without inverters.
- **Synchrophasor Technology.** Use the IEEE C37.118 client protocol to integrate synchrophasor messages from relays or PMUs in your system. These messages can be used for logic and control in the station or converted to DNP3 or other protocol for SCADA usage.

- **Standard Data Management.** Map and scale data points easily between protocols in small and large systems. You can also normalize IED data into common data types, time-stamp formats, and time zones.
- **Simple Setup With ACSELERATOR RTAC® SEL-5033 Software.** Build a system quickly by using preconfigured device templates for SEL relays and other communications connections. The Tag Processor provides methods to map data relationships between communication protocols visually.
- **PCIe Expandability**. Employ as many as 4 standard PCI/PCIe form factor expansion cards, enabling you to add as many as 8 fiber or copper Ethernet ports or 18 additional rear-panel (RJ45) serial ports.
- **Remote Management**. Use remote access with Intel vPro™ Active Management Technology to give you full access to system video, keyboard, mouse, and storage.
- **Versatile Display Interfaces**. Connect to a Digital Visual Interface (DVI) or DisplayPort to use simultaneous independent high-definition display interfaces. Other video connections, such as High Definition Multimedia Interface (HDMI), are available when using interface adapters. The two front-panel and four rear-panel USB ports provide keyboard and mouse control.
- **Flexible Protocol Conversion.** Apply any available client or server protocol on any serial or Ethernet port. Each serial port on the expansion card can be used in software-selectable EIA-232 or EIA-485. The two rear Ethernet ports can optionally be copper of fiber connectors.

Product Overview

Functional Diagram



IEC 61131 Logic Engine

As depicted in the functional diagram, each RTAC includes an IEC 61131 logic engine that is preconfigured to have access for all system tags, IED data, diagnostics, alarms, security events, and communications statistics for use integrating your system. The system has no functional separation between those tags mapped for communications protocols and those used in programmable logic. This architecture greatly simplifies system configuration effort because no additional selection is required to identify tags used by the logic engine. You simply use any needed IED data, calculated values, and system tags in deterministic logic for the control of critical applications.

Management of the task processing sequence and solve rate in the RTAC is similar to that for traditional PLCs or PACs. The fastest processing rate is 4 ms for the main task and 1 ms for the automation task. Optimize the processor utilization by setting the processing rate no faster than necessary for your application.

Task processing in the logic engine includes protocol I/O, system management, and any custom logic programs you create using Structured Text (ST), Ladder Logic Diagram (LD), or Continuous Function Charts (CFC). CFC programs are a type of IEC 61131-3 Function Block Diagram (FBD) that provide more programming flexibility than standard FBDs. The ACSELERATOR RTAC software includes the IEC 61131-3 and Tag Processor editors you will use to manage any protocol information and custom logic needed for your system.

Manage User Accounts and Alarms in Web Server

The built-in RTAC web interface provides the ability to manage user accounts and system alarms remotely. Each user account has a unique username, password, and assigned role that defines system permissions. The RTAC can also be configured to use LDAP central authentication for user account management. The system includes web pages for monitoring user logs and maintaining network policies.

Logged tag values and system events provide a system-wide Sequence of Events report. View logs online or use ODBC connectivity to download them to a central database.

You can also configure Ethernet connections and monitor system status from the web interface. All of the Ethernet ports can operate on independent networks, or you can bind them for failover operation.

Flexible Engineering Access

Access Point Routers in the RTAC provide a means for creating transparent connections between any two ports. A transparent connection is a method for using the RTAC as a port server to connect remotely to an IED. Simple logic in the RTAC enables remote engineering access only through supervisory commands.

Seamless System Configuration

ACSELERATOR RTAC is a Microsoft® Windows® compatible configuration software for offline and online use with the SEL-3555 RTAC. A project in ACSELERATOR RTAC contains the complete configuration, settings and logic, for an individual RTAC device. Preconfigured device templates are available for you to add all device and master connections to the project tree view.

Once you create the settings for a specific device connection, improve engineering efficiency by saving a custom device template for later use with similar projects. Share custom templates via email or network for even greater savings.

The Tag Processor view facilitates the mapping of operational data quickly between IEDs and SCADA. ACSELERATOR RTAC is compatible with Microsoft Excel® and other programs, so you can save time and increase accuracy by copying SCADA maps from the source.

There is no need to install or learn more than one software interface. Use the Structured Text, Ladder Diagram, or Continuous Function Chart editors included with ACSELERATOR RTAC to develop custom IEC 61131 logic.

Data Concentration and Protocol Conversion

Configure each serial or Ethernet port to use any of the client, server, or peer-to-peer protocols available for the RTAC. For example, when you use IEEE C37.118 protocol to receive synchrophasor messages, you can map analog or Boolean tags and time stamps to DNP3 and send the data to SCADA very efficiently. You can also map data to IEC 61850 GOOSE messages for high-speed control schemes.

Additionally, when you need to define relay connections in a primary/backup arrangement, use the Tag Processor to map relay tags so that the master stations will receive power system information only from the active relay.

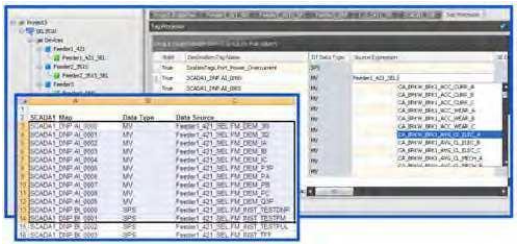


Figure 1 Map Source and Destination Tags Using Tag Processor or Copy SCADA Maps Directly From Spreadsheet

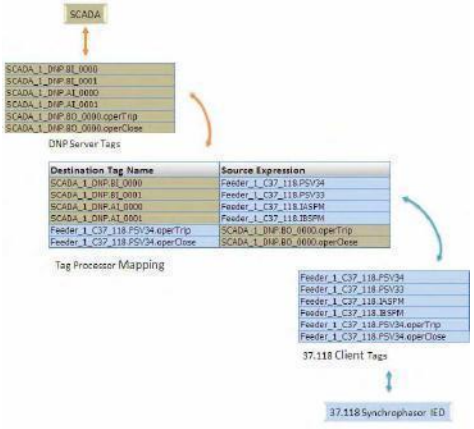


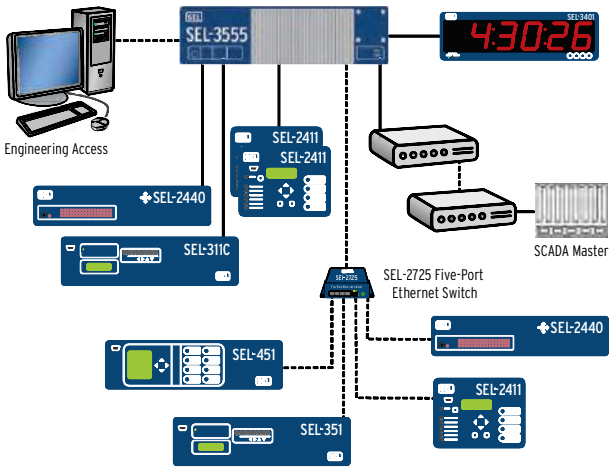
Figure 2 Synchrophasor Data Map Seamlessly Into SCADA Connections

Applications

Substation SCADA, Report Retrieval, Engineering Access, and Alarm Notification

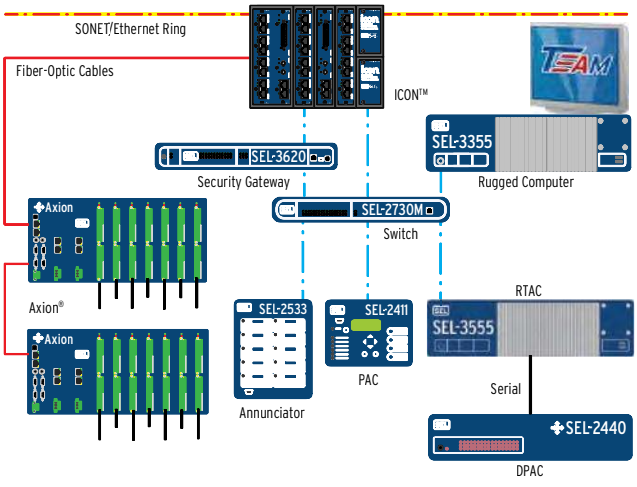
The RTAC can act as a data concentrator by using protocols such as IEC 61850 MMS client, Modbus®, DNP3, IEC 61850 GOOSE or MIRRORED BITS® communications to integrate both serial and Ethernet IEDs. Enable logging on any system or IED tag to view and archive a station-wide event record.

The RTAC Ethernet connection provides a means to remotely access the system to monitor logs and diagnostics. First establish a remote connection with any IED connected to the RTAC through Engineering Access communications channels. Then use the ACSELERATOR QuickSet® SEL-5030 Software suite to manage protection and control settings for these relays remotely.



Micro-Grid Automation and Control

The SEL-3555 RTAC provides the control and monitoring capabilities necessary to automate a micro-grid. Implement capacitor bank control, load-shedding schemes, power-grid reconfigurations, and power-source selection with the built-in logic processor in the RTAC. Coupled with the secure, redundant, and self-healing network capabilities of the SEL ICON®, as well as accurate time distribution to all IEDs, the RTAC provides the capability to control and monitor all aspects of a micro-grid as well display data with the optional built-in HMI. Built-in protocols provide a gateway to local and remote SCADA systems. To complete system integration, control and monitor remote I/O with the SEL-2240 Axion and collect event reports from connected IEDs with ACSELERATOR TEAM® SEL-5045 Software.

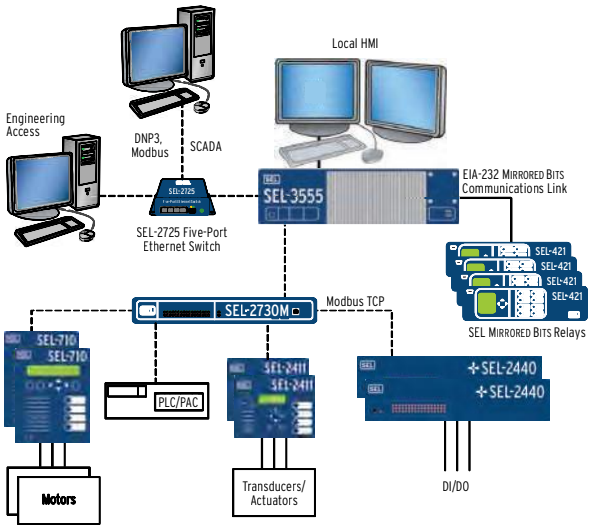


Real-Time Control and Logic Processing

The built-in logic processor provides high-speed control and transfer of signals from SEL MIRRORED BITS devices, or other protocols. The RTAC can serve as the system controller and SCADA gateway to eliminate costly equipment (such as breakers, interposing relays, and wiring) while also reducing engineering and labor costs.

The intuitive ACSELERATOR RTAC software provides simple setup of analog and binary tags from any device in the system. Integrated tools scale values and create logic in a flexible IEC 61131-3 configuration environment.

You can take advantage of multiprotocol support to collect SCADA information, process control commands, and use NTP time synchronization through a single communications link to each Ethernet device.

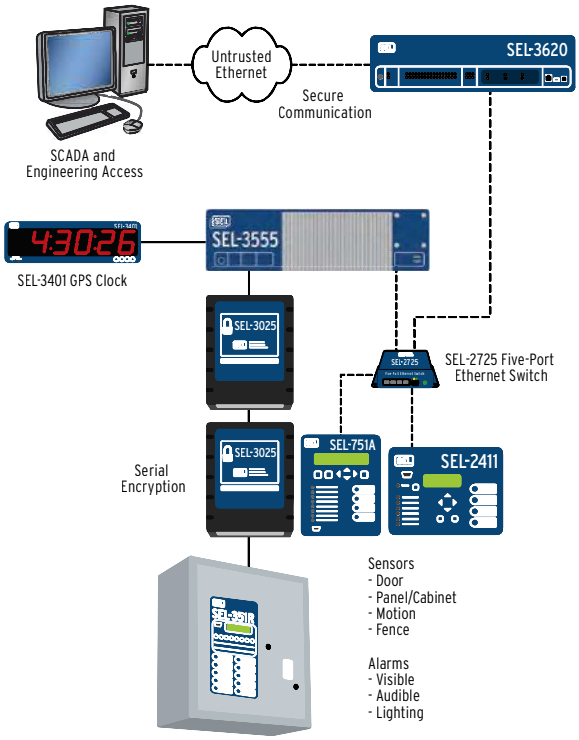


Secure Communications and User Management

The RTAC and SEL accessories offer security for your automation network. Per-user security profiles provide compliance with role-based requirements. The system can employ intrusion detection, notification, and logging to help maintain perimeter integrity.

The RTAC includes security features so that your system complies with NERC/CIP requirements for auditing, logging, port control, web authentication, and password restrictions. The RTAC also supports central authentication through your existing LDAP server.

By including SEL serial and wireless encrypting devices with the RTAC, you can protect remote serial communication to recloser controls or other connected devices.

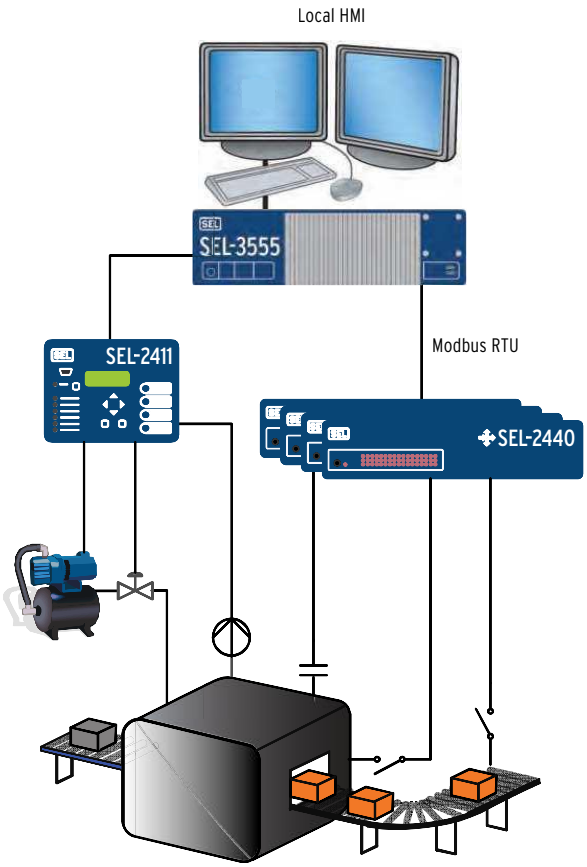


Control Systems

The custom logic and communications protocols in the SEL-3555 RTAC, along with the I/O in the SEL-2411 and SEL-2440, permit you to implement complete control systems, whether you perform discrete sequences, continuous control, monitoring, or asset management. SEL subjects its products to tests for harsh environments, so you can be confident that your control system will work reliably in tough applications. Minimize loop wiring and simplify commissioning by installing controls close to process equipment and integrating them with industry standard communications protocols. Additionally, the SEL-3355 Computer can provide HMI and data archiving functions.

Use a powerful IEC 61131 logic engine to design custom control programs in the RTAC. You can set the logic solve rate and program execution order to meet your system requirements. Operate the RTAC as a master controller and use SELOGIC® control equations in the SEL-2411 and SEL-2440 to perform distributed sequential or continuous control algorithms.

With a variety of physical interfaces and open protocol options, such as IEC 61850 GOOSE messaging, the RTAC makes system integration simple. It will reduce engineering time and complexity, so that you can focus on improving productivity and efficiency rather than on fixing communications problems.



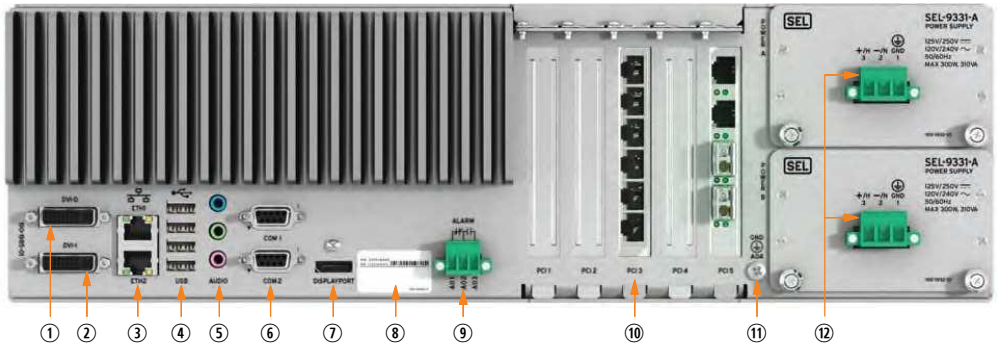
Ordering Options

Ethernet Communication	Two rear Ethernet ports, 10/100BASE-T copper
Serial Communication	Two rear EIA-232 ports
Power Supply	125/250 Vdc 120/240 Vac
Environment	Conformal coating for chemically harsh and high-moisture environments
Software Options	Human-Machine Interface (HMI) IEC 61850 GOOSE IEC 61850 MMS client IEC 61850 MMS server File I/O library
Ethernet Expansion	Optional SEL-3390E4 PCIe x4 Expansion Card As many as 8 additional 10/100/1000 Mbps ports, copper or LC fiber SFP
Serial Expansion	Optional SEL-3390S8 PCIe x1 Expansion Cards As many as 18 additional EIA-232/422/485 ports (RJ45)

Panel Features

① LEDs may all be tested by holding down the **LAMP TEST** button.
② **ENABLED** LED provides operational status. Green indicates normal operation, and red indicates that the system is halted or booting, or that an alarm condition has occurred. The **ALARM** LED indicates a non-optimal system condition exists. The **ALARM** LED illuminates red whenever the alarm contact operates.
③ **LINK** and **ACT** LEDs indicate link status and network activity for each Ethernet port.
④ Transmit (**TX**) and Receive (**RX**) LEDs indicate activity on serial ports.
⑤ Reset pinhole may also be configured as a power button in the BIOS.
⑥ See SATA drive activity at a glance with the **HDD** LED indicator.
⑦ Program three bicolor **AUXILIARY** LEDs for your custom application.
⑧ Attach mouse and keyboard to any of the USB ports.
⑨ Rugged enclosure withstands EMI, RFI, shock, and vibration.
⑩ Easily access removable solid-state drive behind the front panel.
⑪ High contrast, white-on-blue lettering is highly legible even in dark areas.

Figure 3 Front Panel



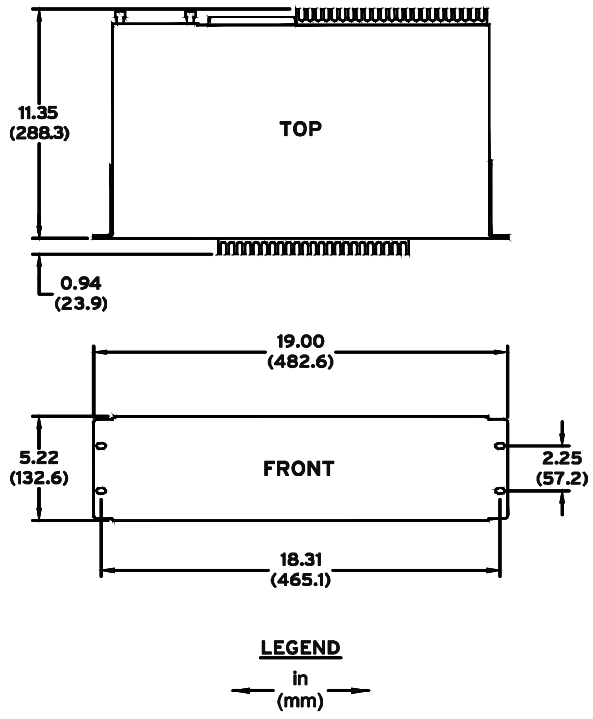
① Connect digital displays to the DVI-D video port.
② Connect digital or analog (VGA) displays to the DVI-I video port.
③ Network with two high-speed gigabit Ethernet ports. Ports may be bonded for redundancy or used individually.
④ Use any of the four USB 2.0 ports for keyboard and mouse connections.
⑤ Audio output is not used in the RTAC at this time.
⑥ Two built-in EIA-232 ports are BIOS configurable for +5 Vdc port power.
⑦ Connect monitors using the DisplayPort technology video port to leverage higher performance features than any other digital interface.
⑧ Serial number label.
⑨ Wire a Form C alarm contact output either normally closed or normally open. The **ALARM** LED on the front provides indication of the alarm contact state.
⑩ Use SEL rugged PCI Express expansion cards for additional networking, serial, and IRIG-B input*. One six-port serial expansion card included standard.
⑪ Attach chassis to ground.
⑫ Choose single or dual power supplies, and attach power from independent sources for even higher availability. Supplies load share and are hot-swappable for maximum online serviceability.

*IRIG-B input only available through PCI expansion cards.

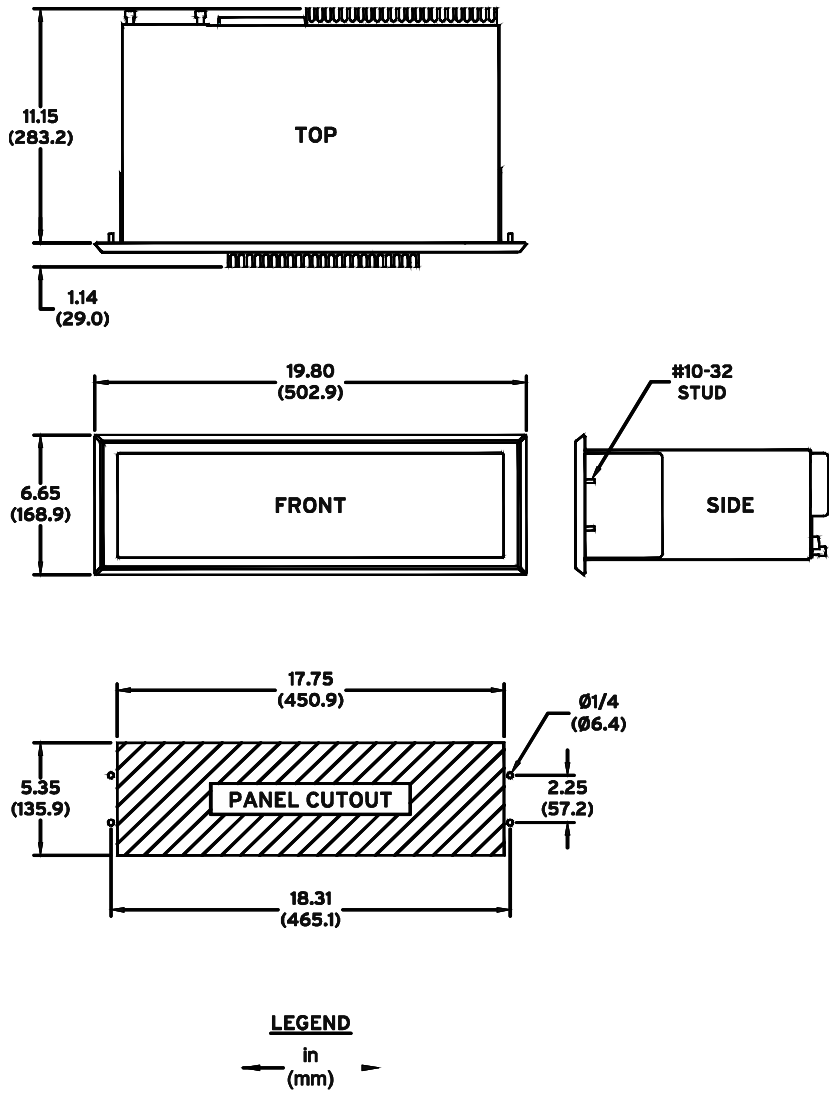
Figure 4 Rear Panel

Dimensions

Rack-Mount Chassis



Panel-Mount Chassis



Specifications

Compliance

Designed and manufactured under an ISO 9001 certified quality management system

47 CFR 15B, Class A
Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

General

Operating System

SEL Linux® Yellowstone running Linux kernel 3.x with real-time preemption patches

CPU

Intel Core i7-3555LE Dual-Core

Speed:	2.5 GHz base, 3.2 GHz turbo
Cache:	2 x 256 KB L2, 4 MB L3

Intel Core i7-3612QE Quad-Core

Speed:	2.1 GHz base, 3.1 GHz turbo
Cache:	4 x 256 KB L2, 6 MB L3

RAM

8 GB DDR3 ECC PC3-10600 (1333 MHz)

Chipset

Intel QM77 Express Chipset

Mass Storage

1 Internal Drive Bay:	One 2.5" SSD SATA II 3.0 Gb/s

Video

Intel HD Graphics 4000 Controller

Dual Independent Displays From 2 of the 3 Outputs:	DVI-I (digital + VGA) maximum resolution 1920 x 1200 @ 32 bpp DVI-D (digital only) maximum resolution 1920 x 1200 @ 32 bpp DisplayPort maximum resolution 1920 x 1200 @ 32 bpp

Audio (not used)

IDT 92HD91 HD Audio codec

3 Analog 3.5 mm TRS Jacks:	Line input Line/headphone output Microphone input

USB

4 Rear-Panel Ports, 2 Front-Panel Ports
USB 2.0 Compliant
800 mA Current Limit Each

Expansion Cards

5 Half-Length, Full-Height PCI Expansion Card Slots:	2 PCIe x4 (Revision 2.0) 2 PCIe x1 (Revision 2.0) 1 32-bit 5 V PCI (not used)

Ethernet

2 Rear-Panel 1 Gb Copper RJ45 Ports

ETH1:	Intel 82579LM, 10/100/1000 Mbps RJ45 copper
ETH2:	Intel 82574L, 10/100/1000 Mbps RJ45 copper
Optional SEL-3390E4 PCIe x4 Expansion Cards:	As many as 8 additional 10/100/1000 Mbps ports, copper or LC fiber SFP

Serial Ports

Standard Ports:	2 EIA-232 ports, DB-9 connectors, 300 to 115200 bps Included SEL-3390S8 PCIe expansion provides 6 additional EIA-232/422/485 ports, RJ45 connectors, 300 to 921600 bps
Optional SEL-3390S8 PCIe x1 Expansion Cards:	As many as 18 additional EIA-232/422/485 ports, RJ45 connectors, 300 to 921600 bps

On-board and SEL-3390S8 serial ports meet EIA/TIA-562 specifications

Time-Code Input/Output

Available With SEL-3390S8 Expansion Card

Connector:	RJ45 serial port
Time-Code:	Demodulated IRIG-B TTL compatible

Note: Output generated from either IRIG-B input or SEL-3555 clock.

Real-Time Clock/Calendar

Battery Type:	IEC No. BR2335 Lithium
Battery Life:	10 years with power 2 years without power

BIOS

Phoenix SecureCore Tiano™ UEFI

Trusted Platform Module

Integrated TPM 1.2

Intel Active Management Technology

Intel AMT v8.0

Power Supply

Option: 125/250 Vdc or 120/240 Vac; 50/60 Hz

DC Range:	100–300 Vdc
AC Range:	85–264 Vac
Frequency Range:	45–65 Hz
Typical Burden:	50 W
Max Burden:	300 W, 310 VA
DC Ripple:	< 15% rated voltage
Peak Inrush:	20 A
Insulation:	3100 Vdc

Recommended External Overcurrent Protection

Breaker Type:	Standard
Breaker Rating:	20 A at 250 Vdc
Current Breaking Capacity:	10 kA

Grounded Neutral Systems:	Device in series with the HOT or energized conductor
DC and Isolated Systems:	Device in series with both conductors

See *Table 1.1* for additional burden information.

Fuse Ratings

HV Power Supply Fuse:	5 A, 250 Vdc/277 Vac Time-lag T 277 Vac/1500 A break rating
Heater Fuses F2, F3:	5 A, 125 V slow blow 125 Vdc/50 A break rating

Fuses are not serviceable.

Alarm Output Contact

Per IEC 60255-0-20:1974, using the simplified method of assessment.

Output Type:	Relay, Form C, break-before-make
Power Supply Burden:	<1 W maximum
Mechanical Life:	2000000 operations
Operational Voltage:	250 Vac/Vdc
Make:	30 A at 250 Vdc
Carry:	6 A continuous at 70°C
1 s Rating:	50 A
MOV Protection:	270 Vac/360 Vdc, 75 J
Insulation Voltage:	300 Vac/Vdc
Pickup Time:	<8 ms
Dropout Time:	<8 ms

Breaking Capacity (10000 operations):

24 V	0.75 A	L/R = 40 ms
48 V	0.50 A	L/R = 40 ms
125 V	0.30 A	L/R = 40 ms
250 V	0.20 A	L/R = 40 ms

Cyclic Capacity (2.5 cycles/second):

24 V	0.75 A	L/R = 40 ms
48 V	0.50 A	L/R = 40 ms
125 V	0.30 A	L/R = 40 ms
250 V	0.20 A	L/R = 40 ms

Terminal Connections

Compression Screw Terminal

Power Wiring

Insulation:	300 V min.
Size:	12–18 AWG

Alarm Wiring

Insulation:	300 V min.
Size:	12–18 AWG

Tightening Torque

Minimum:	0.6 Nm (5 in-lb)
Maximum:	0.8 Nm (7 in-lb)

Crimp Ferrule Recommended

Mounting Ear Tightening Torque

Minimum:	0.18 Nm (1.6 in-lb)
Maximum:	0.25 Nm (2.2 in-lb)

Grounding Screw

Ground Wiring

Insulation:	300 V min.
Size:	12 AWG, length <3 m

Tightening Torque

Minimum:	0.9 Nm (8 in-lb)
Maximum:	1.4 Nm (12 in-lb)

Ring Terminal Recommended

Serial Port

Tightening Torque

Minimum:	0.6 Nm (5 in-lb)
Maximum:	0.8 Nm (7 in-lb)

Video Port

Tightening Torque

Minimum:	0.6 Nm (5 in-lb)
Maximum:	0.8 Nm (7 in-lb)

Operating Temperature Range

i7-3555LE CPU:	–40° to +75°C (–40° to +167°F)
i7-3612QE CPU:	–40° to +60°C (–40° to +140°F)

Note: Not applicable to UL applications.

Storage Temperature

–40° to +85°C (–40° to +185°F)

Relative Humidity

5 to 95% noncondensing

Maximum Altitude

2000 m

Atmospheric Pressure

80–110 kPa

Overvoltage Category

Category II

Pollution Degree

2

Insulation Class

1

Weight (Maximum)

9.072 kg (20 lb)

Type Tests

Electromagnetic Compatibility Emissions

Conducted Emissions:	IEC 60255-25:2000 FCC 15.107:2014 Severity Level: Class A
Radiated Emissions:	IEC 60255-25:2000 CISPR 22:2008 FCC 15.109:2014 IEC 61850-3:2013 Severity Level: Class A

Electromagnetic Compatibility Immunity

Conducted RF:
IEC 60255-26:2013
IEC 61000-4-6:2008
IEC 61850-3:2013
Severity Level: 10 Vrms

Electrostatic Discharge:
IEC 60255-26:2013
IEC 61000-4-2:2008
IEC 61850-3:2013
IEEE 1613-2003
IEEE C37.90.3-2001
Severity Level:
2, 4, 6, 8 kV contact discharge;
2, 4, 8, 15 kV air discharge

Fast Transient/Burst:
IEC 60255-26:2013
IEC 61000-4-4:2012
IEC 61850-3:2013
Severity Level: Class A
4 kV, 5 kHz on power supply and outputs;
2 kV, 5 kHz on communications lines

Magnetic Field:
IEC 61000-4-8:2009
IEC 61850-3:2013
Severity Level:
1000 A/m for 3 s
100 A/m for 1 m
IEC 61000-4-9:2001
Severity Level: 1000 A/m
IEC 61000-4-10:2001
Severity Level: 100 A/m

Power Supply:
IEC 60255-26:2013
IEC 61000-4-11:2004
IEC 61000-4-17:2009
IEC 61000-4-29:2000
IEC 61850-3:2013
IEEE 1613-2003

Radiated Radio Frequency:
IEC 60255-26:2013
IEC 61000-4-3:2010
IEC 61850-3:2013
Severity Level: 10 V/m
IEEE C37.90.2-2004
IEEE 1613-2003
Severity Level: 35 V/m

Surge Withstand Capability:
IEC 60255-26:2013
IEC 61000-4-18:2006
Severity Level:
Power supply and outputs
2.5 kV peak common mode
1.0 kV peak differential mode
Communications ports
1.0 kV peak common mode
IEEE C37.90.1-2002
IEEE 1613-2003
Severity Level:
2.5 kV oscillatory
4 kV fast transient

Surge Immunity:
IEC 60255-22-5:2008
IEC 61000-4-5:2005
1 kV line-to-line
2 kV line-to-earth
1 kV communications ports

Environmental

Cold:
IEC 60068-2-1:2007
IEC 61850-3:2013
IEEE 1613-2003
Severity Level:
16 hours at –40°C

Damp Heat, Cyclic:
IEC 60068-2-30:2005
IEC 61850-3:2013
IEEE 1613-2003
Severity Level:
12 + 12-hour cycle
25° to 55°C, 6 cycles, 95% r.h.

Dry Heat:
IEC 60068-2-2:2007
IEC 61850-3:2013
IEEE 1613-2003
Severity Level:
16 hours at 60°C (i7-3612QE CPU)
16 hours at 75°C (i7-3555LE CPU)

Vibration:
IEC 60255-21-1:1988
IEC 61850-3:2013
Severity Level:
Endurance Class 2
Response Class 2
IEC 60255-21-2:1988
Severity Level:
Shock Withstand, Bump Class 1
Shock Response Class 2
IEC 60255-21-3:1993
Severity Level:
Quake Response Class 2
IEEE 1613-2003
Severity Level: V.S.4

Safety

Enclosure Protection:
IEC 60529:2001 + CRGD:2003
Severity Level: IP30

Dielectric Strength:
IEC 60255-5:2000
IEEE 1613-2003
IEEE C37.90-2005
Severity Level:
3100 Vdc on power supply
2500 Vac on contact output
1500 Vac Ethernet ports
Type tested for one minute

Impulse:
IEC 60255-5:2000
IEEE 1613-2003
Severity Level:
5 kV power supply, contact outputs
1.5 kV Ethernet ports

Table 1.1 System Power Consumption

Power Consumption (Watts)[a]			
Component	Minimum	Typical	Maximum
Base System (Dual-Core CPU, 1 PSU, 8GB RAM, 30GB SSD, 1 serial card):	31 W	42 W	60 W
Additional Consumption From Optional Components			
Quad-Core CPU:	2 W	5 W	13 W
2nd Power Supply:	10 W	10 W	13 W
SEL-3390E4 Ethernet Card:	6 W	8 W	10 W
SEL-3390S8 Serial Card:	4 W	5 W	7 W
Chipset Heater[b]			
Cold startup (<5°C [41°F]):	N/A	N/A	90 W
Continuous operation (0°C [32°F]):	0 W	5 W	10 W
Continuous operation (–40°C [–40°F]):	0 W	20 W	40 W

[a] Minimum: 0% load on all components; minimum power consumption started and idle. Typical: 25–50% load on all components; good indication of most application loads. Maximum: 100% load on all components; generally cannot be reached in normal applications.
[b] Chipset heaters operate at low temperatures to keep the CPU and PCH within specified operating limits.

Part Number	Key Code
35304BA0XX211X0XXXXXX	**7164**

SEL-3530-4 RTAC

Product Configuration

Category	Selection
Mounting	19" Horizontal Rack Mount with Bracket (bracket on right side in front view)
Power Supply	125/250 Vdc; 120/240 Vac
Rear Communications Ports	Two 10/100BASE-T, 4 DB-9 EIA-232/EIA-485
Web Human Machine Interface (HMI)	None
Client Protocols	SEL, DNP3, Modbus, C37.118 Synchrophasors, L&G 8979, CP2179
Server Protocols	SEL, DNP3, Modbus, L&G 8979, SES-92, IEC 60870-5-101/104, C37.118 Synchrophasors
Peer-to-Peer Protocols	MIRRORED BITS®, Network Global Variable List (NGVL)
Conformal Coat	None
Library Extension Support	None

* Additional Cost

(1) One complimentary Printed Instruction Manual is available upon request with each product purchased.

Chassis (1.75 inch height x 8.5 inch width)

NOTE:
- The SEL-3530-4 comes standard with a CD manual.
- ACSELERATOR® RTAC SEL-5033 software is included for no charge.

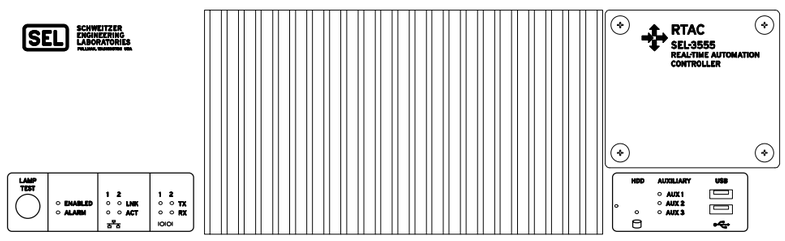
WI-8916
20151102

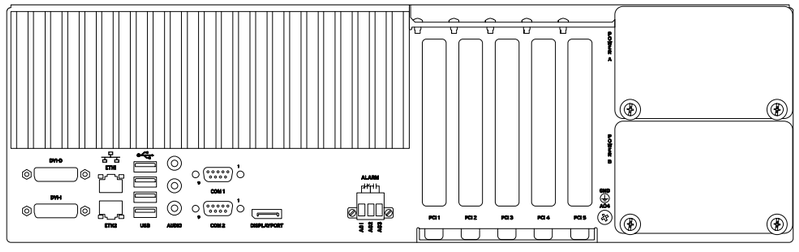
DIGIT: 1 2 3 4 5 6 7 8 9

3	5	5	5	-	-	-	-	-

NOTES:

1. IF YOU ARE NOT FAMILIAR WITH MASTER CONFIGURATION DRAWINGS, PLEASE SEE INSTRUCTIONS LOCATED FIRST IN THE SEL WEBSITE DRAWING LINKS.
2. THIS DRAWING IS FOR THE 3555, 3U CHASSIS ONLY.
3. USE LAYERS TO UPDATE VIEWS. SOME COMBINATIONS MAY NOT BE AVAILABLE. VERIFY PART NUMBER USING SEL WEBSITE.
4. ONLY SELECT ONE OPTION PER SLOT.
5. DRAWINGS ARE UPDATED FREQUENTLY, PLEASE USE CURRENT LINK FROM SEL WEBSITE.
6. DASHED SLOTS DO NOT AFFECT PRODUCT GRAPHICS AND ARE NOT SHOWN AS CONFIGURABLE OPTIONS.





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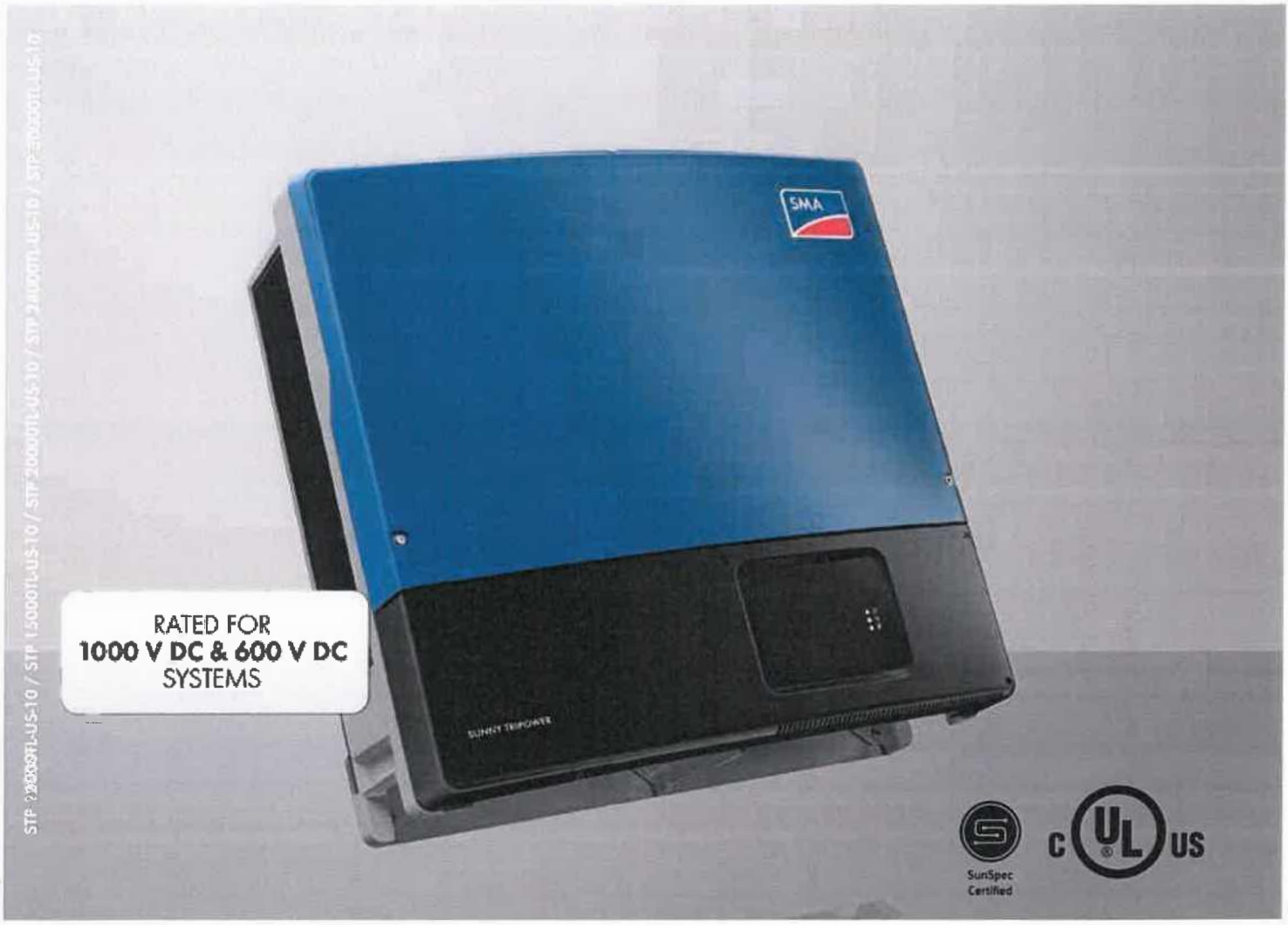


Design flexibility

1000 V DC or 600 V DC
- Two independent DC inputs
- 15° to 90° mounting angle range
- Detachable DC Connection Unit

System efficiency

- 98.0% CEC, 98.6% Peak
- 1000 V DC increases system efficiency
- OptiTrac Global Peak MPPT

Enhanced safety

- Integrated DC AFCI
- Floating system with all-pole sensitive ground fault protection
- Reverse polarity indicator in combination with Connection Unit

Future-proof

- Complete grid management feature set
- Integrated Speedwire, WebConnect, ModBus interface
- Bi-directional Ethernet communications
- Utility-interactive controls for active and reactive power

SUNNY TRIPOWER 12000TL-US / 15000TL-US / 20000TL-US / 24000TL-US / 30000TL-US

The ultimate solution for decentralized PV plants, now up to 30 kilowatts

The world's best-selling three-phase PV inverter, the SMA Sunny Tripower TL-US, is raising the bar for decentralized commercial PV systems. This three-phase, transformerless inverter is UL listed for up to 1000 V DC maximum system voltage and has a peak efficiency above 98 percent, while OptiTrac Global Peak minimizes the effects of shade for maximum energy production. The Sunny Tripower delivers a future-proof solution with full grid management functionality, cutting edge communications and advanced monitoring. The Sunny Tripower is also equipped with all-pole ground fault protection and integrated AFCI for a safe, reliable solution. It offers unmatched flexibility with a wide input voltage range and two independent MPP trackers. Suitable for both 600 V DC and 1,000 V DC applications, the Sunny Tripower allows for flexible design and a lower levelized cost of energy.

MADE IN THE USA OF U.S. AND IMPORTED PARTS

www.SMA-America.com

Technical data	Sunny Tripower 12000TL-US	Sunny Tripower 15000TL-US	Sunny Tripower 20000TL-US	Sunny Tripower 24000TL-US	Sunny Tripower 30000TL-US
Input (DC)					
Max. usable DC power (@ cos φ = 1)	12250 W	15300 W	20400 W	24500 W	30800 W
Max. DC voltage	*1000 V	*1000 V	*1000 V	*1000 V	1000 V
Rated MPPT voltage range	300 V...800 V	300 V...800 V	380 V...800 V	450 V...800 V	500 V...800 V
MPPT operating voltage range	150 V...1000 V	150 V...1000 V	150 V...1000 V	150 V...1000 V	150 V...1000 V
Min. DC voltage / start voltage	150 V / 188 V	150 V / 188 V	150 V / 188 V	150 V / 188 V	150 V / 188 V
Number of MPP tracker inputs	2	2	2	2	2
Max. input current / per MPP tracker input	66 A / 33 A	66 A / 33 A	66 A / 33 A	66 A / 33 A	66 A / 33 A
Output (AC)					
AC nominal power	12000 W	15000 W	20000 W	24000 W	30000 W
Max. AC apparent power	12000 VA	15000 VA	20000 VA	24000 VA	30000 VA
Output phases / line connections	3 / 3-N-PE				3 / 3-N-PE, 3-PE
Nominal AC voltage	480 / 277 V WYE				480 / 277 V WYE, 480 V Delta
AC voltage range	244 V...305 V				
Rated AC grid frequency	60 Hz				
AC grid frequency / range	50 Hz, 60 Hz / -6 Hz...+5 Hz				
Max. output current	14.4 A	18 A	24 A	29 A	36.2 A
Power factor at rated power / adjustable displacement	1 / 0.0 leading...0.0 lagging				
Harmonics	< 3%				
Efficiency					
Max. efficiency / CEC efficiency	98.2% / 97.5%	98.2% / 97.5%	98.5% / 97.5%	98.5% / 98.0%	98.6% / 98.0%
Protection devices					
DC reverse polarity protection	●	●	●	●	●
Ground fault monitoring / grid monitoring	●	●	●	●	●
All-pole sensitive residual current monitoring unit	●	●	●	●	●
DC AFCI compliant to UL 1699B	●	●	●	●	●
AC short circuit protection	●	●	●	●	●
Protection class / overvoltage category	I / IV	I / IV	I / IV	I / IV	I / IV
General data					
Dimensions (W / H / D) in mm (in)	665 / 650 / 265 (26.2 / 25.6 / 10.4)				
Packing dimensions (W / H / D) in mm (in)	780 / 790 / 380 (30.7 / 31.1 / 15.0)				
Weight	55 kg (121 lbs)				
Packing weight	61 kg (134.5 lbs)				
Operating temperature range	-25°C...+60°C				
Noise emission (typical) / internal consumption at night	51 dB(A) / 1 W				
Topology	Transformerless				
Cooling concept / electronics protection rating	OptiCool / NEMA 3R				
Features					
Display / LED indicators (Status / Fault / Communication)	– / ●				
Interface: RS485 / Speedwire, WebConnect	o / ●				
Data interface: SMA Modbus / SunSpec ModBus	● / ●				
Mounting angle range	15°...90°				
Warranty: 10 / 15 / 20 years	● / o / o				
Certifications and approvals	UL 1741, UL 1998, UL 1699B, IEEE 1547, FCC Part 15 (Class A & B), CAN/CSA C22.2 107.1-1				

NOTE: US inverters ship with gray lids. Data at nominal conditions. *Suitable for 600 V DC max. systems

● Standard features o Optional features – Not available

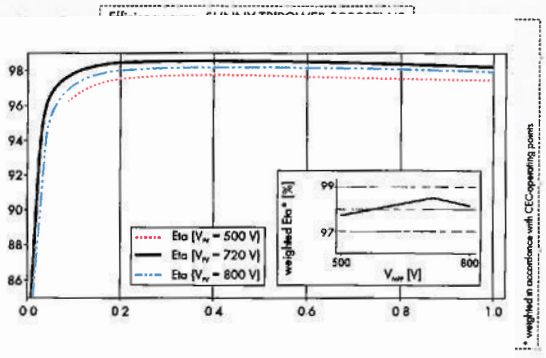
Type designation	STP 12000TL-US-10	STP 15000TL-US-10	STP 20000TL-US-10	STP 24000TL-US-10	STP 30000TL-US-10

Accessories

RS485 interface
DM-485CB-US-10

Connection Unit
CU 1000-US-10

SMA Cluster Controller
CLCON-10



NEW

CanadianSolar

MAXPOWER (1500 V)
CS6U-325|330|335|340M

Preliminary Datasheet

Canadian Solar's new 1500 V module is a product for high voltage systems, which can increase the string length of solar systems by up to 50%, saving BOS costs.

KEY FEATURES

- 1500 V — Designed for high voltage systems of up to 1500 V_{DC}, saving on BoS costs
- Cell efficiency of up to 20.0 %
- Outstanding low irradiance performance: 96.5 %
- No. 1 PTC — High PTC rating of up to 91.7 %
- IP67 — IP67 junction box for long-term weather endurance
- Heavy snow load up to 5400 Pa, wind load up to 2400 Pa

25 years linear power output warranty

10 years product warranty on materials and workmanship

MANAGEMENT SYSTEM CERTIFICATES*

ISO 9001:2008 / Quality management system

ISO/TS 16949:2009 / The automotive industry quality management system

ISO 14001:2004 / Standards for environmental management system

OHSAS 18001:2007 / International standards for occupational health & safety

PRODUCT CERTIFICATES*

IEC 61215 / IEC 61730: VDE (Expected late August 2016)

UL 1703: CSA (Expected late August 2016)

* As there are different certification requirements in different markets, please contact your local Canadian Solar sales representative for the specific certificates applicable to the products in the region in which the products are to be used.

CANADIAN SOLAR INC. is committed to providing high quality solar products, solar system solutions and services to customers around the world. As a leading PV project developer and manufacturer of solar modules with over 15 GW deployed around the world since 2001, Canadian Solar Inc. (NAS-DAQ: CSIQ) is one of the most bankable solar companies worldwide.

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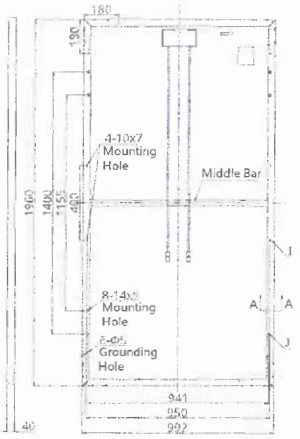
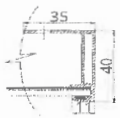
ENGINEERING DRAWING (mm)

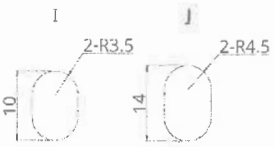
Rear View



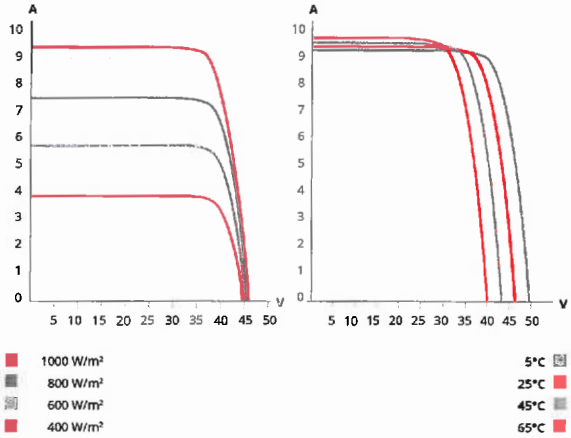
Frame Cross Section A-A



Mounting Hole



CS6U-335M / I-V CURVES



ELECTRICAL DATA | STC*

CS6U	325M	330M	335M	340M
Nominal Max. Power (Pmax)	325 W	330 W	335 W	340 W
Opt. Operating Voltage (Vmp)	37.4 V	37.5 V	37.8 V	37.9 V
Opt. Operating Current (Imp)	8.69 A	8.80 A	8.87 A	8.97 A
Open Circuit Voltage (Voc)	45.8 V	45.9 V	46.1 V	46.2 V
Short Circuit Current (Isc)	9.21 A	9.31 A	9.41 A	9.48 A
Module Efficiency	16.72%	16.97%	17.23%	17.49%
Operating Temperature	-40°C ~ +85°C			
Max. System Voltage	1500 V (IEC) or 1500 V (UL)			
Module Fire Performance	TYPE 1 (UL 1703) or CLASS C (IEC 61730)			
Max. Series Fuse Rating	15 A			
Application Classification	Class A			
Power Tolerance	0 ~ + 5 W			

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

MECHANICAL DATA

Specification	Data
Cell Type	Mono-crystalline, 6 inch
Cell Arrangement	72 (6×12)
Dimensions	1960×992×40 mm (77.2×39.1×1.57 in)
Weight	22.4 kg (49.4 lbs)
Front Cover	3.2 mm tempered glass
Frame Material	Anodized aluminium alloy
J-Box	IP67, 3 diodes
Cable	PV1500DC-F1 4 mm2 (IEC) & 12 AWG 2000 V (UL), 1160 mm (45.7 in)
Connector	T4-1500V or PV2 series or H4-UTX
Per Pallet	26 pieces
Per container (40' HQ)	572 pieces

ELECTRICAL DATA | NOCT*

CS6U	325M	330M	335M	340M
Nominal Max. Power (Pmax)	235 W	238 W	242 W	245 W
Opt. Operating Voltage (Vmp)	34.1 V	34.2 V	34.5 V	34.6 V
Opt. Operating Current (Imp)	6.88 A	6.96 A	7.01 A	7.10 A
Open Circuit Voltage (Voc)	42.0 V	42.1 V	42.3 V	42.4 V
Short Circuit Current (Isc)	7.46 A	7.54 A	7.62 A	7.67 A

* Under Nominal Operating Cell Temperature (NOCT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

TEMPERATURE CHARACTERISTICS

Specification	Data
Temperature Coefficient (Pmax)	-0.41 % / °C
Temperature Coefficient (Voc)	-0.31 % / °C
Temperature Coefficient (Isc)	0.053 % / °C
Nominal Operating Cell Temperature	45±2 °C

PERFORMANCE AT LOW IRRADIANCE

Outstanding performance at low irradiance, average relative efficiency of 96.5 % from an irradiance of 1000 W/m² to 200 W/m² (AM 1.5, 25°C).

The specification and key features described in this datasheet may deviate slightly and are not guaranteed. Due to on-going innovation, research and product enhancement, Canadian Solar Inc. reserves the right to make any adjustment to the information described herein at any time without notice. Please always obtain the most recent version of the datasheet which shall be duly incorporated into the binding contract made by the parties governing all transactions related to the purchase and sale of the products described herein.

Caution: For professional use only. The installation and handling of PV modules requires professional skills and should only be performed by qualified professionals. Please read the safety and installation instructions before using the modules.

PARTNER SECTION