| **DOCKETED** |
|-------------------|-------------------|
| **Docket Number:** | 00-AFC-14C         |
| **Project Title:**  | El Segundo Power Redevelopment Project Compliance |
| **TN #:**           | 207213            |
| **Document Title:** | Steam Turbine Weatherization Enclosures - Petition to Modify |
| **Description:**    | N/A               |
| **Filer:**          | Camile Remy-Obad  |
| **Organization:**   | El Segundo Energy Center LLC |
| **Submitter Role:** | Applicant         |
| **Submission Date:**| 1/7/2016 9:26:58 AM |
| **Docketed Date:**  | 1/7/2016          |
El Segundo Energy Center Project
(00-AFC-14C)
Steam Turbine Weatherization
Enclosures – Petition to Modify

December 2015

Submitted by: El Segundo Energy Center LLC
Date Submitted: 12-23-2015
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I. Overview of the Petition

El Segundo Energy Center LLC (ESEC LLC), the Project Owner, a wholly owned subsidiary of NRG Energy, Inc. (NRG), proposes to make modifications to specified equipment licensed by July 8, 2010 Commission Decision for the El Segundo Energy Center (ESEC) Project (Docket No.00-AFC-14C). This Petition to Modify entails the replacement of thermal insulation on steam turbine (ST) casings and installation of weatherization enclosures (i.e., ST weatherization enclosures) over the ESEC steam turbines, located at 301 Vista Del Mar, El Segundo, California. This Petition does not propose any changes to the COCs included in the Final Decision.

ESEC LLC seeks CEC approval to proceed with installation of the ST enclosures as soon as possible to avoid any further maintenance issues with the generating equipment. The timing of this request is made with consideration of the pending El Nino season.

a. Information Requirements for the Post-certification Amendment

This Petition contains the information required under the CEC’s Siting Regulations for post-certification project modifications (California Code of Regulations [CCR] Title 20, Section 1769). This Petition, as summarized in Table 1 below, contains the information necessary for staff to determine that that the replacement of the ST thermal insulation and installation of the weatherization enclosures will not (a) significantly affect the environment, (b) cause a change or deletion of a COC, or (c) cause the project not to comply with applicable laws, ordinances, regulations, and standards (LORS).
### TABLE 1
Informational Requirements for Post-Certification Modifications

<table>
<thead>
<tr>
<th>Section 1769 Requirement</th>
<th>Section of Petition Fulfilling Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) A complete description of the proposed modifications, including new language for any conditions that will be affected</td>
<td>I. Overview of Petition</td>
</tr>
<tr>
<td></td>
<td>IV. Analysis of Project Modification, Environmental Analysis Summary - Table 2</td>
</tr>
<tr>
<td>(B) A discussion of the necessity for the proposed modifications</td>
<td>III. Necessity of Proposed Changes</td>
</tr>
<tr>
<td>(C) If the modification is based on information that was known by the petitioner during the certification proceeding, an explanation why the issue was not raised at that time</td>
<td>III. Necessity of Proposed Changes</td>
</tr>
<tr>
<td>(D) If the modification is based on new information that changes or undermines the assumptions, rationale, findings, or other bases of the final decision, an explanation of why the change should be permitted</td>
<td>Not Applicable – final decision not changed</td>
</tr>
<tr>
<td>(E) An analysis of the impacts the modification may have on the environment and proposed measures to mitigate any significant adverse impacts</td>
<td>IV. Analysis of Project Modifications and Environmental Analysis Summary - Table 2</td>
</tr>
<tr>
<td>(F) A discussion of the impact of the modification on the facility's ability to comply with applicable laws, ordinances, regulations, and standards;</td>
<td>IV. b. Consistency of Changes with Certification</td>
</tr>
<tr>
<td>(G) A discussion of how the modification affects the public</td>
<td>V. Potential Offsite Impacts and IV a. Visual Analysis</td>
</tr>
<tr>
<td>(H) A list of property owners potentially affected by the modification</td>
<td>V. Potential Offsite Impacts and Attachment H</td>
</tr>
<tr>
<td>(I) A discussion of the potential effect on nearby property owners, the public and the parties in the application proceedings.</td>
<td>V. Potential Offsite Impacts</td>
</tr>
</tbody>
</table>
II. Project Description
The proposed modifications consist of the replacement of thermal insulation on ST casings and installation of ST weatherization enclosures on Units 6 and 8 at the ESEC site. The weatherization enclosures are proposed improvements suggested by Siemens, the ST manufacture designer. The weatherization enclosures are necessary due to operation and maintenance issues associated with the lengthy removal and replacement requirements of spray on thermal insulation on the ST casings. The originally installed spray on thermal insulation was designed to provide thermal insulation to the ST casing to help maintain consistent temperature across the ST rotor and prevent exposure of ancillary operational equipment and sensor systems to rain and corrosive marine environment.

The ESEC units consist of two 1x1 (one gas turbine generator (GTG) and one HRSG and ST generator (STG)) combined cycle power blocks. The ST’s were designed and installed with a spray on thermal insulation and hard shell (plaster-like) coating on the exterior of the ST casing that also encapsulated numerous valves, electric heating mats, and various sensors. Attachment A provides the site general arrangement for reference.

III. Necessity of Proposed Changes
The Siting Regulations require a discussion of the necessity for any revision to a CEC certification and of whether the modification is based on information that was known by the petitioner during the certification proceeding (Title 20, CCR, Sections 1769 [a][1][B] and [C]). The proposed modifications to the ST units were only determined to be necessary after significant operational time and one annual scheduled outage period. The proposed modification was not known to the Petitioner, ESEC LLC at the time of licensing. Descriptions of the necessary modifications are discussed in the following sections.

a. Project Background
ESEC project online date was August 1, 2013. During 2014 the ST casing electric heater mats began to fail prematurely. The failed heater mats were scheduled to be replaced during the 2015 spring outage. During the outage the hard shell spray on thermal insulation was removed. The removal process of the thermal insulation coating damages the coating and requires the coating be reinstalled, a process that takes several days to accomplish. The thermal spray on coating also requires several days of “curing” before the ST could be placed back into service. Information on the spray on thermal insulation is provided in Attachment B.

b. Project Modifications
Due to the difficulty with the removal process of the thermal insulation, maintenance issue with the heater mat, and the long cure time for reinstallation of the thermal insulation a decision was made in consultation with Siemens to reinstall the heater mats directly on the ST casing; covering them with removable insulation pads. The heater elements and the removable insulation pads are not recommended for outdoor use.
Rather than install the hard shell insulation again, ESEC plans to install the weather protection enclosures discussed herein, which will improve future maintenance requirements and reduce the duration or eliminate potential outages associated with replacement/re-installation of the hard shell material.

The weather enclosures would be mounted over each ST unit and would also provide weather protection for sensors and valves that also experienced failure and corrosion from exposure. The ST units have experienced short outages due to failure of control transmitter connections, and controls (i.e., speed probes) from environmental exposure. The original ST casing insulation was designed to protect delicate controls and instrumentation hardware on the top of the ST units.

The proposed ST enclosures are steel framed, canopy type structures that will be bolt mounted to the turbine platform (Attachment C). The enclosures are designed to be bolted in place (not welded) to allow any future major maintenance activity possible by simply unbolting the structure and removing in a single lift in one piece. This greatly increases the efficiency of maintenance activities as compared the hard shell plaster coating as originally designed. The turbine platforms are constructed of steel I-beams and grated walkways. The enclosures were engineered and provided with PE Stamped design calculations and drawings (Attachment D). The enclosures are open on the bottom and will allow complete access around the ST for workers. There will be no enclosed work spaces created, and no electrical, plumbed, or mechanical systems installed on the enclosure. The enclosures were shipped to the site in parts and assembled on the ground in a staging area at the plant. The enclosures would be lifted into place with a crane in a single lift (Attachment E). Installation is estimated to require one day per enclosure.

IV. Analysis of Project Modification
The ST units are located on the eastern half of the ESEC site (Attachment A, Item 2 on Site Arrangement Drawing), east of the air-cooled heat exchangers, and south of combustion turbine air inlets. The proposed enclosures are 21-feet in height, 20.67-feet wide, and 28.1-feet in length. They would be installed on the ST platform which is 14-feet in height. The total structure elevation height will be 35-feet above grade. For comparison, the ST generator is located immediately south of ST. The ST generator enclosure is 17-feet in height for total elevation of 31-feet above grade. Photos of the assembled enclosures, ST, and general installation locations are shown in Attachment F.

ESEC LLC evaluated all the resource disciplines that may have the potential for the insulation replacement and ST weatherization enclosures to impact to public health and safety, or the environment. A summary of the analysis is provided in Table 2 below. Of the resource disciplines, only visual resources may have the potential to be impacted by the installation of the weatherization enclosures. All other resources disciplines were determined to have no impact. An example of potential benefits from the installation of the ST enclosures would be reduced noise profile for the ST unit and improvement to work safety by providing better equipment
maintenance options. The system reliability will be improved due to less maintenance on the ST unit and ancillary equipment located inside the enclosure. Potential visual resource impacts are discussed in the following section.

**TABLE 2**  
**Environmental Analysis Summary**

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Quality</td>
<td>No operating equipment. All chemicals used are South Coast Air Quality Management District Compliant. Work activities are operations and maintenance related and/or fabrication of enclosures do no trigger air permit thresholds for permitting. No Impact.</td>
</tr>
<tr>
<td>Biological Resources</td>
<td>Work is not within habitat area and does not impact local flora or fauna. No Impact.</td>
</tr>
<tr>
<td>Cultural Resources</td>
<td>Insulation installation and weatherization enclosure do not require any ground disturbance activities. No Impact.</td>
</tr>
<tr>
<td>Geology and Paleontology</td>
<td>No ground disturbance work. No Impact.</td>
</tr>
<tr>
<td>Hazardous Materials</td>
<td>No hazardous materials used or storage modifications made to existing facilities. No Impact.</td>
</tr>
<tr>
<td>Land Use</td>
<td>No change to land use. No Impact.</td>
</tr>
<tr>
<td>Noise and Vibration</td>
<td>Installation if insulation is all manual labor, no noisy equipment required. Enclosure fabrication requires minimal welding, and bolting during normal work hours 7AM to 6PM. Installation of enclosures will require heavy lift crane, also used during normal work hours. Enclosures may reduce noise in and around the immediate ST area; however, overall no increase in far field noise is anticipated. No Impact.</td>
</tr>
<tr>
<td>Public Health</td>
<td>No change to emissions. No Impact.</td>
</tr>
<tr>
<td>Socioeconomic Resources</td>
<td>Operation and maintenance activity. No Impact.</td>
</tr>
<tr>
<td>Soil and Water Resources</td>
<td>No ground disturbance or water resources</td>
</tr>
</tbody>
</table>
TABLE 2
Environmental Analysis Summary

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic and Transportation</td>
<td>No offsite work or heavy haul equipment needed. No Impact.</td>
</tr>
<tr>
<td>Visual Resources</td>
<td>Possible visual impact from weatherization enclosure discussed in following section.</td>
</tr>
<tr>
<td>Waste Management</td>
<td>Replacing the spray on thermal insulation with removable insulation blankets will actually reduce waste (non-hazardous, municipal waste debris) over the lift of project. No Impact.</td>
</tr>
<tr>
<td>Worker Safety and Fire Projection</td>
<td>Installation of removable insulation blankets will improve work safety with a more efficient and safe insulation installation and removal option for maintenance. The removable insulation blankets are fire retardant and designed for high temperature industrial use. No Impact.</td>
</tr>
</tbody>
</table>

a. Visual Analysis
For perspective of whether the protection enclosures proposed for the two ST’s would be visible following implementation of this maintenance procedure, photos were taken from Key Observations Points (KOPs) used during the licensing (Attachment G). KOPs 1 (Dockweiler State Beach looking south), 7 (Dockweiler Beach looking east), and 5 (Vista Del Mar south) seem to be the most appropriate. Based on the location of the ST units in the middle of the ESEC facility equipment, and the total height of the final installed equipment, it does not appear that the weatherization enclosures will be visible. In accordance with CEC Condition of Certification VIS-5 the color of the enclosure is gray with a translucent roof panels. The colors are similar to the galvanized and coated equipment around the ST, and the finish on the enclosure is not reflective or glossy.

b. Consistency of Changes with Certification
The CEC Siting Regulations require a discussion of the consistency of a proposed project revision with the LORS and whether the modifications are based on new information that changes or undermines the assumptions, rationale, findings, or other basis for the final decision (Title 20, CCR Section 1769 [a][1][D]). If any such modification would cause a project to be inconsistent with the certification, the Petition must provide an explanation of why the modification should be permitted.
The Petition to Modify the thermal insulation and install weatherization enclosures is consistent with the purpose of ESEC as licensed and amended and is consistent with the applicable LORS and COCs as described in the Final Decision. This Petition is not based on new information that changes or undermines any basis of Final Decision. The findings and conclusions contained in the Final Decision are applicable to the replacement of thermal insulation and installation of weatherization enclosures.

The enclosures are designed by a California Professional Engineer (Civil) to comply with design standards for structural and seismic requirements for the southern California area. The construction, installation, and use of the enclosures are not subject to any other laws, ordinances, regulations, and/or standards.

V. Potential Offsite Impacts
The installation and use of the enclosures will have no impact on the public. Construction and installation of the enclosures requires one to two weeks of welding and bolting construction. Installation of the enclosures will only require one day to complete. The weatherization enclosures are simple steel frame and corrugated metal canopy type enclosures that have no electrical, lighting, or air emissions. Although the tops of the enclosures may be visible from very limited vantage points, they will most likely be indistinguishable from the rest of the power block equipment. The enclosures are to be installed to reduce equipment exposure to rain and the coastal marine environment, reducing the frequency of equipment failure and increasing equipment operational availability.

The installation and use of the enclosures has no potential to affect nearby property owners. The enclosures are stationary and designed to engineering standards that ensure stability in earthquake and severe weather conditions. The proof of service list from the last Petition to Amend the ESEC Final Decision is included in Attachment H.
ATTACHMENT A

Site General Arrangement
ATTACHMENT B

Original Heater Element Specifications, and Thermal Insulation Information
Operation and Maintenance Manual
for
Electric Surface Heating Systems

Personal involved in the installation, testing and maintenance of electric heat-tracing systems must be suitably trained in all special techniques required, as well as in general electrical installation work!

Ensure that the heating cable voltage rating is suitable for the application!

1. Power supply and electrical protection
Size overcurrent protective devices according to the THERMOPROZESS Heating-Systems GmbH design specification.
We require the use of a maximum 300 mA residual current device to provide maximum safety and protection.
Bond the metal sheath or metallic braid of the heating cable to a suitable earth terminal.
Also refer to local standards.
Special regard should be given to electrical safety. All safety aspects need to be proven. Also refer to local standards.

2. Power System testing and operating
After installation of the heating system, it has to be checked for visible damage on the components installed.
Measure the resistance
   a.) Insulation resistance
   b.) Resistance of heating cable (not required for self regulating tapes)

2.1 Insulation Resistance (IR) testing
IR testing (using a megohmmeter) should be conducted with minimum 500 V and max. 2000 V.
Measure the resistance between the heating cable bus wire and the braid or metal sheath.
All insulation resistance values should be greater than 50 MΩ, regardless of the heating cable length.
The installer should record the values for each circuit on the installation record sheet.

THERMOPROZESS Heating-Systems GmbH recommends insulation resistance test after installing thermal insulation and as part of the periodic maintenance.

Function testing of electrical protection, residual current device and temperature control systems should be carried out at regular intervals.

3. Operation and maintenance
- switch on power
- set value on regulator, controller, limiter etc.
  if the controller setpoint is below the actual value, set values above actual values temporary.
- the same procedure with possibly existing safety controller / limiter
- Measure the current ampere immediately and after 10 minutes of operation with an a-meter.
- if existing, check the low temperature controller by changing the values

Attention!
After commissioning / maintenance set all values back to the required one.

Geschäftsführer: Dipl.-Ing. Karl Funke, HRB 15979 Duisburg
# Heating circuit list

## vessel / area

| No. | Description          | area total | area heated | Insulation | Heat loss W / m² | Heat occ. Coverage m / m² | Heating cable type | Length m | P (meas. Value) kW | I (meas. Value) A | U (meas. Value) V | Insul-R (meas. value) MΩ | Connection box type | thermocouples type | reference mark TC | Reference range ° C | reference range ° C |
|-----|----------------------|------------|-------------|------------|-----------------|---------------------------|---------------------|----------|-------------------|-------------------|-----------------|------------------------|--------------------|-----------------|-------------------|---------------------|
| 1   | turbine case         | approx. 3.4| 200-300     | laser      | 14.7            | 50                        | MTC/Q 630           | 7.3      | 14.1              | 14.3              | 31.7            | 480                    | aluminium          | B1'1                | 1 x NiCr-Ni        | + 600               |
|     | heating zone 1       |            |             |            |                 |                           |                     |          |                   |                   |                 |                        |                    | (1 x NiCr-Ni)      |                   |
| 10MAA50 AH013 |                      |            |             |            |                 |                           |                     |          |                   |                   |                 |                        |                    |                   |                   |
| 2   | turbine case         | approx. 5.6| 200-300     | laser      | 10.4            | 58                        | MTC/Q 400           | 9.9      | 20.1              | 20.0              | 22.4            | 480                    | aluminium          | B1'1                | 1 x NiCr-Ni        | + 600               |
|     | heating zone 2       |            |             |            |                 |                           |                     |          |                   |                   |                 |                        |                    | (1 x NiCr-Ni)      |                   |
| 10MAA50 AH010 |                      |            |             |            |                 |                           |                     |          |                   |                   |                 |                        |                    |                   |                   |
| 3   | turbine case         | approx. 3.4| 200-300     | laser      | 14.7            | 50                        | MTC/Q 630           | 7.3      | 14.2              | 14.3              | 31.7            | 480                    | aluminium          | B1'1                | 1 x NiCr-Ni        | + 600               |
|     | heating zone 3       |            |             |            |                 |                           |                     |          |                   |                   |                 |                        |                    | (1 x NiCr-Ni)      |                   |
| 10MAA50 AH012 |                      |            |             |            |                 |                           |                     |          |                   |                   |                 |                        |                    |                   |                   |
| 4   | turbine case         | approx. 5.6| 200-300     | laser      | 10.4            | 58                        | MTC/Q 400           | 9.9      | 20.1              | 20.3              | 22.4            | 480                    | aluminium          | B1'1                | 1 x NiCr-Ni        | + 600               |
|     | heating zone 4       |            |             |            |                 |                           |                     |          |                   |                   |                 |                        |                    | (1 x NiCr-Ni)      |                   |
| 10MAA50 AH011 |                      |            |             |            |                 |                           |                     |          |                   |                   |                 |                        |                    |                   |                   |
| 5   | turbine case         | approx. 7.4| 200-300     | laser      | 13.5            | 2 x 50                    | MTC/Q 630           | 14.6     | 14.6 / 14.7        | 14.3 / 14.4       | 31.1 / 32.1      | 480                    | aluminium          | B1'1                | 2 x NiCr-Ni        | + 600               |
|     | heating zone 5       |            |             |            |                 |                           |                     |          |                   |                   |                 |                        |                    | (2 x NiCr-Ni)      |                   |
| 10MAA10 AH020 |                      |            |             |            |                 |                           |                     |          |                   |                   |                 |                        |                    |                   |                   |

**Object**

Heating for turbine case

T 6645 Flex Plant 10 SP A1

**Com.Nr.:** 48046x811

Client: Siemens AG - IA - Görlitz

Date: 25.06.09

Order-No.: 61-45061470

S. Stricker, Siemens

**R. Küpper**

THERMOPROZESS

---

B1'1 - Controller / B2'1 - safety controller max temp. heating cable / B3'1 - low temp. control
MAA50CT013
AU16889/1A

MAA50AH013

MAA50CT013
AU16889/2A
redundant / spare

MAA50AH013
redundant / spare

THERMOPROFESS HEATING-SYSTEMS GMBH
Wiehagen 6
D - 45472 Mülheim
Tel.: +49 208 49539-50
Fax: +49 208 49539-59

Datum: 28.05.2009
gez.: sp

Anmerkung

Siemens AG FGI Industrial Applications Gürlitz
Applications:

MTC/- range of Mineral insulated metal sheathed heating cables are primarily used for process maintenance and freeze protection of piping/vessels where high density loadings and high withstanding temperatures are required.

MTC/C  Copper sheathed cable.
MTC/CF Copper sheathed cable with outer FEP jacket for highly corrosive areas.
MTC/CH Copper sheathed cable with outer HDPE jacket for corrosive areas.
MTC/F  Cupro nickel sheathed cable.
MTCF/Q Konstantan conductor with stainless steel sheathed cable.
MTC/Q  Stainless steel sheathed cable.
MTC/I  Inconel sheathed cable.
MTC/A  Alloy sheathed cable.

Ratings:

MTC/
Max. sheath temperature bare cable 200°C
Max. sheath temperature CF overjacket 200°C
Max. sheath temperature CH overjacket 80°C
Min. installation temperature -20°C

MTC/F and MTCF/Q
Maximum sheath temperature 400°C
Minimum installation temperature -20°C

MTC/Q
Maximum sheath temperature 600°C
Minimum installation temperature -20°C

MTC/I and MTC/A
Maximum sheath temperature 800°C
Minimum installation temperature -20°C

Approvals - for use in hazardous areas
- BASEEFA
- PTB
These semi rigid thermocouples are ideal for all applications from simple temperature measurement to more arduous environments. They have insulated junctions to prevent earth loops and can be formed to shape to suit particular applications without impairing performance. A pot seal which allows the transition to 1 metre PVC insulated leads is supplied as standard.

Thermocouple type K (NiCr/NiAl) tolerance class 2 accord. DIN EN 60 584-2
Diameter 3.0mm
Length 2000 mm
Sheath material: Inconel 600® W-Nr. 2.4816 (1100°C)
Thermocouple will be supplied ungrounded
Compensating leads: 1m with PVC sheath
Protective hose 31mm length made of stainless steel, diameter 6.35mm, suitable for temperatures up to +105°C
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<tr>
<th>Prüfnummer</th>
<th>Messergebnisse</th>
<th>Testbedingungen</th>
<th>Heizleiterwiderstand</th>
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Project: El Segundo
PKZ: USA659
Document Number: Erection & Commissioning Documentation, Rev. 1
UNID # 481401471

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<td>-</td>
<td>Steam turbine commissioning checklist</td>
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<td>MAV – Lubricant supply system commissioning checklist</td>
<td>-</td>
<td>MAV – Lubricant supply system commissioning checklist</td>
</tr>
<tr>
<td>MAX – Control oil system commissioning checklist</td>
<td>-</td>
<td>MAX – Control oil system commissioning checklist</td>
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Turbine Set

Erection Manual (Rev. a as of 2011-07-29)

Type of Machine: SST 800
Siemens Order No.: 76692/93
Codeword: EL SEGUNDO
Maschine No.: T76645-46

Energy Sector Energy Service
1. Geltungsbereich

Diese Spezifikation gilt für die Wärmedämmung von Industriedampfturbinen, die als Spritzdämmung mit Hartmantel ausgeführt wird.

2. Allgemeine Anforderungen


Die auftragsbezogenen Angaben sind der Stückliste 2-31700- T.Nr. -00 zu entnehmen.
T.Nr. = Turbinenummer

3. Spritzdämmung mit Hartmantel


4. Auslegung der Wärmedämmung

Die max. Oberflächentemperatur der Isolierung darf max. 20°C über der Umgebungstemperatur liegen.

1. Scope

This Specification applies to thermal insulation for industrial steam turbines in the form of spray-on insulaion with a hard outer covering.

2. General Requirements

The insulating materials employed shall not contain any asbestos. If forms of insulation, methods of securement and/or materials other than those described in this Specification are to be used, these shall be subject to prior approval by the Turbine Engineering Dept. The requisite certificates according to EU legislation or equivalent codes and standards shall be submitted (EU safety data sheets and certificates according to the latest edition of the hazardous materials ordinance).

Project-specific data are given in Item List of Materials No. 2-31700- T.Nr. -00.
T.Nr. = Turbine number

3. Spray Insulation with Hard Outer Covering

The thermal insulation shall comprise a mixture of mineral wool fibers and inorganic binder which is sprayed onto the outer turbine casing to provide a homogeneous layer with no gaps or junctions. The spray insulation shall be applied such as to conform to the contours of the casing. Due consideration shall be given to differential movement of the casing and the turbine valves. The spray insulation may not come into contact with the concrete foundation or with the steel baseframe. All bolted connections (bolts and nuts, etc.) must be covered with aluminum foil (see Figure 1). The insulation on the outer casing bottom must be 20% thicker than that installed on the outer casing top half.

4. Thermal Insulation Design

The maximum surface temperature of the insulation shall be no more than 20°C above the ambient temperature.
5. Befestigung (siehe Bild 1)
Die Spritzdämmung ist wie folgt am Außengehäuse befestigt:
Es werden Stege aus verzinktem Bandeisen (30x3) angeschraubt. Um Wärmebrücken zu verhindern sind die Stege mindestens einmal mit einer 5mm Zwischenlage zu unterbrechen. Die Abstandsteile sind umlaufend mit Bandeisen zu verbinden. Im Bereich der Turbinenteilfläche ist die Bandeisenunterkonstruktion zu unterbrechen.
Zur Sicherung der Spritzdämmung und zur Aufnahme des Hartmantels wird zusätzlich ein Rabitzgeflecht montiert.
Achtung: am Turbinengehäuse darf nicht angeschweißt werden.

6. Hartmantel
Die Spritzdämmung ist mit einem Hartmantel, bestehend aus einer CalciumSilikat-Zement Komposition (5-10mm), zu versehen. In den Hartmantel ist eine Gewebeplatte (Gazgewebe) als Armierung einzubauen. Diese soll Haarrissen in der Oberfläche verhindern.

7. Anstrich
Nach dem Austrocknen des Hartmantels ist die Oberfläche mit einer dauerelastischen Fugenmasse abzuschüttern. Anschließend ist der Hartmantel mit einem ölbeisenden Anstrich zu imprägnieren und zu beschichten. Schichtdicke ca. 80 - 100µm.

8. Abschirmblech - Lagerung
Im Bereich der vorderen Lagerungen und bei Gegendruckturbinen der hinteren Lagerung muß ein Abschirmblech vorgesehen werden.
Das Abschirmblech muß die gesamte Stirnfläche der Turbine zum Lagerkörper hin abschirmen. Das Abschirmblech müssen die unbehinderte Montieren und Demontieren im Lagerbereich ermöglichen, ohne das die Dämmung beschädigt wird.
Die Abmessung und Gestaltung der Abschirmbleche sind den örtlichen Gegebenheiten anzupassen. Das Abschirmblech darf nicht am Lagergehäuse anliegen, Zwischenraum > 25mm. Die Abschirmbleche werden mit Winkeleisen 30x30x3, im Bereich des Teilfugensflansches, mit Schrauben M6 x 10 befestigt.
Ausführung der Abschirmbleche:
2 Aluminium-Bleche, je 1mm dick, alleseitig geschlossen, mit dazwischenliegender mindestens 4mm dicker Nefalitplatte zusammengenietet.

5. Method of Securement (see Figure 1)
The spray insulation shall be secured to the outer casing of the turbine as follows:
Spacers constructed from galvanized steel plates (30x3) shall be bolted to the casing. To prevent thermal short circuits, the spacers shall be provided with at least one 6mm-thick intermediate layer of insulating material. The spacers shall be tied together circumferentially by means of steel straps. The spacer strap structure shall be discontinued in the vicinity of the horizontal joint of the turbine casing. A woven wire netting shall be installed to provide additional securement for the spray insulation and to support the hard outer covering.
Note: No parts shall be welded to the outer casing.

6. Hard Outer Covering
The spray insulation shall be provided with a hard outer covering consisting of a mixture of calcium silicate and cement, applied to a thickness of 5 to 10mm. A layer of reinforcing cloth shall be embedded in the covering. This is intended to prevent hairline cracks at the surface.

7. Finish Coating
Following curing of the hard outer covering, a permanently elastic sealing compound shall be troweled onto the surface.
The outer covering shall then be coated with an oil-repellent paint (film thickness = approx. 80 - 100 µm).

8. Thermal Shield Plates at Bearings
A shielding plate shall be provided at the front bearings and, in the case of backpressure turbines, also at the rear bearings. This shielding plate shall cover the entire front end of the turbine.
The shielding plates must permit installation and dismantling work to be performed in the vicinity of the bearings without any damage being incurred by the insulation.
The dimensions and geometries of the shielding plates shall be adapted to conform to local site conditions. Shielding plates must not come into contact with the bearing housing (gap of > 25mm). The shielding plates shall be secured in the vicinity of the casing joint flange using 30x30x3 steel angles and M6 x 16 bolts. Design of the thermal shield plates:
2 Aluminium plates, each 1mm thick, all around closed, with an intermediate Nefalit plate (at least 4mm thick) riveted together.
9. Besonderheiten

Das Gehäuse-Abdampfteil (K oder WK) ist nur nach Vorgeben zu dämmen.

Die Teillugenschrauben sind mit abnehmbaren Kappen, mit eingelegten Wärmedämmung, zu dämmen.

Im Bereich der Ventildockel der HD- und ND-Ventile, ist die Dämmung als Mattendämmung auszuführen. Eine Demontage der Ventildockel muss möglich sein, ohne die Spritzdämmung zu zerstören.

Im Bereich von Flanschanschlüssen am Turbinengehäuse ist die Isolierung so zu gestalten, dass ein Wechsel der Dichtungen möglich ist, ohne die Isolierung zu zerstören.

Die Abgrenzung zwischen Mattenisolierung und Spritzisolierung ist mit entsprechenden Blechen zu realisieren.

Die Anschlussköpfe der elektrischen Thermoelemente müssen aus der Dämmung herausragen. (siehe Bild 2)

Die Konvektionsöffnungen an den Steuerböcken der Schnellverschlussventile und ND-Ventile dürfen nicht von der Isolierung verdeckt, oder anderweitig mit Isoliermaterial verschlossen werden. Der freizuhaltende Bereich ist in den Bildern 3 bis 5 mit X gekennzeichnet.

Die Isolierung darf auf der Dampfseite der Steuerböcke nicht wesentlich über die Stiftschrauben der Ventildockels hinausragen. Vorzugsweise sind dauerhaft formstabile Abschmelbleche als Abschluss zu verwenden. Sollten deshalb in diesem Bereich die erforderlichen Dämmschichtdicken nicht zu realisieren sein, so sind gegebenenfalls höherwertige Isoliermaterialien wie z.B. Microtherm einzusetzen.

Freiliegende Schubstangen als axiale Verbindung zwischen dem Außengehäuse und der vorderen Lagerung sind mit Isolierhalbschalen zu isolieren (siehe Bild 7).

wichtig für den Servicebereich:

Eventuell vorhandene Messstellen, die sich vor dem Einstromkasten im Schachtfelde der Gehäusevorderkasten des Oberkastens befinden, sind mit Schalenelementen zu umschließen.

Zugänglichkeit zu allen Verschraubungen dieser Messstellen muss im Nachhinein möglich sein, ohne die Spritzdämmung zu zerstören. Der Zwischenraum zwischen Schalenelement und Messelement muss mit Mineralfasermatten zu dämmen.

9. Special Requirements

Insulation may only be installed on the casing exhaust section (K or WK) as specified.

Insulate the casing joint bolts using removable, insulated caps.

Use mat-type insulation in the region of the valve covers for HP and LP valves. It must be possible to remove the valve cover without destroying the spray insulation.

Within the range of flange connections at the turbine case the insulation is to be arranged in such a way that without destroying the insulation a change of the seals is possible.

The demarcation between mat insulation and spray insulation has to be realized with appropriate sheet metals.

The connection heads for the electric thermocouples must protrude out of the insulation, see Figure 2.

Convection openings at the control blocks for the turbine stop valves and low pressure control valves may not be covered by the insulation, nor in any other manner closed off by insulation material. Areas which must be kept free are marked with X in Figures 3 to 5.

At the stem end of the control blocks the insulation may not extend excessively over the pins for the valve cover. Thermal shield plates with permanent dimensional stability should be used as the end item. In the event that insulation with the requisite thickness cannot be installed in this area, high-quality insulating materials, such as Microtherm, shall be used if possible.

Exposed push rod (connection between outer casing and front bearing casing) are to be insulated with insulating half-shell (see figure 6).

Wichtig für den Servicebereich:

Eventuell vorhandene Messstellen, die sich vor dem Einstromkasten im Schachtfelde der Gehäusevorderkasten des Oberkastens befinden, sind mit Schalenelementen zu umschließen.

Zugänglichkeit zu allen Verschraubungen dieser Messstellen muss im Nachhinein möglich sein, ohne die Spritzdämmung zu zerstören. Der Zwischenraum zwischen Schalenelement und Messelement muss mit Mineralfasermatten zu dämmen.

Spray Insulation with Hard Outer Covering

Siemens AG

Power Generation
Industrial Applications

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10. Dokumentation

Die Dämmdicken der Anlagenteile ist anzugeben.

Die Abschirmbleche müssen als Konturenzeichnung vorliegen. Diese dient zur Montage und zur Wiederbeschriftung der Abschirmbleche.

Alle notwendigen Bescheinigungen der verwendeten Materialien sind vorzulegen.
Z.B.: EG-Sicherheitsdatenblatt

11. Mitgeltende Normen

VDI 2055 Wärme- und Kälteschutz für betriebs-technische Anlagen
VDI 18421 Dämmarbeiten an technischen Anlagen
DIN 4140 Dämmarbeiten an betriebs- und haustechnischen Anlagen
- Ausführung von Wärme- und Kälte- dämmung -

Bild 1: Befestigung

Spritzdämmung
Spray insulation

Rabitzgeflecht/Bandseile
Wire netting/steel straps

Hartmantel
Hard outer covering

Anstrich
Finish coating

Alu - Folie
Aluminum foil

asbestfreie Zwischenlage
Asbestos-free intermediate layer

10. Dokumentation

All insulation thicknesses shall be stated.

Outline and arrangement drawings shall be provided for the shielding plates. These will be used as a basis for installing the plates and for procuring new plates.

All requisite certificates shall be submitted for the materials employed; e.g. EU safety data sheets.

11. Applicable Codes and Standards

VDI 2055 Thermal insulation for heated and refrigerated industrial and domestic installations
VDI 18421 Insulation of technical installations
DIN 4140 Insulation work on industrial installations and building equipment
- Execution of thermal and cold insulation -

Figure 1: Method of Securement

Flacheisen 30 x 3 mm
Steel flats

Spritzdämmung
Spray insulation

Rabitzgeflecht/Bandseile
Wire netting/steel straps

Hartmantel
Hard outer covering

Anstrich
Finish coating

Alu - Folie
Aluminum foil

asbestfreie Zwischenlage
Asbestos-free intermediate layer

Spray Insulation with Hard Outer Covering

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Power Generation
Industrial Applications

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C

T33/T43

T43 Motter
T43 Hekers
### Bild 2: Thermoelemente

- nicht zulässig
  - Not permissible

- zulässig
  - Permissible

### Bild 3: Steuerbock Ausf. 1

Spray Insulation with Hard Outer Covering

<table>
<thead>
<tr>
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<th>Blatt-Nummer</th>
<th>Planungs-Nummer</th>
<th>Datum</th>
<th>Prüftek / Inspector</th>
<th>Änderung / Description of Change</th>
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</table>

**Siemens AG**

**Power Generation Industrial Applications**

**5-6657-4010-00**

**T33/T43**


**T43 Mötter**

**T43 Hekers**
Bild 4: Steuerbock Ausf. 2  
Figure 4: Control block, Design 2

Bild 5: Steuerbock Ausf. 3  
Figure 5: Control block, Design 3

Wärmedämmung – Spritzdämmung mit Hartmantel
Spray Insulation with Hard Outer Covering

Siemens AG
Power Generation
Industrial Applications

Buch-Nr. / Vereinger-Nr.  
Item Number / Document Number
5-6657-4010-00  
6 von 7

Abteilung / Department: T33/T43  
Date / Date: 18. Aug. 2000

T43 Mötter
T43 Hekers

Ges.  
Checked

ATTACHMENT C

Steam Turbine Cover Design Drawings
ATTACHMENT D

Steam Turbine Cover Design Summary
El Segundo Steam Turbine Building Awning Design Summary
Joe Mazzeo 8/25/14

An awning was designed to cover the existing steam turbine to protect it from rain and sun. The awning structure is designed to be 21’ tall from the base to the top of the roof. The roof consists of translucent roofing material. The lower 7’ of the structure will be open and the rest will be enclosed with cladding. Tie rod assemblies area utilized for shear strength. Conservatively, no shear strength was assumed to be provided by the cladding. The structure is designed to be unbolted from the base plates in order to be lifted by crane. Lifting lugs attached to a cantilevered section of the roof beam were designed to carry the entire dead load of the structure.

A finite element model was created to evaluate the loads on the new structure. In order to determine the effects of the additional loads onto the existing structure, it too was included in the model. The loads were determined by ASCE 7-05 and the Worley Parsons design report for the Steam Turbine Generator structure.

The following is a summary of the loads utilized in the analysis:

**Live Loads**
- Existing grating areas 125 PSF
- Roof LL = 20 PSF

**Dead Loads**
- Weight of all structural components, grating and cladding

**Seismic Analysis**

Earthquake loads were qualified by response spectra methods. The response spectra was generated based on ASCE 7-10 using the site conditions taken from the Worley Parsons design report for the Steam Turbine Generator structure. The following is a summary of the report.

Table 2 – Seismic Design Parameters
Site Class D
Site Coefficient, F_s 1.0
Site Coefficient, F_v 1.5
Mapped Short Period Spectral Acceleration, S_1 1.618g
Mapped One-Second Period Spectral Acceleration, S_1 0.658g
Short Period Spectral Acceleration Adjusted For Site Class, S_{1S} 1.618g
One-Second Period Spectral Acceleration Adjusted For Site Class, S_{11} 0.988g
Design Short Period Spectral Acceleration, S_{s1} 1.079g
Design One-Second Period Spectral Acceleration, S_{d1} 0.658g

**Resulting Response Spectra Plot**
Modal Analysis

All modes up to 33 Hz were calculated and utilized in the response spectra analysis. The lowest mode found was 4.68 Hz. Mass not captured in the modal analysis was subjected to rigid range acceleration, based on the response spectra acceleration at 33 HZ. The equilibrium condition for the rigid range acceleration was calculated statically.

The AISC generated response spectra was applied independently in the two horizontal directions. For the vertical direction, 2/3 of the response spectra was applied.

The modal responses for each of the 3 directions were combined using the complete quadratic combination (CQC) method with 0.5% critical damping as specified by ASCE requirements. The combined modal results were combined with the rigid range responses with SRSS. The response from the 3 directions were combined with SRSS.

Wind Loads

The following is a summary of the wind load parameters

- 100 mph
- Exposure C
- The structure was conservatively assumed to be partially enclosed
- Gable Roof
- Low Rise Criteria
- Rigid Structure Fundamental Mode > 1.0 Hz (see modal analysis discussion)
- Topo factor 1.0
- Qh = 22.45 psf
- Since the structure is < 30’ tall, torsional load case analysis is not required per AISC. (Note 5 of figure 6-10)

The analysis resulted in the following Wind Pressure Load Cases by Zones:
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<th>Surface</th>
<th>GCpf</th>
<th>( p = \text{Net Pressures (psf)} )</th>
<th>((w/ +GCpf))</th>
<th>((w/ - GCpf))</th>
<th>Surface</th>
<th>GCpf</th>
<th>( p = \text{Net Pressures (psf)} )</th>
<th>((w/ +GCpf))</th>
<th>((w/ - GCpf))</th>
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<td>23.46</td>
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</table>
Load Combinations

ASCE 2.4.1 Basic Combinations for ASD was used, to combine dead weight, live loads, earthquake and wind. The roof live loads were conservatively considered to act simultaneously with the floor live loads.
Results: The loads on all structural members were determined and evaluated by AISC 05 and 10 specifications and found to be acceptable, the original structure being quite overdesigned. The new structure required cross bracing tie rods to support lateral loads for earthquake and wind.

The cladding was qualified by table provided by the manufacturer for live load and wind.

Conclusions: The existing structure is robust enough to take the additional loads imposed by the new structure. The new structure should adequately perform for any future earthquake or wind storm.

Attach Spreadsheet output.
ATTACHMENT E

Steam Turbine Lift Plan
Title: Lift Plan
Project: NRG Canopy
Customer: NRG
Description: hoisting
Drawn By: Kelan Bragg

CRANE
Link-Belt HTC-8690
120' Main Boom (Mode EM2) at 63.7°
Base: 100% Outriggers
Counterweight: 39500 lbs
50' Lift Radius (360°)
Crane Capacity at 50' = 27,800 lbs

LOAD
Block = 1,100 lbs
Hook = 600 lbs
Rigging = 2,000 lbs
Load = 14,000 lbs
TOTAL LOAD = 17,700 lbs
64% of capacity

*Spreader Bar will be 30' end cap bar with a 50 ton capacity.
*(2) 12 ton shackles
*(4) slings good for 22,000 a piece
ATTACHMENT F

Steam Turbine Cover Photos
Removable insulation pads. Replaced plaster insulation.

Lead for heating element

Cover Mounting Location

Control Valve

Cover Mounting Location
KOP 5, view to the south
ATTACHMENT G

El Segundo Energy Center
Final Staff Assessment
Key Observation Point Figures
VISUAL RESOURCES - FIGURE 5
El Segundo Power Redevelopment Project - Final View KOP 7

ESPR - Approved Application for Certification

ESPR - Petition to Amend
ATTACHMENT H

Proof of Service List
Proof of Service List

Docket: 00-AFC-14C
Project Title: El Segundo Power Redevelopment Project Compliance
Generated On: 12/17/2015 1:52:03 PM

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