Table of Attachments

Attachment A: William A. Monsen Statement of Qualifications

WILLIAM ALAN MONSEN

PROFESSIONAL EXPERIENCE

Principal
MRW & Associates, LLC
(1989 - Present)

Specialist in electric utility generation planning, resource auctions, demand -side management policy, power market simulation, power project evaluation, and evaluation of energy cost management options. Typical assignments include: analysis, testimony preparation and strategy development in large, complex regulatory efforts pertaining to utility mergers, independent or merchant power, renewable energy resources, and wholesale or retail electric prices; analysis of markets for non -utility generator power in the western U .S., China, and Korea ; evaluation of the cost-effectiveness of onsite power generation options ; advising large commercial and industrial customers on energy management and cost-reduction options; analysis of the value of incentives and regulatory mechanisms in encouraging utility-sponsored DSM; and negotiating non-utility generator power sales contract terms with utilities.

Energy Economist
Pacific Gas & Electric Company
(1981 - 1989)

Responsible for analysis of utility and non -utility investment opportunities using PG&E's Strategic Analysis Model. Performed technical analysis supporting PG&E's Long Term Planning efforts. Performed Monte Carlo analysis of electric supply and demand uncertainty to quantify the value of resource flexibility. Developed DSM forecasting models used for long -term planning studies. Created an engineering-econometric modeling system to estimate impacts of DSM programs. Responsible for PG&E's initial efforts to quantify the benefits of DSM using production cost models.

Academic Staff
University of Wisconsin-Madison Solar Energy Laboratory
(1980 - 1981)

Developed simplified methods to analyze efficiency of passive solar energy systems. Performed computer simulation of passive solar energy systems as part of Department of Energy's System Simulation and Economic Analysis working group.

EDUCATION

Masters, Mechanical Engineering, University of Wisconsin-Madison, 1980.
B.S., Engineering Physics, University of California, Berkeley, 1977.

WILLIAM A. MONSEN
PREPARED TESTIMONIES

Contents

Electricity Market Structure and Stranded Cost Recovery

1. CPUC Rulemaking 94-04-031 and Investigation 94-04-032
   Prepared Testimony regarding Transition Costs for The Independent Energy Producers . December 5, 1994.

2. D.T.E. 97-120
   Direct Testimony regarding Nuclear Cost Recovery for The Commonwealth of Massachusetts Division of Energy Resources. October 23, 1998.

3. CPUC Application 97-12-039
   Direct Testimony on Behalf of California Cogeneration Council. June 8, 1999.

4. CPUC Application 97-12-039
   Prepared Direct Testimony Evaluating an Auction Proposal by SDG&E on Behalf of The California Cogeneration Council. June 15, 1999.

5. CPUC Application 99-09-053
   Prepared Direct Testimony regarding PG&E's Proposed Divestiture of its Hydroelectric Facilities on Behalf of the Independent Energy Producers Association. March 2, 2000.

6. CPUC Application 99-09-053
   Prepared Rebuttal Testimony regarding PG&E's Proposed Divestiture of its Hydroelectric Facilities on Behalf of the Independent Energy Producers Association. March 16, 2000.

7. Arizona Docket Numbers E-00000A-02-0051, E-01345A-01-0822, E-0000A-01-0630, E-01933A-98-0471, E01933A-02-0069
   Rebuttal Testimony on Behalf of AES NewEnergy, Inc. and Strategic Energy L.L.C.: Track A Issues. June 11, 2002.

8. CPUC Rulemaking 03-10-003
Opening Testimony of William A. Monsen Regarding Phase One Issues Related to Implementation of Community Choice Aggregation on Behalf of Local Government Commission. April 15, 2004.

9. CPUC Rulemaking 03-10-003
Reply Testimony of William A. Monsen Regarding Phase One Issues Related to Implementation of Community Choice Aggregation on Behalf of Local Government Commission. May 7, 2004.

Qualifying Facilities and Avoided Cost Calculations

1. CPUC 90-10-003
Prepared Testimony with Mark A. Bachels regarding the Value of Qualifying Facilities and the Determination of Avoided Costs for the San Diego Gas & Electric Company for the Kelco Division of Merck & Company, Inc. December 21, 1990.

2. CPUC Rulemaking 99-11-022
Testimony of the Independent Energy Producers Association Regarding Short-Run Avoided Costs. May 7, 2001.

3. CPUC Rulemaking 99-11-022
Rebuttal Testimony of the Independent Energy Producers Association Regarding Short-Run Avoided Costs. May 30, 2001.

4. Sonoma County Assessment Appeals Board Application Nos.: 01/01-137 through 157
Testimony of William A. Monsen Regarding the Market Price Electricity in the Matter of the Application for Reduction of Assessment of Geysers Power Company, LLC, Sonoma County Appeals Board On Behalf of Calpine. September 10, 2004.

5. CPUC Rulemaking 04-04-025; R.04-04-003
Prepared Testimony of William A. Monsen Regarding Avoided Costs on Behalf of the Independent Energy Producers. August 31, 2005.

6. CPUC Rulemaking 04-04-025; R.04-04-003
Prepared Rebuttal Testimony of William A. Monsen Regarding Avoided Costs on Behalf of the Independent Energy Producers. October 28, 2005.

7. CPUC Rulemaking 04-04-025; R.04-04-003
Errata to Prepared Testimony of William A. Monsen Regarding Avoided Costs on Behalf of the Independent Energy Producers. January 27, 2006.

8. CPUC Rulemaking 04-04-025; R.04-04-003
Errata to Prepared Rebuttal Testimony of William A. Monsen Regarding Avoided Costs on Behalf of the Independent Energy Producers. January 27, 2006.

Electricity Resource Planning

1. CPUC Rulemaking 01-10-024
   Prepared Direct Testimony on Behalf of Independent Energy Producers and Western Power Trading Forum. May 31, 2002.

2. CPUC Rulemaking 01-10-024
   Rebuttal Testimony on Behalf of Independent Energy Producers and Western Power Trading Forum. June 5, 2002.

3. CPUC Rulemaking 01-10-024
   Prepared Testimony in the Renewable Portfolio Standard Phase on Behalf of Center for Energy Efficiency and Renewable Technologies. April 1, 2003.

4. CPUC Rulemaking 01-10-024
   Direct Testimony Regarding Long-term Resource Planning Issues on Behalf of the City of San Diego. June 23, 2003.

5. CPUC Rulemaking 04-04-003
   Direct Testimony of William A. Monsen Regarding the 2004 Long-Term Resource Plan of San Diego Gas & Electric Company on Behalf of the City of San Diego. August 6, 2004.

6. Nevada Public Utilities Commission Docket No. 06-06-051
   Testimony of William A. Monsen on behalf of the Nevada Resort Association Regarding Integrated Resource Planning. September 13, 2006.

7. Colorado Public Utilities Commission Docket No. 05A-543E
   Answer Testimony of William A. Monsen on behalf of AES Corporation and the Colorado Independent Energy Association. April 18, 2006.

8. Colorado Public Utilities Commission Docket No. 07A-447E
   Answer Testimony and Exhibits of William A. Monsen. April 2008.

9. Public Service Company of Colorado Docket No. 11A-869E
   Answer Testimony of William A. Monsen on Behalf of Colorado Independent Energy Association, Colorado Energy Consumers and Thermo Power & Electric LLC. June 4, 2012.

Electricity Rate Cases, Rate Design, and Rate Surcharges

1. CPUC Application 01-08-028
   Direct Testimony on Behalf of Bear Mountain, Inc. in the Matter of Southern California Water Company's Application to Increase Rates for Electric Service in the Bear Valley Electric Customer Service Area. December 20, 2001.

2. CPUC Application 00-10-045; 01-01-044
   Direct Testimony on Behalf of the City of San Diego. May 29, 2002.

3. CPUC Application 00-11-038
Testimony on Behalf of the Alliance for Retail Energy Markets in the Bond Charge Phase of the Rate Stabilization Proceeding. July 17, 2002.

4. CPUC Application 05-02-019
Testimony of William A. Monsen SDG&E's 2005 Rate Design Window Application on Behalf of the City of San Diego. June 24, 2005.

5. CPUC Application 05-01-016
Prepared Testimony of William A. Monsen Regarding SDG&E's Default Critical Peak Pricing Proposal on Behalf of the City of San Diego. October 5, 2005.

6. CPUC Application 07-01-047
Testimony of William A. Monsen on Behalf of the City of San Diego Concerning the Application of San Diego Gas & Electric Company For Authority to Update Marginal Costs, Cost Allocation, and Electric Rate Design. August 10, 2007.

7. CPUC Application 08-06-034
Testimony of William A. Monsen on Behalf of Snow Summit, Inc. Concerning Cost allocation and Rate Design. January 9, 2009.

8. CPUC Application 08-11-014
Testimony of William A. Monsen on Behalf of the City of San Diego Concerning the Application of San Diego Gas & Electric Company tor Authority to Update Cost Allocation and Electric Rate Design

Distributed Generation and Demand Response

1. CPUC Application 99-10-025
Joint Testimony Regarding Auxiliary Load Power and Standby Metering Policy on Behalf of Duke Energy North America. July 3, 2000.

2. CPUC Application 99-03-014
Joint Testimony Regarding Auxiliary Load Power and Standby Metering Policy on Behalf of Duke Energy North America. September 29, 2000.

3. CPUC Application 03-03-029
Testimony William A. Monsen Regarding Auxiliary Load Power Metering Policy and Standby rates on Behalf of Duke Energy North America. October 3, 2003.

4. CPUC Rulemaking 04-03-017
Testimony of William A. Monsen regarding the Itron Report on Behalf of the City of San Diego. April 13, 2005.

5. CPUC Rulemaking 04-03-017
Rebuttal Testimony of William A. Monsen regarding the Cost Effectiveness of Distributed Energy Resources on behalf of the City of San Diego. April 28, 2005.

6. CPUC Application 08-06-001, 08-06-002, 08-06-003
Prepared Testimony of William A. Monsen on Behalf of the California Demand Response Coalition Concerning Demand Response Cost-Effectiveness and Baseline Issues. November 24, 2008.

7. CPUC Application 08-06-001, 08-06-002, 08-06-003
Prepared Testimony of William A. Monsen on Behalf of the California Demand Response Coalition Concerning Demand Response Cost-Effectiveness and Baseline Issues. Revised with Errata 1-7-09. November 24, 2008.

Electricity, other

1. CPUC Applications 90-08-066, 90-08-067, 90-09-001
Prepared Testimony with Aldyn W. Hoekstra regarding the California-Oregon Transmission Project for Toward Utility Rate Normalization. TURN. November 29, 1990.

2. CEC Docket No. 93-ER-94
Rebuttal Testimony regarding the Preparation of the 1994 Electricity Report for the Independent Energy Producers Association. December 10, 1993.

Natural Gas Market Structure

1. CPUC Rulemaking 04-01-025
Direct Testimony of William A. Monsen on behalf of Crystal Energy, LLC. July 18, 2005.

2. CPUC Rulemaking 04-12-004
Direct Testimony of William A. Monsen on behalf of Crystal Energy, LLC. July 29, 2005.

3. CPUC Rulemaking 04-12-004
Rebuttal Testimony of William A. Monsen on behalf of Crystal Energy, LLC. August 26, 2005.

4. CPUC Application 04-12-004
Prepared Testimony of William A. Monsen Regarding Firm Access Rights on Behalf of Clearwater Port, LLC. July 14, 2006.

5. CPUC Application 04-12-004
Prepared Rebuttal Testimony of William A. Monsen Regarding Firm Access Rights, on behalf of Clearwater Port, LLC. July 31, 2006.

Natural Gas Rate Case

1. CPUC Application 08-02-001
   Testimony of William A. Monsen on Behalf of the City of Long Beach Gas & Oil Department Concerning the Application of San Diego Gas & Electric Company and Southern California Gas Company for Authority to Revise Their Rates Effective January 1, 2009 in their Biennial Cost Allocation Proceeding. June 18, 2008.

2. CPUC Application 08-02-001
   Rebuttal Testimony of William A. Monsen on Behalf of the City of Long Beach Gas & Oil Department Concerning the Application of San Diego Gas & Electric Company and Southern California Gas Company for Authority to Revise Their Rates Effective January 1, 2009 in their Biennial Cost Allocation Proceeding. July 10, 2008.

3. CPUC Application 08-02-001
   Testimony of William A. Monsen on Behalf of the City of Long Beach Gas & Oil Department Concerning Revenue Allocation and Rate Design Issues in the San Diego Gas & Electric Company and Southern California Gas Company Biennial Cost Allocation Proceeding. December 23, 2008.

4. CPUC Application 08-02-001
   Rebuttal Testimony of William A. Monsen on Behalf of the City of Long Beach Gas & Oil Department Concerning Revenue Allocation and Rate Design Issues in the San Diego Gas & Electric Company and Southern California Gas Company Biennial Cost Allocation Proceeding

rev.9/27/11

Attachment B: California Energy Commission, Decision Approving Carlsbad Energy Center

CARLSBAD ENERGY CENTER PROJECT

Commission Decision

CALIFORNIA
ENERGY COMMISSION
Edmund G. Brown, Jr., Governor

JUNE 2012
CEC-800-2011-004-CMF

DOCKET NUMBER 07-AFC-06

□□□IF□□□I□
□□□□□□□□MMI□□I□□
1516□1 □th□ tr□□t
. a□ra□ □□t□,□□□95814

http://www.□□□rgy.□a.g□v/□t□□g□a□□□/□arl□bad/□d□x.ht□l

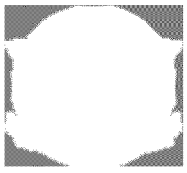
□□***MMI***□□***I***□□□□□-
, 6 / □, 4□/ .□W□I. □1 Ml□□□, ,□5h.□.
□***ha□r***

K□, □1 □□6 U□ □□.
□□□ □ □□□□□□□***r***

□□, □□□5 □4□, M□1
□□□ □ □□□□□□□***r***

□1 □, □W□M□□□□□I. 4□,
□□□ □ □□□□□□□***r***

H□□□***I***□□□□***FFI***□□□-
5□U□K, □M□,



0F6, 04H0 010, 23, 0.6U, 0. 61.0, V 4I61 1 0V0-65M014
6 MMI. . I61 6F4H0. 4 40 6F - IF6, 1I
1516 1 I14H. 4, 004, . , M0146, 95814
1-800-822-6228 – WWW.010, 23. .26V

K

07-F-6

0 M 3 31 2012

0 . U1 01 2012

55-I 4I61 F6, 0, 4IFI 4I61

F H

k t1 .07-F-06

6rd r1 .12-0531-06

6 MMI. . I61 654I61 6, 0,

h 6rd) r ad pt th) ( ) th) arl bad 0) rgy) t) r r j) t(0) ppl at f r) rt f at . h) ( ) (, M( ) d k) t) d Mar h 28, 2012, a d f) d by th) ( ) tt)) ,) v t th) , M(d k) t) d May 16, 2012, th) 0rrata d k) t) d May 31, 2012 a d th) add t al ha g) ad) dur g th) May 31, 2012 u M)) t g d) r b) d tta h) t t th 6rd) r. h) ( ) ba) d up th)) v d) tary r) rd f th)) pr)) d g a d d) r th) ( ) t r)) v) d at th) May 31, 2012, u M)) t g. h) ( ) ta a u ary f th) pr)) d g, th)) v d)) pr)) t) d, a d th) rat al) f r th) f d g r) a h) d a d d t p) d.

h 6rd) r rp rat) by r) f) r)) th) t) xt, d t f at , pl a) V) rf at , a d pp) d) ta) d th) ( ) . h) r) qu r)) t ta) d th) ( )) ur) that th) pr p) d fa lity w ll b) d) g) d, t) d, a d p) r at) d a a) r t pr t) t) v r) tal qual ty, t a ur) publ h) alth a d af) ty, a d t p) rat) a af) a d r) labl) a) r.

FI1 I12.

h) ( ) h) r) by ad pt th) f ll w g f d g add t t th) ta) d th) ( ) :

1. h) arl bad 0) rgy) t) r r j) t w ll pr v d) a d) gr)) f) b)) f t a d) l) tr ty r) l ab lity t th) l al ar) a.

2. h) d t f) rt f at ta) d th) ( ) , f pl)) t) d by th) pr j) t w) r,) ur) that th) pr j) t w ll b) d) g) d, t) d, a d p) rat) d f r ty w th appl abl) l al, r) g al, tat) , a d f) d) ral law, rd a) , r) gulat , a d ta dard, lud g appl abl) publ h) alth a d af) ty ta dard, a d a r a d wat) r qual t y ta dard) x) pt f r th) ty f arl bad' la d u) r) gulat a d ta da rd, th) al f r a a tal t, a d

th) . tat) F$) d) a d) r$) d $ th) 6 v) rr$l) F$d$g) t$ f th)
( ) $$.

3. l pl)) tat$ f th) d$$ f) rt$$at$ ta$) d$ th) $ $
( ) $$ w$l) ur) pr t) t$ f) v $) tal qual$y a d a ur) r) a ably
af) a d r) l$abl) p) rat$ f th) fa$$y. 4 h) dt f) rt$f$at$ al
a ur) that th) pr j) t w$l) $h) r r) ult $, r tr$but) ub ta t$ally t, a y
$g $$a td$) t, d) t, r u ulat$v)) v$) t al $ pa t) x) pt f r th)
$ $t) $) w$h th) $y f arl bad' la d u) r) gulat $ a d ta dard,
a d th) al$ r $a a tal t, a d) r$) d $ th) 6 v) rr$l) F$d$g) t$ f
th) ( ) $$.

4. 4h) pr j) t' $ $t) $) w$h $y f arl bad- 6 , . d) r$) d ab v) , w$h
th)) x) pt$ f th) fa$ur) t pr v$l) “) xtra rd$ary purp) ” u d) r th)
,) d) v) l p) t r) a 5 la , r) ult fr r)) t a) d) t t th) $y' pla
a d rd$a) ,) a t) d atl) a t$ part t pr) v) t appr val f th) 0 5 . U t$
th) a) d) t w) r)) a t) d, th) 0 5 wa $t) t w$h th) $y' pla
a d rd$a) .

5. 4h) 0 5 fa $$y $ r) qu$) d f r publ$ v) $)) a d)) $y. 4h) r) ar) t
r) prud) t a d f) a $bl)) a f a h$ v$g th) publ$ v) $)) a d
)) $y.

6. 4h) 0 5' b)) f$ utw) $gh th) $g $$a t) v$) tal $ pa t $l) t$$ d $
th) $ $ ( ) $$.

7. 0xtg g v) r) tal la d u) r) tr$ t$ ar) uff$$ t t ad) quat) ly tr l
p pulat$ d) $y $ th) ar) a urr u d$g th) fa $$y a d ay b) r) a ably
) xp) t) d t) ur) publ$ h) alth a d af) ty.

8. 4h) pr j) t $ ubj) t t F$h a d 2 a) d)) t$ 711.4 a d th) pr j) t
w) r u t th) r) f r) pay a $) hu dr) d $) ty tw d llar a d f$ty) t
($992.50) f)) t th) al$ r $a ( ) part) t f F$h a d 2 a) .

9. 1 f) a $bl) alt) r at$v) t th) pr j) t w uld r) du) r) l$ $at) a y $g $$a t
) v$) tal $ pa t f th) pr j) t.

10. 4h)) v$l)) d) t) tabl$h th)) x $t)) f a y) v$) tally up) r$ r
alt) r at$v) $) .

11.) v$) tal ju t $) r)) $g a aly $ wa du t) d a d th) pr j) t, a
$$gat) d, w$l t hav) a d$ pr p rt$ at) $ pa t l w-$) r $ r$y
p pulat$.

12. 4h) □□□□ □ □□□□□□( ) □□□□□□□□□ta□□□a□ d□□u□□□□□□f□th) □publ□□b) □) f□t□□□f□th) □ pr□j) □t□a□r) qu□r) d□by□5ubl□□,) □□ur□) □□□ □d) □□) □t□□□25523(h).

13. Hav□□g□□□□□□d) r) d□th) □□) wly□ad□pt) d□□arl□bad□6 rd□□a□□) □1 □.□□. -184□a□d□ r) lat) d□□taff□r) p□rt, □□f□wh□ □□h□w) □tak) □□ff□□al□□□t □□) , □a□d□th) □□□□ □) □t□□□ad) □ dur□□g□th) □May□31, □2012□□u□□□) □□□M)) t□□g, □w) □f□□d□that□th) □pr□j) □t□□□□□□ □□□f□r□□ty□w□th□th) □□rd□□a□□) □a□d□th) r) f□r) □□□□-6 , . □□v) rr□d) □□□□) □) □□ary. □W) □ furth) r□f□□d□that□th) □ad□pt□□□□□f□th) □6 rd□□a□□) □□□□□□t□□g□f□□a□t□□) w□□f□r□at□□□□ u□d) r□□0Q□□b) □au□) □t□d□) □□□□t□r) □ult□□□a□□) w□□g□f□□a□t□) □v□r□□□□) □tal□□□pa□t□ fr□□□th) □pr□j) □t, □a□□ub□ta□t□al□□□r) a□) □□□th) □□) v) r□ty□□f□a□□) □v□r□□□□) □tal□□□pa□t□ fr□□□th) □pr□j) □t, □□r□□r) at) □□□) w□f) a□bl) □pr□j) □t□alt) r□at□v) □□□r□□□t□gat□□□□ □) a□ur) □□□□t□pr) v□□u□ly□a□alyz) d□b) □au□) □th) □□rd□□a□□) □□□□□□□□□t) □t□w□th□th) □ , 5M5(.

14. 4h) □□□□□ □ □□□□□□( ) □□□□□□□□□□□ta□□□□□) a□ur) □□t□□) □□ur) □that□th) □pla□□) d, □ t) □p□rary, □□r□u□) xp) □t) d□□l□□ur) □□f□t h) □pr□j) □t□w□ll□□□□ur□□□□□□f□r□□a□□) □w□th□ appl□□abl) □law□, □□rd□□a□□) □, □r) gulat□□□□, □a□d□□ta□dard□.

15. 4h) □pr□□)) d□□g□l) ad□□g□t□th) □□□ □□ □□□□□□( ) □□□□□□hav) □b)) □□□□du□t) d□□□ □□□f□r□□ty□w□th□th) □appl□□ abl) □pr□v□□□□□□□f□□□ □□ □□□□□□□r) gulat□□□□g□v) r□□□g□ th) □□□□□□d) rat□□□□□f□a□□□ppl□□at□□□□f□r□□□) rt□f□□at□□□□a□d□th) r) by□□□)) t□th) □ r) qu□r) □) □t□□□f□5ubl□□,) □□ur□) □□□ □d) □□) □t□□□□21000□) t□□) q. □a□d□25500□) t□ □) q.

□□□□□

4h) r) f□r) , □th) □□□□ □ □□□□□□□□ □□□□□□th) □f□ll□w□□g:

1. 4h) □,) v□□) d□5r) □d□□g□M) □b) r'□□5r□p□□) d□( ) □□□□□□(, 5M5( ) □d□□k) t) d□□□□ Mar□h□28, □2012, □a□□□ □d□f□) d□by□th) □□□□□ □□tt)) □,) v□□□□□□□t□□th) □, 5M5(□ d□□k) t) d□□□May□16, □2012, □th) □0rrata □d□□k) t) d□□□May□31, □2012, □a□d□th) □ add□t□□□al□□ha□g) □□□ad) □dur□□g□th) □May□31, □2012□□u□□□) □□□M)) t□□g□d) □□r□b) d□ □□□□tta□h□) □t□□□t□□th□□6 rd) r, □□□h) □r) by□ad□pt) d□a□th) □□□ □ □ □□□□□□( ) □□□□□□ a□d□□□□rp□rat) d□by□r) f) r) □□□) □□□t□th□□6 rd) r.
.

2. 4h) □□ppl□□at□□□□f□r□□) rt□f□□at□□□□f□th) □□arl□bad□0□) rgy□□) □t) r□5r□j) □t□a□□ d) □□r□b) d□□th) □□□□ □ □□□□□□( ) □□□□□□□□□ h) r) by□appr□v) d□a□d□a□□) rt□f□□at) □t□□ □□□□tru□t□a□d□□p) rat) □th) □pr□j) □t□□□h) r) by□gra□t) d.

3. 4h) □appr□val□□f□th) □□ppl□□at□□□□f□r□□) rt□f□□at□□□□□□□ubj) □t□t□□th) □t□□) ly□ p) rf□r□a□□) □□f□th) □□□□d□t□□□□□□f□□) rt□f□□at□□□a□d□□□□p□l□a□□) □V) r□f□□at□□□. 4h) □ □□□d□t□□□□a□d□□□□pl□a□□) □V) r□f□□at□□□□ar) □□□t) grat) d□w□th□th□□6 rd) r□a□d□ar) □ □□t□□) v) rabl) □th) r) fr□□. □Wh□l) □th) □pr□j) □t□w□) r□□ay□d) l) gat) □th) □p) rf□r□a□□) □

f a d$$ r V) r$$ at$, th) duty t) ur) ad) quat) p) rf r a) f a d$$ r V) r$$ at$ ay t b) d) l) gat) d.

4. 4h$ 6 rd) r $ ad pt) d, $ u) d,) ff) t$v) , a d f$ al th) dat) th$ 6 rd) r $ d k) t) d.

5. ,) $l) rat$ f th$ 6 rd) r $ g v) r) d by 5ubl$,) ur) d) ,) t$ 25530.

6. 7ud$ $al r) v$ w f th$ 6 rd) r $ g v) r) d by 5ubl$,) ur) d) ,) t$ 25531.

7. 4h) $ $ h) r) by ad pt th) d$$ f) rt$$ at$, pl$a) V) r$$ at$, a d a $at) d d$put) r) lut$ pr) dur)) t f rth $ th) $ $ ( ) $$ a $ $$gat$ $ r$g pr gra r) qu$) d by 5ubl$,) ur) d)) t$ 255 32. ll d$$ tak)) ff) t$) d$at) ly up ad pt$ a d apply t all tru t$ a d $) pr) parat$ a t$v$$ $ lud$g, but t l$ $) d t, gr u d d$t urba) , $) pr) parat$, a d p) r a) t tru tur) tru t$.

8. 4h$ 6 rd) r l$)) th) pr j) t w) r t)) tru t$ th) pr j) t wh f$v) y) ar f th) dat) th$ 6 rd) r $ f$ al. ubj) t t th) pr v$$ f al$ r $a d) f ,) gulat$, t$l) 20,) t$ 1720.3, th$ l$))) xp$) by p) rat$ f law wh) th) pr j) t' tart-f- tru t$ d) adl$) pa) w$h tru t$.

9. 4h) pr j) t w) r hall pr v$l) th) 0x) ut$v) ($) t r a h) k$ th) a u t f $) hu dr) d $) ty tw d llar a d f$ty) t ($992.50) payabl) t th) al$ r $a ( ) part) t f F$h a d 2 a) .

10. 4h) 0x) ut$v) ($) t r f th) $ $ hall tra $a 1 t$) f ( ) $$ a d appr pr$at) a pa y$ g d u) t, $ lud$g th) ab v) ( ) part) t f F$h a d 2 a) f)) , a pr v$l) d by 5ubl$,) ur) d)) t$ 25537, al$ r $a d) f ,) gulat$, t$l) 20,) t$ 1768, a d F$h a d 2 a) d)) t$ 711.4.

11. 5ur ua t t 5ubl$,) ur) d)) t$ 25523(d)(1), th) 0x) ut$v) ($) t r f th) $ $ hall t$y th) appr pr$at) ag) $ f th) $ $ ' ad pt$ f f$ d$g pur ua t t 5ubl$,) ur) d)) t$ 25525.

12. 4h) H) ar$ g 6 ff$) hall $ rp rat) th) , 5M5 (a d var$u r) v$$ d u) t d) r$b) d ab v) , $ t a $ gl) d u) t. 5ublat f that pat hall t aff) t th) ad pt$,) ff) t$v) , $ ua) , r f$ al dat) f th$ 6 rd) r) tabl$h) d $ paragraph 4, ab v) .

*

13. The Application for Certification docket file for this proceeding shall be closed effective 30 days after this Order is final, unless a timely petition is filed pursuant to Public Resources Code section 25530.

CERTIFICATION

The undersigned Secretariat to the Commission does hereby certify that the foregoing is a full, true, and correct copy of an Order duly and regularly adopted at a meeting of the California Energy Commission held on May 31, 2012.

AYE: Weisenmiller, Douglas, Peterman, McAllister
NAY: None
ABSENT: None
ABSTAIN: None

Dated: May 31, 2012, at Sacramento, California.

Original Signed By:

Harriet Kallemeyn
Secretariat
California Energy Commission

*

Attachment C: Siemens AG, Energy Sector Germany, "Operational Flexibility Enhancements of Combined Cycle Power Plants"

Operational Flexibility Enhancements of Combined Cycle Power Plants

Dr. Norbert Henkel,
Erich Schmid and
Edwin Gobrecht

Siemens AG, Energy Sector
Germany

POWER-GEN Asia 2008 in Kuala Lumpur, Malaysia

October 21-23, 2008

Answers for energy.

SIEMENS

Table of Contents

1 Abstract

High operational flexibility 閫 the ability of a power plant for fast start-up and to adjust load output fast and predictable to changing market requirements 閫 an essential prerequisite to ensure economic success in a liberalized market. The paper describes upgrade opportunities for combined cycle power plants, which were originally built as base load plants and are now - due to changing market conditions and fuel prices - forced to operate as peak load plants or as cycling plants with daily start-up.

Major factors limiting the load output of an existing combined cycle power plant are the allowed pressure and temperature transients of the steam turbine and the heat recovery steam generator waiting times to establish required steam chemistry conditions and warm-up times for the balance of plant and the main piping system. Those limitations also influence the fast start-up capability of the gas turbine by requiring waiting times compared to a simple cycle start-up.

The authors 鈥 company provides solutions to address all these limitations. For example, the use of final stage heat recovery steam generator attemperators and associated controls to adjust steam temperatures to steam turbine requirements independent from gas turbine load; stress monitoring systems for the thick walled components in the steam turbine and the heat recovery steam generator with different start-up modes for flexible use of component life; optimized main steam line warm-up systems; condensate polishing systems and flexible steam purity requirements; to name only a few.

The steam turbine start-up is modified to allow an early roll off and fast loading 閫 the so called 鍶start-up on the fly 鎷. Here, the steam turbine is rolled off with the very first 鍶cold 鎷 steam produced in the heat recovery steam generator with full pressure and temperature transients. With these upgrades a start-up time of less than 40 minutes is possible for a 400 MW combined cycle power plant after an overnight shutdown.

2 Introduction

Existing power plants must cope with the challenges of liberalized and deregulated markets. Further on, the compliance with increasing environmental requirements is gaining more importance. Looking closer to the requirements of a power plant in modern power markets, operational flexibility becomes a major topic.

Operational flexibility comprises:

* Fast start-up and shutdown
* Fast load changes and load ramps
* High start-up reliability and load predictability
* Frequency control and ancillary services.

Drivers for this demand are risks like fluctuating fuel and electricity prices. Additionally, a flexible plant opens up new business opportunities like utilizing hourly and seasonal market arbitrage, participation in ancillary energy markets or peak shaving.

An operating profile optimized for these market circumstances increases the economic value of the plant. Depending on seasonal load and the dispatch rank of the plant, driven by competition and fuel prices, it is likely that the plant will be partly operated as base load unit and partly as cycling unit over its lifetime. Therefore, a plant needs advanced cycling capabilities and highest efficiency at base load.

Fig. 1: View of a SCC5-4000F single shaft combined cycle power plant.

Typically, combined cycle power plants built in the 1990s and early years of the new millennium were designed as base load plants with focus on highest efficiency and low initial cost. Due to the significant increase in gas prices and changing market conditions in deregulated markets many combined cycle power plants are now being operated in intermediate or even daily cycling mode. The current plant and control design may not fully support these cycling conditions and the requirements on start-up performance and times.

The authors 鈥 company provides upgrade solutions for existing plants to meet these market requirements which are based on the latest and proven cycling plant developments for new units.

3 Plant Design for Fast Cycling

Most of the existing combined cycle power plants were initially designed for base load operation due to low fuel prices in the nineties resulting in low electricity costs. Nowadays, many operating combined cycle plants are shifted to intermediate load and new plants are specified for cycling load regimes because of today 鈥s high gas prices. Therefore, features for high operational flexibility like short start-up and shut-down times are emphasized by customers.

3.1 Cycling Plant Design Features

As an answer to the changed market requirements, Siemens has developed a fast start-up concept and implemented it into the reference power plant design for new units. With this design, a reduction of the start-up time of more than 50% can be achieved after an overnight shutdown. Additionally, the start-up times after a weekend outage shutdown (64 hours) and an extended outage shutdown (more than 120 hours) were also significantly reduced.

To achieve this cycling capability, some new features have been introduced in the plant design:

Attachment D: GE OpFlex Advanced Control Solutions Brochure

GE Energy

OpFlex Advanced Control Solutions, only from GE.

Technology that helps you flex your operational muscle.

imagination at work

Your plant.
Under your control.

Rising fuel costs. Fluctuating market conditions. Emerging renewables. Fast-changing environmental regulations. With so many things out of your control these days, it just makes good economic sense to get a firmer grip on those things you can control. That's where GE Energy's OpFlex Advanced Control Solutions come in. This suite of advanced technologies gives you unprecedented control over your power plant—from start-up to balancing to turndown. It's an intelligent way to better manage grid stability, fuel variability, emissions, compliance and all those other challenges that impact your ability to reduce costs and maximize revenue. With OpFlex Solutions, it's all about giving you more control to respond in real time to real challenges.

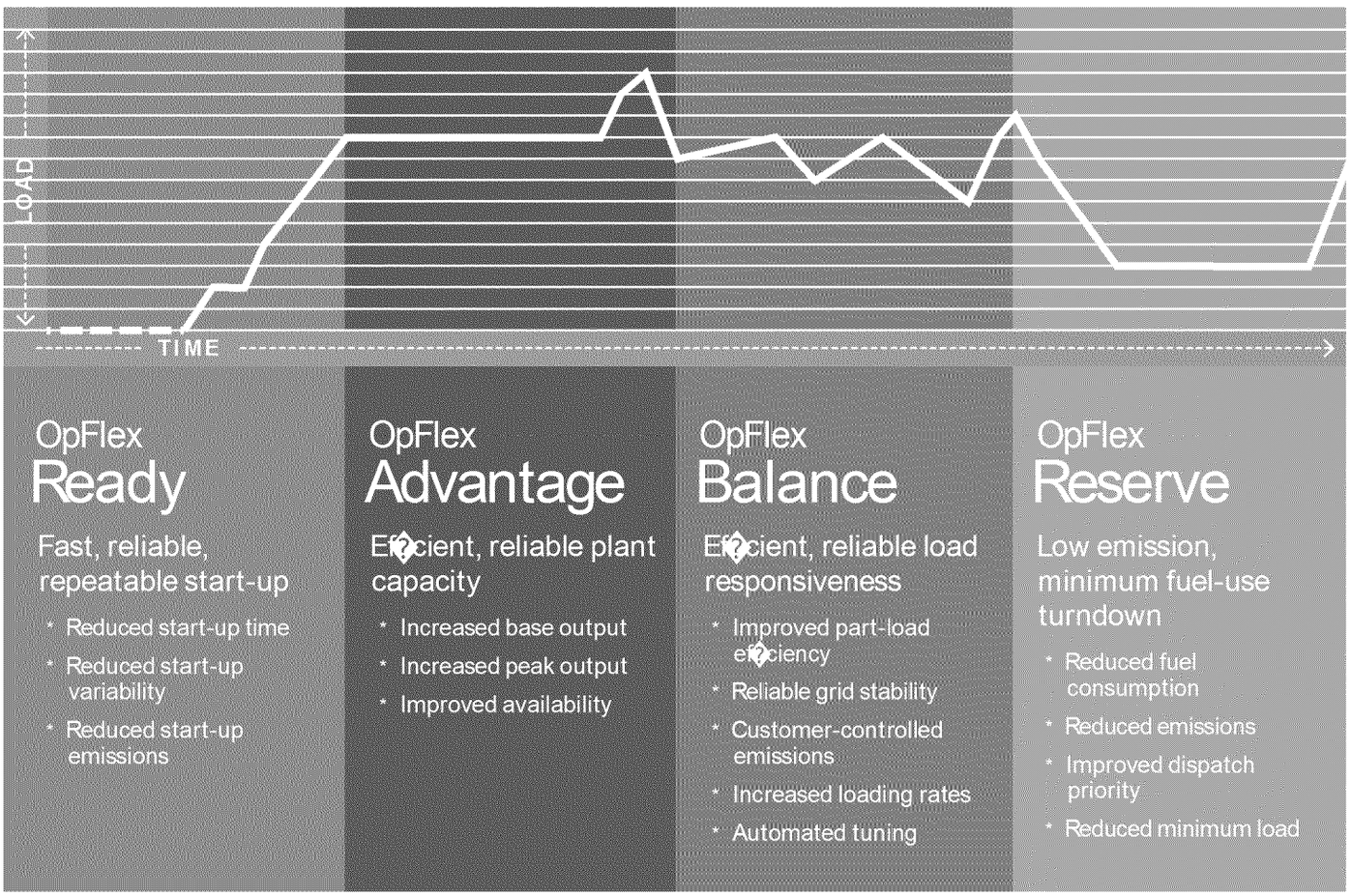
Empowerment redefined.

Today's plant owners are faced with more unknowns—and more opportunities—than ever. Unfortunately, even if you can identify those challenges and opportunities, you may not have the ability to act upon them the way you want. At GE Energy, we can help you capitalize on new

Why OpFlex Solutions?

Today the average power plant operates at less than half capacity. In that light, the need for OpFlex Solutions becomes clear—when market opportunities arise, you want to be ready to jump in and generate revenue. And because it's designed

Advanced controls for advanced flexibility.



OpFlex Solutions enable unparalleled efficiency, availability, emissions management, and operating flexibility for your GE gas turbine-based power plant by addressing four key modes of power plant operation.

Solutions customized to your plant's profile.

Unlike most advanced control technologies, OpFlex Solutions aren't cookie cutter products that require you to overhaul your processes. It starts with a model-based controls platform—which was originally developed by GE's Aircraft Engines business for critical aircraft applications and considered among GE's finest technology. From there, our power island experts created a set of 'apps' (40+) designed specifically to optimize the flexibility of your turbine and related operations.

Before we implement an OpFlex solution, our Total Plant Optimization consultants carefully review your needs, help you establish goals and then tailor a solution that addresses your specific operating parameters, plant requirements and business objectives.