ABENGOA SOLAR INC
11500 West 13th Avenue
Lakewood, CO 80215
Phone: 303-928-8500
Fax: 303-928-8510

DOCKET
09-AFC-5
DATE FEB 24 2010
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February 24, 2010

Mr. Craig Hoffman
Project Manager
California Energy Commission
Siting, Transmission and Environmental Protection Division
1516 Ninth Street, MS 15
Sacramento, CA 95814

Re: Abengoa Mojave Solar Project (09-AFC-5)
Interconnection Optional Study by California ISO, dated January 14, 2010

Dear Craig;

Attached is the *Interconnection Optional Study* completed by the California ISO (CAISO) in coordination with Southern California Edison (SCE), dated January 14, 2010. Although this document is labeled "Final Report," CAISO and SCE are currently revising the report pursuant to recent discussions which revealed that their assumptions may have been too aggressive. Specifically, the report includes a project in the analysis, CAISO #142 (SEGS X), which has not yet submitted an AFC to the CEC. Without this project, the estimate of up to 5% maximum curtailment with the SPS upgrade option drops to an estimate of below 2% maximum curtailment. Therefore, this will confirm that there is no significant risk of curtailment of the Mojave Solar Project delivery with the SPS upgrade option.

We expect to receive the revised Final Report within the next week. When we receive it, we will forward it to you.

Thank you for your and your staff's continued efforts in this permitting process. Please contact Mr. Tandy McMannes (310-384-2325) or Mr. Fred Redell (303-513-5376) with any questions.

Sincerely,

Kathleen Sullivan

Kathleen L. Sullivan, PE

Attachment

California Independent
System Operator Corporation

VIA EMAIL

January 14, 2010

Mr. Frederick H Redell
Redell Engineering, Inc.
1820 E. Garry Avenue, Suite 116
Santa Ana, CA 92705

Subject: Harper Lake Solar Plant Project Interconnection Optional Study Report

Dear Mr. Redell:

Attached is the Interconnection Optional Study Report for the interconnection of the proposed 250 MW Harper Lake Solar Plant Project (the Project) to the Southern California Edison Company's (SCE) Cool Water – Kramer No.1 220 kV transmission line. The California Independent System Operator Corporation (CAISO) and SCE performed the Interconnection Optional Study (IOS) at the request of Abengoa Solar, Inc. and in accordance with the CAISO's LGIP tariff.

The IOS determined that the extent of the Project is directly proportional to flows on the two existing Kramer – Lugo 220 kV transmission lines. Congestion associated with flows on the two Lugo 500/230 kV transformer banks was found to be insignificant.

Should you have questions regarding the study, please contact Haifeng Liu at (916) 608-5889 (hliu@caiso.com) or myself at (916) 608-1113 (AChowdhury@caiso.com).

Sincerely,

Ali Asraf Chowdhury

Ali Asraf Chowdhury, MBA, Ph.D.
Director of Regional Transmission (South)

Attachment

cc: *via e-mail:*
Frederick H. Redell (fred@redellengineering.com)
John Tucker (John.Tucker@sce.com)
Jorge Chacon (Jorge.Chacon@sce.com)
Leanne Swanson (Leanne.Swanson@sce.com)

CAISO via email:
Judy Brown (JBrown@caiso.com)
Ali Asraf Chowdhury (AChowdhury@caiso.com)
Haifeng Liu (hliu@caiso.com)

Interconnection Optional Study

Generation Interconnection

Abengoa Solar Inc.

Harper Lake Solar Plant Project

Final Report

January 14, 2010

This study has been completed in coordination with Southern California Edison per the Large Generator Interconnection Procedure

Table of Contents

ABENGOA SOLAR INC
HARPER LAKE SOLAR PROJECT
CONGESTION ASSESSMENT

January 13, 2010

I. INTRODUCTION

Southern California Edison Company (SCE) performed and delivered an Interconnection System Impact Study (ISIS), Technical Assessment (TAS), and Facilities Study (FaS) for the new 250 MW Harper Lake Solar Plant (HLSP). The System Impact Study identified the impacts associated with interconnection of the new 250 MW solar thermal generation project. The ISIS was performed with the inclusion of a number of queued ahead projects some of which were moved to a transitional cluster consistent with the California Independent System Operator's (CAISO) Petition for Waiver of Tariff Provisions to Accommodate Transition to Reformed Large Generator Interconnection Procedures, and Motion to Shorten Comment Period filed at the Federal Energy Regulatory Commission (FERC) on May 15, 2008 and some others which have since withdrawn. The TAS was performed to reassess the impacts of the new 250 MW Harper Lake Solar Plant with the removal of these projects. Both the ISIS and the TAS identified the need for significant facility upgrades to increase south of Kramer transmission capacity. As part of the FaS, the scope and cost estimates for the upgrades needed to increase South of Kramer capacity were further refined and classified as Deliverability Upgrades by the California Independent System Operator (CAISO). The Deliverability Upgrade scope primarily involves the installation of a new Cool Water-Lugo 220 kV transmission line.

Since the upgrades needed to increase south of Kramer transmission capacity has been classified as a Deliverability Upgrade, the Harper Lake Solar Project can be interconnected even without the construction of these upgrades, if elected by Abengoa Solar Inc (ASI). To physically interconnect the Harper Lake Solar Project to the existing Cool Water-Kramer No.1 220 kV, a new substation is required. In addition, the Harper Lake Solar Project would be included into a Special Protection System ("SPS") which would trip up to the full 250 MW (both units) under certain outage conditions. However, SCE and the CAISO informed ASI that without the new Cool Water-Lugo 220 kV transmission line, the Project could be exposed to significant curtailment during times of congestion created when the area generation levels exceed the existing transmission capacity. ASI requested that the CAISO and SCE perform an Optional Study pursuant to the LGIP to evaluate the potential extent of curtailment.

This Optional Study (OpS) provides the results of the curtailment analysis. As stated in the study agreement, the curtailment analysis is based solely on historical power flow, historical outage information, and the additional assumptions as requested by ASI. **It is important to note that SCE and the CAISO cannot, and do not, warrant that the analysis will correctly predict future system performance and the associated curtailment of the Project under congestion or outage conditions.** In addition, system conditions not anticipated by this study such as changes to existing generation production profiles can result in changes to the study results. Consequently, this report should be used only for informational purposes.

II. OPTIONAL STUDY CONDITIONS AND ASSUMPTIONS

The Optional Study was based on the results of the SIS, TAS, and FaS, and the following assumptions:

1. A Project Trial Operation date of January 1, 2012; however, such assumption is subject to change after study results, permitting requirements, design, land issues and material lead times are better known, so that a more accurate determination can be made.

2. The technical data supplied by the Interconnection Customer for the Project is assumed to be accurate and complete.

3. The initial interconnection capacity requested by the Interconnection Customer is 250 MW net of auxiliary load.

4. The Project will connect to the existing Cool Water-Lugo No.1 220 kV transmission line and utilize congestion management and a special protection system to address congestion and overloads that occur under contingency.

5. The proposed Cool Water-Lugo transmission line (identified in the FaS as a Delivery Network Upgrade) is assumed not in service.

6. Applicable generation projects queued ahead and queued behind the HLSP Project will be modeled and dispatched at 100 percent capacity factor unless queued ahead project developers have provided specific project production profiles.

7. Historical metered data will be adjusted to include the queued ahead generation projects with an in-service date prior to the HLSP Project, as shown in Table 1-1, in order to reflect anticipated pre-project power flows.

Table 1-1
Queued Ahead Generation Projects Modeled in Optional Study

Queue Position	Queue Date	Generating Facility Fuel	Project Size (MW)	Project County Location	Point of Interconnection
WDT164	10/21/2004	Wind	80	San Bernardino	New substation connected between Gale and pole-switch 512 of the existing Victor-Black Mountain-Sopport-Southcap-Southdown-Gale 115 kV line (normally open at PS512)
CAISO #68	5/11/2005	Solar	275*	San Bernardino	Pisgah 220 kV Substation

* Capacity for CAIS0 #68 will be limited to 275 MW to reflect a partial capacity amount for which an early connection may be allowed until associated network upgrades are subsequently placed in service. The impacts of this project will be included as a "sensitivity in/out case" for indicative Lugo AA bank loading only

8. Historical metered data will be adjusted to include the queued behind generation projects with an in-service date prior to the HLSP Project, as shown in Table 1-2, to reflect anticipated higher stressed flows with the addition of such projects.

Table 1-2
Queued Behind Generation Projects Modeled in Optional Study

Queue Position	Queue Date	Generating Facility Fuel	Project Size (MW)	Project County Location	Point of Interconnection
CAISO #142	11/6/2006	Solar	80	San Bernardino	Kramer 220 kV Substation

9. The curtailment analysis will be based solely on adjusted historical power flow, historical outage information, production profile provided for the HLSP Project, and any additional assumptions requested by the Interconnection Customer. SCE and the CAISO cannot, and do not, warrant that the analysis will correctly predict future system performance and the associated curtailment of the Project under congestion or outage conditions.

10. Load growth in the area was assumed to not adversely modify the expected future line flows derived by applying “anticipated” flow distributions.

11. Any future long-term outages that may be needed to upgrade system were not addressed in this study.

12. The study assumes that the production profile provided for the HLSP Project representing the combined output of two identical 125 MW solar-thermal units is equally split between the two units.

13. If the need for congestion (curtailment) of the HLSP Project is identified, the study assumes curtailment to be implemented in two discrete step intervals by reducing the complete output of one generation unit at a time.

14. The Optional Study results will reflect the ISO Tariff, rules and protocols and SCE's Interconnection Handbook in effect at the time SCE provides the Optional Study results to the Interconnection Customer.

III. EVALUATION OF EXPECTED POWER FLOWS

Five years of historical metered data was reviewed in order to adequately capture “expected” flow patterns on the existing network over the entire calendar year. Power flow studies were then performed to identify the expected flow distribution after inclusion of WDT164, CAISO #68, HLSP Project, and CAISO #142. Based on the power flow studies, distribution factors of each project’s contribution to power flows on the two Kramer-Lugo 220 kV transmission lines and two Lugo 500/220 kV transformer banks were identified. These studies determined that

WDT164, HLSP, and CAISO #142 increase flows on the two Kramer-Lugo 220 kV transmission lines and that all projects increase flows on the two Lugo 500/220 kV transformer banks. A summary of each project's contribution on the two Kramer-Lugo 220 kV transmission lines and two Lugo 500/220 kV transformer banks is provided below in Table 2-1 and Table 2-2.

Table 2-1
Project Contribution to Flow on two Kramer-Lugo 220 kV T/Ls

Project	Percent Project Output	Peak MW Contribution
WDT164	56.3%	45
CAISO #68	0%	0
HLSP Project	76.0%	190
CAISO #142	75.0%	60

Table 2-2
Project Contribution to Flow on two Lugo 500/220 kV Banks

Project	Percent Project Output	Peak MW Contribution
WDT164	87.5%	70
CAISO #68	69.1%	190
HLSP Project	98.0%	245
CAISO #142	97.5%	78

A. South of Kramer Expected Power Flow

To develop appropriate Kramer-Lugo No.1 and No.2 220 kV transmission line "expected" power flow data over an entire calendar year, historical data profiles for years 2005 through 2009 were adjusted to reflect the identified project contributions as shown above in Table 2-1. Historical peak flow on the two Kramer-Lugo 220 kV transmission lines and the "adjusted" peak flow after the inclusion of each new generation project that would increase flows on the two Kramer-Lugo 220 kV transmission lines are provided below in Table 2-3. The corresponding flow duration curves for each of the years evaluated are presented in Figures 1-1 through Figure 1-5.

Table 2-3
Kramer-Lugo 220 kV Transmission Line Peak Flow (MW)

	2005	2006	2007	2008	2009
Historical Peak	840.78	847.97	797.61	779.91	721.74
Adjusted to Include WDT164	847.24	858.10	808.34	779.91	732.47
Adjusted to Include HLSP	1035.16	1046.02	996.26	962.23	879.91
Adjusted to Include CAISO #142	1095.16	1106.02	1056.26	1022.23	939.91

Figure 1-1
Kramer-Lugo 220 kV T/L Flow Duration Curves
Year 2005

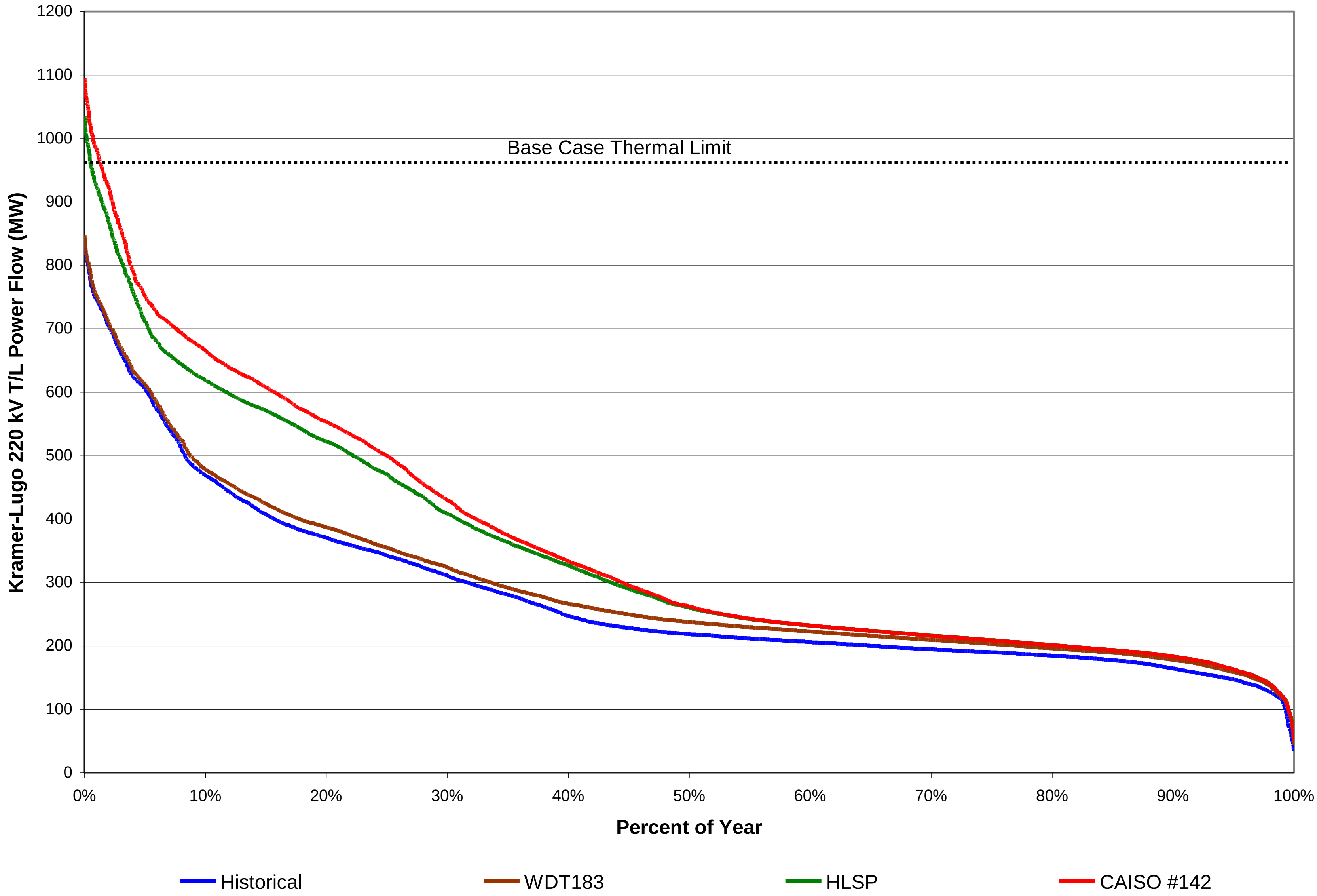


Figure 1-2
Kramer-Lugo 220 kV T/L Flow Duration Curves
Year 2006

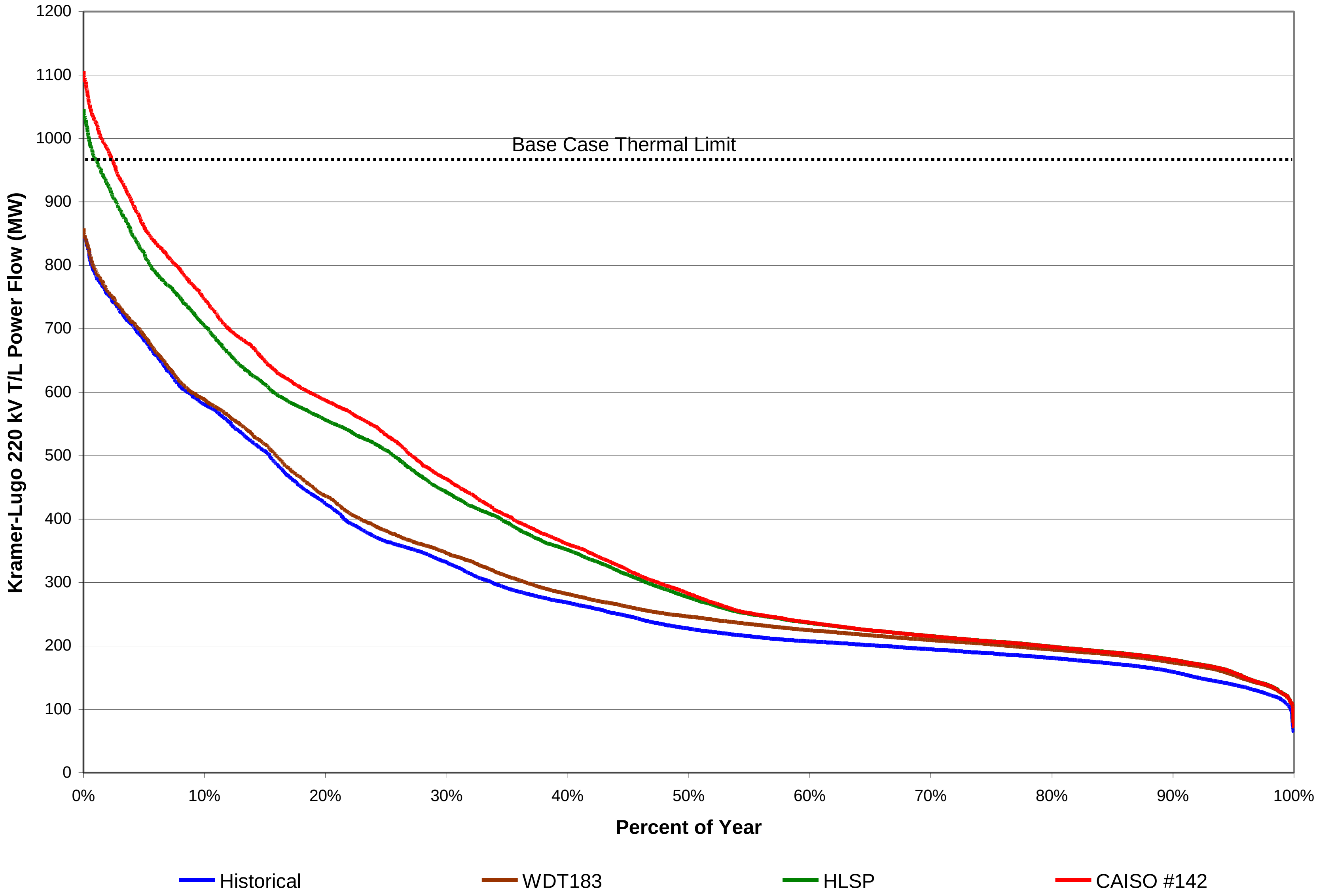


Figure 1-3
Kramer-Lugo 220 kV T/L Flow Duration Curves
Year 2007

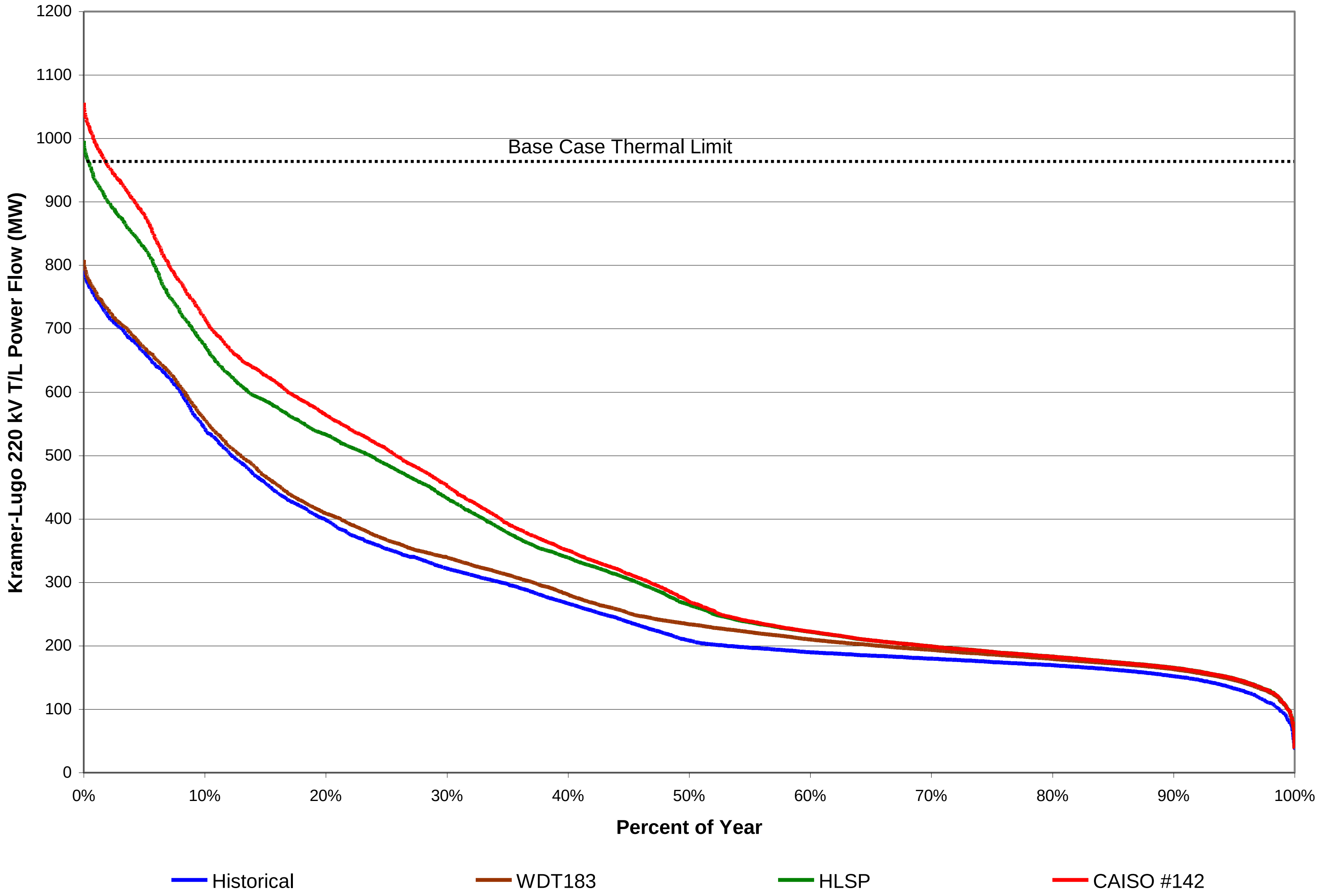


Figure 1-4
Kramer-Lugo 220 kV T/L Flow Duration Curves
Year 2008

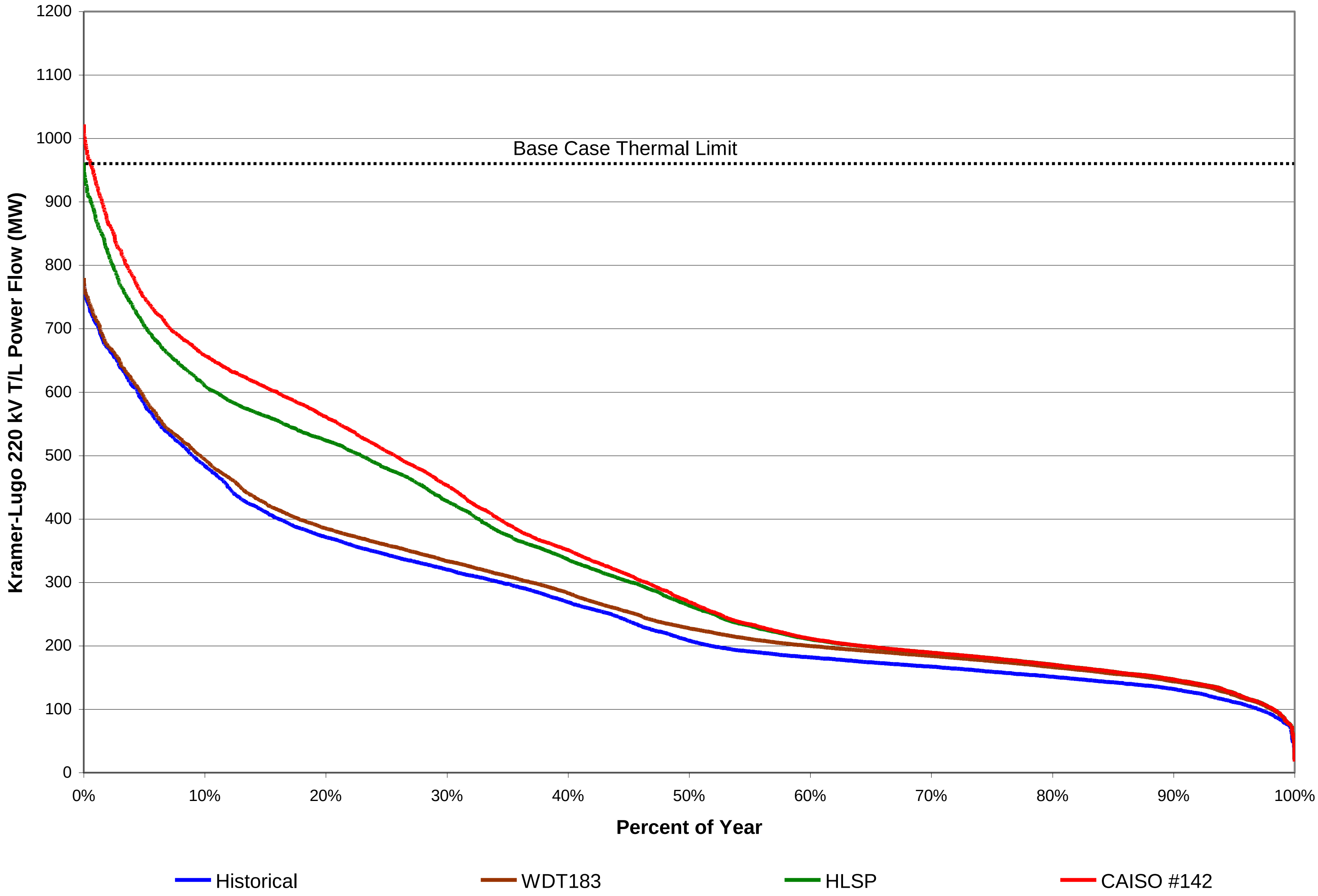
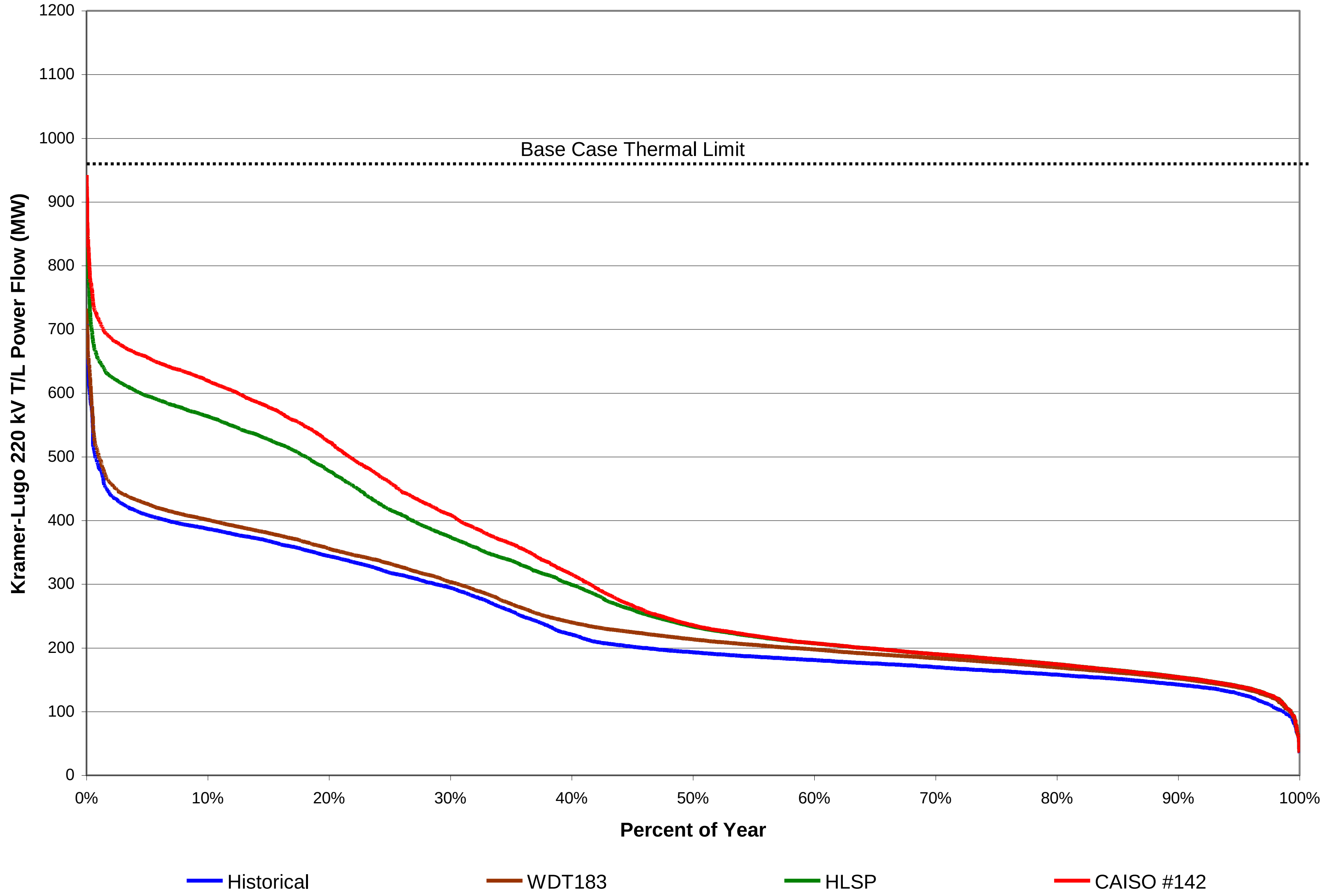


Figure 1-5
Kramer-Lugo 220 kV T/L Flow Duration Curves
Year 2009



As can be seen in Figure 1-1 through Figure 1-5, the addition of WDT164, HLSP, and CAISO #142 will result in expected base case congestion. Such base case condition thermal limit is associated with the thermal limits of the 1033 kcmil ACSR conductor used on the two existing Kramer-Lugo 220 kV transmission lines. Further discussion on extent of base case congestion and SPS curtailment is provided below in Section IV.

B. Lugo 500/220 kV Transformer Bank Expected Power Flow

To develop appropriate Lugo 500/220 kV transformer bank "expected" power flow data over an entire calendar year, historical data profiles for years 2005 through 2009 were adjusted to reflect the identified project contributions as shown above in Table 2-2. Historical peak flow on the two Lugo 500/220 kV transformer banks and the "adjusted" peak flow after the inclusion of each new generation project that would increase flows on the two Lugo 500/220 kV transformer bank are provided below in Table 2-4. The corresponding flow duration curves for each of the years evaluated are presented in Figures 1-6 through Figure 1-10.

Table 2-4
Lugo 500/220 kV Transformer Bank Peak Flow (MW)

	2005	**2006**	**2007**	**2008**	**2009**
Historical Peak	1549.03	1608.40	1414.69	1440.48	1382.31
Adjusted to Include WDT164	1551.08	1608.40	1440.84	1440.48	1399.00
Adjusted to Include CAISO #68	1648.73	1798.40	1630.84	1619.78	1507.90
Adjusted to Include HLSP	1864.30	2040.72	1873.16	1862.00	1739.38
Adjusted to Include CAISO #142	1942.30	2118.72	1941.70	1940.00	1817.38

The adjusted Lugo 500/220 kV Transformer Bank peak flows are under the base case thermal limit of both transformer banks. Further discussion on extent of potential SPS curtailment is provided below in Section IV.

Figure 1-6
Lugo 500/220 kV Transformer Bank Flow Duration Curves
Year 2005

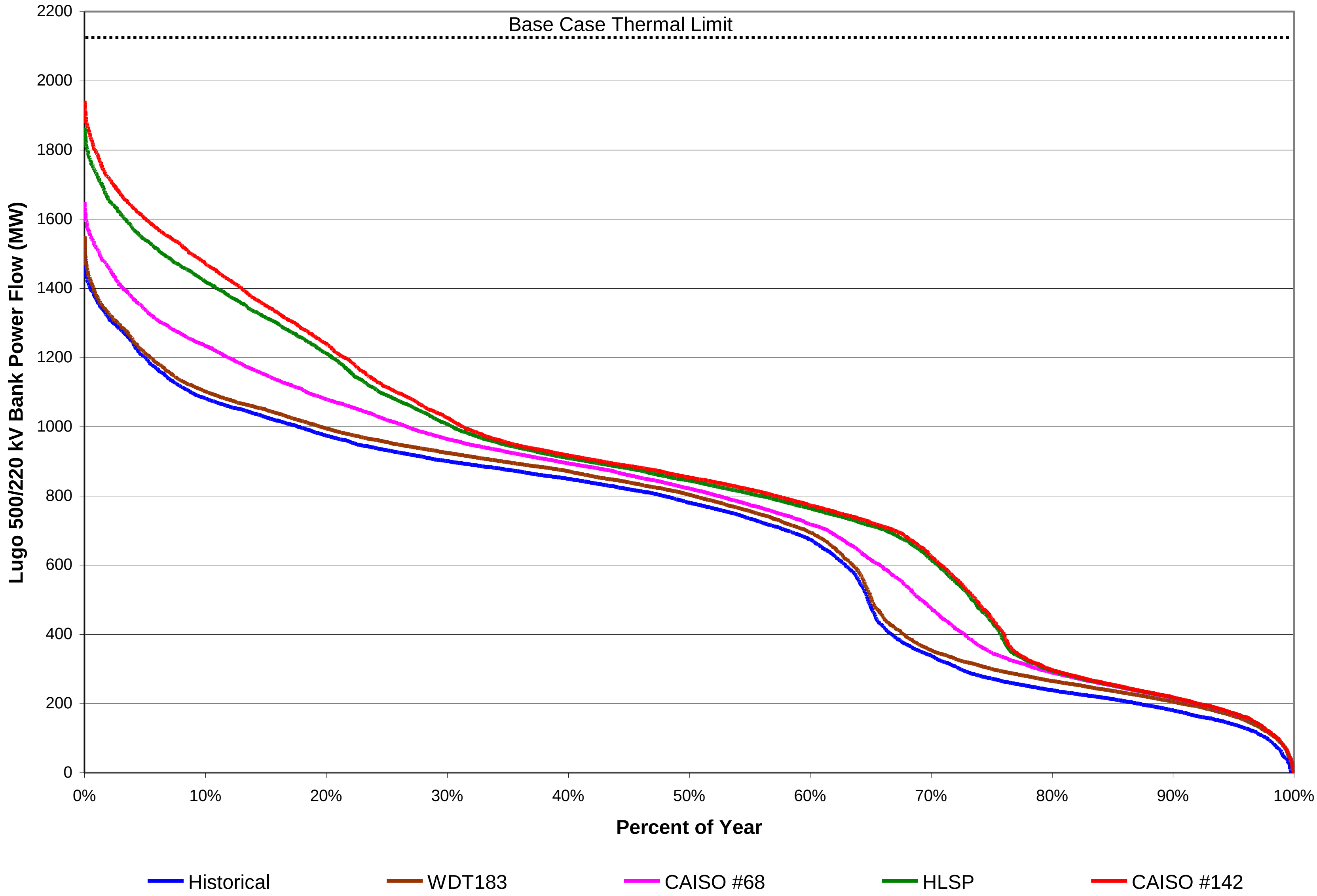


Figure 1-7
Lugo 500/220 kV Transformer Bank Flow Duration Curves
Year 2006

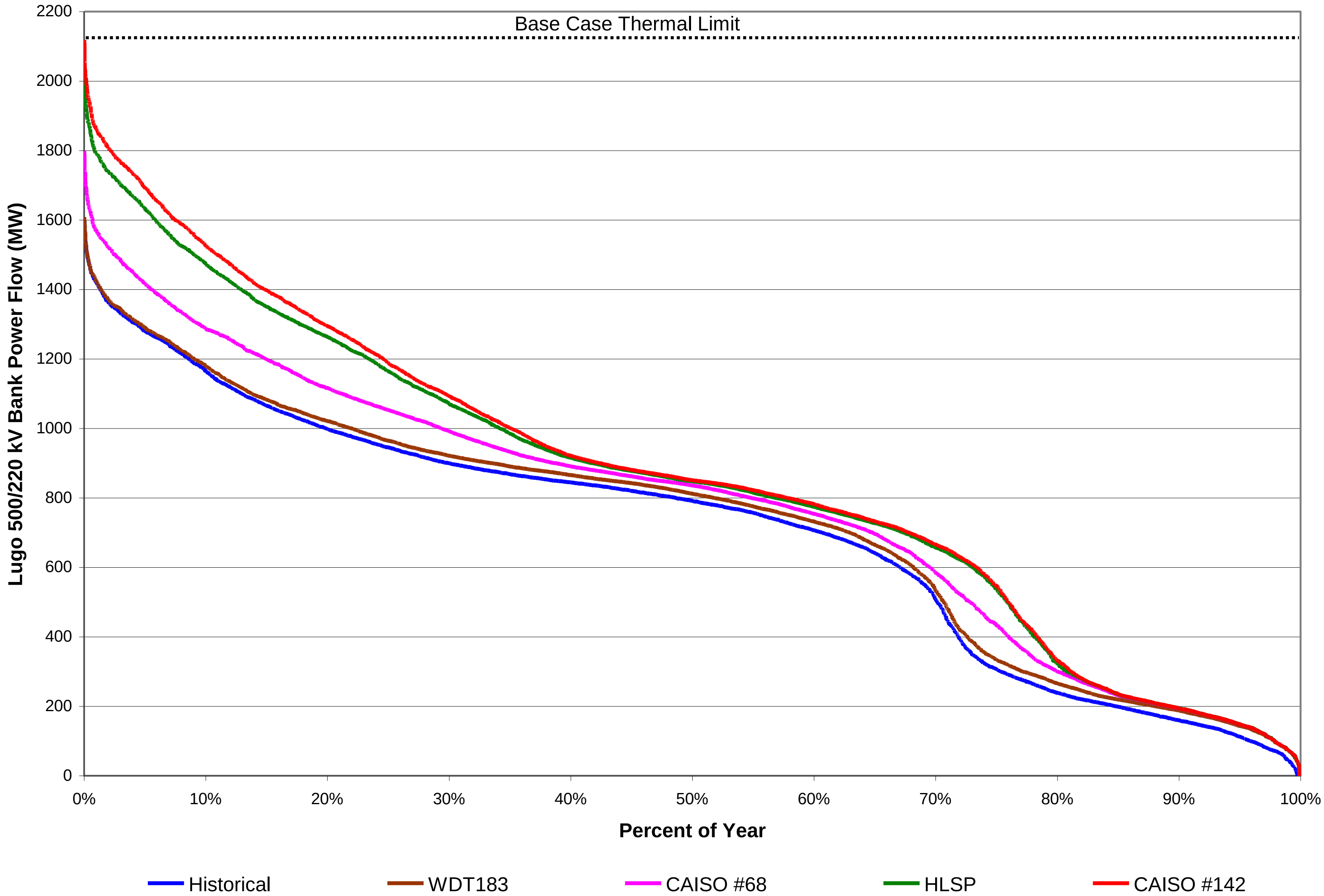


Figure 1-8
Lugo 500/220 kV Transformer Bank Flow Duration Curves
Year 2007

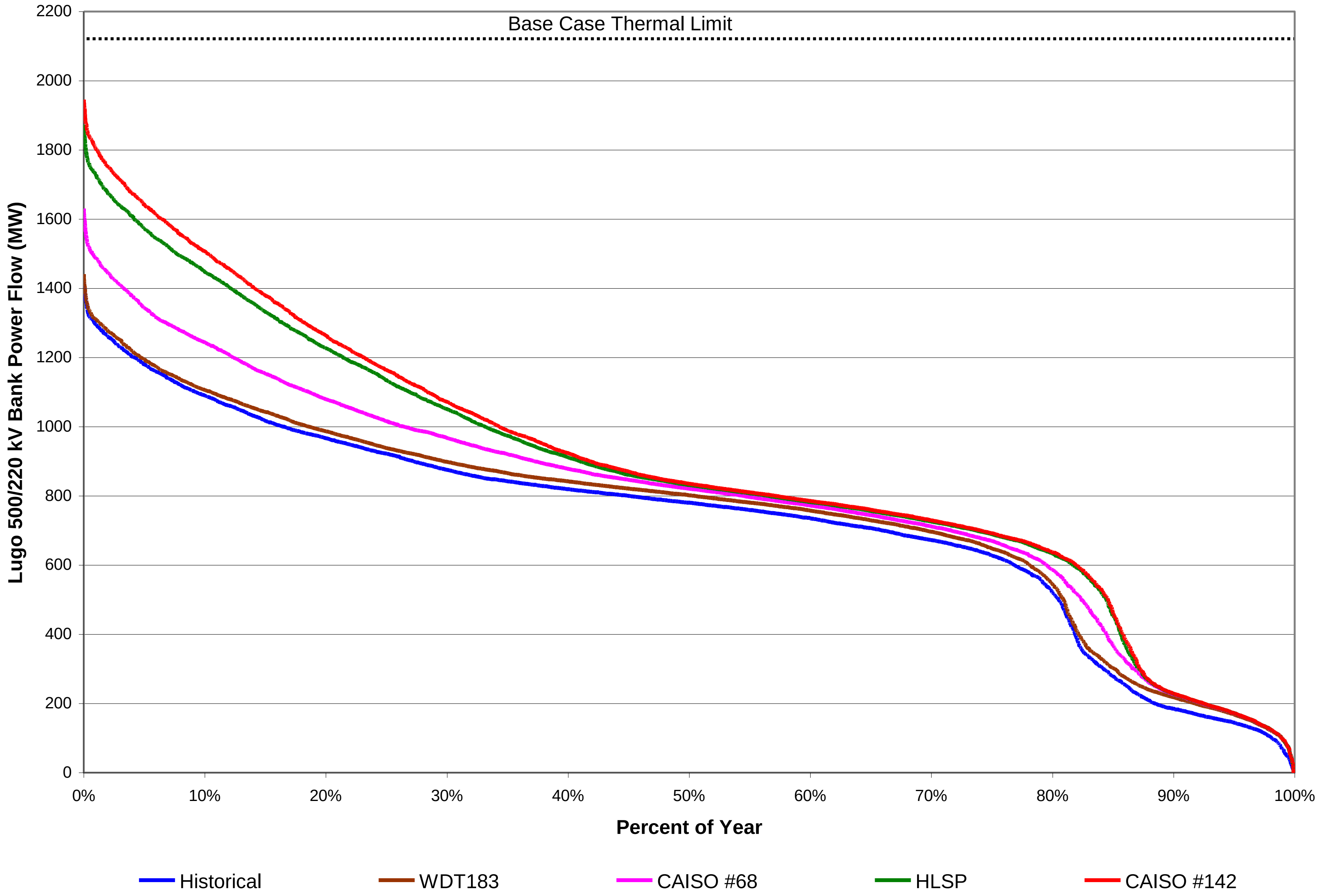


Figure 1-9
Lugo 500/220 kV Transformer Bank Flow Duration Curves
Year 2008

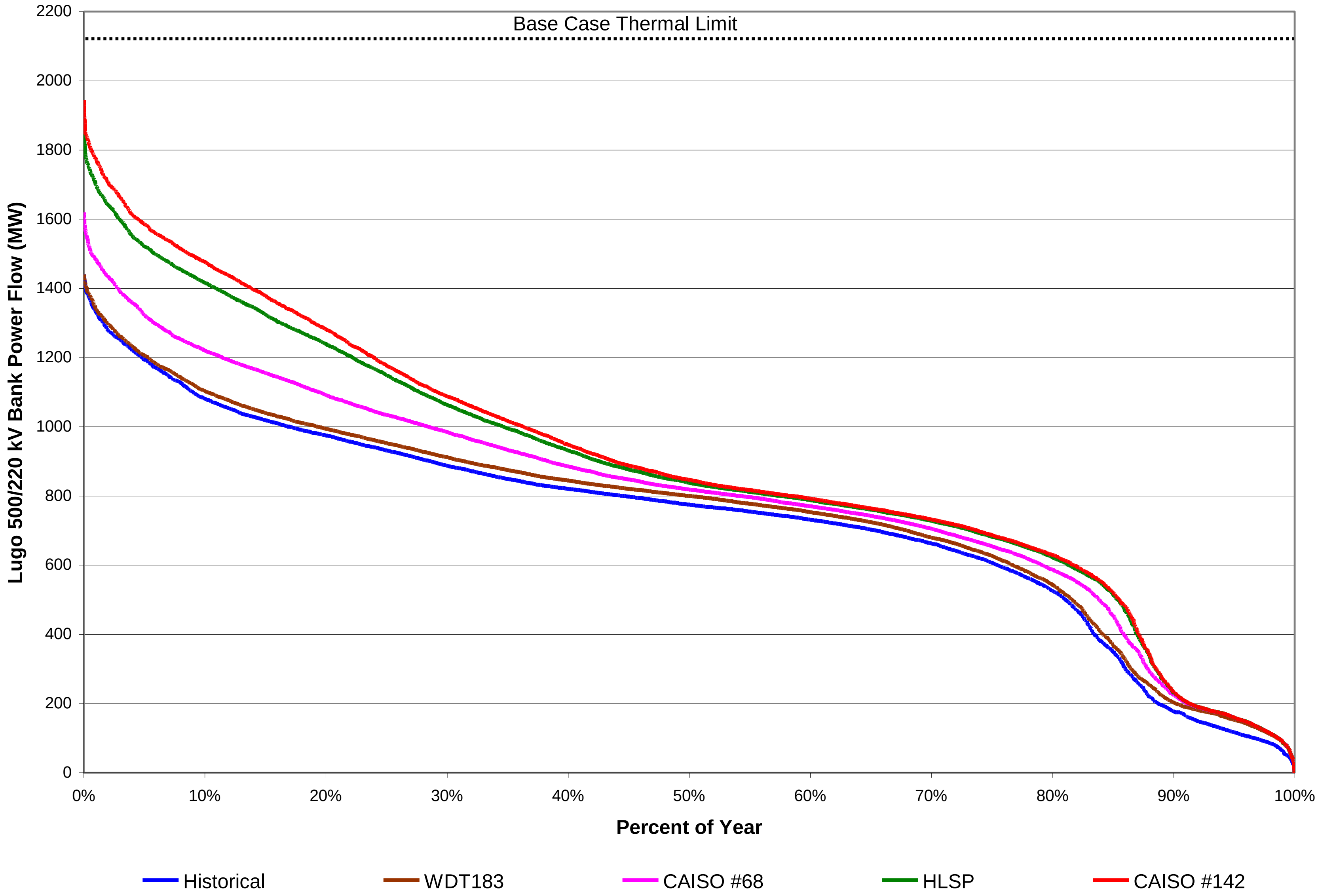
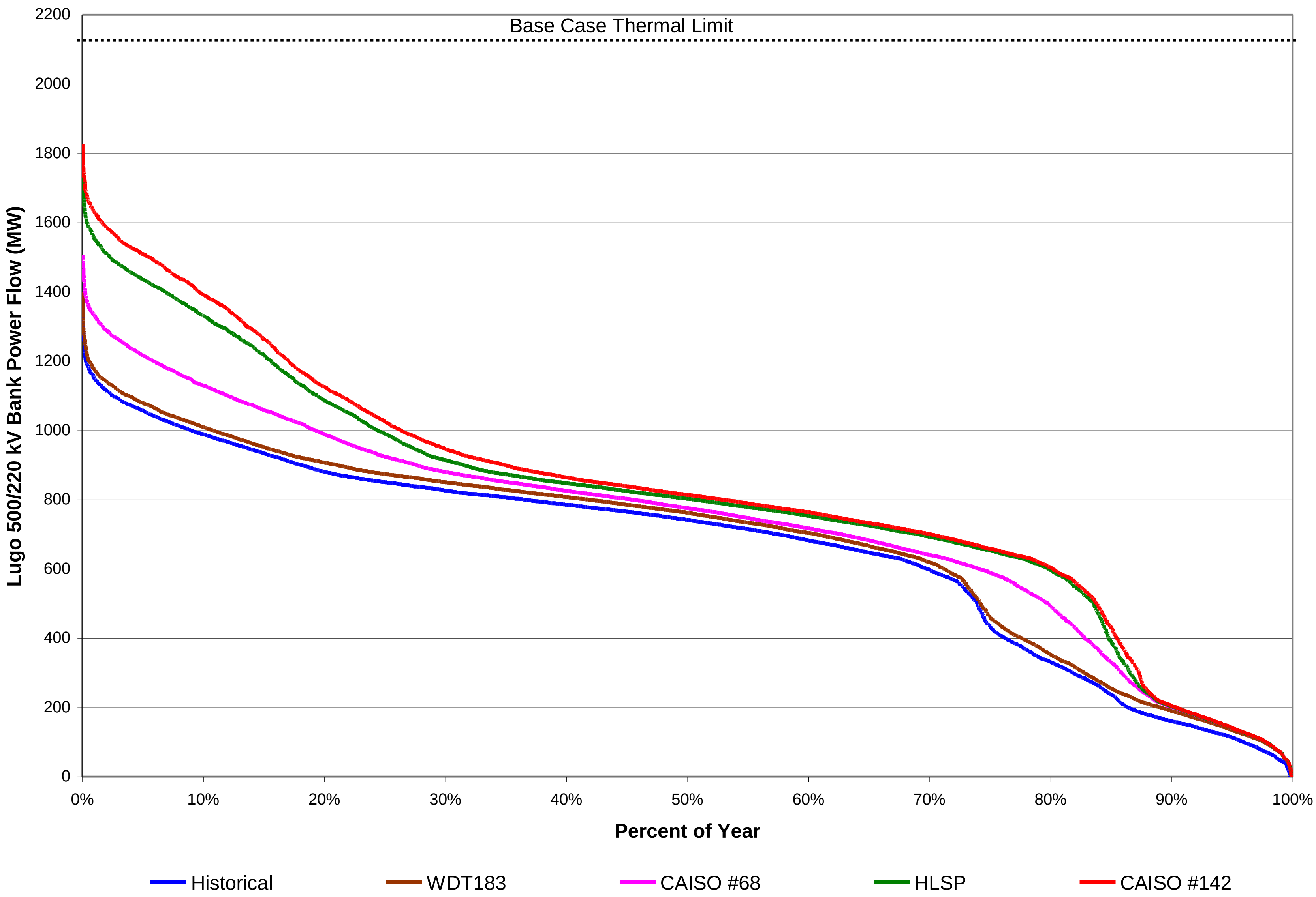


Figure 1-10
Lugo 500/220 kV Transformer Bank Flow Duration Curves
Year 2009



IV. EVALUATION OF EXPECTED CURTAILMENT

A. Curtailment associated with South of Kramer 220 kV Transmission Constraints

Base Case Congestion

Thermal overloads on the Kramer-Lugo 220 kV transmission line and system instability in this area is currently mitigated by the Kramer RAS. These problems could occur during high generation conditions under loss of one or both Kramer-Lugo 220 kV transmission lines. The existing RAS monitors the line flows on the two Kramer-Lugo 220 kV transmission lines and alarms for an Operator to arm existing generation units if the total flow level metered on these two transmission lines exceeds the SPS arming threshold. Generation tripping only occurs if an outage monitored as part of this SPS is detected and generation units were armed to trip for such outage condition.

To evaluate the extent of potential base case congestion, the historical data adjusted to include the contributions from WDT164 (80 MW wind generation project), HLSP (250 MW solar-thermal), and CAISO #142 (80 MW solar-thermal) as described above in Section III.A was reviewed. Power flow studies were performed to identify capacity factor associated with maximum line loading. Based on the power flow study, the two Kramer-Lugo 220 kV transmission lines were identified to perform with a 97.5% capacity factor. Reactive power flows utilize the remaining 2.5% of line thermal capacity. Based on the detailed review of the data and a maximum capacity of approximately 960 MW (988 MVA * 0.975), base case congestion on the two Kramer-Lugo 220 kV transmission lines was identified in the adjusted historical data corresponding to four of the five years as summarized below in Table 2-5. Based on the study, the entire HLSP is subjected to potential curtailment. The results also indicate an unrealized production ranging from zero to up 30,755 MW-hours which is a correlates to approximately 5.0% of the total HLSP Project annual production.

Table 2-5
Kramer-Lugo 220 kV Transmission Line Congestion

	2005	2006	2007	2008	2009
Congestion Risk (Hours)	111	214	158	47	0
Peak Curtailment (MW)	247.26	247.26	247.26	123.63	0
Unrealized Production (MW-hours)	15,876	30,755	19,305	5,704	0
Percent of Total HLSP Production	2.6%	5.0%	3.1%	0.9%	0.0%

The amount of base case congestion reflects the full extent of congestion to the HLSP Project associated with Kramer-Lugo 220 kV transmission line capacity constraints provided the HLSP Project is included into an SPS that would trip the project under outage of one or both existing Kramer-Lugo 220 kV transmission lines. However, if HLSP is interconnected without including the project into an SPS, the amount of congestion exposure would increase significantly as discussed below.

Congestion without SPS

If the project is not included into an SPS, the amount of congestion is dictated by the maximum flow that can be supported south of Kramer without reliance on an SPS. This amount is presently limited to no more than 250 MW on both Kramer-Lugo 220 kV transmission lines.

To evaluate the extent of potential congestion if the project is not included into an SPS, the historical data adjusted to include the contributions from all projects as described above in Section III.A was further adjusted. This second adjustment involved backing out the flow contributions of all existing generation that currently participates in the existing Kramer RAS. The generators that currently participate in the existing Kramer RAS include 480 MW from the Cool Water Power Plant, 160 MW currently connected to the Kramer-Luz 220 kV generation tie-line, and 180 MW currently connected to the Kramer-BLM West 220 kV generation tie-line. In addition, the contributions of CAISO #142 were also backed out since this project requested physical interconnection to the Kramer-Luz 220 kV generation tie-line which is currently a participating element that is tripped under operation of the Kramer RAS.

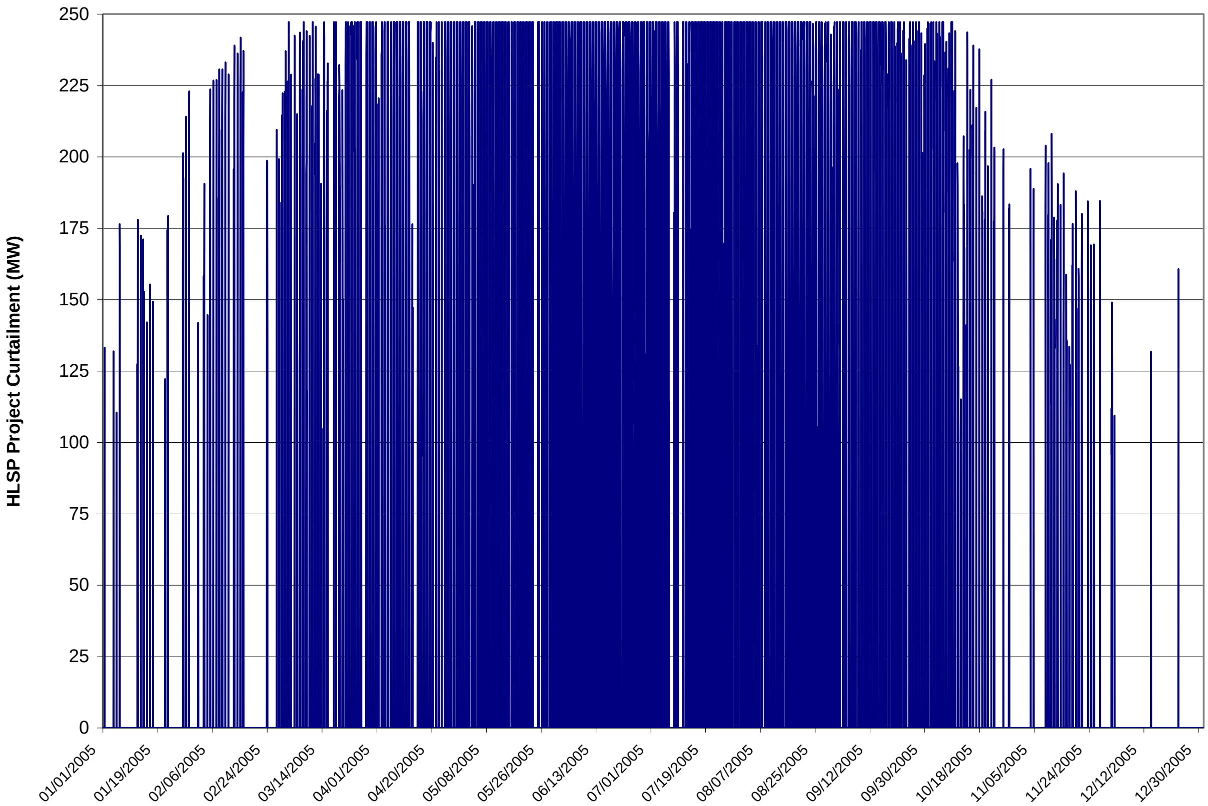
After backing out the flow contributions of all existing generation and CAISO #142 that would participate in the existing Kramer RAS, the readjusted data was reviewed to identify if the remaining flows which are not participants to any SPS exceed the 250 MW maximum flow that can be supported south of Kramer without reliance on an SPS. Based on the readjusted Kramer-Lugo 220 kV flow patterns, the study identified that the entire HLSP is subjected to extensive curtailment as summarized below in Table 2-6.

Table 2-6
Kramer-Lugo 220 kV Transmission Line Congestion
HLSP Project not Included into SPS

	2005	**2006**	**2007**	**2008**	**2009**
Congestion Risk (Hours)	2121	2128	2112	2073	2178
Peak Curtailment (MW)	247.26	247.26	247.26	247.26	247.26
Unrealized Production (MW-hours)	476,863	477,135	475,564	469,469	490,511
Percent of Total HLSP Production	77.3%	77.3%	77.1%	76.0%	79.5%

The results associated with 2005 historical data samples are illustrated below in Figure 2-1. If the HLSP Project is interconnected with the inclusion of an SPS, all of this congestion exposure is eliminated. However, the number of hours that the project is expected to be armed for tripping by the SPS is the same number of hours identified in Table 2-6. Actual generation tripping will only occur if an outage of one or both existing Kramer-Lugo 220 kV transmission lines is experienced.

Figure 2-1
Potential HLSP Project Congestion
If HLSP is Interconnection Without an SPS



B. Curtailment associated with Lugo 500/230 kV Transformer Bank Capacity Constraints

In addition to the South of Kramer system constraints, the SCE North of Lugo system is also constraint by the two existing Lugo 500/220 kV transformer banks (AA-Banks). Thermal capacity and stability problems associated with the Lugo AA-Banks are currently mitigated with the use a special protection system (HDPP SPS). The thermal overload and stability problems could occur during high generation conditions under loss of one of the two Lugo AA-Banks. The existing HDPP SPS monitors the total flows on the two Lugo AA-Banks and automatically arms the existing High Desert Power Project generation units if the total flow level metered exceeds the SPS arming threshold. Generation tripping associated with this SPS will only occur under loss of one of the Lugo AA-Banks if the generation units were armed to trip for such an outage condition.

To evaluate the extent of potential base case congestion, the historical data adjusted to include the contributions from WDT164 (80 MW), CAISO #68 (275 MW), HLSP (250 MW), and CAISO #142 (80 MW) was reviewed. Based on the detailed review of the data, base case congestion on the two Lugo 500/220 kV transformer banks was identified for only three hours of the calendar year and only for the 2006 adjusted historical data set. The peak Lugo 500/220 kV transformer bank congestion exposure for the HLSP Project was identified to be approximately 30 MW with a corresponding unrealized production of 65.36 MW-hours. This represents an insignificant amount of potential base case congestion exposure (0.011%) due to transformer bank limitations at Lugo.

To evaluate the extent of potential congestion under outage loss of one Lugo 500/230 kV transformer bank, the historical data adjusted to include the contributions from all four projects was reviewed taking into account generation tripping of the existing High Desert Power Project and CAISO #68 which will be included into the SPS. Based on the detailed review of the data, congestion under outage conditions of one Lugo 500/220 kV transformer bank was identified for only four hours of the calendar year and only for the 2006 adjusted historical data set. The peak Lugo 500/220 kV transformer bank outage congestion exposure for the HLSP Project was identified to be the full project output with a corresponding unrealized production of 384.43 MW-hours. This also represents an insignificant amount of potential congestion exposure (0.062%) due to transformer bank limitations at Lugo.

V. CONCLUSION

This congestion assessment provides the customer an estimated forecast of the amount of congestion that the HLSP Project could be exposed to during a calendar year with and without the installation of SPS. Based on the study results, the extent of HLSP Project congestion is directly proportional to flows on the two existing Kramer-Lugo 220 kV transmission lines. Congestion associated with flows on the two Lugo 500/230 kV transformer banks was found to be insignificant. Review of five years of historical data adjusted to include contributions from WDT164 (80 MW wind generation project), HLSP (250 MW solar-thermal), and CAISO #142 (80 MW solar-thermal) identified the maximum amount of potential congestion exposure to be approximately 5.0% of the total HLSP Project annual production if the project is interconnected with an SPS. Without an SPS, the study identified the maximum amount of potential congestion exposure to be approximately 78% of the total HLSP Project annual production.

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA
1516 NINTH STREET, SACRAMENTO, CA 95814
1-800-822-6228 – [WWW.ENERGY.CA.GOV](http://www.energy.ca.gov)

APPLICATION FOR CERTIFICATION
FOR THE *ABENGOA MOJAVE SOLAR POWER PLANT*

Docket No. 09-AFC-5
PROOF OF SERVICE
(Revised 2/9/2010)

APPLICANT
Emiliano Garcia Sanz
General Manager
Abengoa Solar Inc.
11500 West 13th Avenue
Lakewood, CO 80215
emiliano.garcia@solar.abengoa.com

Scott D. Frier
Chief Operating Officer
Abengoa Solar Inc.
13911 Park Ave., Ste. 206
Victorville, CA 92392
scott.Frier@solar.abengoa.com

Tandy McMannes
2030 Addison Street, Suite 420
Berkeley, CA 94704
tandy.mcmannes@solar.abengoa.com

APPLICANT'S CONSULTANTS
Frederick H. Redell, PE
Engineering Manager
Abengoa Solar, Inc.
11500 West 13th Avenue
Lakewood, CO 80215
frederick.redell@solar.abengoa.com

COUNSEL FOR APPLICANT
Christopher T. Ellison
Ellison, Schneider & Harris
2600 Capitol Ave.
Sacramento, CA 95816
cte@eslawfirm.com

INTERESTED AGENCIES
California ISO
e-recipient@caiso.com

INTERVENORS
California Unions for Reliable Energy ("CURE")
Tanya A. Gulesserian
Marc D. Joseph
Elizabeth Klebaner
Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Suite 1000
South San Francisco, CA 94080
E-mail Preferred
tgulesserian@adamsbroadwell.com
eklebaner@adamsbroadwell.com

Luz Solar Partners Ltd., VIII
Luz Solar Partners Ltd., IX
Jennifer Schwartz
700 Universe Blvd
Juno Beach, FL 33408
jennifer.schwartz@nexteraenergy.com

ENERGY COMMISSION
*ANTHONY EGGERT
Commissioner and Presiding Member
aeggert@energy.state.ca.us

JAMES D.BOYD
Vice Chairman and Associate Member
jboyd@energy.state.ca.us

Paul Kramer
Hearing Officer
pkramer@energy.state.ca.us

Craig Hoffman
Project Manager
choffman@energy.state.ca.us

Christine Hammond
Staff Counsel
chammond@energy.state.ca.us

Jennifer Jennings
Public Adviser's Office
publicadviser@energy.state.ca.us

*indicates change

DECLARATION OF SERVICE

I, Mary J. Doty, declare that on February 25, 2010, I served and filed copies of the attached *Interconnection Optional Study* by California ISO, dated January 14, 2010. The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at: [**http://www.energy.ca.gov/sitingcases/abengoa/index.html**

The document has been sent to both the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, in the following manner:

(*Check all that Apply*)

For service to all other parties:

__X_ sent electronically to all email addresses on the Proof of Service list;

__X_ ~~by personal delivery or~~ by depositing in the United States mail at Abengoa Solar Inc. 11500 W 13 Ave, Lakewood, CO 80215, with first-class postage thereon fully prepaid and addressed as provided on the Proof of Service list above to those addresses **NOT** marked "email preferred."

AND

For filing with the Energy Commission:

_X__ sending an original paper copy and one electronic copy, mailed and emailed respectively, to the address below (preferred method);

OR

_____ depositing in the mail an original and 12 paper copies, as follows:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 09-AFC-5
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512
docket@energy.state.ca.us

I declare under penalty of perjury that the foregoing is true and correct.

Mary J. Doty

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