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July 21, 2010

Docket Office
Attn: Docket No. 08-AFC-5
California Energy Commission
1516 Ninth Street, MS-4
Sacramento, CA 95814

Re: CURE July 21, 2010 Rebuttal Testimony
Imperial Valley Solar Project (08-AFC-5)

Dear Docket Clerk:

Enclosed are an original and copy of **CALIFORNIA UNIONS FOR RELIABLE ENERGY JULY 21, 2010 REBUTTAL TESTIMONY**. Please process this document, conform and return the copy in the envelope provided.

Sincerely,

/S/

Loulena A. Miles

LAM:bh
Enclosure

2218-136a

STATE OF CALIFORNIA
California Energy Commission

In the Matter of: The Application for Certification for the IMPERIAL VALLEY SOLAR PROJECT	Docket No. 08-AFC-5

CALIFORNIA UNIONS FOR RELIABLE ENERGY
SECOND REVISED SEQUENTIAL EXHIBIT LIST

EXHIBIT NO.	DATE	TITLE	SUBJECT	SPONSOR
400	5/10/10	Opening Testimony of Dr. Vernon C. Bleich on Behalf of the California Unions for Reliable Energy on Biological Resources for the Imperial Valley Solar Project	Biology	Vernon C. Bleich
401	5/10/10	Bleich Declaration	Biology	Vernon C. Bleich
402		Bleich C.V.	Biology	Vernon C. Bleich
403	1993	DeForge, J. R., S. D. Ostermann, D. E. Toweill, P. E. Cyrog, and E. M. Barrett. 1993. Helicopter survey of peninsular bighorn sheep in northern Baja California. Desert Bighorn Council Transactions 37:24-28	Biology	Vernon C. Bleich
404	2000	U.S. Fish and Wildlife Service. 2000. Recovery plan for bighorn sheep in the peninsular ranges, California	Biology	Vernon C. Bleich
405	6/17/09	Memo from Guy Wagner to Toni Parr dated 17 June 2009, with a subject line of Solar Two Map PBHS Map.ppt	Biology	Vernon C. Bleich
406	1990	Bleich, V. C., J. D. Wehausen, and S. A. Holl. 1990. Desert-dwelling mountain sheep: conservation implications of a naturally fragmented distribution. Conservation Biology 4:383-390.	Biology	Vernon C. Bleich
407	2007	Epps, C. W., J. D. Wehausen, V. C. Bleich, S. G. Torres, and J. S. Brashares. 2007. Optimizing dispersal and corridor models using landscape genetics. Journal of Applied Ecology 44:714-724.	Biology	Vernon C. Bleich
408	1986	Schwartz, O. A., V. C. Bleich, and S. A. Holl. 1986. Genetics and the conservation of mountain sheep *Ovis canadensis nelsoni*. Biological Conservation 37:179-190.	Biology	Vernon C. Bleich
409	1996	Bleich, V. C., J. D. Wehausen, R. R. Ramey II, and J. L. Rechel. 1996. Metapopulation theory and mountain sheep: implications for conservation. Pages 353-373 in D. R. McCullough (editor). Metapopulations and wildlife conservation. Island Press, Covelo, California.	Biology	Vernon C. Bleich
410	2005	Bleich, V. C. 2005. Politics, promises, and illogical legislation confound wildlife conservation. Wildlife Society Bulletin 33:66-73.	Biology	Vernon C. Bleich
411	2010	Flesch, A. D., C. W. Epps, J. W. Cain III, M. Clark, P. R. Krausman, and J. R. Morgart.	Biology	Vernon C. Bleich

		2010. Potential effects of the United States-Mexico border fence on wildlife. Conservation Biology 24:171-181.		
412	1999	Andrew, N. G., V. C. Bleich, and P. V. August. 1999. Habitat selection by mountain sheep in the Sonoran Desert: implications for conservation in the United States and Mexico. California Wildlife Conservation Bulletin 12:1-30.	Biology	Vernon C. Bleich
413	2004	Pierce, B. M., R. T. Bowyer, and V. C. Bleich. 2004. Habitat selection by mule deer: forage benefits or risk of predation? Journal of Wildlife Management 68:533-541.	Biology	Vernon C. Bleich
414	1997	Bleich, V. C., R. T. Bowyer, and J. D. Wehausen. 1997. Sexual segregation in mountain sheep: resources or predation? Wildlife Monographs 134:1-50.	Biology	Vernon C. Bleich
415	1994	Andrew, N. G. 1994. Demography and habitat use of desert-dwelling mountain sheep in the East Chocolate Mountains, Imperial County, California. MS Thesis, University of Rhode Island, Kingston, Rhode Island, USA.	Biology	Vernon C. Bleich
416	2005	Marshal, J. P., P. R. Krausman, and V. C. Bleich. 2005. Dynamics of mule deer forage in the Sonoran Desert. Journal of Arid Environments 60:593-609.	Biology	Vernon C. Bleich
417		SES Solar Two LLC, Response to CURE Data Requests, Set One, 08-AFC-5.	Biology	Vernon C. Bleich
418	2000	Rubin, E. S., W. M. Boyce, and V. C. Bleich. 2000. Reproductive strategies of desert bighorn sheep. Journal of Mammalogy 81:769-786.	Biology	Vernon C. Bleich
419	2005	Marshal, J. P., P. R. Krausman, and V. C. Bleich. 2005. Rainfall, temperature, and forage dynamics affect nutritional quality of desert mule deer forage. Rangeland Ecology and Management 58:360-365.	Biology	Vernon C. Bleich
420	1992	Bleich, V. C., R. T. Bowyer, D. J. Clark, and T. O. Clark. 1992. Quality of forages eaten by mountain sheep in the eastern Mojave Desert, California. Desert Bighorn Council Transactions 36:41-47.	Biology	Vernon C. Bleich
421	2003	Oehler, M. W., Sr., R. T. Bowyer, and V. C. Bleich. 2003. Home ranges of mountain sheep: effects of precipitation in a desert ecosystem. Mammalia 67:385-402.	Biology	Vernon C. Bleich
422	2005	Oehler, M. W., V. C. Bleich, R. T. Bowyer, and M. C. Nicholson. 2005. Mountain sheep	Biology	Vernon C. Bleich

		and mining: implications for conservation and management. California Fish and Game 91:149-178.		
423	2005	Wehausen, J. D. 2005. Nutrient predictability, birthing seasons, and lamb recruitment for desert bighorn sheep. Pages 37-50 in J. Goerrissen and J. M. Andre, editors. Sweeney Granite Mountains Desert Research Center 1978-2003. A Quarter Century of Research and Teaching. University of California Natural Reserve System, Riverside, California, USA.	Biology	Vernon C. Bleich
424		SES Solar Two, Appendix Y. Biological Resources Technical Report, Attachment B. Plant species observed on the Solar Two project site. Pages B-1 – B-4.	Biology	Vernon C. Bleich
425	1968	Weaver, R. A., J. L. Mensch, and W. V. Fait. 1968. A survey of the California desert bighorn (*Ovis canadensis*) in San Diego County. California Department of Fish and Game, Federal Aid in Wildlife Restoration Project W-51-R-14. Final Report.	Biology	Vernon C. Bleich
426	1978	Hicks, L. L. 1978. The status and distribution of peninsular bighorn sheep in the In-Ko-Pah Mountains, California. USDI Bureau of Land Management, Riverside District, El Centro, California, USA.	Biology	Vernon C. Bleich
427	1989	Dodd, N. 1989. Dietary considerations. Pages 109-134 in R. M. Lee (editor). The desert bighorn sheep in Arizona. Arizona Game and Fish Department, Phoenix, Arizona, USA.	Biology	Vernon C. Bleich
428	1986	Scott, J. E. 1986. Food habits and nutrition of desert bighorn sheep (*Ovis canadensis cremnobates*) in the Santa Rosa Mountains, California. MS Thesis, California State Polytechnic University, Pomona, California, USA.	Biology	Vernon C. Bleich
429	5/10/10	Opening Testimony of Scott Cashen on Behalf of the California Unions for Reliable Energy on Biological Resources for the Imperial Valley Solar Project - Figure 1 – Map #1 of MA blockage - Figure 2 – Map #2 of MA blockage - Figure 3 – GOEA nesting habitat - Figure 4 – CDFTL map - Figure 5 – Pictures of sensitive communities	Biology	Scott Cashen

		- Figure 6 – SS plants near Seeley - Figure 7 – Yuha and W. Mesa MAS		
430	5/10/10	Cashen Declaration	Biology	Scott Cashen
431		Cashen C.V.	Biology	Scott Cashen
432		Calico Solar Project SA/DEIS	Biology	Scott Cashen
433		Calico Solar Project. Applicant's response to CURE data request 162	Biology	Scott Cashen
434		Energy Commission Staff's Rebuttal Testimony, Ivanpah Solar Electric Generating System	Biology	Scott Cashen
435		Final Staff Assessment, Ivanpah Solar Electric Generating System	Biology	Scott Cashen
436	3/12/10	Applicant's Comments on the SA/DEIS. Imperial Valley Solar (formerly solar Two) (08-AFC-5)	Biology	Scott Cashen
437	2010	California Native Plant Society (CNPS). 2010. Inventory of Rare and Endangered Plants (online edition, v7-10a). California Native Plant Society. Sacramento, CA	Biology	Scott Cashen
438	4/29/10	California Natural Diversity Database Info [internet]. Sacramento: California Department of Fish and Game; [cited 2010 Apr 29].	Biology	Scott Cashen
439	2009	Bureau of Land Management. 2009. Survey Protocols Required for NEPA/ESA Compliance for BLM Special Status Plant Species	Biology	Scott Cashen
440	2003	Flat-tailed Horned Lizard Interagency Coordinating Committee. 2003. Flat-tailed horned lizard rangewide management strategy, 2003 revision. 80 pp. plus appendices	Biology	Scott Cashen
441	1991	Dodd CK Jr., RA Seigel. 1991. Relocation, repatriation, and translocation of amphibians and reptiles: Are they conservation strategies that work? Herpetologica 47(3): 336-350	Biology	Scott Cashen
442	3/2009	Flat-tailed Horned Lizard Interagency Coordinating Committee. 2009 Mar. Annual Progress Report: Implementation of the Flat-tailed Horned Lizard Rangewide Management Strategy, January 1, 2008 – December 31, 2008.	Biology	Cashen
443	4/21/09	Ecosphere Environmental Services. 2009 Apr 21. SES Solar Two AFC Supplemental Cumulative Analysis	Biology	Scott Cashen
444	2005	Young KV and AT Young. 2005. Indirect effects of development on the flat-tailed horned lizard. Final Report submitted to Arizona Game and Fish Department, Yuma. 11 pp.	Biology	Scott Cashen
445	2007	Painter ML, MF Ingraldi. 2007. Use of Simulated Highway Underpass Crossing Structures by Flat-Tailed Horned Lizards (*Phrynosoma mcallii*), Final Report 594.	Biology	Scott Cashen

		Arizona Department of Transportation, Phoenix, Arizona		
446	11/29/93	58 Fed. Reg. 62624 (November 29, 1993), Proposed Rule to List Flat-tailed Horned Lizard as Threatened.	Biology	Scott Cashen
447	2000	Okin GS, B Murray, WH Schlesinger. 2000. Degradation of sandy arid shrubland environments: observations, process modelling, and management implications. Journal of Arid Environments Vol. 47, No. 2	Biology	Scott Cashen
448	2006	Bates C. 2006. Burrowing Owl (*Athene cunicularia*). In The Draft Desert Bird Conservation Plan: a strategy for reversing the decline of desert-associated birds in California. California Partners in Flight.	Biology	Scott Cashen
449	2004	DeSante DF, ED Ruhlen, DK Rosenberg. 2004. Density and abundance of burrowing owls in the agricultural matrix of the Imperial Valley, California. Studies in Avian Biology No. 27: 116-119	Biology	Scott Cashen
450	2004	Rosenburg, DK and KL Haley. 2004. The ecology of burrowing owls in the agroecosystem of the Imperial Valley, California. Studies in Avian Biology No. 27: 120-135	Biology	Scott Cashen
451	1993	The California Burrowing Owl Consortium. 1993. Burrowing Owl Survey Protocol and Mitigation Guidelines	Biology	Scott Cashen
452	1995	California Department of Fish and Game. 1995. Staff Report on Burrowing Owl Mitigation	Biology	Scott Cashen
453		AFC, Biological Resources, Figure 6	Biology	Scott Cashen
454	2009	US Fish and Wildlife Service, Division of Migratory Bird Management. 2009. Final Environmental Assessment, Proposal to Permit Take. Provided Under the Bald and Golden Eagle Protection Act. Washington: Dept. of Interior	Biology	Scott Cashen
455		AFC, p. 5.6-9	Biology	Scott Cashen
456	1993	Martin TE, GR Geupel. 1993. Nest-Monitoring Plots: Methods for Locating Nests and Monitoring Success. J. Field Ornithol. 64(4):507-519	Biology	Scott Cashen
457	2009	North American Bird Conservation Initiative, U.S. Committee, 2009. The State of the Birds, United States of America, 2009. U.S. Department of Interior: Washington, DC.	Biology	Scott Cashen
458	1986	DeSante DF, GR Geupel. 1987. Landbird productivity in central coastal California: the relationship to annual rainfall and a reproductive failure in 1986. Condor. 89:636-653	Biology	Scott Cashen
459	1996	Martin TE, C Paine, CJ Conway, WM Hochacka. 1996. BBIRD field protocol. Montana Cooperative Wildlife Research Unit, Missoula (MT)	Biology	Scott Cashen
460		AFC p. 5.6-4	Biology	Scott Cashen

461	12/28/09	California Department of Fish and Game. 2009 Dec 28. List of California Vegetation Alliances. Sacramento: Biogeographic Data Branch	Biology	Scott Cashen
462	2003	BRG Consulting, Inc. 2003. Final Mitigated Negative Declaration and Environmental Assessment: Proposed Seeley Water / Wastewater Master Plans	Biology	Scott Cashen
463	2010	US Fish and Wildlife Service. 2010. Species Profile: Yuma clapper rail [internet]. Environmental Online Conservation System.	Biology	Scott Cashen
464	2009	Dudek. 2009. Draft Mitigated Negative Declaration for the Seeley Wastewater Reclamation Facility Improvements, Imperial County, California	Biology	Scott Cashen
465	1975	Gould GI Jr. 1975. Yuma Clapper Rail Study – Census and Habitat Distribution. Wildlife Management Branch Administrative Report No. 75-2. Supported by Federal Aid in Wildlife Restoration Project W-54-R-7, Nongame Wildlife Investigations	Biology	Scott Cashen
466	2006	US Fish and Wildlife Service. 2006. Yuma Clapper Rail 5-Year Review.	Biology	Scott Cashen
467	2006	California Department of Water Resources and California Department of Fish and Game. 2006. Salton Sea Ecosystem Restoration Program Draft Programmatic Environmental Impact Report.	Biology	Scott Cashen
468	9/23/09	URS Corporation. 2009 Sep 23. Letter from Matt Moore, Project Engineer, to David Dale, Seeley County Water District	Biology	Scott Cashen
469	1/7/10	Imperial Irrigation District. 2010 Jan 7. Comment letter on the Seeley County Water District's Wastewater Reclamation Facility Improvements Project	Biology	Scott Cashen
470	6/09	URS. 2009 Jun. Supplement to SES Solar Two Application for Certification. p. 2.6-1	Biology	Scott Cashen
471	2002	Evans Ogden LJ. 2002. Summary Report on the Bird Friendly Building Program: Effect of Light Reduction on Collision of Migratory Birds. Special Report for the Fatal Light Awareness Program (FLAP). Available at: http://www.flap.org/	Biology	Scott Cashen
472	1994	National Park Service. 1994. Report to Congress: Report on effects of aircraft overflights on the National Park System	Biology	Scott Cashen
473		A. Letter from Sierra Club San Diego Chapter to David Dale, Seeley County Water District, February 2, 2010. B. Salton Sea Authority Website Information, Environmental Issues Around the Sea, accessed online at http://www.saltonsea.ca.gov/environ.htm on 2/2/2010. C. Letter from U.S. Fish and Wildlife Service to Seeley County Water District, February 2, 2010, re: Draft Mitigated Negative Declaration for the Seeley Wastewater Treatment	Biology	Scott Cashen

		Plant Improvements, Imperial County, California. D. California Environmental Protection Agency, Regional Water Quality Control Board, Staff Report: Water Quality Issues in the Salton Sea Transboundary Watershed, February 2003. E. State Water Resources Control Board – Colorado River Basin Region, website, www.waterboards.ca.gov/coloradoriver/water_issues/programs/salton_sea/index.shtml, accessed on 2/2/2010. F. Letter from Imperial County Public Works Department, January 25, 2010 re: Notice of Intent to adopt a Mitigated Negative Declaration for Seeley County Water District. G. Letter from Department of Toxic Substances Control to Seeley County Water District, January 25, 2010 re: Notice of Intent to adopt a Proposed Mitigated Negative Declaration for Seeley County Water District Wastewater Reclamation Facility.		
474	6/2/01	CNPS Botanical Survey Guidelines, December 9, 1983, Revised June 2, 2001	Biology	Scott Cashen
475	11/24/09	Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities, State of California, Natural Resources Agency, Department of Fish and Game, November 24, 2009	Biology	Scott Cashen
476		Yuma Clapper Rail, Species Profile, US Fish and Wildlife Service	Biology	Scott Cashen
477	2000	Klem, Preventing Bird-Window Collisions (2000) Wilson Ornithological Society	Biology	Scott Cashen
478	5/10/10	Opening Testimony of Dr. Chris Bowles and Chris Campbell on Behalf of California Unions for Reliable Energy on Soil and Water Resources for the Imperial Valley Solar Project - Figure 1 – 100-year discharge comparison - Figure 2 – 6-hour temporal rainfall distributions	Soil Water	Chris Bowles Chris Campbell ("Bowles/Campbell")
479	5/7/10	Bowles Declaration	Soil Water	Chris Bowles
480	5/17/10	Campbell Declaration	Soil Water	Chris Campbell
481		Christopher Bowles, Ph.D., C.V.	Soil	Chris Bowles

			Water	
482		Christopher Campbell, M.S., C.V.	Soil Water	Chris Campbell
483	10/2006	California Department of Water Resources, California Department of Fish and Game (October 2006), Salton Sea Ecosystem Restoration Program, Draft Programmatic Environmental Impact Report, Volume I: PEIR, Hydrology chapter	Soil Water	Bowles/Campbell
484	2005	Y.A. Wood, R.C. Graham, S.G. Wells. 2005. Surface control of desert pavement pedologic process and landscape function, Cima Volcanic field, Mojave Desert, California	Soil Water	Bowles/Campbell
485	2008	Julianne J. Miller, Todd G. Caldwell, Michael H. Young, and Graham K. Dalldorf (2008) Verifying Curve Numbers in Arid Environments by Combining Detailed Geomorphic Mapping and Pedotransfer Functions	Soil Water	Bowles/Campbell
486	2009	Young & Chen. (2009) "Soil Heterogeneity and Moisture Distribution Due to Rainfall Events in Vegetated Desert Areas: Potential Impact on Soil Recharge and Ecosystems Annual Report 2009"	Soil Water	Bowles/Campbell
487	2007	Jon D. Pelletier, Michael Cline, Stephen B. DeLong (2007) Desert pavement dynamics: numerical modeling and field-based calibration	Soil Water	Bowles/Campbell
488		An Introduction to Biological Soil Crusts, accessed 5/10/10 at www.soilcrust.org	Soil Water	Bowles/Campbell
489	2005	James R. Angel, Michael A. Palecki, Steven E. Hollinger. (2005) Storm Precipitation in the United States. Part II: Soil Erosion Characteristics	Soil Water	Bowles/Campbell
490	2004	F. Gonzalez-Bonrino, W.R. Osterkamp (2004) Applying RUSLE 2.0 on burned-forest lands: An appraisal	Soil Water	Bowles/Campbell
491	2009	Li Chen, Jun Yin, Julianne Miller, Michael Young (2009) The Role of the Clast Layer of Desert pavement in Rainfall-Runoff Processes	Soil Water	Bowles/Campbell
492	2006	Peter R. Griffiths, Richard Hereford, Robert H. Webb (2006) Sediment yield and runoff frequency of small drainage basins in the Mojave Desert, U.S.A.	Soil Water	Bowles/Campbell
493	3/26/10	Draft Programmatic Agreement – Imperial Valley Solar Project	Cultural	Janet M. Laurain
494	5/7/09	CURE Comments on the Draft Programmatic Agreement	Cultural	Janet M. Laurain
495		National Register Bulletin, Guidelines for Evaluating and Documenting Historic Aids to Navigation to the National Register of Historic Places	Cultural	Janet M. Laurain
496		Letter from the National Park Service to the Energy Commission and BLM commenting	Cultural	Janet M. Laurain

		on The Staff Assessment/Draft Environmental Impact Statement		
497	5/4/10	Letter from Quechan Indian Tribe, Ft. Yuma Indian Reservation, to Carrie Simmons, Bureau of Land Management commenting on the Draft Programmatic Agreement	Cultural	Janet M. Laurain
498-A	5/17/10	Rebuttal Testimony of Scott Cashen on Behalf of California Unions for Reliable Energy on Biological Resources for the Imperial Valley Solar Project	Biology	Scott Cashen
498-B		Cashen Declaration	Biology	Scott Cashen
498-C		Cashen comment letter to Army Corps	Biology	Scott Cashen
498-D		Manci KM, DN Gladwin, R Villella, MG Cavendish. 1988. Effects of aircraft noise and sonic booms on domestic animals and wildlife: a literature synthesis. National Ecology Research Center Report # NERC-88/29	Biology	Scott Cashen
498-E		ICC Meeting Minutes	Biology	Scott Cashen
498-F	2010	Western Regional Climate Center [internet]. 2010. Period of Record Monthly Climate Summary, El Centro 2 SSW, California. Available at: http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca2713	Biology	Scott Cashen
498-G	2003	Department of Fish and Game. List of California Terrestrial Natural Communities Recognized by The California Natural Diversity Database. September 2003 edition.	Biology	Scott Cashen
498-H	2001	Okin GS, B Murray, WH Schlesinger. 2001. Degradation of sandy arid shrubland environments: observations, process modeling, and management implications. Journal of Arid Environments Vol. 47, No. 2, pp. 123–144	Biology	Scott Cashen
498-I		US Gypsum Final EIR/EIS, p. 3.3-42	Biology	Scott Cashen
498-J	5/12/10	USEPA letter to USACE (5/12/10) re Public Notice (PN) SPL-2008-01244-MLM for the proposed Imperial Valley Solar Project, Tessera Solar North America, Imperial County, California	Biology	Scott Cashen
498-K		Travis Huxman, UA Biosphere 2 and B2 Earthscience, Associate Professor, Ecology and Evolutionary Biology, University of Arizon, Tucson, Arizona: Climate Change and the Sonoran Desert	Biology	Scott Cashen
498-L	5/28/09	CURE letter addressed to Christopher Meyer and Jim Stobaugh (5/28/09) re Biological Resource Survey Techniques for the Solar Two Project	Biology	Scott Cashen
498-M		Monthly Precipitation, El Centro 2 SSW, California	Biology	Scott Cashen
498-N		EPA: Sole Source Aquifer Designations in EPA, Region 9	Biology	Scott Cashen
498-O		Ground-Water Resources, Ocotillo-coyote Wells Basin, Calif.	Biology	Scott Cashen
498-P		U.S. Geological Survey Water-Resources Investigations 77-30: Digital-Model Evaluation of the Ground-Water Resources in the Ocotillo-Coyote Wells Basin, Imperial	Biology	Scott Cashen

		County, California		
498-Q	5/17/20	Rebuttal Testimony of Dr. Vernon C. Bleich on Behalf of California Unions for Reliable Energy on Biological Resources for the Imperial Valley Solar Project	Biology	Vernon C. Bleich
498-R		Bleich Declaration	Biology	Vernon C. Bleich
498-S	5/13/10	S. Torres email	Biology	Vernon C. Bleich
498-T	5/14/10	R. Botta email	Biology	Vernon C. Bleich
498-U	5/11/10	Felicia Sirchia email	Biology	Vernon C. Bleich
498-V	5/17/10	Testimony of Bridget Nash-Chrabascz on Cultural Resources for the Imperial Valley Solar Project	Cultural	B. Nash-Chrabascz
498-W	5/17/10	Nash-Chrabascz Declaration	Cultural	B. Nash-Chrabascz
498-X		Nash-Chrabascz C.V.	Cultural	B. Nash-Chrabascz
498-Y	5/17/10	Quechan Indian Tribe Comments on Staff Assessment/Draft Environmental Impact Statement, May 17, 2010	Cultural	B. Nash-Chrabascz
498-Z		Comment letters on Draft Programmatic Agreement for Imperial Valley Solar Project from consulting parties	Cultural	B. Nash-Chrabascz
499-A	5/17/10	Rebuttal Testimony of Dr. Christopher Bowles and Christopher Campbell on Behalf of California Unions for Reliable Energy on Soil and Water Resources for the Imperial Valley Solar Project	Soil/Water	Bowles/Campbell
499-B		Bowles/Campbell Declaration	Soil/Water	Bowles/Campbell
499-C	5/15/10	Grismer, M.E., M. Orang, R. Snyder, and R. Matyac. 2002. Pan evaporation to reference evapotranspiration conversion methods. *Journal of Irrigation and Drainage Engineering* 128(3):180-184	Soil/Water	Bowles/Campbell
499-D	4/05	Coleman, MacRae and Stein, Effect of Increases in Peak Flows and Imperviousness on the Morphology of Southern California Streams, April 2005	Soil/Water	Bowles/Campbell
499-E	5/17/10	Janet Laurain Declaration with comment letter from Center for Biological Diversity of the USACE dated 5/11/10	Soil/Water	Janet M. Laurain
499-F	**7/21/10**	**Additional Rebuttal Testimony of Dr. Vernon Bleich on Behalf of California Unions for Reliable Energy on Biological Resources for the Imperial Valley Solar Project**	**Biology**	**Vernon C. Bleich**
499-G	**7/21/10**	**Bleich Declaration**	**Biology**	**Vernon C. Bleich**
499-H	**2010**	**Epps, C. W., J. D. Wehausen, P. J. Palsbøll, and D. R. McCullough. 2005. Using genetic methods to describe and infer recent colonizations by desert bighorn sheep.**	**Biology**	**Vernon C. Bleich**
499-I	**7/21/10**	**Additional Rebuttal Testimony of Dr. Christopher Bowles and Christopher Campbell on Behalf of California Unions for Reliable Energy on Soil and Water Resources for the**	**Soil/Water**	**Bowles/Campbell**

		Imperial Valley Solar Project		
499-J	**7/21/10**	**Bowles/Campbell Declaration**	**Soil/Water**	**Bowles/Campbell**
499-K	**7/21/10**	**Additional Rebuttal Testimony of Scott Cashen on Behalf of California Unions for Reliable Energy on Biological Resources and Alternatives for the Imperial Valley Solar Project**	**Biology Alternatives**	**Scott Cashen**
499-L	**7/21/10**	**Cashen Declaration**	**Biology Alternatives**	**Scott Cashen**
499-M	**4/7/10**	**SDGE Advice Letter 2161-E re: 300 Mw Project**	**Alternatives**	**Scott Cashen**

STATE OF CALIFORNIA
California Energy Commission

In the Matter of: The Application for Certification for the IMPERIAL VALLEY SOLAR PROJECT	Docket No. 08-AFC-5

CALIFORNIA UNIONS FOR RELIABLE ENERGY
SECOND REVISED TOPIC EXHIBIT LIST

BIOLOGY				
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400	5/10/10	Opening Testimony of Dr. Vernon C. Bleich on Behalf of the California Unions for Reliable Energy on Biological Resources for the Imperial Valley Solar Project	Biology	Vernon C. Bleich
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405	6/17/09	Memo from Guy Wagner to Toni Parr dated 17 June 2009, with a subject line of Solar Two Map PBHS Map.ppt	Biology	Vernon C. Bleich
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407	2007	Epps, C. W., J. D. Wehausen, V. C. Bleich, S. G. Torres, and J. S. Brashares. 2007. Optimizing dispersal and corridor models using landscape genetics. Journal of Applied Ecology 44:714-724.	Biology	Vernon C. Bleich
408	1986	Schwartz, O. A., V. C. Bleich, and S. A. Holl. 1986. Genetics and the conservation of mountain sheep *Ovis canadensis nelsoni*. Biological Conservation 37:179-190.	Biology	Vernon C. Bleich
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429	5/10/10	Opening Testimony of Scott Cashen on Behalf of the California Unions for Reliable Energy on Biological Resources for the Imperial Valley Solar Project - Figure 1 – Map #1 of MA blockage - Figure 2 – Map #2 of MA blockage - Figure 3 – GOEA nesting habitat - Figure 4 – CDFTL map	Biology	Scott Cashen

		- Figure 5 – Pictures of sensitive communities - Figure 6 – SS plants near Seeley - Figure 7 – Yuha and W. Mesa MAS		
430	5/10/10	Cashen Declaration	Biology	Scott Cashen
431		Cashen C.V.	Biology	Scott Cashen
432		Calico Solar Project SA/DEIS	Biology	Scott Cashen
433		Calico Solar Project. Applicant's response to CURE data request 162	Biology	Scott Cashen
434		Energy Commission Staff's Rebuttal Testimony, Ivanpah Solar Electric Generating System	Biology	Scott Cashen
435		Final Staff Assessment, Ivanpah Solar Electric Generating System	Biology	Scott Cashen
436	3/12/10	Applicant's Comments on the SA/DEIS. Imperial Valley Solar (formerly solar Two) (08-AFC-5)	Biology	Scott Cashen
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447	2000	Okin GS, B Murray, WH Schlesinger. 2000. Degradation of sandy arid shrubland environments: observations, process modelling, and management implications. Journal of Arid Environments Vol. 47, No. 2	Biology	Scott Cashen
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466	2006	US Fish and Wildlife Service. 2006. Yuma Clapper Rail 5-Year Review.	Biology	Scott Cashen
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470	6/09	URS. 2009 Jun. Supplement to SES Solar Two Application for Certification. p. 2.6-1	Biology	Scott Cashen
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498-B		Cashen Declaration	Biology	
498-C		Cashen comment letter to Army Corps	Biology	
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498-E		ICC Meeting Minutes	Biology	
498-F	2010	Western Regional Climate Center [internet]. 2010. Period of Record Monthly Climate	Biology	

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498-G	2003	Department of Fish and Game. List of California Terrestrial Natural Communities Recognized by The California Natural Diversity Database. September 2003 edition.	Biology	
498-H	2001	Okin GS, B Murray, WH Schlesinger. 2001. Degradation of sandy arid shrubland environments: observations, process modeling, and management implications. Journal of Arid Environments Vol. 47, No. 2, pp. 123–144	Biology	
498-I		US Gypsum Final EIR/EIS, p. 3.3-42	Biology	
498-J	5/12/10	USEPA letter to USACE (5/12/10) re Public Notice (PN) SPL-2008-01244-MLM for the proposed Imperial Valley Solar Project, Tessera Solar North America, Imperial County, California	Biology	
498-K		Travis Huxman, UA Biosphere 2 and B2 Earthscience, Associate Professor, Ecology and Evolutionary Biology, University of Arizon, Tucson, Arizona: Climate Change and the Sonoran Desert	Biology	
498-L	5/28/09	CURE letter addressed to Christopher Meyer and Jim Stobaugh (5/28/09) re Biological Resource Survey Techniques for the Solar Two Project	Biology	
498-M		Monthly Precipitation, El Centro 2 SSW, California	Biology	
498-N		EPA: Sole Source Aquifer Designations in EPA, Region 9	Biology	
498-O		Ground-Water Resources, Ocotillo-coyote Wells Basin, Calif.	Biology	
498-P		U.S. Geological Survey Water-Resources Investigations 77-30: Digital-Model Evaluation of the Ground-Water Resources in the Ocotillo-Coyote Wells Basin, Imperial County, California	Biology	
498-Q	5/17/20	Rebuttal Testimony of Dr. Vernon C. Bleich on Behalf of California Unions for Reliable Energy on Biological Resources for the Imperial Valley Solar Project	Biology	
498-R		Bleich Declaration	Biology	
498-S	5/13/10	S. Torres email	Biology	
498-T	5/14/10	R. Botta email	Biology	
498-U	5/11/10	Felicia Sirchia email	Biology	
499-F	**7/21/10**	**Additional Rebuttal Testimony of Dr. Vernon C. Bleich on Behalf of California Unions for Reliable Energy on Biological Resources for the Imperial Valley Solar Project**	**Biology**	**Vernon C. Bleich**
499-G	**7/21/10**	**Bleich Declaration**	**Biology**	**Vernon C. Bleich**
499-H	**2010**	**Epps, C. W., J. D. Wehausen, P. J. Palsbøll, and D. R. McCullough. 2005. Using genetic**	**Biology**	**Vernon C. Bleich**

		methods to describe and infer recent colonizations by desert bighorn sheep.		
499-K	**7/21/10**	**Additional Rebuttal Testimony of Scott Cashen on Behalf of California Unions for Reliable Energy on Biological Resources and Alternatives for the Imperial Valley Solar Project**	**Biology**	**Scott Cashen**
499-L	**7/21/10**	**Cashen Declaration**	**Biology**	**Scott Cashen**

	SOIL/WATER			
478	5/10/10	Opening Testimony of Dr. Chris Bowles and Chris Campbell on Behalf of California Unions for Reliable Energy on Soil and Water Resources for the Imperial Valley Solar Project - Figure 1 – 100-year discharge comparison - Figure 2 – 6-hour temporal rainfall distributions	Soil Water	Chris Bowles Chris Campbell ("Bowles/Campbell")
479	5/7/10	Bowles Declaration	Soil Water	Chris Bowles
480	5/17/10	Campbell Declaration	Soil Water	Chris Campbell
481		Christopher Bowles, Ph.D., C.V.	Soil Water	Chris Bowles
482		Christopher Campbell, M.S., C.V.	Soil Water	Chris Campbell
483	10/2006	California Department of Water Resources, California Department of Fish and Game (October 2006), Salton Sea Ecosystem Restoration Program, Draft Programmatic Environmental Impact Report, Volume I: PEIR, Hydrology chapter	Soil Water	Bowles/Campbell
484	2005	Y.A. Wood, R.C. Graham, S.G. Wells. 2005. Surface control of desert pavement pedologic process and landscape function, Cima Volcanic field, Mojave Desert, California	Soil Water	Bowles/Campbell
485	2008	Julianne J. Miller, Todd G. Caldwell, Michael H. Young, and Graham K. Dalldorf (2008) Verifying Curve Numbers in Arid Environments by Combining Detailed Geomorphic Mapping and Pedotransfer Functions	Soil Water	Bowles/Campbell
486	2009	Young & Chen. (2009) "Soil Heterogeneity and Moisture Distribution Due to Rainfall Events in Vegetated Desert Areas: Potential Impact on Soil Recharge and Ecosystems	Soil Water	Bowles/Campbell

		Annual Report 2009"		
487	2007	Jon D. Pelletier, Michael Cline, Stephen B. DeLong (2007) Desert pavement dynamics: numerical modeling and field-based calibration	Soil Water	Bowles/Campbell
488		An Introduction to Biological Soil Crusts, accessed 5/10/10 at www.soilcrust.org	Soil Water	Bowles/Campbell
489	2005	James R. Angel, Michael A. Palecki, Steven E. Hollinger. (2005) Storm Precipitation in the United States. Part II: Soil Erosion Characteristics	Soil Water	Bowles/Campbell
490	2004	F. Gonzalez-Bonrino, W.R. Osterkamp (2004) Applying RUSLE 2.0 on burned-forest lands: An appraisal	Soil Water	Bowles/Campbell
491	2009	Li Chen, Jun Yin, Julianne Miller, Michael Young (2009) The Role of the Clast Layer of Desert pavement in Rainfall-Runoff Processes	Soil Water	Bowles/Campbell
492	2006	Peter R. Griffiths, Richard Hereford, Robert H. Webb (2006) Sediment yield and runoff frequency of small drainage basins in the Mojave Desert, U.S.A.	Soil Water	Bowles/Campbell
499-A	5/17/10	Rebuttal Testimony of Dr. Christopher Bowles and Christopher Campbell on Behalf of California Unions for Reliable Energy on Soil and Water Resources for the Imperial Valley Solar Project	Soil/Water	Bowles/Campbell
499-B		Bowles/Campbell Declaration	Soil/Water	Bowles/Campbell
499-C	5/15/10	Grismer, M.E., M. Orang, R. Snyder, and R. Matyac. 2002. Pan evaporation to reference evapotranspiration conversion methods. *Journal of Irrigation and Drainage Engineering* 128(3):180-184	Soil/Water	Bowles/Campbell
499-D	4/05	Coleman, MacRae and Stein, Effect of Increases in Peak Flows and Imperviousness on the Morphology of Southern California Streams, April 2005	Soil/Water	Bowles/Campbell
499-E	5/17/10	Janet Laurain Declaration with comment letter from Center for Biological Diversity of the USACE dated 5/11/10	Soil/Water	Janet M. Laurain
499-I	**7/21/10**	**Additional Rebuttal Testimony of Dr. Christopher Bowles and Christopher Campbell on Behalf of California Unions for Reliable Energy on Soil and Water Resources for the Imperial Valley Solar Project**	**Soil/Water**	**Bowles/Campbell**
499-J	**7/21/10**	**Bowles/Campell Declaration**	**Soil/Water**	**Bowles/Campbell**

CULTRURAL				
493	3/26/10	Draft Programmatic Agreement – Imperial Valley Solar Project	Cultural	Janet M. Laurain
494	5/7/09	CURE Comments on the Draft Programmatic Agreement	Cultural	Janet M. Laurain
495		National Register Bulletin, Guidelines for Evaluating and Documenting Historic Aids to Navigation to the National Register of Historic Places	Cultural	Janet M. Laurain
496		Letter from the National Park Service to the Energy Commission and BLM commenting on The Staff Assessment/Draft Environmental Impact Statement	Cultural	Janet M. Laurain
497	5/4/10	Letter from Quechan Indian Tribe, Ft. Yuma Indian Reservation, to Carrie Simmons, Bureau of Land Management commenting on the Draft Programmatic Agreement	Cultural	Janet M. Laurain
498-V	5/17/10	Testimony of Bridget Nash-Chrabascz on Cultural Resources for the Imperial Valley Solar Project	Cultural	B. Nash-Chrabascz
498-W	5/17/10	Nash-Chrabascz Declaration	Cultural	B. Nash-Chrabascz
498-X		Nash-Chrabascz C.V.	Cultural	B. Nash-Chrabascz
498-Y	5/17/10	Quechan Indian Tribe Comments on Staff Assessment/Draft Environmental Impact Statement, May 17, 2010	Cultural	B. Nash-Chrabascz
498-Z		Comment letters on Draft Programmatic Agreement for Imperial Valley Solar Project from consulting parties	Cultural	B. Nash-Chrabascz
ALTERNATIVES				
499-K	**7/21/10**	**Additional Rebuttal Testimony of Scott Cashen on Behalf of California Unions for Reliable Energy on Biological Resources and Alternatives for the Imperial Valley Solar Project**	**Alternatives**	**Scott Cashen**
499-L	**7/21/10**	**Cashen Declaration**	**Alternatives**	**Scott Cashen**
499-M	**4/7/10**	**SDGE Advice Letter 2161-E re: 300 Mw Project**	**Alternatives**	**Scott Cashen**

EXHIBIT 499-F

STATE OF CALIFORNIA
California Energy Commission

In the Matter of: The Application for Certification for the **IMPERIAL VALLEY SOLAR PROJECT**	Docket No. 08-AFC-5

ADDITIONAL REBUTTAL TESTIMONY OF DR. VERNON BLEICH ON BEHALF OF CALIFORNIA UNIONS FOR RELIABLE ENERGY ON BIOLOGICAL RESOURCES FOR THE IMPERIAL VALLEY SOLAR PROJECT

July 21, 2010

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I. Introduction

The Supplemental Staff Assessment for the Imperial Valley Solar Project (SSA) recognizes the potential for the project to impact foraging habitat for peninsular bighorn sheep (PBHS), and requires a formal Section 7 consultation with the U.S. Fish and Wildlife Service.[1] This is a positive departure from the Staff Assessment that concluded the project is not likely to adversely affect peninsular bighorn sheep. This change is due in part to biologists from the California Department of Fish and Game (CDFG) and Bureau of Land Management (BLM) concurring with my testimony that evidence was inadequate to prove that PBHS would not be impacted by the loss of foraging habitat.[2]

Unfortunately, the SSA also concludes that evidence that the project would disrupt a potential movement corridor for PBHS in the vicinity of the site is speculative, and is based on an absence of radiotelemetry data, "... that shows no evidence of long-distance movements of BHS (bighorn sheep) across the site."[3] It is my professional opinion that an absence of contemporary evidence confirming long-distance movements across the project site does nothing to denigrate the potential importance of the project site as part of a movement corridor used by bighorn sheep. Moreover, use of the area in the past cannot be known and, therefore, cannot simply be dismissed as having never occurred. Thus, the potential importance of project development to the ecology of PBHS in the vicinity of the project cannot simply be dismissed as unimportant to sheep today or for the recovery of the sheep in the future. Moreover, the presence of PBHS moving through the Project site[4] strongly suggests that the site functions as a movement corridor.

II. The SSA fails to acknowledge the potential for the project to impact long-distance movements by peninsular bighorn sheep

The SSA acknowledges that any potential movement through the Project site by PBHS will be impeded due to perimeter fencing around the project site, but concludes that bighorn sheep have not been documented to utilize the project site as a movement corridor.[5] Thus, Staff erroneously conclude that impacts to a movement corridor for BHS through the project site are speculative and considered "... to be less than significant level [sic]."[6] This conclusion is based, in part, on a lack of telemetry data or road-kills in the vicinity of the project site, as well as proximity of the project site to flat terrain and the Yuha desert.

The rationale for concluding that the project site and associated perimeter fencing will not impact bighorn sheep movement is flawed for several reasons. Movement corridors do not simply represent narrow corridors through which bighorn sheep and

[1] Imperial Valley Solar Project Supplemental Staff Assessment, pages ES-15 and ES-21, and others.
[2] Imperial Valley Solar Project Supplemental Staff Assessment, page ES-21.
[3] Imperial Valley Solar Project Supplemental Staff Assessment, page ES-21 and ES-30, and others.
[4] SES Solar Two LLC, Response to CURE Data Request 158, Set Two, 08-AFC-5.
[5] Imperial Valley Solar Project Supplemental Staff Assessment, page ES-30.
[6] Imperial Valley Solar Project Supplemental Staff Assessment, page ES-30.

other wildlife restrict their movements but, instead, are those intermountain areas that separate individual mountain ranges or portions of very large mountain ranges.[7] Without citing any support, the original SA concluded that the site "… does not provide any corridor to other habitat that would support Peninsular bighorn sheep [PBHS]."[8] As a result, the SA did not analyze the likely potential that PBHS observed on the project site were moving from permanently occupied areas to other permanently or seasonally occupied areas. Unfortunately, the SSA replicates that egregious error.[9] My testimony explains why Staff's conclusion that fencing of the project site would not significantly impact bighorn sheep in the absence of "road kills and telemetry data"[10] is based upon factual assumptions that are not supported by any evidence and are not likely to be correct. I believe that a correctly prepared Section 7 consultation will prove that the project site is located within a potential movement corridor that, if protected, could support the recovery of the endangered distinct population segment. The potentially significant impact to this corridor should be acknowledged and mitigated.

As noted in my previous testimony, PBHS occupy a number of areas surrounding the project site including (a) the area known as the Coyote Mountains immediately west of the project site and north of Interstate Highway 8, which supports a population of between 45 and 60 individuals;[11] (b) the Fish Creek Mountains immediately north of the project site that are occupied by PBHS on at least a seasonal basis;[12] [13] (c) the Sierra Juarez,[14] located immediately south of the Jacumba Mountains near the project site; (d) the Sierra Cucapa,[15] located immediately southeast of the project site; and (e) a portion of the Jacumba Mountains immediately south of Interstate 8.[16] PBHS are also known to use the Interstate Highway 8 "island" between the northbound (westbound) and southbound (eastbound) lanes of that heavily traveled route.[17] These mountainous areas have been designated as the Carrizo Mountains/Tierra Blanca Mountains/Coyote Mountains Recovery Area[18] (henceforth referred to as the CTCRA) in the Recovery Plan for PBHS in the Peninsular Ranges.[19] The project site may be part of an important movement corridor in this Recovery Area.

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[7] Bleich, V. C. 2005. Politics, promises, and illogical legislation confound wildlife conservation. Wildlife Society Bulletin 33:66-73.
[8] Imperial Valley Solar Project Staff Assessment, Page ES-21.
[9] Imperial Valley Solar Project Supplemental Staff Assessment, Page C-2-6.
[10] Imperial Valley Solar Project Supplemental Staff Assessment, page ES-30.
[11] R. Botta, California Department of Fish and Game, personal communication on 24 March 2010.
[12] R. Botta, California Department of Fish and Game, personal communication on 24 March 2010.
[13] M. Jorgensen, California Department of Parks and Recreation (retired), personal communication on 23 March 2010.
[14] DeForge, J. R., S. D. Ostermann, D. E. Toweill, P. E. Cyrog, and E. M. Barrett. 1993. Helicopter survey of peninsular bighorn sheep in northern Baja California. Desert Bighorn Council Transactions 37:24-28.
[15] DeForge, J. R., S. D. Ostermann, D. E. Toweill, P. E. Cyrog, and E. M. Barrett. 1993. Helicopter survey of peninsular bighorn sheep in northern Baja California. Desert Bighorn Council Transactions 37:24-28.
[16] R. Botta, California Department of Fish and Game, personal communication on 24 March 2010.
[17] R. Botta, California Department of Fish and Game, personal communication on 24 March 2010.
[18] U.S. Fish and Wildlife Service. 2000. Recovery plan for bighorn sheep in the peninsular ranges, California.
[19] Note that the Sierra Juarez and the Sierra Cucapa are not a part of the CTCRA.

As I stated in my opening testimony, the conclusions presented in the SA, that "[t]he site is several miles from designated critical habitat and does not provide any corridor to other habitat that would support Peninsular bighorn sheep" are not supported by the literature on this topic.[20] My testimony – that bighorn sheep moving between occupied areas, or even from occupied areas into unoccupied areas, are capable of moving long distances, and that such movements and, in fact, colonization events, may occur more frequently than previously recognized – has not been rebutted.[21] [22] [23] Moreover, my testimony on the value of intermountain areas like the project site to metapopulation function and, in turn, population persistence, was not rebutted in the SSA.[24] [25] [26] [27] Finally, the SSA did not rebut my opinion that it was significant that the sheep photographed on the Project site were female; because female bighorn sheep are inherently conservative in their behavior and are slow to colonize vacant areas,[28] the presence of female PBHS on the project site suggests those sheep were *moving* from one area to another within the CTCRA.

The SSA responds to my testimony regarding a potential movement corridor on the site by pointing to the absence of data supporting a movement corridor:

> "The potential for the loss of movement corridors through the site is speculative based on a lack of radiotelemetry data in the vicinity of the site that shows no evidence of long distance movements of BHS across the site (Guy Wagner, personal communication)."[29]

That sentence is difficult to interpret because of the double negative (absence of radiotelemetry data; no evidence). This wording makes it sound as though an absence of radiotelemetry data demonstrates that long distance movements of PBHS across the site has never occurred. Nevertheless, the basis for the conclusion is attributed to Dr. Wagner at the US Fish and Wildlife Service, but the conclusion may have been misconstrued. Dr. Wagner's statement appears to have been simply an acknowledgment of the potential for

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[20] Staff Assessment, SES Solar Two Project, Page ES-21.
[21] Bleich, V. C., J. D. Wehausen, and S. A. Holl. 1990. Desert-dwelling mountain sheep: conservation implications of a naturally fragmented distribution. Conservation Biology 4:383-390.
[22] Epps, C. W., J. D. Wehausen, V. C. Bleich, S. G. Torres, and J. S. Brashares. 2007. Optimizing dispersal and corridor models using landscape genetics. Journal of Applied Ecology 44:714-724.
[23] Epps, C. W., J. D. Wehausen, P. J. Palsboll, and D. R. McCullough. 2010. Using genetic tools to track desert bighorn sheep colonizations. Journal of Wildlife Management 74:522-531.
[24] Schwartz, O. A., V. C. Bleich, and S. A. Holl. 1986. Genetics and the conservation of mountain sheep *Ovis canadensis nelsoni*. Biological Conservation 37:179-190.
[25] Bleich, V. C., J. D. Wehausen, and S. A. Holl. 1990. Desert-dwelling mountain sheep: conservation implications of a naturally fragmented distribution. Conservation Biology 4:383-390.
[26] Bleich, V. C., J. D. Wehausen, R. R. Ramey II, and J. L. Rechel. 1996. Metapopulation theory and mountain sheep: implications for conservation. Pages 353-373 in D. R. McCullough (editor). Metapopulations and wildlife conservation. Island Press, Covelo, California.
[27] Bleich, V. C. 2005. Politics, promises, and illogical legislation confound wildlife conservation. Wildlife Society Bulletin 33:66-73.
[28] Bleich, V. C., J. D. Wehausen, R. R. Ramey II, and J. L. Rechel. 1996. Metapopulation theory and mountain sheep: implications for conservation. Pages 353-373 in D. R. McCullough (editor). Metapopulations and wildlife conservation. Island Press, Covelo, California.
[29] Imperial Valley Solar Project Supplemental Staff Assessment, Page C-2-6.

a movement corridor to be disrupted or blocked. I have been able to confirm the latter interpretation (i.e., that Dr. Wagner actually was acknowledging that use of the area for movement by bighorn sheep was, *in the absence of telemetry data, speculative*), but that he did not rule out concerns about the potential impacts of the project to connectivity within the CTCRA.[30] Moreover, Mr. Randy Botta, area biologist for the California Department of Fish and Game, reiterated his concern that the area could be important as a movement corridor, and that the absence of telemetry data should not negate concern over potential impacts.[31]

No additional information is included in the SSA to demonstrate that there is little potential for the area to serve as a movement corridor to substantiate the claim that the project site is not potentially important to the conservation of bighorn sheep in the CTCRA, or that project implementation would not impact the potential for movement through the area by bighorn sheep occupying more stereotypical bighorn sheep habitat. In fact, Dr. Wagner noted, after reading the conclusions of Epps et al.,[32] that the issues related to disruption of movement opportunities for bighorn sheep in the peninsular ranges led him to believe that there is the potential for more of an impact than was acknowledged in the SA.[33]

Reasons that telemetered bighorn sheep have not been detected on the project site are numerous and complex. Until October 2009, there have been very few bighorn sheep telemetered in the vicinity of the project site, yet the number of bighorn sheep that occur in that geographic area (specifically the Coyote Mountains) on at least a seasonal basis is estimated to be between 45 and 60;[34] hence, the probability of detecting movements through the project site by animals from the closest subpopulation of bighorn sheep has been very remote. As noted in my previous testimony, bighorn sheep are extremely conservative in their behavior and, although there is increasing evidence that those large mammals move more often and, perhaps, over longer distances than previously recognized,[35] [36] [37] [38] such movements would still be expected to occur infrequently at most. Additionally, the stimulus (or stimuli) for bighorn sheep to traverse large areas of

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[30] R. Botta, California Department of Fish and Game, personal communication on 16 July 2010.
[31] R. Botta, California Department of Fish and Game, personal communication on 16 July 2010.
[32] Epps, C. W., J. D. Wehausen, V. C. Bleich, S. G. Torres, and J. S. Brashares. 2007. Optimizing dispersal and corridor models using landscape genetics. Journal of Applied Ecology 44:714-724.
[33] Telephone conversation with Dr. Guy Wagner, USFWS, on 24 May 2010.
[34] Telephone conversation with Mr. Randy Botta, California Department of Fish and Game, 24 March 2010.
[35] Bleich, V. C., J. D. Wehausen, R. R. Ramey II, and J. L. Rechel. 1996. Metapopulation theory and mountain sheep: implications for conservation. Pages 353-373 in D. R. McCullough (editor). Metapopulations and wildlife conservation. Island Press, Covelo, California.
[36] Epps, C. W., J. D. Wehausen, V. C. Bleich, S. G. Torres, and J. S. Brashares. 2007. Optimizing dispersal and corridor models using landscape genetics. Journal of Applied Ecology 44:714-724.
[37] Epps, C. W., J. D. Wehausen, P. J. Palsbøll, and D. R. McCullough. 2005. Using genetic methods to describe and infer recent colonizations by desert bighorn sheep. Pp. 51-62 in Goerrissen, J., and J. M. Andre, editors. Symposium Proceedings for the Sweeney Granite Mountains Desert Research Center 1978-2003: A quarter century of research and teaching. University of California, Riverside.
[38] Epps, C. W., J. D. Wehausen, P. J. Palsboll, and D. R. McCullough. 2010. Using genetic tools to track desert bighorn sheep colonizations. Journal of Wildlife Management 74:522-531.

non-traditional habitat may not have been present since the deployment of additional telemetry collars (i.e., environmental conditions did not favor dispersal or movement). Moreover, the population likely had not yet recovered to a level to favor dispersal or movement through the project site. Finally, the absence of contemporary hard evidence (i.e., telemetry data) that PBHS have moved through the project site and that the Project would block a movement corridor does not negate the potential for sheep to have done so in the past, or to do so in the future.

In addition to the issues raised above, the logic behind the unsubstantiated conclusion that the project site is not part of a movement corridor for bighorn sheep in the CTCRA is flawed. Bighorn sheep reported on the project site during March, 2009 were described as moving and "... following the wash in a northwest to southeast direction" and a conclusion was reached that fencing of the project site "... will likely preclude *the apparent transitory use of the proposed developed portions of the site by PBHS* [peninsular bighorn sheep]."[39]

It is important to note that the presence of bighorn sheep on the project site on 25 March 2009 was noted in the SA as a "transitory" movement,[40] a description that was further emphasized by the Project Applicant in their conclusion that, "*Use of the site is likely to be transitory*."[41] Such transitory movements across, or through, non-stereotypical bighorn sheep habitat that consists largely of desert flats [and associated washes] are necessary to maintain connectivity among more typical areas occupied by bighorn sheep,[42] and the value of intermountain areas (like the site on which the project is proposed to be built) to metapopulation function and, in turn, metapopulation persistence, has been repeatedly emphasized in the literature.[43,44,45,46] Further, as mentioned, the PBHS photographed on the project site were female, and female bighorn sheep are inherently conservative in their behavior and are slow to colonize vacant areas,[47] so the presence of female PBHS on the project site suggests those sheep were moving from one area to another within the CTCRA. Bighorn sheep sign was again observed near the project site on 10 January 2010,[48] providing additional evidence that the area is traversed

[39] SES Solar Two LLC, Response to CURE Data Request 158, Set Two, 08-AFC-5; *emphasis added*.
[40] SES Solar Two LLC, Response to CURE Data Request 158, Set Two, 08-AFC-5.
[41] SES Solar Two LLC, Response to CURE Data Request 143, Set One, 08-AFC-5; *emphasis added*.
[42] Bleich, V. C. 2005. Politics, promises, and illogical legislation confound wildlife conservation. Wildlife Society Bulletin 33:66-73.
[43] Schwartz, O. A., V. C. Bleich, and S. A. Holl. 1986. Genetics and the conservation of mountain sheep *Ovis canadensis nelsoni*. Biological Conservation 37:179-190.
[44] Bleich, V. C., J. D. Wehausen, and S. A. Holl. 1990. Desert-dwelling mountain sheep: conservation implications of a naturally fragmented distribution. Conservation Biology 4:383-390.
[45] Bleich, V. C., J. D. Wehausen, R. R. Ramey II, and J. L. Rechel. 1996. Metapopulation theory and mountain sheep: implications for conservation. Pages 353-373 in D. R. McCullough (editor). Metapopulations and wildlife conservation. Island Press, Covelo, California.
[46] Bleich, V. C. 2005. Politics, promises, and illogical legislation confound wildlife conservation. Wildlife Society Bulletin 33:66-73.
[47] Bleich, V. C., J. D. Wehausen, R. R. Ramey II, and J. L. Rechel. 1996. Metapopulation theory and mountain sheep: implications for conservation. Pages 353-373 in D. R. McCullough (editor). Metapopulations and wildlife conservation. Island Press, Covelo, California.
[48] Imperial Valley Solar Project Supplemental Staff Assessment, Page C-2-123.

by bighorn sheep that may be moving through the project site and contributing to metapopulation function within the CTCRA. Thus, the project site provides a potentially important source of forage for bighorn sheep,[49] and movement through the area may be more frequent than acknowledged in the SSA.

It is also important to emphasize that maintenance of genetic diversity within subpopulations that comprise metapopulations of bighorn sheep occurs as a result of *transitory movements*, and that the rate of gene flow necessary to preclude declines in genetic diversity is exceedingly low.[50] Moreover, *transitory movements* from occupied stereotypical bighorn sheep habitat to areas of unoccupied, but stereotypical, bighorn sheep habitat are necessary for colonization of unoccupied habitat to occur,[51] [52] and such movements have resulted in a number of recent colonization events in California.[53] [54] These events are important to the recovery of this endangered distinct population segment. Or in the inverse, without these events, this endangered distinct population segment may not recover.

Metapopulation persistence is a function of colonization and extinction processes,[55] both of which occur as a result of multiple factors. Metapopulation persistence is dependent upon the colonization rate being greater than the extinction rate among subpopulations comprising the metapopulation,[56] as well as the number of habitat patches that are available for colonization.[57] Thus, fencing of the project site has ramifications for metapopulation function because of its potential to disrupt opportunities for "*transitory*"[58] [59] use of the project site by bighorn sheep within the CTCRA. This potential substantiates the necessity of a formal Section 7 consultation with the U.S. Fish and Wildlife Service, rather than simple dismissal of the potential for impacts to occur based on the spurious arguments that radiotelemetered bighorn sheep have not been detected moving through the project site and no road-killed bighorn sheep have been

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[49] Imperial Valley Solar Project Supplemental Staff Assessment, pages ES-15 and ES-21, and others.
[50] Schwartz, O. A., V. C. Bleich, and S. A. Holl. 1986. Genetics and the conservation of mountain sheep *Ovis canadensis nelsoni*. Biological Conservation 37:179-190.
[51] Bleich, V. C., J. D. Wehausen, and S. A. Holl. 1990. Desert-dwelling mountain sheep: conservation implications of a naturally fragmented distribution. Conservation Biology 4:383-390.
[52] Bleich, V. C., J. D. Wehausen, R. R. Ramey II, and J. L. Rechel. 1996. Metapopulation theory and mountain sheep: implications for conservation. Pages 353-373 in D. R. McCullough (editor). Metapopulations and wildlife conservation. Island Press, Covelo, California.
[53] Epps, C. W., J. D. Wehausen, P. J. Palsbøll, and D. R. McCullough. 2005. Using genetic methods to describe and infer recent colonizations by desert bighorn sheep. Pp. 51-62 in Goerrissen, J., and J. M. Andre, editors. Symposium Proceedings for the Sweeney Granite Mountains Desert Research Center 1978-2003: A quarter century of research and teaching. University of California, Riverside.
[54] Epps, C. W., J. D. Wehausen, P. J. Palsboll, and D. R. McCullough. 2010. Using genetic tools to track desert bighorn sheep colonizations. Journal of Wildlife Management 74:522-531.
[55] Hanski, I. 1989. Metapopulaton dynamics: does it help to have more of the same? Trends in Ecology and Evolution 4(4):113-114.
[56] Hanski, I., and M. Gilpin. 1991. Metapopulation dynamics: brief history and conceptual domain. Biological Journal of the Linnean Society 42:3-16.
[57] Hanski, I. 1989. Metapopulaton dynamics: does it help to have more of the same? Trends in Ecology and Evolution 4(4):113-114.
[58] SES Solar Two LLC, Response to CURE Data Request 158, Set Two, 08-AFC-5; *emphasis added*.
[59] SES Solar Two LLC, Response to CURE Data Request 143, Set One, 08-AFC-5; *emphasis added*.

recovered in the vicinity of the project site.[60] During a recent conversation, a representative from the California Department of Fish and Game reiterated his opinion to me that a formal Section 7 consultation regarding the potential for the proposed project to disrupt connectivity would be appropriate and should occur.[61] In the absence of such consultation, it is my contention that the potential for connectivity to be disrupted by the proposed project will not be fully assessed, and project implementation would occur in the absence of appropriate mitigation.

In the absence of certainty that project implementation will not disrupt connectivity among subpopulations that comprise the metapopulation of bighorn sheep in the CTCRA and nearby areas, thereby impacting metapopulation function and, potentially, metapopulation persistence and slowing the recover effort for this endangered population segment of bighorn sheep, it is always better to err on the conservative side of such issues. Rigorous application of the precautionary principle is warranted in this situation: in the absence of scientific consensus that the proposed action is harmful, the burden of proof that it is *not* harmful falls on those taking the action.[62] Thus, application of the precautionary principle dictates, at a minimum, that a formal Section 7 consultation is necessary before the full impacts of the proposed project can be fully evaluated.

III. Failure to adequately mitigate for project impacts to connectivity

As emphasized above, the SSA has inadequately considered the development of the project in terms of its potential to impact connectivity within the CTCRA. By relying on an absence of movement data[63] through the project site by bighorn sheep, Staff has erroneously concluded that bighorn sheep do not use the site for a movement corridor and would not do so in the future. Therefore, Staff does not consider mitigation for this impact to be necessary.

As explained in Section II, above, there have been very few telemetry collars deployed on bighorn sheep until recently and, even now, only a small proportion of the total number of bighorn sheep inhabiting the CTCRA are marked. Moreover, no bighorn sheep are marked south of the international border, and bighorn sheep are as capable of moving northward toward to the project site from the Sierra Juarez or the Sierra Cucapa as they are of moving northward from the Jacumba Mountains, eastward from the Coyote Mountains, or southward from the Fish Creek Mountains. There is an almost zero likelihood of detecting movements among uncollared bighorn sheep, and the frequency of movement by collared bighorn sheep is exceedingly low, but consistent with the conservative behavior of those ungulates.[64]

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[60] Imperial Valley Solar Project Supplemental Staff Assessment, page ES-30.
[61] R. Botta, California Department of Fish and Game, personal communication on 16 July 2010.
[62] http://en.wikipedia.org/wiki/Precautionary_principle.
[63] Imperial Valley Solar Project Supplemental Staff Assessment, Page C.2-72.
[64] Bleich, V. C., J. D. Wehausen, R. R. Ramey II, and J. L. Rechel. 1996. Metapopulation theory and mountain sheep: implications for conservation. Pages 353-373 in D. R. McCullough (editor). Metapopulations and wildlife conservation. Island Press, Covelo, California.

To argue that movement is unlikely because of the failure to detect movements to date is clearly inappropriate, and to ignore the potential importance of such movements in the maintenance of metapopulation dynamics[65] [66] is unfortunate. Only very low rates of movement are necessary to maintain connectivity, and Staff unfortunately has failed to acknowledge the significance of the potential impact of the project to connectivity and, as a result, to metapopulation function, persistence, and recovery efforts for bighorn sheep.

Mitigation measures described in Condition of Certification BIO-8 (Impact Avoidance and Minimization Measures) that involve gating and fencing to safeguard bighorn sheep from wandering onto the project site and potentially being injured only exacerbate the potential impacts to connectivity. To compensate for these unrecognized impacts, the project applicant must take action to ensure that connectivity in portions of the peninsular ranges is not similarly decreased.

I am not convinced that lands acquired for FTHL, burrowing owl, kit fox, and badger mitigation in BIO-10 will be appropriate for compensating for impacts to sheep foraging habitat. Suitable mitigation for project development would include the acquisition of a similar number of acres (i.e., mitigation on an acre-for-acre basis) currently in private ownership elsewhere in the peninsular ranges and turning that acreage over to the appropriate land management agency to ensure that additional impacts to connectivity do not occur. The California Department of Parks and Recreation (Anza-Borrego Desert State Park) and the California Department of Fish and Game have developed lists of lands in private ownership that are necessary to acquire to more fully protect habitat for bighorn sheep in the southern peninsular ranges,[67] [68]and both agencies should be consulted to ensure that any mitigation that is forthcoming as a result of this project is appropriate and meaningful. Purchase of land to compensate for any impacts to potential movement corridors should be considered separately, and should be acquired in areas known to be used by bighorn sheep.

[65] Schwartz, O. A., V. C. Bleich, and S. A. Holl. 1986. Genetics and the conservation of mountain sheep *Ovis canadensis nelsoni*. Biological Conservation 37:179-190.
[66] Hanski, I., and M. Gilpin. 1991. Metapopulation dynamics: brief history and conceptual domain. Biological Journal of the Linnean Society 42:3-16.
[67] R. Botta, California Department of Fish and Game, personal communication on 24 March 2010.
[68] M. Jorgensen, California Department of Parks and Recreation (retired), personal communication on 23 March 2010.

EXHIBIT 499-G

Declaration of Vernon C. Bleich
Imperial Valley Solar Project

Docket 08-AFC-5

I, Vernon C. Bleich, declare as follows:

1) I recently retired from the California Department of Fish and Game, where I worked extensively and primarily with large mammals in the arid ecosystems that characterize eastern and southeastern California. As a private citizen, I currently offer expertise with respect to natural resource conservation issues.

2) I hold an M.A. degree in biology, and a Ph.D. in wildlife biology. My relevant professional qualifications and experience are set forth in the attached *curriculum vitae* and the attached testimony, and are incorporated herein by reference.

3) I prepared the testimony attached hereto and incorporated herein by reference as it relates to the Supplemental Staff Assessment prepared for the project known as Imperial Valley Solar in western Imperial County.

4) It is my professional opinion that the attached testimony is true and accurate.

5) I am personally familiar with the facts and conclusions described within the attached testimony and if called as a witness, I could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 21 July 2010 Signed: _____

At: Bishop, CA

EXHIBIT 499-H

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Tools and Technology Article

Using Genetic Tools to Track Desert Bighorn Sheep Colonizations

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ABSTRACT Understanding colonization is vital for managing fragmented populations. We employed mitochondrial DNA haplotypes and 14 microsatellite (nuclear DNA) markers to infer the origins of newly established populations of desert bighorn sheep (*Ovis canadensis nelsoni*) and to assess loss of genetic diversity during natural colonizations. We used haplotype distribution, *F*-statistics, Bayesian population clustering, and assignment tests to infer source populations for 3 recent colonies and identified a previously undetected colonization from multiple source populations. Allelic richness declined in 3 of 4 colonies in comparison to the primary source populations, but not as much as has been reported for translocated populations. Heterozygosity declined in only one colony. We also demonstrated that both native and translocated desert bighorn sheep have naturally recolonized empty habitats and suggest that colonization may partially offset population extinction in the region as long as connectivity is maintained. Genetic techniques and mitochondrial DNA haplotypes we described will allow managers to determine the origins of future colonizations by bighorn sheep in California, USA, and prioritize protection of linkages between known sources and colonies.

KEY WORDS assignment test, California, colonization, metapopulation, microsatellites, mitochondrial DNA, *Ovis canadensis*, translocation.

Colonization of empty habitat is required to offset high population extinction rates for species with fragmented distributions (Levins 1970). Understanding colonization could help wildlife managers identify and protect key linkages between habitat patches, prioritize translocations when natural colonization rates are thought to be inadequate, predict range expansions, and respond appropriately to newly discovered populations of unknown origins. Colonization processes also can affect loss or retention of genetic diversity, which has been linked to individual fitness and population performance (Vila et al. 2003, Hogg et al. 2006). However, studying colonization usually requires either repeated surveys in all potential habitat patches or long-term monitoring of many individuals (Ims and Yoccoz 1997).

Population genetic data offer alternative means to track or identify recent colonizations (e.g., Eldridge et al. 2001, Scribner et al. 2003, Latch et al. 2006*b*). Emigration of a few individuals to new habitat results in a founder event that is analogous to a population bottleneck and, therefore, is predicted to affect genetic structure and diversity in 2 ways. First, because of the underrepresentation of rarer alleles in emigrants, genetic diversity is expected to be lower in the colony than in the source population (Nei et al. 1975). Second, although allele frequencies in colony and source(s) are expected to diverge after a founder event (e.g., Mock et al. 2004, Hawley et al. 2006), the identity and frequency of alleles in a recent colony should be more similar to those in the source population(s) than to other nearby populations. The largest changes in allele frequencies and genetic diversity are expected when there are few founders, the colony remains small, and if there is no subsequent gene flow between colony and source (Nei et al. 1975, Keller et al. 2001). Those changes are also influenced by time since the founder event (see Cornuet and Luikart 1996). Changes in genetic structure and loss of genetic diversity resulting from population reintroductions or translocations (e.g., Mock et al. 2004, Whittaker et al. 2004), invasions (e.g., Hufbauer et al. 2004, Hawley et al. 2006), or rare long-distance natural recolonizations (e.g., Onorato et al. 2004, Hedmark and Ellegren 2007) have been well-described. Effects of local-scale colonizations on genetic structure and diversity in a metapopulation may be less predictable because the size of the founding population is rarely known and gene flow between source and colony may continue after colonization.

Bighorn sheep favor mountainous habitat that is often naturally discontinuous, resulting in natural metapopulations (Schwartz et al. 1986; Bleich et al. 1990, 1996; Epps et al. 2003). In the 19th and 20th centuries bighorn sheep suffered dramatic range reductions, many of which were attributed to disease and human exploitation (Buechner 1960). In the California, USA, deserts, however, extinctions were a more recent phenomenon of the mid–20th century (Wehausen et al. 1987, Wehausen 1999, Epps et al. 2004). In part because colonization was considered unlikely, bighorn sheep have been translocated extensively throughout the western United States (Ramey 1993). However, unaided colonization of empty habitat patches has now been well-documented (Bleich et al. 1996, Singer et al. 2000,

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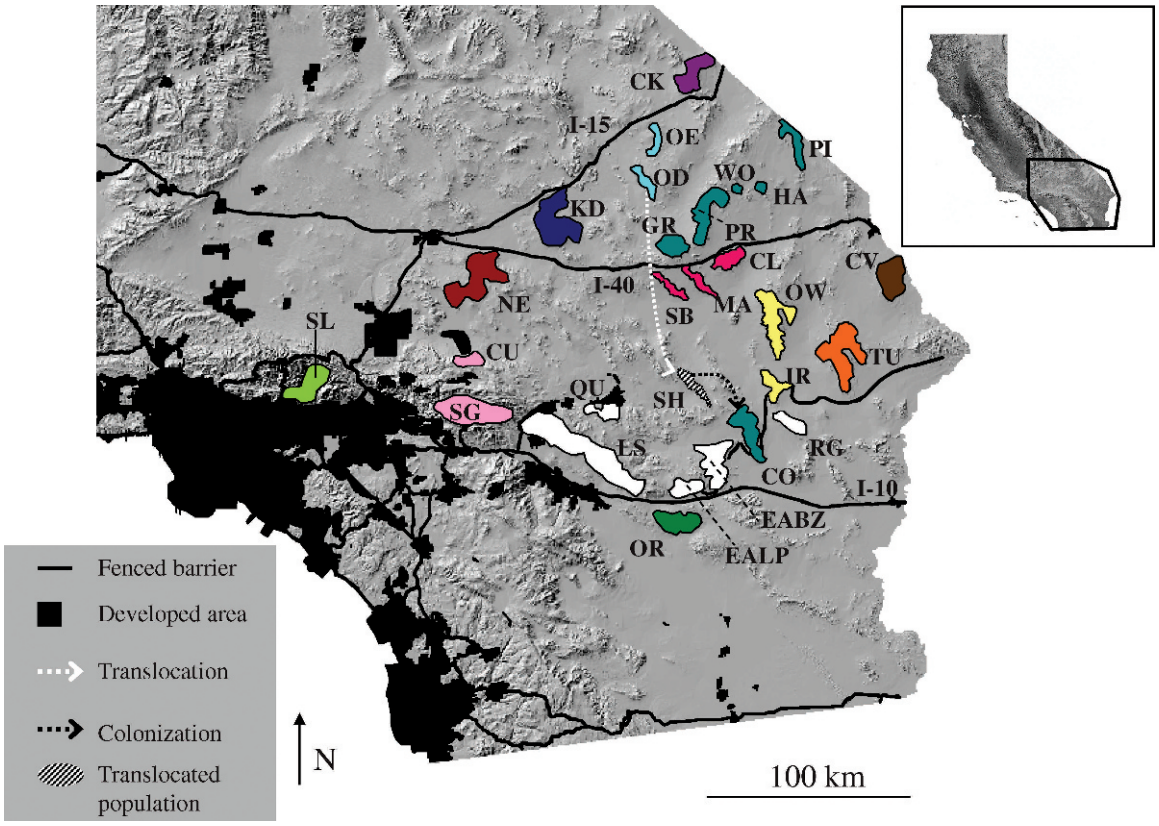

Figure 1. Relief map of southeastern California, USA, showing the 27 populations of desert bighorn sheep we sampled in 2000–2004, as well as the translocated population in the Sheephole Mountains (SH). Population polygon coloring represents results of BAPS clustering analysis; we clustered like-colored populations by genetic similarity, indicative of recent or current gene flow. We defined population identification codes in Appendix A; human-made dispersal barriers including fenced highways, fenced canals, and urban areas are mapped in black with interstate highways indicated as, for example, "I-15." We inferred colonization of the Coxcomb Range (CO; dashed black arrow) from SH because CO individuals were assigned genetically to the Old Dad (OD) population. Old Dad was the source of the bighorn sheep translocated to SH (dashed white arrow).

Epps et al. 2003). We define colonization as emigration of individuals of both sexes to an empty habitat patch, with subsequent reproduction. We examined recent colonizations by desert bighorn sheep (*Ovis canadensis nelsoni*) in California to determine 1) whether source populations could be confidently identified using standard tests for genetic structure and population assignment, and 2) whether significant reductions in genetic diversity (i.e., allelic richness) and heterozygosity occurred during natural colonizations.

STUDY AREA

We conducted our study in the Mojave and Sonoran Desert regions of California (Fig. 1), where desert bighorn sheep typically inhabited small mountain ranges isolated by flat desert with little water and limited forage. More than 50 native and reintroduced populations totaled approximately 4,200 bighorn sheep (*O. c. nelsoni*), but about half of those populations contained <50 individuals (Epps et al. 2003), making them vulnerable to genetic drift and loss of genetic diversity. Gene flow among those populations was affected by distance, topography, and human-made barriers such as fenced interstate highways (Epps et al. 2005, 2007). Due to frequent extinction of bighorn sheep populations in the 20th century, uninhabited mountain ranges occur throughout the study area (Wehausen et al. 1987, Wehausen 1999).

Although population monitoring often was sporadic (Wehausen 1999), radiotelemetry and population surveys identified 3 recent colonizations (or recolonizations). The South Bristol Mountains (SB; Fig. 1) were uninhabited (Torres et al. 1994) until 3 females radiocollared in the nearby (5 km) Marble Mountains (MA; Fig. 1) traveled to SB in 1993. By the late 1990s, a small but rapidly increasing population was established; a 2007 survey resulted in a mark–resight estimate of 68 individuals (J. D. Wehausen, White Mountain Research Station, personal communication). The second colonization occurred in the Iron Mountains (IR; Fig. 1). Observations at the sole known water source in IR indicated no resident sheep in 1993 (G. Sudmeier, Society for the Conservation of Bighorn Sheep, personal communication) but we observed males, females, and juveniles in 2001–2003. Historical evidence of movement by male and female bighorn sheep between the Old Woman Mountains (OW; Fig. 1) and IR, as well as movements between those ranges by radiocollared males, suggested OW was the likely source (Bleich et al. 1990; A. Pauli, California Department of Fish and Game, personal communication). The third apparent colonization occurred when emigrants from an unknown source founded the

Cushenbury population (CU; Fig. 1) in the 1980s (J. Davis, California Department of Fish and Game, personal communication), which at the time of our study was estimated at 25–50 individuals (Epps et al. 2003).

METHODS

Genetic Data Collection

We used previously published microsatellite genotypes and mitochondrial DNA (mtDNA) sequence data for 397 individuals from 27 populations of desert bighorn sheep in southeastern California (Fig. 1), collected from fecal and blood samples obtained during 2000–2004 (Epps et al. 2005). We restricted analyses to unique individuals that were successfully genotyped at all 14 microsatellite loci; 515 nucleotides near the beginning of the mtDNA control region were sequenced for 394 of these samples. Mean sample size per population was 15 individuals (range = 6–29).

Where sex identification was necessary, we determined sex of each individual sampled using the SE47 and SE48 sex identification primers (Yamamoto et al. 2002), which amplify fragments of different sizes on the X and Y chromosomes. We used 20 μL PCR (Polymerase Chain Reaction) with the following reaction conditions: 1× PCR Buffer I (Applied BioSystems, Foster City, CA), 0.16 mM dNTPs, 10 μg bovine serum albumin (New England BioLabs, Ipswich, MA), 2.25 mM $MgCl_2$, 80 nM each primer, 0.7 units of Amplitaq Gold™ DNA polymerase (Applied BioSystems), and 1 μL of extracted DNA. We used an initial heating cycle of 95° C for 7 minutes and 30 seconds, followed by 40 cycles of 95° C for 30 seconds, 54° C for 45 seconds, and 72° C for 30 seconds. We visualized the SE47 and SE48 amplification products on 2% agarose gels, prestained with ethidium bromide. We repeated amplifications until we observed the male-specific PCR fragment or we observed the single female band in 3 replicates.

Analyses

We applied common analytical techniques for describing genetic structure and diversity among populations to confirm (SB and IR) or infer (CU and other) source populations for recent colonizations and to test for population bottlenecks and decreased genetic diversity in colonies. Because most gene flow in this system occurred between populations <15 km apart (Epps et al. 2005), we evaluated potential source populations <30 km from each colonized population. To infer the source of females for each colony, we mapped distribution of mtDNA haplotypes (maternally inherited) in potential source populations. Female movements probably limited colonization because female bighorn are more philopatric than males (Festa-Bianchet 1986, Singer et al. 2000).

We evaluated whether genetic distance (F_{ST}; Wright 1921, Weir and Cockerham 1984) was significantly lower between colony and source in comparison to other nearby populations. Interpreting gene flow from F_{ST} is problematic unless populations are assumed to be in drift–migration–mutation equilibrium, which is unlikely in recent colonizations, but F_{ST} provides a useful relative estimate of population similarity (Neigel 2002). We used FSTAT (Goudet 1995) to calculate F_{ST} with bootstrap 95% confidence intervals from the microsatellite data between all population pairs. We also estimated F_{ST} from the mtDNA sequence variation and haplotype frequency (ARLEQUIN Version 3.11, http://cmpg.unibe.ch/software/arlequin3/; accessed 30 Jun 2008).

To distinguish clusters of populations linked by high gene flow, we grouped all 27 study populations by genetic similarity using Bayesian clustering methods employed by BAPS (Corander et al. 2003). We set burn-in time to 10,000, chain length to 50,000, thinning to 5, and ensured these values were sufficient to achieve convergence of estimates (Corander et al. 2003). We reported only clusters with posterior probabilities >0.95.

Individual-based assignment tests such as STRUCTURE (Pritchard et al. 2000) are often used to identify migrants or determine population origins (e.g., Mock et al. 2004). We used STRUCTURE to evaluate whether colonies had single or multiple origins. We combined all individuals from all 27 populations into one data set with no information on sample origin and estimated the likely number of clusters (k) of genetically similar individuals by running 10 simulations for each k from 1 and 30, using a burn-in of 500,000 chains followed by 1,000,000 chains for each run. We assumed that individuals were of admixed ancestry and allele frequencies were correlated (λ set at 1), and we allowed STRUCTURE to infer the degree of admixture. We identified the best value of k (k_{best}) as that where the second-order rate of change in the log-likelihood values for different k was maximized (Evanno et al. 2005). Program STRUCTURE fractionally assigns each individual to each cluster based on an assignment index (q) that sums to 1 across all clusters; we assigned individuals to the single most likely cluster based on the maximum value of q (q_{max}) estimated at k_{best} and defined individual assignments at $q_{max} > 0.5$ as high confidence.

Methods that assign individuals to a priori populations (e.g., mountain ranges) with high gene flow may split assignment probabilities among those populations. Alternatively, methods that assign individuals to clusters determined post hoc from genetic structure (e.g., STRUCTURE) may be hard to interpret or evaluate statistically, especially if assignment indices are low. To address both of those problems, we used GENECLASS2 (Piry et al. 2004) to assign 1) recently colonized populations to potential source populations (all other populations sampled) by ranked likelihood scores using the Bayesian classification method of Rannala and Mountain (1997) and an assignment threshold of 0.01, and 2) individuals from recently colonized populations to potential source populations (all other populations sampled) based on ranked likelihood scores. We then interpreted assignments to individual populations in the context of population clusters with high gene flow as identified by BAPS.

After identifying the most likely sources for each colony, we tested whether genetic diversity declined sharply during natural colonizations. We estimated allelic richness (A; average allelic diversity corrected for differences in sample size) at each locus for source and colony with FSTAT (Goudet 1995) and estimated unbiased heterozygosity (H_e; Nei 1987). After examining distribution of differences for normality, we used a 1-tailed paired sample t-test across loci to determine whether A and H_e in each colony were lower than in the respective sources (Zar 1999). For populations with clear evidence of mixed origins (see Results), we tested for differences in A and H_e via 2-tailed paired sample t-tests. We checked for population bottlenecks by testing for shifted modes in allele frequencies in each population (Luikart et al. 1998) using BOTTLENECK (Cornuet and Luikart 1996) because Mock et al. (2004) found that test to be most effective in detecting founder events.

RESULTS

We detected 19 mtDNA haplotypes in 27 populations (Appendix A; GenBank accession no. AY903993-AY904012, AF076912). The SB and IR colonies contained a subset of mtDNA haplotypes detected in their respective source populations (MA and OW; Appendix A). However, NE (>80 km W of SB; Fig. 1) also contained the 2 haplotypes found in SB (Appendix A). The CU colony (unknown source) contained only one haplotype (N), also found in SG, and found elsewhere only in the more distant QU, LS, EALP, and RG complex of populations (Appendix A; Fig. 1). We detected none of the NE haplotypes in CU, implying that SG was the most likely source of colonizing females. Genetic distance values calculated from mtDNA values accurately linked IR–OW and supported CU–SG (Table 1) but conflicted with other data in one case: $F_{ST\text{-}mtDNA} = 0$ for NE–SB, whereas $F_{ST\text{-}mtDNA} = 0.11$ for MA–SB (the likely source–colony pair based on radiotelemetry and microsatellite analyses; Table 1). Genetic distance estimates (F_{ST}) from microsatellite data generally corroborated known source–colony pairs, although wide confidence intervals precluded confident distinction of the source population for SB (Table 1). Despite identical mtDNA haplotypes in NE and SB, microsatellite markers did not support NE as a population of origin (Table 1). Genetic distance between CU and NE was 5 times higher than that between CU and SG, implying that male as well as female colonizers originated in SG (Table 1).

Bayesian population (not individual) clustering via BAPS from the microsatellite data resulted in 13 population clusters (Fig. 1). Although BAPS may overestimate cluster number (Latch et al. 2006*a*), the observed number of clusters was less than determined by STRUCTURE (below). Program BAPS grouped MA with SB and grouped OW with IR (Fig. 1). The CU population was linked to SG rather than NE. A population previously considered to be native (CO) was grouped with PR, HA, WO, and PI >95 km north rather than with other nearby populations (Fig. 1).

Table 1. Genetic distance (F_{ST}) values for microsatellite (with 95% CIs) and mitochondrial DNA (mtDNA) markers for 4 recently colonized populations and potential source populations of desert bighorn sheep we sampled in 2000–2004 in California, USA. See Appendix A for explanation of population codes.

Population pair	F_{ST} (microsatellite markers)			F_{ST} (mtDNA)
	Point estimate	95% CI (lower lim)	95% CI (upper lim)	
SB–MA[a]	0.039	0.019	0.061	0.112
SB–GR	0.111	0.057	0.171	0.336
SB–NE	0.189	0.110	0.274	−0.005
SB–KD	0.118	0.079	0.157	0.802
SB–OD	0.152	0.091	0.220	0.767
SB–PR	0.140	0.093	0.196	0.384
SB–CL	0.069	0.046	0.097	0.589
IR–OW[a]	0.048	0.023	0.075	0.0346
IR–TU	0.212	0.161	0.273	0.946
IR–RG	0.212	0.105	0.237	0.872
IR–CO	0.157	0.094	0.214	0.596
CU–SG[a]	0.069	0.035	0.102	0
CU–SL	0.374	0.274	0.471	1
CU–LS	0.197	0.133	0.260	0.768
CU–QU	0.233	0.169	0.301	0.387
CU–NE	0.372	0.276	0.459	0.850
CO–OD[a]	0.059	0.026	0.096	0.320
CO–EABZ	0.110	0.042	0.191	0.686
CO–IR	0.157	0.092	0.214	0.596
CO–RG	0.103	0.051	0.160	0.470

[a] Known or inferred comparison between source population and colony.

Using the Evanno et al. (2005) method for identifying cluster number with STRUCTURE, all 397 individuals were grouped into 14 genetic clusters ($k_{best} = 14$) from the microsatellite data. Individual assignments across replicate runs at same k were consistent, although q for each individual varied slightly; therefore, we present only the results of the first run at $k = 14$. Most individuals were grouped in clusters that matched source–colony pairings determined by other methods (Appendix B). Previously known colonies appeared to be of single origin with one possible exception: 13 of 14 individuals from SB were assigned to the same cluster as 23 of 29 individuals from MA (cluster c5; Appendix B), but the 14th individual, determined via SE47 and SE48 to be female, was assigned at low confidence ($q < 0.5$) to cluster c4, which included mostly individuals from other populations to the north (Appendix B; Fig. 1). All 11 individuals from the IR were assigned to cluster c8 at high confidence ($q > 0.5$), which also included 23 of 26 individuals from the OW population (22 at $q > 0.5$) but only one individual from TU ($q > 0.5$) and none from the CO, EABZ, and RG populations. Finally, all 15 of the CU individuals were assigned at $q > 0.5$ to cluster c9, to which none of the NE but all 17 of the SG individuals were also assigned at $q > 0.5$ (Appendix B).

Because of the counterintuitive clustering of CO with populations >95 km away by BAPS, we also examined individual assignments for CO after determining their sex with SE47 and SE48. Four males and one female were assigned (4 of 5 at $q > 0.5$) to the same cluster as 25 bighorn sheep sampled at OD (c4; Appendix B); those 5 sheep also had OD-type mtDNA haplotypes D or I (Appendix A).

Table 2. Sample size (n), differences in average allelic richness at 14 loci (A, corrected for the smaller sample size within each comparison) and average unbiased heterozygosity (H_e) as inferred from 1-tailed Wilcoxon paired-sample tests (except where noted), and shifted mode in allele frequencies test for population bottlenecks in source populations and colonies of desert bighorn sheep in California, USA, 2000–2004.

	n		A		H_e		Bottleneck	
Source–colony	Source	Colony	Source	Colony	Source	Colony	Source	Colony
MA–SB	27	14	4.1	3.6*	0.65	0.60	yes	yes
OW–IR	26	11	3.5	3.1*	0.51	0.46	no	no
SG–CU	17	15	3.1	2.7*	0.54	0.45*	no	yes
OD–CO	25	7	3.1	3.6[a]	0.52	0.58[a]	no	no[b]
EABZ–CO	17	7	3.8	3.6[a]	0.65	0.58[a]	no	no[b]

[a] 2-tailed Wilcoxon paired-sample test.
[b] Sample size below recommended min. of 10 individuals.
* $P < 0.05$.

The remaining 2 males were assigned at $q > 0.5$ to the same cluster as many of the bighorn sheep from the nearby EABZ, EALP, LS, QU, and RG populations (c12; Appendix B); those 2 individuals had mtDNA haplotype F, which was commonly found in those nearby populations but unknown at OD (Appendix A).

At the population level, GENECLASS2 grouped SB with MA, IR with OW, and CU with SG at likelihood scores of 100%. CO was grouped with GR (a population N of Interstate 40 and connected to OD with moderate gene flow; likelihood score = 91%) and OD (source of the translocated individuals in the SH population N of CO, likelihood score = 9%). At the individual level, GENECLASS2 assigned 12 of 14 individuals from SB to MA at likelihood scores >96%, one to CL (61%) and MA (39%), and the same female distinguished by STRUCTURE to OD north of Interstate 40 (90%). Ten of 11 individuals from IR were assigned to OW at scores >95%, and the 11th was assigned to OW at 51% with remaining assignment score percentage apportioned among the closely linked EALP, EABZ, LS, and QU populations (Fig. 1). All 15 individuals from CU were assigned to SG (13 at >99%, 1 at 93%, and 1 at 89%). Lastly, the 2 male individuals in CO with Haplotype F were assigned to QU with scores >99% (part of a BAPS cluster including the more likely EABZ; Fig. 1), whereas the other 5 individuals with OD-type mtDNA were assigned to OD (3 at >96%, 1 at 93%) and GR (1 at 89%).

In comparison with each inferred source, allelic richness (A) was lower for all 3 colonies primarily of single origin (Table 2; MA–SB $t_{1,13} = 3.10$, $P = 0.004$; OW–IR $t_{1,13} = 1.83$, $P = 0.045$; SG–CU $t_{1,13} = 2.06$, $P = 0.030$). Estimates of A in CO did not differ from OD (Table 2; $t_{2,13} = 1.79$, $P = 0.097$) or EABZ (Table 2; $t_{2,13} = 0.58$, $P = 0.284$). Heterozygosity in CU was 17% lower than in SG (Table 2; SG–CU $t_{1,13} = 3.15$, $P = 0.004$) but H_e did not decline for any other single-origin colony (Table 2; MA–SB $t_{1,13} = 1.48$, $P = 0.081$; OW–IR $t_{1,13} = 1.35$, $P = 0.100$). Estimated H_e for CO did not differ from OD (Table 2; $t_{2,13} = 1.05$, $P = 0.273$) or EABZ ($t_{2,13} = 1.51$, $P = 0.170$). We detected shifted modes in distribution of allele frequencies, indicative of recent population bottlenecks (Luikart et al. 1998), in MA and SB and CU but not SG. We did not detect shifted modes in IR, OW, CO, OD, or EABZ, although the sample size for CO was less than the recommended minimum (Table 2).

DISCUSSION

As expected given the philopatric and social nature of female bighorn sheep in particular (Festa-Bianchet 1986, Singer et al. 2000), the 3 previously known colonies (SB, IR, and CU) appear to have originated primarily from single source populations (MA, OW, and SG). Nearly all analyses agreed, although we detected 2 ambiguities: 2 possible source populations for SB had identical mtDNA haplotypes (Fig. 1; Appendix A), and one female in SB was assigned by STRUCTURE and GENECLASS2 to populations north of Interstate 40 rather than MA. Because that assignment was not at high confidence, that individual could be, rather than a migrant, the offspring of a migrant.

We also identified a possible cryptic colonization (CO; Fig. 1) with males originating in multiple source populations. Population clustering (BAPS) demonstrated that bighorn in CO were closer genetically to populations north of Interstate 40 (Fig. 1). Population CO is near the SH population, which was reestablished or augmented by translocation of desert bighorn sheep from population OD in 1984 and 1985 (Bleich et al. 1990, 1996). The F_{ST} estimate between CO and OD was 50% lower than the lowest estimate between CO and any other population (Table 1). Because the 1 female and 4 of 6 males sampled in CO had OD-type mtDNA haplotypes that could only have originated in SH, and because those same individuals were also assigned using nuclear DNA markers by both STRUCTURE and GENECLASS2 to OD or other distant northern populations, we hypothesize that females and males from SH recently recolonized CO after an unobserved extinction and were then joined by males from other nearby populations. Although neither mtDNA data, F_{ST} values, nor population assignments clearly indicated whether the 2 males with local haplotypes originated in EABZ, RG, or even QU to the west of EABZ (Table 1; Appendices A, B), the close proximity of the EABZ to CO and the presence of a fenced canal between the CO and RG imply that EABZ was the likely origin (Fig. 1). Because mtDNA and nuclear DNA assignments matched, little interbreeding appears to have occurred yet between the SH

(OD-derived) individuals and EALP–EABZ–RG-derived individuals present in CO.

The genetic structure and loss of genetic diversity that we detected for these colonizations demonstrate that bighorn sheep of both sexes will move substantial distances across unsuitable habitat, but only occasionally (Tables 1, 2). Although founding population sizes and the degree of subsequent gene flow between colony and source are still unclear, decreased A in the colonies (Table 2) implied that founder effects occurred and, thus, the size of the founding population was small. However, we did not observe declines in H_e except in CU (Table 2). Studies of translocated populations and long-distance colonizations have typically detected declines in A (e.g., Mock et al. 2004) but not always in H_e (e.g., Hicks et al. 2007), especially when founder numbers are high (e.g., Hufbauer et al. 2004). Expected heterozygosity is predicted to decline more slowly than A after a bottleneck, particularly if the colony or bottlenecked population grows rapidly (Allendorf 1986).

Direct comparisons of genetic diversity between source and colony were more informative than results of the bottleneck test; although we detected a bottleneck in CU but not SG, as might be expected after a founder event, we did not detect a bottleneck in IR or OW. Because we detected a bottleneck in MA, it is unclear whether the bottleneck detected in SB resulted from the founder event or reflects the bottleneck in the source population. Divergence (Table 1) and loss of genetic diversity (Table 2) was greatest in the SG–CU colonization, which also occurred over the greatest distance. Thus, ongoing gene flow may be an important mechanism for maintaining higher genetic diversity in the other less isolated colonies (i.e., OW–IR and MA–SB). For instance, radiocollared males made repeated movements between IR and OW during monitoring in 2001–2003, but no radiocollared individual in CU has returned to SG (J. Davis, personal communication).

Employing multiple analytical approaches strengthened inferences about source populations. Although F_{ST} estimates from mtDNA could not always determine population of origin (Table 1), mapping mtDNA haplotypes provided useful inferences on female dispersal and may provide sufficient resolution if strong genetic structure is suspected (e.g., Latch et al. 2006*b*). Comparing F_{ST} estimates from microsatellite markers identified the same source populations as other analyses but did not completely exclude one nearby nonsource population (Table 1; SB–GR) and did not distinguish multiple source populations for CO. Population clustering methods using BAPS (Fig. 1) and GENECLASS2 demonstrated isolating effects of both distance and human-made dispersal barriers such as fenced canals, interstate highways, and urban areas (Fig. 1) and identified the cryptic colonization of CO from SH.

Individual-based assignment tests (STRUCTURE, GENECLASS2) were useful for evaluating whether colonies had multiple origins but are difficult to summarize and interpret for large data sets. Counterintuitive results are common, such as an assignment at $q > 0.5$ for one individual in OW to the same cluster as SL (Appendix B, c3), which is >250 km distant. Therefore, we stress that interpreting assignment tests for individual animals requires great caution. Nonsensical assignments may result from homologous mutations, genotyping errors, or poor ability to distinguish clusters among areas of high gene flow (e.g., Worley et al. 2004). We had greater confidence in assignments of CO individuals to different populations because mtDNA haplotype matching to sources corresponded exactly. The weak assignment of one individual in SB to OD is more difficult to interpret.

Wildlife managers are sometimes confronted by newly discovered populations or stray individuals of unknown origin (e.g., Onorato et al. 2004, Latch et al. 2006*b*). Determining the origin may be critical to identifying the appropriate response. For instance, did the strays originate from a population of high conservation value? In California, where an Endangered Species Act (ESA)–listed subspecies (Sierra Nevada bighorn sheep [*O. c. sierrae*]) and an ESA-listed distinct population segment of desert bighorn sheep in the Peninsular Ranges occur in close proximity to unlisted populations of desert bighorn sheep, population genetic data may provide the best means for determining origin quickly. For instance, 2 small groups of bighorn sheep were documented in 2005 at the western edge of the Coso Range, where they have been absent for half a century (Wehausen 1999). Using DNA from fecal pellets collected in the vicinity of those sheep, microsatellites to distinguish individuals, and sequencing of mtDNA control region, 2 individuals with mtDNA haplotype E were identified (J. D. Wehausen, unpublished data). Haplotype E is common in the OD population (Fig. 1; Appendix A), which was the source of a reintroduction to the Argus Range immediately east of the Coso Range in 1986 (Bleich et al. 1990). Clearly, the newly detected individuals in the Coso Range were descendents of animals introduced into the Argus, rather than endangered Sierra Nevada bighorn. Similarly, Latch et al. (2006*b*) applied the mtDNA protocols we described here to determine that a newly detected population of bighorn sheep in Arizona originated from Rocky Mountain bighorn (*O. c. canadensis*) rather than desert bighorn populations.

Our findings demonstrate that translocations of bighorn sheep into habitat within 10–15 km of established populations may not always be necessary in the absence of other dispersal barriers. Translocation is expensive, sometimes unsuccessful, and comes at the biological cost of the individuals removed from the source population (Bleich et al. 1996). However, colonizations of CO and the Coso Range (above) suggest that translocated individuals may help maintain populations in nearby habitat patches and could help offset high population extinction rates.

Natural colonizations in this system have lower genetic diversity, like translocations described elsewhere (e.g., Hedrick et al. 2001, Whittaker et al. 2004). However, although A decreased in 3 of 4 and H_e declined in 1 of 4 colonizations that we examined (Table 2), genetic diversity still exceeded values reported in translocated populations of bighorn sheep in other locations (Gutierrez-Espeleta et al. 2000, Hedrick et al. 2001). For instance, using a different

set of 11 loci and samples sizes of 10–23 individuals/population, Whittaker et al. (2004) reported 2.2–2.4 alleles/locus and much lower H_e estimates (0.32–0.39) in translocated populations in Oregon but comparable estimates of 3.8 alleles/locus and $H_e = 0.57$ in one native population in Nevada, USA. Because natural colonization can result in continued interaction, genetic diversity may not decline as severely as after a translocation. For instance, we did not detect declines in H_e in the 2 cases where we observed radiocollared individuals traveling repeatedly between the source and colony (SB and IR). Thus, when human-made barriers threaten to block bighorn sheep dispersal (e.g., Flesch et al. 2010), translocation is less likely to be a successful strategy for mitigating loss of genetic diversity than maintaining natural connectivity.

MANAGEMENT IMPLICATIONS

Our data and data from Boyce et al. (1999) and recent extensive sampling in the northern desert from Death Valley to the Sierra Nevada (J. D. Wehausen, unpublished data) describe 42 unique mtDNA control region haplotypes among nearly all known bighorn sheep populations in California. These, coupled with microsatellite data, could be used to determine populations or regions of origin for future bighorn sheep colonizations. The colonizations we described and detected demonstrate that natural recolonization still helps maintain bighorn sheep across this region despite high rates of population extinctions (Epps et al. 2004). We recommend that populations described as extinct in previous surveys be resurveyed more frequently to determine whether recolonization has occurred. Populations reestablished by translocation served as sources for natural recolonizations of other nearby mountain ranges in 2 cases (SH and Argus), implying that translocation is an important tool for metapopulation management. However, because genetic diversity in colonizations did not decline as severely as has been reported for population translocations (e.g., Hedrick et al. 2001), we recommend maintaining connectivity and the potential for recolonization by avoiding disruption of natural dispersal routes and bridging anthropogenic barriers rather than relying solely on translocation. Known linkages between source populations and colonies should be protected.

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Appendix A. Mitochondrial DNA haplotypes (515 base pairs) from 394 bighorn sheep we sampled in 2000–2004 in 27 populations in southeastern California, USA. Haplotype 5 was first described by Boyce et al. (1999) in the Peninsular Ranges of California.

Code	Population	5	A	A2	B	C	D	E	F	G	H	I	J	K	M	N	O	P	Q	R	S	Total
CK	Clark					9									3							12
CL	Clipper		4			7			2					3								16
CO	Coxcomb						4		2			1										7
CU	Cushenbury															15						15
CV	Chemhuevi		7																			7
EABZ	Eagle-Buzzard Spring								18													18
EALP	Eagle-Lost Palms	3							10							1						14
GR	Granite		1			2	2	6	9			1										21
HA	Hackberry								13													13
IR	Iron				10	1																11
KD	Cady						4	1			5						2					12
LS	Little San Bernardino	1							9							2						12
MA	Marble					1			24	3												28
NE	Newberry								10	4												14
OD	Old Dad						7	12				6										25
OE	Indian Spring						1	10				1										12
OR	Orocopia								14									1	3			18
OW	Old Woman		3		18	5																26
PI	Piute Range					3					7									3		13
PR	Providence		8		3			2	6				1									20
QU	Queen								4							6			1			11
RG	Riverside Granite	3							5													8
SB	South Bristol								8	6												14
SG	San Gorgonio															17						17
SL	San Gabriel																				6	6
TU	Turtle		13	1																		14
WO	Wood					3			6		1											10
Total		7	36	1	31	31	18	31	140	13	13	9	1	3	3	41	2	1	4	3	6	394

Appendix B. Individual assignments of desert bighorn sheep sampled in 2000–2004 from 27 populations (rows) in California, USA, to genetic clusters (columns) using STRUCTURE (Pritchard et al. 2000). First number of each entry is number of assignments with assignment index >0.5 and the second number reflects total number of assignments to that cluster based on the highest assignment probability for each individual.

Code	c1	c2	c3	c4	c5	c6	c7	c8	c9	c10	c11	c12	c13	c14
CK	1/1		10/11											
CL	8/8				8/8									
CO				4/5								2/2		
CU									15/15					
CV	7/7													
EABZ									0/1		10/12	3/4		
EALP											7/7	5/7		
GR	1/1	0/1		4/4			8/12		0/1				1/2	
HA			0/1			6/6	5/6							
IR								11/11						
KD				1/1	0/1								10/10	
LS											8/11	1/1		
MA	1/1	2/2			23/26									
NE		15/15												
OD				25/25										
OE				7/7									5/5	
OR										18/18				
OW			1/1					22/23				1/1		0/1
PI		0/2				9/10	0/1							
PR						2/4	16/16							
QU											6/6	4/5		
RG					0/2						2/2	4/6		
SB				0/1	12/13									
SG									17/17					
SL			6/6											
TU								1/1			1/1			10/12
WO						5/6	4/4							

EXHIBIT 499 - I

STATE OF CALIFORNIA
California Energy Commission

In the Matter of: The Application for Certification for the IMPERIAL VALLEY SOLAR PROJECT	Docket No. 08-AFC-5

ADDITIONAL REBUTTAL TESTIMONY OF DR. CHRISTOPHER BOWLES and CHRISTOPHER CAMPBELL ON BEHALF OF CALIFORNIA UNIONS FOR RELIABLE ENERGY ON SOIL AND WATER RESOURCES FOR THE IMPERIAL VALLEY SOLAR PROJECT

July 21, 2010

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INTRODUCTION

The following additional rebuttal testimony is in response to the Supplemental Staff Assessment (SSA) prepared by CEC Staff (July 7, 2010) and Additional Opening Testimony prepared by the Applicant (July 13, 2010). In addition to reviewing these documents and their attachments, the independent groundwater model review (Todd, 2007a) and water supply assessment (Todd, 2007b) developed for the US Gypsum Draft EIR/EIS were also reviewed since they were referenced in the SSA.

RESPONSE TO CEC'S SUPPLEMENTAL STAFF ASSESSMENT

Modifications to the Staff Assessment (SA) via the SSA regarding soil and water resources are predominately focused on the Dan Boyer groundwater supply for the project. The SSA fails to address a majority of our Opening and Rebuttal testimony pertaining to the Soil and Water issues we raised. As such, our comments on the SSA are focused on aspects of the groundwater supply.

WATER DEMAND VERSUS WATER SUPPLY

COCs Soil&Water-2 and Soil&Water-9 specifies that extractions from the Dan Boyer well for project purposes will be limited to 34 AFY, leaving the remaining 6 AFY of the permitted 40 AFY for residential users. There are three main unaddressed signfiicant impacts associated with the water demand exceeding water supply, as discussed below.

First, the SSA states that the construction phase requires 51.1 AFY on average (or 166 AF total) based on 45,000 gpd for dust control and 90,000 gpd for 15 peak construction days during a 39 month construction window. Clearly, there is an average deficiency of 17.1 AFY of water supply if only 34 AFY is allowed. However, the SSA only suggests that to meet the demand that additional water come from another source, the Dan Boyer permit limit be modified, or the construction schedule be modified. There is no evidence in the record that any of these alternative scenarios are feasible. Neither Staff nor the Applicant has proffered a new source of groundwater. The Dan Boyer permit is governed by the County and the County's comments on the SA "strongly recommended the CEC take into account the on-site water needs for the Westwind's parcel and historical residential users in its permitting of the IVSP to use this off-site water source."[1] More importantly, it is unclear where the construction phase water use values in the SA/DEIS and SSA of 45,000 gpd and 90,000 gpd originated. We were unable to find these numbers in any of the Soil and Water reference materials submitted by SES. Based on SES (2008) Application for Certification (AFC), dust control requires 11,500 gpd and construction requires 26,000 gpd for average conditions. However, the values of 11,500 gpd and 26,000 gpd grossly underestimate average water use conditions based on independent calculations made from Table 3-6 in the AFC (SES, 2008), which are closer to 77,000 gpd for dust control and 43,500 gpd for construction

[1] Imperial County Planning and Development Services, Jim Minnick to California Energy Commission, Christopher Meyer, May 27, 2010, Response to "Imperial Valley Solar Project (IVSP)".

over the 39 month construction window. Based on these calculations, a total of 439 AF of water is required, which is a 165% greater than the construction demand stated in the SA/DEIS and SSA at 166 AF.

Based on the AFC (SES, 2008) for peak construction conditions, dust control requires 223,000 gpd and construction requires 353,000 gpd, which matches the water balance flow diagram. Based on independent calculations made from Table 3-6 in the AFC (SES, 2008), we were able to confirm these monthly peak demand values (unlike the average daily demand values).

Furthermore, the monthly calculations demonstrate that 52% of the water demand would occur in the first 12 months, 40% would occur in the next 12 months, 8% would occur in the final 15 months. If this is a reasonable approximation for the construction phase water demand, and assuming that the total demand is 166 AF (even though it has been independently calculated to be incorrect), then 86 AF would be needed in the first 12 months, which would equate to a deficiency of 52 AF with the Dan Boyer well extractions limited to 34 AFY. However, the calculated demand in the first 12 months is closer to 228 AF, which would result in a severe deficiency. It is also noted that the water demand in the first 12 months at 228 AF is very close to the maximum diversion rate of 200,000 gpd (or 224 AFY) from the Seeley Wastewater Treatment Facility. It is also essential to note that there are pumping restrictions on Dan Boyer at 41,775 gpd and 250,650 gallons per week (or 6 days pumping and 1 day no pumping), so front loading the pumping to meet a peak demand is not possible. These type of restrictions need to be adequately integrated into the water budget calculations.

Second, operations require 32.7 AFY of water supply based on average annual usage. However, there are uncertainties associated with these calculations. Soil & Water Table 3 and SSA statements indicate an increase in the required water demand above 34 AFY, summarized as follows:

1. **Mirror Washing** – it was confirmed in Table 3 calculations that Staff assumed that there are 8 normal washings (at 14 gals/solar unit) and 1 scrub washing (at 42 gals/solar unit) for a total of 9 washings annually or 14.2 AFY. However, there are several instances in the SA/DEIS, SSA, and the Applicant's Additional Opening Testimony that would suggest that washings occur once per month for a total of 12 washings per year with possibly 8 normal washings and 4 scrub washings. If this is the case, then mirror washing would equate to 25.8 AFY and require an additional 10.3 AFY above the 34 AFY limit. In the event that only 11 normal washings and 1 scrub washing are required, then mirror washing would equate to 18.0 AFY and require an additional 2.6 AFY above the 34 AFY limit. If mirror washing is to occur in practice once per month (or more frequently), then these calculations demonstrate that there will be an operational deficiency in addition to the construction deficiency.
2. **Water Treatment** – it is unclear whether the annual calculations account for some percentage of days requiring the maximum amount of water. If not, then there should be an allowance made and the calculations should be updated.
3. **Potable Water** – the annual calculations were confirmed at 5.4 AFY to include a 20% contingency for 188 workers working 5 days per week or 261 days per year. However, the dust control calculations assume 365 days per year. If the operations schedule includes workers for

more than 5 days per week, this would equate up to 7.6 AFY and require an additional 0.9 AFY above the 34 AFY limit.

4. **Dust Control** – the annual calculations were confirmed at 5.6 AFY for 5000 gpd for 365 days per year. However, the maximum use of water for dust control is double the daily rate on any given number of days whereby the Applicant would need to comply with COC WorkerSafety-8 for enhanced dust control. Reasonably assuming 20% of days require enhanced dust control, this would equate to 6.7 AFY and leave a spare 0.2 AFY below the 34 AFY limit.

Considered in combination, we have calculated, based on information provided in the SSA, that there could be an additional need for 13.6 AFY above the stated 34 AFY limit provided by the SSA. Since the SSA assumes operations will be supplied by the Dan Boyer groundwater well, additional backup calculations should be provided to demonstrate that operational water demands will not exceed the 34 AFY limit or exceed daily and weekly pumping limits. In the event that demand will exceed supply, it has been stated in the SSA that the Applicant will suspend mirror washing. Suspension of mirror washing will not solve water deficiencies that arise from construction water needs. Moreover, it is unclear whether any calculations were performed to assess the percent loss of power generation due to dirty mirrors. Efficiency losses as a result of dirty mirrors should be analyzed by Staff since it appears that operational water shortages could be chronic.

Third, the SSA Air Quality section assumes that power generation will occur during the construction window. Such an "overlapping" condition was omitted from the water use calculations. If power generation (or operational) conditions occur jointly with the construction phase, then water budget calculations should take this into consideration as this will amplify the monthly water demand resulting in an even greater deficiency.

In summary, we concur with the Staff's overall water supply assessment in the SSA that the water supplies are not sufficient to meet the demands of the project:

1. Construction demands will exceed supply. Operational demands may exceed supply. Joint demand, if the schedule permits, will exceed supply.
2. Groundwater extractions exacerbate overdraft, which is a significant impact.
3. No backup or supplemental water supply has been firmly identified to help meet construction and operational demands. The extent of the SWWTF operational upgrades and the magnitude of the increase in recycled water supply is a substantial unknown.
4. The Dan Boyer Water Company has furnished a "will serve" letter stating that it will temporarily provide well water up to 11 months. As such, the reliability of the Dan Boyer groundwater supply is questionable beyond the first year of construction.

WELL INTERFERENCE FROM THE DAN BOYER WELL

Staff came to the conclusion in the SSA, when using typical or average well installation water supply characteristics, that groundwater extractions from the Dan Boyer well over the 40-year operational life of the solar farm would be less than significant on the groundwater level drawdown (and hence yield) in neighboring wells. There are two unmitigated significant direct and cumulative impacts that the SSA did not identify that are outlined below:

1. Staff used average well water supply characteristics, simplifying their well interference analysis, which assumed 15 feet of water above the well screens. However, 2 out of the 10 neighboring wells only have 5 feet of water above the well screens. If the groundwater level drops at an average rate of 0.21 feet/year or 8.4 feet in 40 years, then groundwater extractions from the Dan Boyer well could exacerbate yield conditions at those 2 wells as water levels drop below the top of the well screens, depending on location of the pumps relative to top of the well screens. In Staff's calculations, it was assumed that the pumps were near the top of the well screens. It is therefore recommended that such calculations rely upon measured data when available. Moreover, there is an unmitigated significant impact to nearby well users.
2. Staff did not consider the cumulative impact of scenarios when US Gypsum and other industrial / commercial wells are extracting water at the same time as the Dan Boyer well. Impacts to the neighboring wells (and the Dan Boyer well) could be a significant unmitigated impact and should be investigated using measured well water supply characteristics. Staff also did not consider water use from the proposed Wind Zero project as reasonably foreseeable and did not include this Project in the Staff's cumulative groundwater impact analysis. However, the Wind Zero project is being considered by the County now for permitting.

GROUNDWATER UPFLUX FROM THE DAN BOYER WELL

Staff came to the conclusion in the SSA that the estimated upflux volume is only 0.4% of the volume of the minimum affected aquifer volume (as determined from the well interference analysis using WinFlow), and as such, was insignificant. There are two (2) potential issues with this analysis:

1. Staff only considered the relative quantity or volume of water introduced into the upper alluvial aquifer from the underlying Palm Springs / Imperial aquifer and not the quality of the water and its potential impact on the alluvial aquifer. Staff estimated the upflux volume over the construction and operational life of the solar farm to be 145 AF as derived from relationships in Todd (2007a). The average percent change in quality or Total Dissolved Solids (TDS) concentration in the minimum affected aquifer volume is close to 4.5% (based on the weighted average of 38355 AF at 300 mg/L plus 145 AF at 4000 mg/L vs. 38500 AF at 300 mg/L), and thus the SSA failed to analyze a potentially significant impact to water quality in the aquifer.
2. Staff did not consider the cumulative upflux impacts if US Gypsum and other industrial / commercial wells are extracting water at the same time as the Dan Boyer well in the same

general vicinity. The percent increase in TDS concentration will be greater within the same minimum affected area, and higher TDS upflux concentrations will be realized at the bottom of the alluvial aquifer in the vicinity of the well bottoms. This cumulative impact is significant and unmitigated.

SEELEY WASTEWATER TREATMENT FACILITY UPGRADES

It has been stated in the SSA that the Applicant is now proposing to fund the improvements to the Seeley Wastewater Treatment Facility (SWWTF). However, the SWWTF upgrade is uncertain, the MND that was prepared was not adopted by the Seeley County Water District, and as such, the upgrade still needs to go through more detailed environmental review to assess potential impacts to wetland and riparian habitats and water quality in the New River and Salton Sea. In the event that diversions from an upgraded SWWTF cannot be provided to the project due to the severity of impacts, and in consideration of potential water supply deficiencies noted above with the Dan Boyer groundwater well, there is no reliable construction and operations primary or back-up water supply for the Project.

GROUNDWATER RECOMMENDATIONS

Todd (2007a) has provided an independent review of the Bookman-Edmonston (2004) conceptual hydrogeologic numerical model developed for the Draft EIR/EIS for the US Gypsum Expansion / Modernization Project using MODFLOW. Despite the review highlighting uncertainties with the model due to uncertainties associated with subsurface characterization in a large aquifer with limited data outside the cluster of wells in and around Ocotillo, the review indicates that the model does have value in assessing the relative impacts of proposed project (and cumulative project) pumping on groundwater levels and neighboring wells within the Ocotillo / Coyote Wells Groundwater Basin. As such, it is recommended that the MODFLOW model be used (rather than WinFlow3.1) to assess well interference using measured well water supply characteristics (not averages) and that solute transport capabilities be added to the model to assess upflux from the high TDS Palm Springs / Imperial aquifer into the overlying low TDS alluvial aquifer. We concur with recommendations by Todd (2007a) to further refine the conceptual hydrogeologic model through sensitivity testing and additional calibration. Failure to use the best available information and science can lead to a simplification in project understanding and misrepresentation of potential project impacts, which can be significant and detrimental to the environment and beneficial uses.

SEDIMENT BASINS

On page C.7-29 of the SSA, the proposed project description still includes sediments basins. Per the Applicant's revised POD, the Applicant proposed to remove the sediment basins from the project. It is not clear whether the SSA would require that the sediment basins remain. If the sediment basins remain, there would be significant impacts as discussed in our prior testimony.

RESPONSE TO APPLICANT'S ADDITIONAL OPENING TESTIMONY

Our comments on the Applicant's additional opening testimony come specifically in response to this statement in Section 4.2.2 of the 404(b)(1) Alternatives Analysis (AA) by Ecosphere (2010):

> *Chang's sediment modeling study (2010a) and subsequent testimony submitted to the CEC showed that the project will not change hydrology, sediment flow or delivery towards areas downstream from the project site, or change stream morphology on or off site.*

as well as this statement in Section 4.2.3 of the AA:

> *Chang's sediment modeling study (2010a) showed that with the sediment basins removed from the site plan, that the project will not change sediment flow or delivery towards areas downstream from the project site. Further, as the project will not change flow or sediment flow to offsite areas, there should be no impacts to offsite fluvial morphology.*

HYDROLOGY

It has not been demonstrated by the Applicant that the project will not increase local runoff. Chang's expert review of the Stantec and RMT hydrologic studies nor subsequent revisions to those studies have not demonstrated that the project will not result in hydrologic impacts. Again, the Applicant has simply assumed that there will be no project-induced hydrologic impacts. However, this assumption has not been quantified by any calculations demonstrating or proving that this is the case. Soil and vegetation disturbance followed by subsequent soil compaction and application of soil binders (or tackifiers) can reduce the surface storage and infiltration capacity of the disturbed soils, resulting in increases in local surface runoff. These increases in local runoff have both onsite and offsite impacts, which have been highlighted in our previous testimony.

SOIL EROSION

It has not been demonstrated by the Applicant that the project will not increase sediment delivery to the washes from the disturbed solar array fields. Again, the Applicant has assumed that there will be no project-induced soil erosion by water impacts for the solar array fields because the DESCP and SWPPP would address such concerns. However, this assumption has not been quantified by accurate calculations. We have previously demonstrated that the soil loss calculations were severely flawed and that without additional analysis and mitigation the project will pose significant unmitigated impacts to onsite and offsite waters of the US. Consequently, project-induced soil erosion by water impacts could result through increased sediment delivery to the washes via rill and gully erosion followed by onsite

impacts to the washes, as well as offsite WQ impacts, all of which has been highlighted in our previous testimony.

While operational soil erosion impacts may have been reduced in Alternative #3 (at the expense of increased temporary construction impacts) through the proposed construction of narrower maintenance roads and removal of spur roads to individual SunCatchers, the impacts of the project on soil erosion have not been fully addressed. For example, it is proposed that tackifier be applied to the roads to maintain the integrity of the roads. While it is mentioned that the roads will be driven on at least 13 times per year (i.e., 12 for mirror washing, 1 for annual maintenance, plus likely back tracking), the tackifier application specifications (e.g., basic surface treatment vs. heavy duty road treatment), reapplication rates, environmental degradation/accumulation rates, and infiltration impedance (and subsequent rill and gully erosion impacts) have not been quantified or qualified. More so, the severely flawed soil loss calculations have not been updated to reflect a more accurate understanding of the project setting and potential project impacts. Again, it is assumed by the Applicant that all soil erosion concerns will be adequately addressed in the DESCP and SWPPP. This assumption is unwarranted and, without additional mitigation and analysis, this is a significant unmitigated impact.

SEDIMENT TRANSPORT

It has not been demonstrated by the Applicant that the project will not impact wash morphology and subsequent export of sediments offsite. The Applicant has identified Alternative #3 in the amended 404(b)(1) Alternatives Analysis (AA), submitted to the USACE and EPA on June 3, 2010, to be the preferred LEDPA. While Drainage Avoidance #1 in the SA/DEIS (or Alternative #5 in the AA) has a similar level of impacts to the Waters of the US (WUS) compared to Alternative #3, despite placing no SunCatchers in the washes, it was determined by the Applicant that Drainage Avoidance #1 was not practicable from a cost analysis due to the reduction of too many SunCatchers. However, we are of the opinion that Alternative #3 in the AA has not been fully analyzed regarding the impacts of placing SunCatchers in select washes on sediment transport, wash morphology, and water quality, both onsite and offsite per our previous testimony.

Chang's supplemental local scour analysis (2010) was developed to highlight inaccuracies in calculations by Staff in the SA/DEIS with respect to placing SunCatchers in the washes. The results of the local scour analysis by Chang at each pedestal in Wash D were combined in aggregate to infer that the cumulative local scour area relative to total wash area is insignificant. Chang's analysis did not include general scour effects in the calculations, and more importantly did not effectively account for the deposition and transport of the displaced sediment from around each pedestal. Apart from partial refilling of the scour around each pedestal on the receding limb of the flood hydrograph, it is not clear whether the displaced sediments only redeposit in the washes and/or whether they are transported downstream and offsite as an outcome of placing SunCatchers in the washes.

As such, these oversimplifications and unanswered questions in the analysis have reinforced our concerns and recommendations that more detailed calculations are needed to assess the onsite and offsite morphological and sedimentation (or water quality) impacts of the SunCatchers in the washes.

SUMMARY RESPONSE

In addition to the concerns raised above regarding the Staff's supplemental assessment and the Applicant's analyses, the substantial issues raised by our prior testimony remain, since prior issues, concerns, and recommendations have not been adequately addressed in part or in whole.

REFERENCES

CEC. 2010. Imperial Valley Solar Project (08-AFC-5) Supplemental Staff Assessment.

Chang. 2010b. Computation of Local Scour on Streambed Induced by SunCatchers. Prepared for Ecosphere Environmental Services.

Ecosphere Environmental Services. 2010. 404B-1 Alternatives Analysis for the Imperial Valley Solar Project. Prepared for USACE Los Angeles District.

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Todd Engineers. 2007a. Review of Groundwater Issues, Draft EIR/EIS for US Gypsum Expansion / Modernization Project. Prepared for Lilburn Corporation.

Todd Engineers. 2007b. Water Supply Assessment for US Gypsum Expansion / Modernization Project. Prepared for County of Imperial.

EXHIBIT 499 - J

Declaration of Christopher Bowles
Imperial Valley Solar Project

Docket 08-AFC-5

I, Christopher Bowles, declare as follows:

1. I have been a business partner in cbec, inc., eco engineering, a California Corporation, since its incorporation in July 2008. Prior to incorporation, I was a sole proprietor since December 2007. Prior to becoming a sole proprietor, I was a Principal at PWA, Ltd. I have consulted in water resources in the U.S.A. for over 11 years and have been working in the water resources internationally for over 17 years. I am very familiar with the hydrology and geomorphology of the western U.S.A.

2. I hold a Ph.D. in Civil Engineering (with a specialization in water resources) and a Bachelor of Engineering (First Class with Honors) in Civil Engineering. Both of these degrees were obtained in England, UK. My relevant professional qualifications and experience are set forth in the CV attached to my previous testimony.

3. I jointly prepared the testimony with Christopher Campbell, attached hereto and incorporated herein by reference, relating to the hydrologic and geomorphic impacts of the Imperial Valley Solar Project.

4. It is my professional opinion that the attached testimony are true and accurate with respect to the information that they portray.

5. I am personally familiar with the facts and conclusions described within the attached testimony, and if called as a witness, I could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 7/21/2010 **Signed:** C. B. Bowles

Location: WEST SACRAMENTO, CA **Printed:** CHRIS BOWLES

Declaration of Chris Campbell
Imperial Valley Solar Project

Docket 08-AFC-5

I, Christopher Campbell, declare as follows:

1. I have been a business partner in cbec, inc., a California Corporation, since its incorporation in July 2008. Prior to starting the business, I was a Senior Associate at PWA, Ltd.

2. I hold a M.S. degree in Biological and Agricultural Engineering and I am currently pursuing a Ph.D. in Civil Engineering. My relevant professional qualifications and experience are set forth in the CV attached to my previous testimony.

3. I jointly prepared the testimony with Chris Bowles, attached hereto and incorporated herein by reference, relating to the hydrologic and geomorphic impacts of the Imperial Valley Solar Project.

4. It is my professional opinion that the attached testimony are true and accurate with respect to the information that they portray.

5. I am personally familiar with the facts and conclusions described within the attached testimony, and if called as a witness, I could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 7/21/2010 **Signed:** Chris Campbell

Location: WEST SACRAMENTO, CA **Printed:** CHRIS CAMPBELL

EXHIBIT 499 – K

STATE OF CALIFORNIA
California Energy Commission

In the Matter of: The Application for Certification for the **IMPERIAL VALLEY SOLAR PROJECT**	Docket No. 08-AFC-5

ADDITIONAL REBUTTAL TESTIMONY OF SCOTT CASHEN ON BEHALF OF CALIFORNIA UNIONS FOR RELIABLE ENERGY ON BIOLOGICAL RESOURCES AND ALTERNATIVES FOR THE IMPERIAL VALLEY SOLAR PROJECT

July 21, 2010

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Qualifications

Education

I have a Master's of Science Degree in Wildlife and Fisheries Science from the Pennsylvania State University, University Park. The degree program included coursework in Landscape Ecology, Biometrics, Statistics, Conservation Biology, and Wetland Ecology. For my thesis, I conducted seven seasons of independent research on avian use of restored wetlands. The U.S. Fish and Wildlife Service subsequently used my technical report as a model for other habitat restoration monitoring projects in Pennsylvania.

Work Experience

My employment experience has included work in the fields of wildlife biology, forestry, and natural resource consulting. Much of my work over the past two and a half years has involved review of environmental documents associated with development of large-scale solar energy facilities. To date, I have served as an expert on 12 different solar projects, 9 of which are being sited in the Mojave Desert. I am currently entering the second year of a two-year contract I hold with the State of California to conduct surveys for the Peninsular bighorn sheep near Anza-Borrego Desert State Park. I serve as a member of the scientific review team responsible for assessing the effectiveness of the US Forest Service's implementation of the Herger-Feinstein Quincy Library Group Act.

For the past two and a half years I have operated my own consulting business. I previously served as a Senior Biologist for TSS Consultants and ECORP Consulting. Other positions I have held have included conducting wildlife research for the National Park Service, the Point Reyes Bird Observatory, and the University of California. While in graduate school I served as an instructor of Wildlife Management and as a teaching assistant for a course on ornithology.

STATEMENT

I. INTRODUCTION

The testimony contained herein is based on my review of the Supplemental Staff Assessment issued on July 7, 2010 and other environmental documents prepared for the Imperial Valley Solar Project ("Project"). This additional rebuttal testimony is intended to add to my previous opening and rebuttal testimony regarding the biological impacts posed by this Project and to provide additional analysis of Project alternatives proposed by the Applicant in the Applicant's additional Opening Testimony.

II. AVIAN PREDATORS AND RAVEN PLAN

The proposed project is likely to lead to an increased abundance of flat-tailed horned lizard (FTHL) predators. These include loggerhead shrikes, roadrunners, raptors, round-tailed squirrels, common ravens, coyotes, and kit foxes.[1] Researchers have theorized that increased predator density is responsible for the absence of FTHL along anthropogenic boundaries such as those that would be created by the Project.[2]

The applicant has prepared a draft Raven Management Plan, which staff has incorporated into proposed Condition of Certification "BIO-12." Staff has concluded that if the condition is implemented, BIO-12 would minimize the effects of increased predation on the FTHL population to less than significant levels under CEQA.[3]

The Applicant's Proposed Raven Management Plan is not Adequate

TIMELINE NOT SUFFICIENT

The Applicant proposes to monitor the effectiveness of the Raven Management Plan through the Project construction phases, and report on the implementation of the plan for two years following completion of the Project.[4] The Applicant's proposed timeline is insufficient, as demonstrated by statements made in the Applicant's draft Raven Management Plan. These include:

A. "It will be difficult to determine if the project is contributing to a decline in the local flat-tailed horned lizard population due to the difficulty in monitoring flat-tailed horned lizard densities and raven predation."

B. "Much of the plan's success lies in the effectiveness in discouraging human practices that would attract ravens to the area."

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[1] SSA, p. C.2-40.
[2] Young KV and AT Young. 2005. Indirect effects of development on the flat-tailed horned lizard. Final Report submitted to Arizona Game and Fish Department, Yuma. 11 pp.
[3] SSA, p. C.2-81.
[4] SES 2009 (tn 50613) – Draft Raven Monitoring, and Control Plan, dated 03/20/09. Submitted to Energy Commission/Docket Unit on 03/19/09.

C. "Because ravens are highly adaptive, the need for adaptive management would be necessary."[5]

None of these issues can be resolved in the short timeframe proposed by the Applicant. Because "human practices that would attract ravens" and the raven's ability to implement adaptive strategies will occur for the life of the Project, the Applicant's Raven Management Plan must similarly occur for the life of the Project if raven populations are to be adequately controlled. As currently written, Staff's proposed Condition of Certification does not ensure that Project impacts to ravens are mitigated.

MONITORING TECHNIQUES ARE NOT FEASIBLE

The Applicant's proposed Raven Management Plan consists of driving surveys that will target the Project site, the nearby transmission line corridors, and the surrounding areas.[6] The Applicant states these surveys will be used to document raven activity within two kilometers of the "site."

It's not apparent that there are existing roads within the "surrounding areas" to use driving surveys as a means of documenting raven activity in the various locations indicated by the Applicant. Furthermore, vehicles are a direct and indirect threat to FTHLs (e.g., crushing of lizards, habitat degradation, introduction of invasive plants), and thus use of vehicles to survey for ravens would counter the goal of preventing FTHL mortality. Unless Staff and the resource agencies require walking surveys or other raven monitoring techniques (perhaps a suite of different techniques), the monitoring plans are infeasible and pose significant unmitigated impacts to FTHL.

SUCCESS CRITERION IS NOT FEASIBLE

According to the Applicant's proposed Raven Management Plan, "[i]f after two years of reporting the agencies determine that the raven management program is effective, and ravens are not adversely affecting the local flat-tailed horned lizard population due to Solar Two [Imperial Valley Solar] site operation, then the raven surveys and reporting schedule will be phased out."[7] This is not a feasible success criterion because there is no identified means of determining whether ravens are affecting the local FTHL population as a result of the Project development.

Staff's Proposed Condition of Certification Lacks Control Measures for Other FTHL Predators

The proposed Project is likely to lead to an increased abundance of several other predators of FTHL. Research has demonstrated these predators can have a significant effect on FTHL populations.[8] The SSA concludes the Raven Management Plan (BIO-12)

[5] *Id.*
[6] *Id.*
[7] *Id.*
[8] Barrows CW, MF Allen, JT Rotenberry. 2006. Boundary processes between a desert sand dune community and an encroaching suburban landscape. Biological Conservation 131:486–494.

and Weed Management Plan (BIO-18) would reduce impacts from FTHL predators to less than significant levels.[9] This conclusion is unsupported because neither condition addresses how the Applicant will monitor and control the abundance of the numerous other FTHL predators besides ravens.

III. WEED MANAGEMENT PLAN IS NOT ADEQUATE

Staff's proposed mitigation for weed management is insufficient. First, neither the SSA nor the Applicant's draft Weed Management Plan specify the success criteria for weed management, or the triggers that will be used to determine when adaptive management measures are necessary.

Second, the SSA does not specify the duration of the Applicant's weed management efforts. The Applicant's draft Weed Management Plan suggests the Applicant will submit reports during the "monitoring period," but it never specifies the duration of that monitoring period. Activities that will promote the colonization and spread of weeds (e.g., ground disturbance, water use, vehicular traffic) will occur for the life of the Project. Therefore, Staff needs to ensure that the Applicant's weed management efforts occur for the life of the Project.

Third, the Applicant has yet to provide information on how the Project site will be revegetated after closure. The Applicant's draft Weed Management Plan states: "[s]hould the Solar Two project site ever be closed a site reclamation and revegetation plan should be drafted with the goal of reducing the extent of weeds that persist on the site following closure."[10] Until the Applicant provides an adequate plan that ensures proper reclamation and revegetation for Project closure, the Project poses a significant unmitigated impact from long term weed invasion.

IV. THE SSA IMPROPERLY CHARACTERIZES PROJECT VEGETATION AND DISTURBANCE LEVEL

The SSA states the vegetation communities within the proposed Project site consist of 5,024.4 acres of Sonoran creosote bush scrub habitat and 1,038.7 acres of disturbed habitat.[11] This does not appear to be an accurate characterization of the Project site. The AFC indicates the Project site contains only 30.3 acres of disturbed habitat, and that the majority of the Project Site is relatively undisturbed.[12]

The SSA states no sensitive natural vegetation communities occur in the survey area or within one mile of the project boundary.[13] This statement is incorrect. The desert iodine scrub community referenced in the SSA is a sensitive natural community.[14] Additional

[9] SSA, p. C.2-81,82.
[10] Applicant's Draft Noxious Weed Management Plan, p. 6-5.
[11] SSA, p. C.2-2.
[12] AFC, p. 5.6-8.
[13] SSA, p. C.2-21.
[14] SSA, p. C.2-20.

sensitive natural communities are present on the Project site, but have yet to be addressed by the Applicant or Staff. I provided information on this issue in my opening testimony and rebuttal testimony.

V. GOLDEN EAGLE

Staff has concluded the Project site contains suitable foraging habitat for golden eagles, and the loss of foraging habitat is considered a significant impact.[15] Staff has concluded the acquisition of FTHL habitat compensation lands would mitigate impacts to golden eagles.[16] Staff's conclusion lacks scientific support.

First, acquisition of compensatory mitigation for FTHL does not necessarily mitigate Project impacts to golden eagles. This is especially true because the recommended selection criteria for compensation lands do not require the lands to be within the foraging territory of any actual golden eagle nest sites.

Second, research indicates golden eagles selectively use available habitat, and that they concentrate their foraging activities in select "core" areas.[17] In a study on spatial use and habitat selection of golden eagles in Idaho, Marzluff et al. (1997) concluded that there was substantial variation in home range size and habitat use among eagles, and that if such variation was ignored (by focusing on population averages), conservation strategies and biological descriptions will be inaccurate and rarely effective.[18] During the breeding season, eagles in Marzluff's study had home ranges as small as 480 acres, with 95% of the activity concentrated in core areas as small as 74 acres.[19] Home range size and behavior were a function of the types and configuration of prey habitat in the vicinity of the nest, and perhaps individual eagles.[20]

The results of this research have two important implications on the Project. First, in the absence of more appropriate empirical data, one should conclude Marzluff's results apply to the Project site, and thus the Project could eliminate a substantial amount of core habitat (perhaps all) used by at least one pair of breeding eagles. Second, whereas acquisition of compensation land may help conserve foraging habitat for *some* eagle(s), it may be of little consequence to *the* eagle(s) whose core habitat has been eliminated by the Project. This is important because not all eagles contribute equally to maintenance of the population.[21] For example, if all the suitable nest locations are fully-occupied, impacts leading to abandonment of a territory (either through destruction of the nest

[15] SSA, p. C.2-68.
[16] SSA, p. C.2-97.
[17] Marzluff JM, ST Knick, MS Vekasy, LS Schueck, TJ Zarriello. 1997. Spatial use and habitat selection of golden eagles in southwestern Idaho. The Auk 114(4):673-687.
[18] Marzluff JM, ST Knick, MS Vekasy, LS Schueck, TJ Zarriello. 1997. Spatial use and habitat selection of golden eagles in southwestern Idaho. The Auk 114(4):673-687.
[19] *Id.*
[20] *Id.*
[21] US Fish and Wildlife Service, Division of Migratory Bird Management. 2009. Final Environmental Assessment, Proposal to Permit Take. Provided Under the Bald and Golden Eagle Protection Act. Washington: Dept. of Interior.

substrate or through not being re-occupied by either the original nesting pair or a new pair from the floater population) may have a significant negative impact to the area population.[22] Available prey base or intra-species competition may be additional relevant factors in the ability of compensation lands to maintain eagle populations.[23]

Third, the USFWS has indicated that implementation of its Interim Golden Eagle Inventory and Monitoring Protocol is required to "establish the baseline circumstances for evaluation of permit applications and foundation for permit conditions, as well as assist planners so they may conduct informed impact analyses and mitigation during the National Environmental Policy Act (NEPA) process."[24] Yet, the SSA lacks any reference to the USFWS's golden eagle protocol. To conserve the golden eagle population and ensure Project compliance with the Eagle Act, mitigation imposed through Project approval should require the Applicant to implement the USFWS' golden eagle protocol.

Finally, the SSA discusses the USFWS's recommendation to the BLM that it evaluate whether take is likely to occur from loss of foraging habitat and if the loss will impact the ability to meet the preservation standard of the Eagle Act. According to the SSA, San Diego Gas & Electric (SDG&E) is currently collecting data, and once SDG&E's data are available, the BLM can incorporate them into their analysis.[25] This strongly suggests additional data are required to assess whether the Project would comply with the Eagle Act. If my presumption is correct, Staff does not have the information necessary to conclude compliance with the Eagle Act or that Project impacts to golden eagles would be mitigated to less than significant levels through acquisition of FTHL compensation lands.

VI. MITIGATION FOR AMERICAN BADGER AND DESERT KIT FOX

Staff has concluded the proposed Conditions of Certification BIO-15 (Badger and Kit Fox Avoidance and Minimization Measures) and BIO-10 (Flat-Tailed Horned Lizard Habitat Compensatory Mitigation) "would mitigate impacts to American badger and desert kit fox to less than significant levels under CEQA by avoiding take of these species and by *likely offsetting* habitat loss, provided the species occurs on the potential relocation site. The compensation lands acquired under BIO-10 are *assumed to be suitable* as compensation for American badger and desert kit fox."[26] Staff cannot rely on these assumptions to conclude impacts would be mitigated to less than significant levels.

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[22] US Fish and Wildlife Service, Division of Migratory Bird Management. 2009. Final Environmental Assessment, Proposal to Permit Take. Provided Under the Bald and Golden Eagle Protection Act. Washington: Dept. of Interior.

[23] US Fish and Wildlife Service, Division of Migratory Bird Management. 2009. Final Environmental Assessment, Proposal to Permit Take. Provided Under the Bald and Golden Eagle Protection Act. Washington: Dept. of Interior.

[24] Pagel JE, DM Whittington, GT Allen. 2010 Feb. Interim Golden Eagle inventory and monitoring protocols; and other recommendations. Division of Migratory Birds, United States Fish and Wildlife Service.

[25] SSA, p. C.2-97.

[26] SSA, p. C.2-71.

Consequently, BIO-10 needs to specify that American badgers and desert kit foxes occur on the compensation lands. Without the modification to this condition, there is a potentially significant unmitigated impact to American badgers and desert kit foxes.

VII. NOISE

The SSA concludes Project noise that carries offsite would be less than significant because it would be in the estimated range of background noise.[27] This conclusion is not supported. In the Noise and Vibration chapter of the SSA, Staff provides data that demonstrate a considerable increase in cumulative noise levels during the Project construction phase.[28] Noise levels at each of the three sensitive receptors used to collect data would exceed the noise level known to adversely affect bird species.[29] As a result, the data indicate construction noise is likely to have an adverse effect on bird species within at least two miles of the Project site.[30] This is a potentially significant impact for which mitigation is required (e.g., limiting construction noise to the non-breeding season).

According to the SSA, noise from Project operations would not contribute to a significant increase in cumulative noise levels.[31] However, this conclusion was based on data collected at three sensitive receptors located 4,300 to 10,500 feet away from the Project boundary; it ignores the effects of Project noise in the zone between the Project boundary and the sensitive receptors. The noise generated by the SunCatcher engines will be too loud for most birds to tolerate. Therefore, the significant impacts of noise on wildlife as a result of Project operations needs to be analyzed and mitigated.

VIII. WILDLIFE MOVEMENT

Corridors serve important functions in maintaining population viability. Of particular concern is the maintenance of connectivity between the Yuha Desert Management Area and the West Mesa Management Area, two of the five reserves designated for FTHL. I concur with Staff's conclusion that the loss of FTHL movement corridors and connectivity between the management areas would be a significant adverse impact, which is unmitigable as the project is currently proposed.[32]

In discussing movement corridors, the SSA indicates Coyote Wash serves as a possible movement corridor.[33] However, the SSA subsequently indicates "Wind Zero" is a reasonably foreseeable project that includes development in the South Fork Coyote

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[27] SSA, p. C.2-212.
[28] SSA, Noise Table 5, p. C.9-9.
[29] SSA, p. C.2-60. The SSA suggests a threshold of effect at 60 dBA; however, research has shown a threshold as low as 36 dBA.
[30] Staff predicted a cumulative noise level of 61 dBA at ML5, which is 10,500 feet northeast of the Project site. *See* SSA, p. C.9-7 and C.9-9.
[31] SSA, Noise Table 8, p. C.9-12.
[32] See Figures 1 and 2 attached.
[33] SSA, p. C.2-42.

Wash.[34] Consequently, Coyote Wash cannot be considered a potentially viable corridor that would allow wildlife movement between the two management areas.

Climate Change

The SSA provides a good summary on the effects of climate change. In particular, it states:

A. "preservation of connected blocks of habitat ***will be vital*** to allow movement of species to portions of their range that provide more suitable habitat or to allow movement to new areas that may support suitable habitat in the future."[35]

B. "it is important to site renewable energy projects so as to maintain the greatest degree of connectivity as possible to protected blocks of habitat or to acquire compensation lands that protect connectivity."[36]

The SSA then jumps to the conclusion that the impacts of climate change would be less than significant with appropriate levels of compensatory mitigation.[37] This conclusion is unfounded and unlikely. Condition of Certification BIO-10 requires the Applicant to purchase compensatory habitat within or "near" FTHL Management Areas in the Colorado Desert.[38] However, the specific location of the compensation lands must be identified before Staff can analyze the mitigation value for species' movement in response to climate change. Private lands within the Management Areas (i.e., lands potentially available for acquisition) are isolated blocks within a larger matrix of public lands.[39] As such, their acquisition may preserve connectivity *within* a Management Area, but they would do nothing to mitigate the Project's elimination of connectivity *between* Management Areas.

IX. BURROWING OWL

Impact Assessment and Avoidance

To avoid potential impacts to burrowing owls that might be nesting within the impact area, the SSA requires surveys using methods recommended by the California Burrowing Owl Consortium prior to decommissioning/plant closure activities.[40] I agree that surveys conducted according to the recommended protocol are the proper means of minimizing impacts to burrowing owls. However, protocol surveys for burrowing owls must also be conducted before the Project is constructed. To date, the Applicant has not conducted protocol surveys for burrowing owls on the Project site, and the SSA simply requires a "pre-construction" survey before initial ground disturbance. A pre-construction survey of unspecified level of effort is not the appropriate or recommended method for identifying

[34] SSA, p. C.2-111.
[35] SSA, p. C.2-112. [emphasis added]
[36] SSA, p. C.2-112.
[37] SSA, p. C.2-113.
[38] SSA, p. C.2-169.
[39] *See* SSA, Cumulative Impacts Figure 2 and 3.
[40] SSA, p. C.2-93.

and avoiding impacts to burrowing owls. Prior to Project construction, the Applicant should be required to conduct protocol surveys for burrowing owls so Project impacts to the species can be accurately assessed and appropriate mitigation can be developed.

Mitigation Measures

Staff's proposed mitigation requires the Applicant to prepare a Burrowing Owl Relocation Area Management Plan if burrowing owls are detected in the Project disturbance area. The SSA states the Burrowing Owl Relocation Area Management Plan ("Plan") should include monitoring and maintenance requirements, details on methods for measuring compliance goals, and remedial actions to be taken if management goals are not met.[41] However, the SSA itself does not provide any specific minimum, measurable performance standards, contingency plans if the performance standards are not met, or a timeline for implementation of the Plan. These items need to be established before a decision on the Project is made.

Owl burrows were detected on the Project site and live owls were detected both offsite and along the transmission line corridor.[42] Therefore, it is reasonable to expect burrowing owls will be detected during pre-construction surveys, especially on a large project site in Imperial County (which contains the majority of California's burrowing owl population). As a result, preparation of a Burrowing Owl Relocation Area Management Plan should not be deferred to a later date when its outcome would be uncertain.

X. CONSERVATION MEASURES FOR SPECIAL-STATUS PLANTS

Avoidance and Minimization

The SSA discusses the need to establish buffers around environmentally sensitive areas (ESAs). ESAs would be established for protected plant species occurrences, and they would be a minimum of 20 feet from the uphill side of the occurrence and 10 feet from the downhill side.[43] The SSA does not establish success criteria or triggers for remediation to ensure the ESAs are effective in offsetting Project impacts.

Moreover, scientific knowledge further dictates the proposed protection measures would be ineffective. Protection measures (including buffer size) need to be based on a plant's ecological requirements (e.g., sunlight; moisture; shade tolerance; edaphic, physical, and chemical characteristics) and the threats to its viability (including adjacent land use). Staff on the Calico Solar project concluded a 250-foot buffer would be needed for on-site plant protection.[44] There is no basis to conclude a buffer roughly 1/12th the size of that recommended for the Calico Solar Project would provide sufficient protection at the Project site, especially considering both projects would use the same technology.

[41] SSA, p. C.2-184.
[42] AFC, Bio Tech Report, Figure 2.
[43] SSA, p. C.2-194.
[44] Calico Solar Project SA/DEIS, p. C.2-175.

The ecological requirements of most plant species are poorly understood. However, scientific knowledge supports the inference that a project of this size (i.e., approximately 6,156 acres) will disrupt the ecological processes (e.g., seed dispersal, pollination, and gene flow) that may be necessary to maintain viable populations. The SSA lists several indirect impacts from the Project that Staff anticipates will affect special-status plants.[45] I cannot envision a scenario in which a buffer of 10 feet would be likely to protect a plant from these Project impacts. The Energy Commission Staff that evaluated the Ivanpah Solar Electric Project derived a similar verdict. Specifically, Staff concluded mitigation that relied on maintaining islands of protected plants within a disturbance matrix was "infeasible to protect the special-status plants from significant indirect impacts (i.e., from introduction and spread of non-native plants, alterations of the local hydrology, higher than normal dust levels, etc.)."[46] Although there is value in conserving special-status species within the Project site, any attempts to do so should have a reasonable possibility of success, and they should be backed by remedial mitigation measures if conservation goals are not met.

MONITORING AND REPORTING REQUIREMENTS

Condition of Certification BIO-19-A.2.g directs the Applicant to conduct monitoring of the ESAs and submit monitoring reports.[47] However, the condition does not specify the variables the Applicant needs to monitor (e.g., abundance, vigor, reproductive output), or more importantly, the success criteria associated with the monitoring efforts. Without appropriate success criteria, the monitoring effort would be ineffective.

Mitigation Measures

AVOIDANCE

Staff's proposed mitigation establishes certain scenarios in which the Applicant would be required to avoid on-site impacts to a minimum of 75 percent of the total population of a particular plant species.[48] For perennial plants, the SSA indicates the percent avoidance shall be based on the percentage of the total individuals affected.[49] For annual plants, the SSA indicates the percent avoidance shall be based on the total area occupied by the occurrence plus any additional habitat deemed essential for maintaining healthy, reproductive populations.[50] These guidelines need to be strengthened to ensure the Applicant satisfies the intent of the condition.

For perennial plants, higher weights should be applied to mature plants. Most mature plants would have a higher likelihood of surviving the Project's indirect impacts, and

[45] SSA, p. C.2-63.
[46] Energy Commission Staff's Rebuttal Testimony, Ivanpah Solar Electric Generating System. p. 28.
[47] SSA, p. C.2-195.
[48] SSA, p. C.2-201.
[49] *Id.*
[50] *Id.*

they provide a higher conservation value due to their ability to reproduce. For example, suppose the Project site contains 25 mature plants and 75 seedlings of a perennial plant species requiring on-site avoidance. As currently written, the condition of certification would enable the Applicant to kill the 25 mature plants (so as to avoid shading of SunCatchers) as long as the 75 seedlings were avoided. This would not be ecologically viable strategy.

For annual plants, I agree with the need to consider additional habitat that may be essential for maintaining healthy, reproductive populations. However, the condition of certification should establish more stringent guidelines on how this additional habitat may be used in calculating avoidance requirements. For example, suppose the Project site contains 25 acres of the target species and 75 acres deemed essential for maintaining healthy, reproductive populations. As currently written, it appears the condition of certification would enable the Applicant to eliminate the 25 acres occupied by the plants as long as the remaining 75 acres were avoided. Clearly this would not satisfy the intent of Staff's proposed mitigation.

Project Impacts to Wiggin's Croton

Wiggin's croton is a BLM Sensitive plant and it is listed as Rare under the California Endangered Species Act. The Applicant detected two mature individuals and five young Wiggin's croton plants along the proposed water pipeline route. According to the SSA, impacts to Wiggins' croton would be avoided so Project impacts are considered less than significant and no mitigation is expected. However, the SSA indicates specific avoidance measures to reduce potential impacts to special-status plant species were not proposed by the Applicant, and the SSA lacks any specific information to substantiate its statement that Project impacts to Wiggin's croton plants will be avoided.

Impacts to Special-Status Species from Seeley Wastewater Facility Upgrade

The SSA discusses the ongoing efforts to evaluate sensitive avian resources that may be impacted by upgrades to the Seeley Wastewater Treatment Facility. However, it does not provide any information on the sensitive botanical resources that might be affected by upgrade activities. Protocol rare plant surveys are needed to evaluate the impacts of the facility upgrade. The Applicant's 2010 botanical survey report suggests protocol surveys of the wastewater facility have not been conducted, and there is no indication that they are planned. Without protocol rare plant surveys, there are potential significant unmitigated impacts to rare plants associated with the Facility upgrade.

COMPENSATION LANDS

Staff's proposed mitigation allows the Applicant to acquire unoccupied habitat to compensate for Project impacts to special-status plant species.[51] Acquisition of unoccupied habitat would likely result in an unmitigated, significant impact to sensitive botanical resources.

[51] SSA, p. C.2-202.

First, even if the acquisition lands are adjacent to occupied habitat, they would be incapable of addressing direct threats to the target species. These include numerous threats that the Applicant would have no control over (e.g., grazing, mowing, herbicide use, trampling, vehicle activity, and several others). Second, Staff's allowance for acquisition of unoccupied compensation lands that are not adjacent to occupied habitat lacks scientific foundation, and does not meet CEQA mitigation standards for certainty, performance, and feasibility. Arguably, the practice of acquiring unoccupied habitat adjacent to more unoccupied habitat would counter that stated criteria that acquisition lands contain "habitat that is critical to the maintenance or sustainability of the affected species" and that they contain "linkages for species dispersal."[52]

Verification Measures

Verification measures for Condition of Certification BIO-19 include the requirement that the Applicant submit a draft Special-Status Plant Mitigation Plan no less than 30 days prior to ground-disturbing activities. According to the SSA, the plan should contain a "conceptual proposal for compensatory mitigation."[53] To ensure mitigation goals are met, Staff's verification measures need to include a process for revisions to the plan, its approval, and transformation of a concept into an actual plan before impacts to botanical resources occur.

XI. FTHL MITIGATION

Avoidance Measures

The SSA indicates a translocation plan for flat-tailed horned lizards (FTHL) will no longer be required.[54] However, the SSA also indicates FTHLs encountered during construction must be moved out of harm's way.[55] The SSA does not provide any information on the methods that should be implemented to capture any FTHL that are encountered; the process for safely handling and transporting lizards; or the locations of acceptable release sites (including their habitat suitability). These issues need to be addressed and subjected to professional review before the Applicant moves any FTHL.

To reduce impacts to FTHL, the SSA indicates clearance surveys for FTHL would occur prior to each phase of decommissioning/plant closure activity.[56] FTHL would then be relocated to suitable habitat outside of the development impact area.[57] The SSA provides no explanation for why clearance surveys should be implemented before decommissioning, but not before Project construction.

[52] SSA, p. C.2-202,203.
[53] SSA, p. C.2-205.
[54] SSA, p. C.2-74.
[55] *Id.*
[56] SSA, p. C.2-94.
[57] *Id.*

Compensation Measures

SELECTION CRITERIA

Staff has established selection criteria for FTHL compensation lands. However, some of the selection criteria are infeasible and lack certainty.

Selection criterion #1a is that the compensation lands be within or near FTHL Management Areas (MAs) in the Colorado Desert, with potential to contribute to FTHL habitat connectivity and build linkages between FTHL MAs, known populations of FTHLs, and/or other preserve lands.[58] Compensation lands within a FTHL MA would not contribute to connectivity *between* MAs, although they might promote connectivity *within* an individual MA.

Selection criterion #1b specifies that compensation lands should provide moderate to high quality habitat for FTHL. However, the SSA has not defined what is considered moderate or high quality habitat, nor a scientifically defensible process for evaluating habitat quality at proposed compensation sites.

Selection criterion #1c requires compensation lands to be near larger blocks of lands that are either already protected or planned for protection, or which could "feasibly be protected."[59] Even if a property can feasibly be protected, there is no assurance that it *will be* protected.

Selection criterion #1d specifies that compensation lands should be connected to lands occupied by FTHLs, or where FTHLs can be reasonably expected to occur, based on habitat or historic occurrences .[60] To the best of my knowledge, no one has developed a habitat model for FTHL. Therefore, the SSA requires an explanation for how habitat can be used to predict FTHL occurrence, and it should specify the habitat variables that would be measured to support a prediction. Additionally, the criterion states the adjacent lands should "ideally" have FTHL populations that are stable, recovering, or likely to recover.[61] This suggests it would be permissible for the Applicant to acquire lands adjacent to areas where FTHL populations are crashing. Such lands may not support the intent of Staff's condition. Unless the compensation lands are connected to lands where FTHL occupation has been confirmed, there is no basis to conclude the compensation lands will contribute to connectivity (i.e., criterion #1a).

[58] SSA, p. C.2-169.
[59] SSA, p. C.2-170.
[60] *Id.*
[61] *Id.*

Selection criterion #1e specifies that compensation lands should "ideally" contain soils that are stable and not suffering erosional damage.[62] This suggests it would be permissible for the Applicant to acquire lands with unstable soils that are suffering erosion damage. Such lands may contain soils that are incapable of remediation or supporting FTHL.

Selection criterion #1f specifies that compensation lands should not be characterized by high densities of invasive species.[63] Because the SSA has not defined what is considered a "high" density, the criterion lacks a measurable and enforceable standard.

IN-LIEU FEE

Condition of certification BIO-10 allows the Applicant to satisfy its mitigation requirements with an in-lieu fee instead of acquiring compensation lands.[64] However, the SSA has not established how the in-lieu fee would be calculated, nor has it demonstrated that it would be commensurate with the actual cost of acquiring, enhancing, and managing land within a MA.

VERIFICATION MEASURES

Staff's proposed verification measures allow the Applicant 18 months to acquire the compensation lands, and then an additional 180 days to prepare a management plan. However, Staff's proposed mitigation (primarily 1:1) does not account for the lag time between impacts and implementation of offsetting mitigation.

XII. CUMULATIVE IMPACTS

The SSA concludes "[t]he proposed IVS project would be expected to contribute only a small amount to the possible short term cumulative impacts related to biological resources because the proposed conditions of certification described below would minimize and offset the contributions of the proposed IVS project to the cumulative loss of habitat for native plant communities and wildlife, including special status species."[65] This conclusion is misleading and unjustified. First, the Project would not contribute a "small amount to the possible short term cumulative impacts" to biological resources. The Project would be a relatively large contributor to the loss of connectivity and overall ecosystem degradation in the region. These impacts would have a severe, long-term effect on biological resources, and they would not be mitigated by the proposed conditions of certification. Second, there is no scientifically defensible basis to conclude the Project's cumulative contribution to habitat loss will be mitigated until the compensation lands have been identified.

[62] *Id.*
[63] *Id.*
[64] SSA, p. C.2-176.
[65] SSA, p. C.2-111.

XIII. ALTERNATIVES AND LEDPA ANALYSIS

The SSA provides an assessment of reduced acreage alternatives. The Applicant has also provided information on Project alternatives, which was submitted as testimony to support 404B-1 alternatives analysis. Through this analysis, the Applicant concluded "Alternative #3" (the 709MW alternative) was the least environmentally damaging practicable alternative (LEDPA).

The following biological resources have the potential to be adversely affected by the Project: (1) flat-tailed horned lizard; (2) special-status botanical resources; (3) burrowing owl; (4) golden eagle; (5) migratory and other special-status birds; (6) American badger; (7) desert kit fox; (8) wildlife movement corridors; (9) ecosystem processes; (10) Peninsular bighorn sheep; and (11) aquatic resources. In the subsequent testimony I address each of these resources in relation to the Applicant's proposed LEDPA, and then in relation to Staff's proposed alternatives.

Applicant's Proposed LEDPA

FLAT-TAILED HORNED LIZARD

The Applicant's testimony states the Applicant's proposed LEDPA would provide corridors for flat-tailed horned lizards (FTHL) to traverse the proposed project site because Washes C, I, and K would only have perpendicular road crossings and no SunCatchers.[66] In addition, the Applicant has stated the proposed LEDPA would minimize FTHL mortality and provide relatively undisturbed washes for movement because "the roads within the washes throughout the site would be used minimally (Table 16) during operation of the project."[67] The Applicant's conclusion is not supported by the data, which indicate vehicles would make approximately 6,602 wash crossings per month.[68] The Applicant's proposed LEDPA would result in nearly the same amount of land disturbance as the proposed Project. Therefore, the Applicant's proposed LEDPA does not address habitat loss, which is considered the primary reason for the overall population decline of FTHL.[69]

Maintaining connectivity among habitats is important for the long-term conservation of the FTHL. However, the critical distinction between the *presence* of a corridor and its *function* was not addressed in the Applicant's analysis. That is, just because a corridor is present does not mean it will be used, or that it will function as intended.

Research has shown FTHL are absent along human-induced edges, likely due to the increased abundance of predators.[70] Research has also shown that prolonged noise can

[66] Applicant's 404B-1 Alternatives Analysis, p. 50,51.
[67] Applicant's 404B-1 Alternatives Analysis, p. 51.
[68] Applicant's 404B-1 Alternatives Analysis, Table 16.
[69] Flat-tailed Horned Lizard Interagency Coordinating Committee. 2003. Flat-tailed horned lizard rangewide management strategy, 2003 revision. 80 pp. plus appendices.
[70] E.g., Young KV and AT Young. 2005. Indirect effects of development on the flat-tailed horned lizard. Final Report submitted to Arizona Game and Fish Department, Yuma. 11 pp.

adversely affect some lizards (e.g., desert iguana, Mojave fringe-toed lizard). The FTHL Rangewide Management Strategy indicates noise effects on FTHL are more likely where prolonged, loud noise occurs. This would be the situation on the Project site due to the noise generated by the SunCatcher engines. FTHL prey almost entirely on native ants.[71] Ant population dynamics are complex, but it's likely that removal of vegetation from the Project site would reduce native ant populations, which are dependent on seed as a food source. Each of these factors suggests the washes referenced in the Applicant's LEDPA would not function as viable corridors through the Project site.

SPECIAL-STATUS BOTANICAL RESOURCES

The Applicant's LEDPA analysis did not provide any information on the proposed LEDPA's ability to reduce impacts to special-status botanical resources.

BURROWING OWL

The Applicant's LEDPA analysis did not provide any information on the proposed LEDPA's ability to reduce impacts to burrowing owls. However, the Applicant's proposed LEDPA would cause considerable habitat loss for burrowing owls. In addition, any burrowing owls that remain on-site would be subject to collisions with vehicles, which have been cited as a significant source of mortality by several researchers.[72]

GOLDEN EAGLE

The Applicant's LEDPA analysis did not provide any information on the proposed LEDPA's ability to reduce impacts to golden eagles. However, the Applicant's proposed LEDPA would not leave an undisturbed minimum patch that would be required to support foraging eagles, thus it would not reduce impacts to the species.

MIGRATORY AND OTHER SPECIAL-STATUS BIRDS

The Applicant's LEDPA analysis did not provide any information on the impacts to migratory and other special-status birds. However, most bird species are sensitive to noise disturbance, which would not be reduced by the Applicant's proposed LEDPA.

AMERICAN BADGER, KIT FOX, AND WILDLIFE MOVEMENT CORRIDORS

The Applicant's LEDPA analysis did not directly address the impacts to American badger and desert kit fox. However, the Applicant concluded its proposal to omit SunCatchers from Washes C, I, and K would "provide habitat for the numerous animal species that utilize the denser wash vegetation and provide corridors of movement

[71] Flat-tailed Horned Lizard Interagency Coordinating Committee. 2003. Flat-tailed horned lizard rangewide management strategy, 2003 revision. 80 pp. plus appendices. p. 8.
[72] Haug, E. A., B. A. Millsap, and M. S. Martell. 1993. Burrowing Owl (*Speotyto cunicularia*). *In* A. Poole and F. Gill, editors. The birds of North America, No. 61. The Academy of Natural Sciences, Philadelphia, Pennsylvania; The American Ornithologists' Union, Washington, DC.

through the project area."[73] This is not a reliable conclusion. American badgers and kit fox will be cleared from the site prior to construction, and the perimeter fence will then prevent movement of most terrestrial wildlife through the Project area.

ECOSYSTEM PROCESSES

Research in U.S. deserts has shown that (a) complex dynamics of species populations reflect interactions with other organisms and fluctuating climate; and (b) some environmental perturbations can cause wholesale reorganization of ecosystems because they exceed the ecological tolerances of dominant or keystone species.[74] The Applicant's proposed LEDPA would not alleviate the disruption of ecosystem processes that are likely to result from Project impacts.

PENINSULAR BIGHORN SHEEP

The proposed Project would result in loss of foraging habitat and movement corridors for bighorn sheep. These elements on the Project site are critical to the long-term viability of bighorn sheep populations. Due to the perimeter fence, the Applicant's proposed LEDPA would not alleviate Project impacts to bighorn sheep.

AQUATIC RESOURCES

Construction of the Project would include soil excavation, clearing, grading, installation of solar disks, construction of the Main Services Complex, roads, utilities, water pipeline, substation, and other ancillary features.[75] During these activities, there would be both permanent and temporary impacts to the physical substrate of Waters of the U.S. from dredge and fill activities and construction of permanent facilities.[76] Other potential impacts to the surface substrate of Waters of the U.S. would result from periodic vehicle crossings.[77]

The Applicant's testimony states that the proposed LEDPA would reduce permanent impacts to Waters of the U.S. from 177 acres to 39.1 acres, a reduction of 78 percent.[78] The maps provided in the Applicant's analysis are difficult to interpret, but they do not suggest a reduction of this magnitude.[79]

The Applicant's proposed LEDPA would cause extensive disturbance to the site's soils and vegetation. Once this occurs, soils will be extremely susceptible to wind and water erosion. The Applicant submitted testimony that concluded the Project would not change hydrology or sediment flow. To the contrary, Dr. Chris Bowles and Chris Campbell

[73] Applicant's 404B-1 Alternatives Analysis, p. 53.
[74] Brown J.H., Whitham T.G., Ernest S.K.M. & Gehring C.A. 2001. Complex species interactions and the dynamics of ecological systems: long-term experiments. Science 293: 643-650
[75] Applicant's 404B-1 Alternatives Analysis, p. 48.
[76] *Id.*
[77] *Id.*
[78] Applicant's 404B-1 Alternatives Analysis, p. 1.
[79] Applicant's 404B-1 Alternatives Analysis, Map 2 and Map 4.

submitted testimony in which they concluded the proposed Project would result in significant impacts, both onsite and offsite, due to changes in hydrologic processes, increases in soil erosion by water, adverse changes to the morphology of the washes, and potential hazards to the solar dishes placed in the washes. Based on my review of the literature and my experience with development projects, it is impractical to expect even the best BMPs would prevent sediment transfer out of the Project site following mass disturbance.

Most of the sediment that is displaced from the Project site will eventually be deposited into the New River and Salton Sea. The New River is impaired by sediment and siltation.[80] The Project would further contribute to this impairment. It would also jeopardize recovery of the Salton Sea. The Salton Sea provides important food resources for numerous resident and migratory bird species. Although many fish populations in the Salton Sea have crashed, tilapia populations have been recovering and they continue to support a recreational fishery. Mass disturbance of the Project site would contribute suspended silt to the Salton Sea, which would then be potentially toxic to tilapia and other fish species.[81]

River mouths, particularly in the southern part of the Salton Sea, provide areas of reduced salinity and higher dissolved oxygen. These estuarine areas are relatively small, yet very productive, and they routinely support higher concentrations of birds than surrounding areas. The size of the estuarine areas is influenced primarily by the amount of inflow. The New and Alamo rivers, which constitute nearly 80 percent of the inflow to the Salton Sea, support the largest estuarine areas. The Project's contribution of additional sediment to the New River would lower dissolved oxygen levels, and may alter the geomorphology of the estuaries. Both of these issues would cause potentially significant impacts on fish and wildlife resources.

Staff's Proposed Alternatives

The SSA analyzed a 300 MW Project alternative that would reduce impacts to habitat for FTHL, burrowing owls, golden eagles, bighorn sheep, American badgers, kit foxes, and other special-status species by 57 percent.[82] Due to the reduced footprint, less of the landscape would be fenced (from 6,063.1 acres to 2,577 acres).[83] This would allow viable dispersal corridors for terrestrial wildlife. With additional analyses, the 300 MW Alternative could be designed to promote FTHL movement between the Management Areas and reduce impacts to desert washes. These considerations—in conjunction with the attached advice letter from San Diego Gas and Electric— demonstrate that the 300 MW Alternative cannot be dismissed for failing to significantly reduce biological impacts.[84] Similarly the 300 MW Alternative should not be dismissed as economically

[80] California Department of Water Resources and California Department of Fish and Game. 2006. Salton Sea Ecosystem Restoration Program Draft Programmatic Environmental Impact Report. p. 6-2.
[81] Buermann Y, HH Du Preez, GJ Steyn, L Smit. 1997. Tolerance levels of redbreast tilapia, Tilapia rendalli (Boulenger, 1896) to natural suspended silt. Hydrobiologia 344:11-18.
[82] SSA, p. C.2-99.
[83] SSA, p. C.2-100.
[84] See Exhibit 499-M.

infeasible, since the Applicant has a power purchase agreement for a 300 MW project and no more. I recommend Staff and the resource agencies work with the Applicant to develop and further refine the LEDPA because Project impacts to the FTHL, desert washes, and other sensitive biological resources can be further minimized.

FIGURE 1

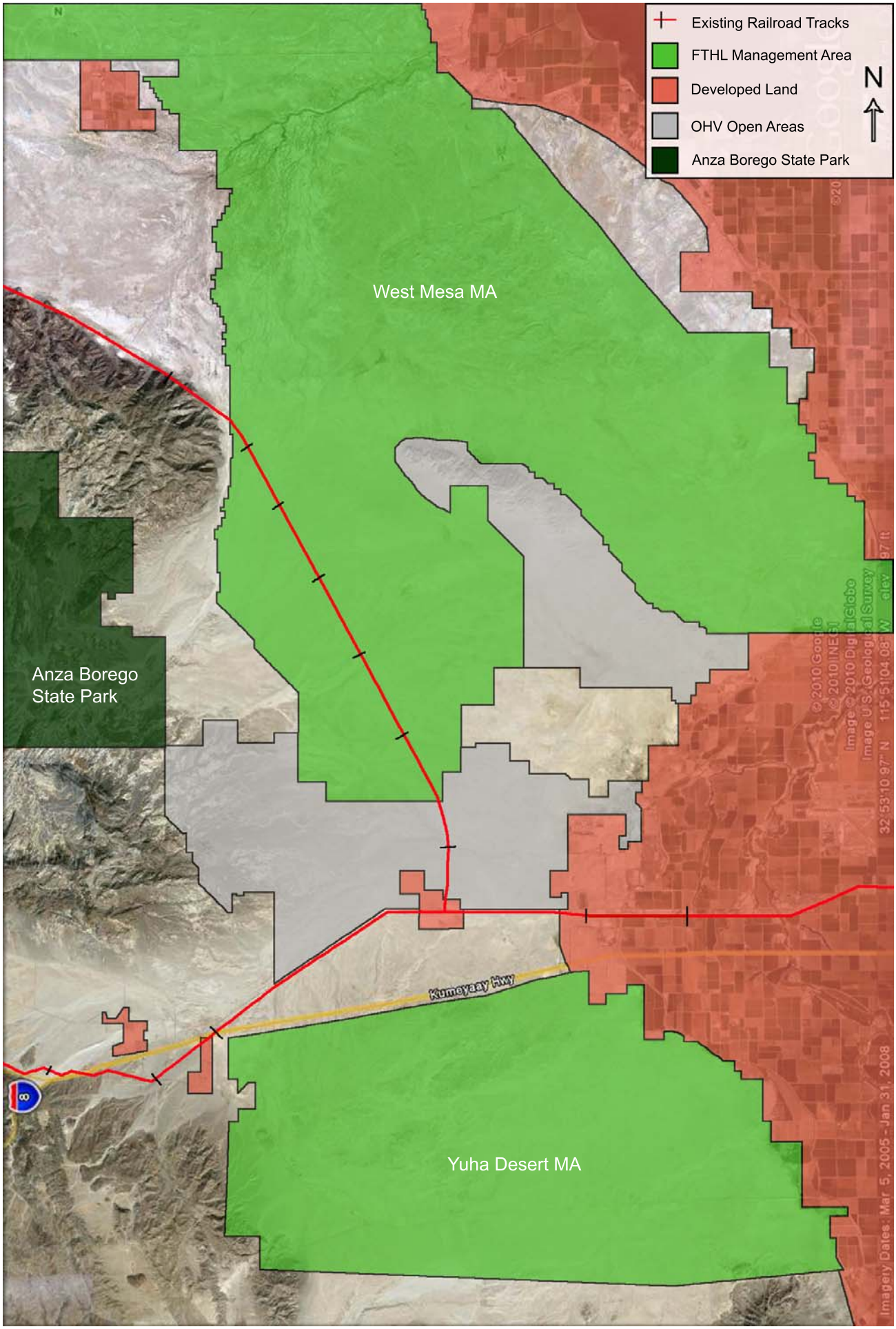

Existing Railroad Tracks
FTHL Management Area
Developed Land
OHV Open Areas
Anza Borego State Park
N
West Mesa MA
Anza Borego
State Park
Kumeyaay Hwy
8
Yuha Desert MA

FIGURE 2

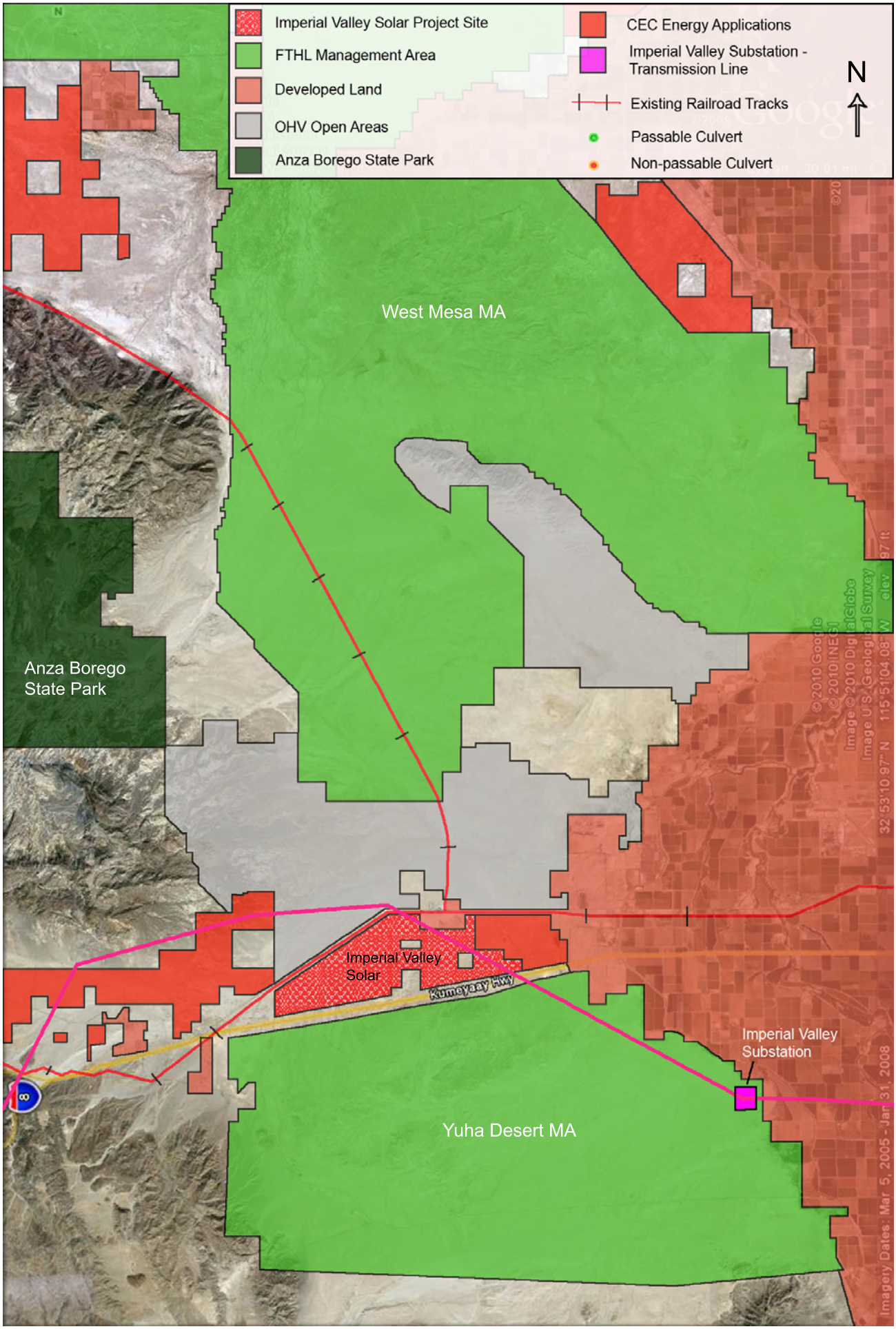

Imperial Valley Solar Project Site
FTHL Management Area
Developed Land
OHV Open Areas
Anza Borego State Park
CEC Energy Applications
Imperial Valley Substation - Transmission Line
Existing Railroad Tracks
Passable Culvert
Non-passable Culvert
N
West Mesa MA
Anza Borego State Park
Imperial Valley Solar
Kumeyaay Hwy
Imperial Valley Substation
Yuha Desert MA
8
Imagery Dates: Mar 5, 2005 - Jan 31, 2008

EXHIBIT 499 – L

Declaration of Scott Cashen
Imperial Valley Solar Project

Docket 08-AFC-5

I, Scott Cashen, declare as follows:

1) I am an independent biological resources consultant. I have been operating my own consulting business for the past three years. Prior to starting my own business I was the Senior Biologist for TSS Consultants.

2) I hold a Master's degree in Wildlife and Fisheries Science. My relevant professional qualifications and experience are set forth in the attached testimony and are incorporated herein by reference.

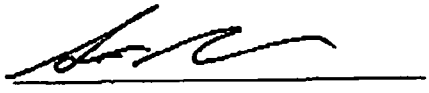
3) I prepared the rebuttal testimony attached hereto and incorporated herein by reference, relating to the biological resource impacts of the Imperial Valley Solar Project.

4) I prepared the rebuttal testimony and maps attached hereto and incorporated herein by reference relating to the distribution of solar energy generation infrastructure in Imperial County.

5) It is my professional opinion that the attached rebuttal testimony and maps are true and accurate with respect to the issues that they address.

6) I am personally familiar with the facts and conclusions described within the attached rebuttal testimony and maps, and if called as a witness, I could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: July 21, 2010 Signed: 

At: Walnut Creek, CA

EXHIBIT 499 - M

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A Sempra Energy utility

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April 7, 2010

ADVICE LETTER 2161-E
(U 902-E)

PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

SUBJECT: REQUEST FOR APPROVAL OF RENEWABLE POWER PURCHASE WITH IMPERIAL VALLEY SOLAR, LLC

I. INTRODUCTION

A. PURPOSE OF THE ADVICE LETTER

San Diego Gas & Electric Company ("SDG&E") seeks approval from the California Public Utilities Commission (the "Commission" or the "CPUC") for an amendment to an existing Master Power Purchase and Sale Agreement ("PPA") dated August 31, 2005, as amended from time to time with Imperial Valley Solar, LLC (formerly known as SES Solar Two, LLC) ("IV Solar"). The amended and restated contract between SDG&E and IV Solar (the "Proposed Amendment") is for 20 years of concentrating dish Stirling solar energy from a plant to be constructed in the Imperial Valley of California with a commercial operation deadline of December 31, 2012 ("COD"). The Proposed Amendment seeks changes to the previously approved agreement to accommodate updated project schedule and pricing terms (and other changes).

B. SUBJECT OF THE ADVICE LETTER

1. PROJECT NAME: Imperial Valley Solar

2. TECHNOLOGY (INCLUDING LEVEL OF MATURITY): Concentrating solar, dish Stirling. While this is an emerging technology, a proof of concept plant of 60 dishes (1.5 MW) in size has been in operation since January, 2010 and six dishes have been in continuous operation at Sandia since 2005.

3. GENERAL LOCATION AND INTERCONNECTION POINT: Near Plaster City, CA in the Imperial Valley; the interconnection point will be the SDG&E / CAISO facilities at the Imperial Valley Substation

4. OWNER(S) / DEVELOPER(S): Imperial Valley Solar, LLC / Tessera Solar North America (TSNA)

   a. **Name(s)**: TSNA is the developer; a special purpose entity - Imperial Valley Solar, LLC - is the project owner.
   b. **Business Relationships between seller/owner/developer:** Imperial Valley Solar, LLC is a wholly owned affiliate of Tessera Solar, North America, Inc.

5. PROJECT BACKGROUND, E.G., EXPIRING QF CONTRACT, PHASED PROJECT, PREVIOUS POWER PURCHASE AGREEMENT, CONTRACT AMENDMENT

SDG&E and IV Solar (under its former name, SES Solar Two, LLC) executed a master power purchase and sale agreement on August 31, 2005 (the "original agreement"). This original agreement was filed for approval on November 15, 2005 (via advice letter 1727-EA) and the Commission approved the original agreement via resolution E-3965 on December 15, 2005. In May, 2008 NTR plc (public limited company) invested $100 million into Stirling Energy Systems, Inc or SES.[1] In addition to its investment, NTR provided new direction to SES, which resulted in the formation of Tessera Solar North America or TSNA. Today SES is strictly a technology provider and TSNA is focused solely on project development. Both companies are affiliates of NTR.

Imperial Valley Solar, LLC (SDG&E's counterparty in the Proposed Amendment) is a wholly owned subsidiary of TSNA. Since signing the original agreement, the developer team has diligently pursued (and continues to pursue) permitting, interconnection and financing for the project, however, over time it became evident to both the developer and SDG&E that an amendment would be necessary. Negotiations of such an amendment began in approximately April, 2009. During this negotiation, the Procurement Review Group (PRG) and Independent Evaluator (IE) have been kept informed of progress and on March 24, 2010 an amended and restated power purchase and sale agreement was executed between the parties.

6. SOURCE OF AGREEMENT, I.E., RPS SOLICITATION YEAR OR BILATERAL NEGOTIATION

The original agreement is a product of SDG&E's 2004 Request for Offers – Eligible Renewable Resources (the "2004 Renewable RFO" or the 2004 RFO). The Proposed Amendment is a product of negotiations to update the original agreement and approval by the Commission will support SDG&E's efforts to achieve its RPS objectives, including the goal of achieving an RPS portfolio of 33% by 2020. SDG&E has compared the Proposed Amendment to bids received in response to the 2009 Renewable RFO and the project is competitive on a cost and viability basis.

C. GENERAL PROJECT(S) DESCRIPTION

PROJECT NAME	Imperial Valley Solar
TECHNOLOGY	Concentrating dish Stirling solar
CAPACITY (MW)	300MW
CAPACITY FACTOR	Approximately 25%
EXPECTED GENERATION (GWH/YEAR)	649.7
COMMERCIAL OPERATIONAL DEADLINE	December 31, 2012
DATE CONTRACT DELIVERY TERM BEGINS	The contract delivery term of 20 years begins on the COD of December 31, 2012, however a significant ramp period will precede

[1] See http://www.tesserasolar.com/international/our-investors.htm

	this date with estimated test energy deliveries beginning in Summer, 2011.
DELIVERY TERM (YEARS)	20 years
VINTAGE (NEW / EXISTING / REPOWER)	New
LOCATION (CITY AND STATE)	near Plaster City, CA
CONTROL AREA (E.G., CAISO, BPA)	CAISO
NEAREST COMPETITIVE RENEWABLE ENERGY ZONE (CREZ) AS IDENTIFIED BY THE RENEWABLE ENERGY TRANSMISSION INITIATIVE (RETI)[2]	CREZ 30 (Imperial South)
TYPE OF COOLING, IF APPLICABLE	n/a
PRICE[3] RELATIVE TO MPR (I.E. ABOVE/BELOW)	Above. See Confidential Appendix A, paragraph I for details

D. GENERAL DEAL STRUCTURE

CHARACTERISTICS OF CONTRACTED DEAL (I.E. PARTIAL/FULL OUTPUT OF FACILITY, DELIVERY POINT (E.G. BUSBAR, HUB, ETC.), ENERGY MANAGEMENT (E.G. FIRM/SHAPE, SCHEDULING, SELLING, ETC.), DIAGRAM AND EXPLANATION OF DELIVERY STRUCTURE

The Proposed Amendment is for power purchase off take of the full bundled (energy and Green Attributes together) output of the facility. Due to its nature as a concentrating solar facility, it will be on an as available basis. Although located physically in the Imperial Irrigation District's service territory, the project's first point of interconnection will be with the CAISO. Consumption by load will occur simultaneously with generation and therefore there is no firming or shaping associated with the project. The delivery point is the point of interconnection with CAISO controlled facilities (SDG&E's facilities) at the Imperial Valley Substation.

E. RPS STATUTORY GOALS

THE PROJECT IS CONSISTENT WITH AND CONTRIBUTES TOWARDS THE RPS PROGRAM'S STATUTORY GOALS SET FORTH IN PUBLIC UTILITIES CODE §399.11.

The Proposed Amendment is consistent with and contributes towards RPS goals which require SDG&E to meet specified RPS procurement targets. Additionally, the Proposed Amendment complies with RPS program requirements, meets the portfolio needs outlined by the 2009 RPS Plan and is competitive when compared to the most recent 2009 RFO offers.

Public Utilities Code section 399.11 states, in part that "increasing California's reliance on eligible renewable energy resources may promote stable electricity prices, protect public health, improve environmental quality, stimulate sustainable economic development, create new employment opportunities, and reduce reliance on imported fuels." The Proposed Amendment will help promote stable electricity prices due to its nature as a fixed price

[2] Information about RETI is available at: http://www.energy.ca.gov/reti/

[3] Refers to the maximum price under the contract

arrangement for 20 years of deliveries. As a solar thermal resource, it will generate clean, renewable energy with zero fuel costs (and therefore contributing zero need for foreign fuel imports) and zero greenhouse gas emissions directly associated with energy production into the atmosphere. In addition, it is anticipated by IV Solar that approximately 719 local jobs will be created during the construction of the facility and approximately 69 long term jobs will be created, primarily to operate and maintain the facility.

F. CONFIDENTIALITY

CONFIDENTIAL TREATMENT OF SPECIFIC MATERIAL IS BEING REQUESTED. THE INFORMATION AND REASON(S) FOR CONFIDENTIAL TREATMENT IS CONSISTENT WITH THE SHOWING REQUIRED BY D.06-06-066, AS MODIFIED.

As directed by the CPUC's Energy Division, confidential information in support of the Proposed Amendment is provided in Confidential Appendices A through G, as listed below:

Appendix A: Consistency with Commission decisions and Rules and Project Development Status
Appendix B: Solicitation Overview
Appendix C: Final RPS Project-Specific Independent Evaluator Report
Appendix D: Contract Summary
Appendix E: Comparison of Contract with Utility's Pro Forma Power Purchase Agreement
Appendix F: Amended and Restated Master Power Purchase and Sale Agreement
Appendix G: Project's Contribution Toward RPS Goals

The appendices contain market sensitive information protected under Commission Decision D.06-06-066, *et seq.*, as detailed in the concurrently-filed declaration. The table below presents the type of information within the confidential appendices and the matrix category under which D.06-06-066 permits the data to be protected.

Type of Information	D.06-06-066 Confidential Matrix Category
Analysis and Evaluation of Proposed RPS Projects	VII.G
Contract Terms and Conditions	VII.G
Raw Bid Information	VIII.A
Quantitative Analysis	VIII.B
Net Short Position	V.C
IPT/APT Percentages	V.C

II. CONSISTENCY WITH COMMISSION DECISIONS

SDG&E's RPS procurement process complies with the Commission's RPS-related decisions.

A. RPS PROCUREMENT PLAN

1. THE COMMISSION APPROVED SDG&E'S RPS PROCUREMENT PLAN AND SDG&E ADHERED TO COMMISSION GUIDELINES FOR FILING AND REVISIONS.

On September 15, 2008 SDG&E filed its draft 2009 Renewable Procurement Plan (the "2009 RPS Plan") in accordance with the Administrative Law Judge's rulings issued on June 20, 2008 and August 12, 2008. On June 8, 2009, the CPUC issued D.09-06-018 ("the Decision") conditionally approving SDG&E's 2009 RPS Plan. In compliance with the direction set forth in the Decision, SDG&E filed a revised 2009 RPS Plan to incorporate changes it was required by the Commission to make. The Decision authorized SDG&E to proceed with its amended Plan unless suspended by the Energy Division Director. No such suspension was issued by the Energy Division; therefore, on June 29, 2009 SDG&E issued the RFO.

2. THE PROCUREMENT PLAN'S ASSESSMENT OF PORTFOLIO NEEDS.

The 2009 RPS Plan expresses SDG&E's commitment to contract in excess of its mandated annual procurement targets in the near term (24% to 26% in 2012) and adopted a goal of serving 33% of its retail sales with renewable resources by 2020. SDG&E's goal is to develop and maintain a diversified renewable portfolio, selecting from offers using the Least-Cost, Best-Fit (LCBF) evaluation criteria. The RFO, approved as part of the 2009 RPS Plan, sought offers from all technologies of renewable projects that meet the requirements for eligible facilities as specified in applicable statute and as established by the CEC. The 2009 RFO sought unit firm or as-available deliveries starting in 2010, 2011, 2012, or 2013. The 2009 RPS Plan also states that to the extent an unsolicited bilateral offer complies with RPS program requirements, fits within SDG&E's resource needs, is competitive when compared against recent RFO offers and provides benefits to SDG&E customers, SDG&E will pursue such an agreement. Amended contracts, like bilateral offers, will be compared to alternatives presented in the most recent RPS RFO.

3. THE PROJECT IS CONSISTENT WITH SDG&E'S PROCUREMENT PLAN AND MEETS SDG&E'S PROCUREMENT AND PORTFOLIO NEEDS (E.G. CAPACITY, ELECTRICAL ENERGY, RESOURCE ADEQUACY, OR ANY OTHER PRODUCT RESULTING FROM THE PROJECT).

The Proposed Amendment conforms to SDG&E's most recent Commission-approved RPS procurement plan by delivering bundled renewable energy and associated Green Attributes that fill a portion of SDG&E's RPS net short position. The Proposed Amendment also provides resource adequacy capacity.

4. THE PROJECT MEETS REQUIREMENTS SET FORTH IN THE SOLICITATION.

Although a renegotiation of an existing agreement, the Proposed Amendment meets the minimum requirements as established in the RFO:

- Deliveries must begin in 2010, 2011, 2012 or 2013
- The project must be RPS-eligible.

- The Net Contract Capacity must be ≥ 1.5MW, net of all auxiliary and station parasitic loads; (if within SDG&E service area)
- The Net Contract Capacity must be ≥ 5MW, net of all auxiliary and station parasitic load (if outside of SDG&E service area)

B. BILATERAL CONTRACTING

1. THE CONTRACT COMPLIES WITH D.06-10-019 AND D.09-06-050.

In D.06-10-019, the Commission concluded that bilateral contracts used for RPS compliance must be submitted for approval via advice letter and, while not subject to the MPR, must contain pricing that is "reasonable."[4] On June 19, 2009, the Commission issued D.09-06-050 establishing price benchmarks and contract review processes for very short term (less than four years), moderately short term (at least 4 years, less than 10 yrs) and bilateral RPS contracts.

SDG&E reviews below the Least Cost Best Fit evaluation used in the 2009 RPS RFO. The same analysis was performed on the Proposed Amendment and the results were compared to the RFO results.

2. THE PROCUREMENT AND/OR PORTFOLIO NEEDS NECESSITATING SDG&E TO PROCURE BILATERALLY AS OPPOSED TO A SOLICITATION.

Competitive RFOs are but one means of procurement. SDG&E's ability to also consider bilateral offers widens the scope of resources available to SDG&E. The WECC has a well-established, liquid bilateral market. SDG&E, for the benefit of its ratepayers, can make full use of this valuable source of renewable supply. Not only is the bilateral market an important tool for procurement, it is available year-round. RPS RFOs, by contrast, are issued annually and therefore take a 'batch-processing' approach to RPS bid evaluation and negotiation. The Commission approved SDG&E's 2009 RPS Plan, which includes provisions for bilateral renewable contracts.

3. WHY THE PROJECT DID NOT PARTICIPATE IN THE SOLICITATION AND WHY THE BENEFITS OF THE PROJECT CANNOT BE PROCURED THROUGH A SUBSEQUENT SOLICITATION.

SDG&E signed the original agreement in August, 2005. Due to this contractual relationship, SDG&E's familiarity with the project and favorable impression of the project status gained through frequent updates, SDG&E believes that a bilateral renegotiation of the Proposed Amendment was the most efficient means of enabling project success.

[4] D.06-10-019, mimeo, p. 31

Further, timing was such that the project was not well served by waiting for the next RFO (issued approximately two months after negotiations started) and the amended terms are competitive with bids received in response to the 2009 RPS RFO.)

C. Least Cost Best Fit (LCBF) Methodology and Evaluation

1. The solicitation was consistent with SDG&E's Commission-approved Request for Offers (RFO) bidding protocol. (Pat, check this section C for consistency with the Geysers AL) <DONE>

Although the Proposed Agreement did not directly result from the 2009 Renewable Portfolio Standard (RPS) RFO, it is being compared with the 2009 shortlist, and therefore the following information regarding the 2009 RPS solicitation is provided.

As specified by the Commission-approved RFO bidding protocol, the 2009 RFO was issued on June 29, 2009. Responses for projects not served by the Sunrise Powerlink were due August 25, 2009. Responses for projects that would flow on the Sunrise Powerlink were due September 8, 2009. SDG&E solicited bids from all RPS-eligible technologies.

SDG&E sought proposals for peaking, baseload, dispatchable (unit firm) or as-available deliveries. Such proposals could include capacity and energy from:

a) Re-powering of existing facilities;
b) Incremental capacity upgrades of existing facilities;
c) New facilities;
d) Existing facilities that are scheduled to come online during the years specified in the RFO that have excess or uncontracted quantities of power for a short time frame;
e) Existing facilities with expiring contracts; or
f) Eligible resources currently under contract with SDG&E. SDG&E shall consider offers to extend terms of or expand contracted capacities for existing agreements.

SDG&E solicited three types of projects:

a) Power purchase agreements for short-term deliveries up to nine years and long-term deliveries for ten years or more.

b) A power purchase agreement with an option price for SDG&E to acquire the facility along with all environmental attributes, land rights, permits and other licenses, thus enabling SDG&E to own and operate the facility at the end of the PPA term.

c) Turnkey projects to develop, permit, and construct new, RPS-eligible generating facilities to be acquired by SDG&E.

SDG&E established an open, transparent and competitive playing field for the procurement effort. The following protocols were established within its solicitation:

a) An RFO website was created, allowing respondents to download solicitation documents, participate in a Question and Answer forum and see updates or revisions associated with the process;
b) Internet upload capabilities were available to accept electronic offers; and,
c) SDG&E adhered to the following RFO schedule:

DATE	EVENT
June 29, 2009	RFO Issued
August 5, 2009	Pre-Bid Conference (in San Diego, California)
August 12, 2009	Pre-Bid Conference (in El Centro, California)
August 25, 2009	Offers Due (projects not flowing on Sunrise Powerlink)
September 8, 2009	Offers Due (projects flowing on Sunrise Powerlink)
September 25, 2009	Briefed PRG on all offers received, preliminary LCBF ranking, preliminary list of highest ranked offers and preliminary shortlist.
October 23, 2009	Briefed PRG and sought PRG feedback on SDG&E's need determination, selection criteria based on the need, final LCBF ranking and final shortlist based on the selection criteria.
November 23, 2009	Notified Energy Division of final shortlist.
December 4, 2009	Final LCBF Report to the CPUC
March 24, 2010	Proposed Agreement Executed

2. THE LCBF BID EVALUATION AND RANKING WAS CONSISTENT WITH COMMISSION DECISIONS ADDRESSING LCBF METHODOLOGY; INCLUDING SDG&E'S APPROACH TO/APPLICATION OF:

SDG&E evaluated all offers in accordance with the LCBF process outlined in D.03-06-071, D.04-07-029 and its approved RPS Procurement Plan. The Commission established in D.04-07-029 a process for evaluating "least-cost, best-fit" renewable resources for purposes of IOU compliance with RPS program requirements. SDG&E has adopted such a process in its renewable procurement plan. In D.06-05-039, the Commission observed that "the RPS project evaluation and selection process within the LCBF framework cannot ultimately be reduced to mathematical models and rules that totally eliminate the use of judgment."[5] It determined, however, that each IOU should provide an explanation of its "evaluation and selection model, its process, and its decision rationale with respect to each bid, both selected and rejected," in the form of a report to be submitted with its short list of bids (the "LCBF Report").[6]

[5] See D.06-05-039, *mimeo*, p. 42.
[6] *Id.* at p. 43.

A. MODELING ASSUMPTIONS AND SELECTION CRITERIA

To incorporate a "best-fit" element into evaluation of offers, instead of simply comparing prices for all offers ("least-cost"), SDG&E calculated an "All-In Bid Ranking Price" for each offer. Elements of the All-In Bid Ranking Price are described below.

The All-In Bid Ranking Price associated with the Proposed Amendment, as calculated and presented in Confidential Appendix A, compared favorably versus the All-In Price of other bids and fell within the shortlist range.

SDG&E compares bids by sorting all projects by the All-In Bid Ranking Price, from lowest to highest. Those projects with the lowest All-In Bid Ranking Price and passed through qualitative filters for location and viability were short listed. From a "best-fit" perspective for 2009, projects which fit SDG&E's portfolio needs best were in-state projects that would flow on the Sunrise Powerlink. SDG&E is mindful of the Commission requirement and SDG&E's commitment to replace failed Imperial Valley projects with projects that would flow on the Sunrise Powerlink. Therefore, SDG&E selected in-state, projects that would flow on the Sunrise Powerlink, ranked high on a quantitative basis and had viability scores higher than SDG&E's currently delayed Imperial Valley projects.

In the case of the Proposed Agreement, its location in the Imperial Valley and its viability as a project that has been in development for a significant period of time both play an important role in its favorable qualitative evaluation.

B. QUANTITATIVE FACTORS

i. Market valuation (the "All-In Bid Ranking Price") – The following discussion describes how SDG&E calculates an all-in price that includes the factors listed. Included in confidential Appendix D is a detailed description of how each of these factors applies to the specific calculation of all-in price for the Proposed Agreement.

   a. Bundled Energy Prices. The offered bundled energy prices are included in the All-In Price, as modified below.

   b. Time of Delivery ("TOD") cost adjustment. SDG&E accounts for differences in the value of various delivery profiles. To properly asses the value of the deliveries from an intermittent resource, SDG&E divides the proposed energy price by SDG&E's Time-of-Delivery factors for each MWh the project delivers during each delivery hour over the term of the agreement. The total cost is summed and divided by energy delivered. A present value figure is calculated for the payment and energy streams and an overall levelized TOD Adjusted Bid Price on a $/MWh is calculated. The difference between the levelized TOD Adjusted Bid Price and an unadjusted levelized bid price represents the TOD Adjustment Adder. Projects that provide a greater proportion of their annual deliveries in summer on-peak, winter on-peak, and summer semi-peak periods will receive a credit that will effectively reduce the

project bid price, whereas projects that provide a greater proportion of annual deliveries in summer and winter off-peak periods will receive a debit that will increase the project bid price. Baseload units deliver equally in all hours, which results in a net TOD Adjustment Adder at or close to zero.

c. Transmission Cost Adder. SDG&E calculated costs for transmission network upgrades or additions for the 2009 short list projects using the information provided through the Transmission Ranking Cost Report ("TRCR") approved by the CPUC. To be as inclusive as possible, SDG&E used TRCR-based transmission costs even for offers that were not submitted to the TRCR rather than considering those offers to be non-conforming. The total amount of contemplated generation interconnections studied in the TRCR always exceeded the amount of generating capacity that SDG&E would ever consider shortlisting

The transmission costs (transmission cost adder) associated with the Proposed Agreement are based on CAISO and SDG&E cost studies as reflected in the Large Generator Interconnection Agreement (LGIA) signed on February 19, 2009 and as amended on July 8, 2009 by the developer, SDG&E and the CAISO.

d. Resource Adequacy ("RA"). The Proposed Amendment and all bids received in response to the 2009 RPS RFO received an RA credit based on the amount of RA benefits provided by each proposed project. The RA benefit (in MW) of a wind or solar resource is a fraction of its nameplate capacity and is derived from the Net Qualifying Capacity values that CAISO has assigned to resources of that technology type. The RA credit for MW for potentially dispatchable resources equals the MPR fixed cost component while RA credits for other resources are computed using a benefit per MW equal to the estimated market price, or to the shortage penalty, for local and/or system RA.

e. Congestion cost adders. Congestion analysis was performed using a model which provides hourly Locational Marginal Prices ("LMP") for specific years for each of the bids and the proposed project. Congestion costs ($/MWh) was calculated based on the difference between the hourly LMP at each generator's injection point and the hourly LMP values for SDG&E's Load Aggregation Point ("LAP"). The LMP values in the LAP was weighted for all bus points within SDG&E's service territory using approved CAISO allocation factors. SDG&E subtracted the LMPs for each generator's injection point from the LMPs in SDG&E's LAP and multiplied the differences by the generator's hourly production profile (MWh). The congestion adder for each bid is the weighted average of the differences.

f. Duration equalization adders ("Begin Effects" and "End Effects"). SDG&E used weighted average bid prices from its 2008 shortlist as market replacement costs to normalize bids of different starting periods and terms. SDG&E assumed the same level of generation for each project as replacement energy during the Begin and End Effects. SDG&E then levelized each bid from 2009 through the end of the evaluation period, putting all projects on equal terms.

A. PORTFOLIO FIT

SDG&E's RPS procurement plan stated that SDG&E does not have a preference for a particular product or technology type and that SDG&E has latitude in the resources that it selects. However, as explained above, time of delivery factors, transmission cost, congestion costs and resource adequacy adjustment were evaluated to determine the impact to SDG&E's portfolio. Time of delivery factors and resource adequacy adjustments were included in the economic comparison of options in order to ensure the least-cost projects were also best-fit selections for the portfolio.

See the section entitled "The Project's bid scores under SDG&E's approved LCBF evaluation criteria" in confidential Appendix A, paragraph C.2. for details on the Proposed Amendment's costs and benefits in the context of SDG&E's portfolio needs.

B. TRANSMISSION ADDER

As stated above, there is an executed LGIA associated with the Proposed Amendment that includes detailed interconnection cost estimates. The transmission cost adder included in SDG&E's analysis is based on these cost estimates.

C. APPLICATION OF TIME OF DELIVERY FACTORS (TODS)

SDG&E utilized TOD factors in its LCBF evaluation via the aforementioned TOD Cost Adjustment. The average all-in price was adjusted to reflect the relative value of projected energy deliveries during peak, semi-peak and off-peak periods. The projected delivery profiles were provided for Imperial Valley Solar as well as for the respondents to the 2009 RFO. Application of the TOD factors in the evaluation of the Proposed Amendment is explained in Confidential Appendix A, paragraph C.2.

The Bid Adjustment Factors were derived from the TOD factors shown below:

	SUMMER July 1 – October 31	WINTER November 1 – June 30
On-Peak	Weekdays 11am – 7pm 1.6411	Weekdays 1pm - 9pm 1.1916
Semi-Peak	Weekdays 6am – 11am; Weekdays 7pm - 10pm 1.0400	Weekdays 6am – 1pm; Weekdays 9pm – 10pm 1.0790
Off-Peak*	All other hours 0.8833	All other hours 0.7928

*All hours during NERC holidays are off-peak.

D. OTHER FACTORS CONSIDERED

No other quantitative factor was considered.

C. QUALITATIVE FACTORS (E.G., LOCATION, BENEFITS TO MINORITIES, ENVIRONMENTAL ISSUES, ETC.)

As stated in the RFO, SDG&E differentiates offers of similar cost by reviewing, if applicable, qualitative factors including the following:

a) Project viability
b) Local reliability
c) Benefits to low income or minority communities
d) Resource diversity
e) Environmental stewardship

D. COMPLIANCE WITH STANDARD TERMS AND CONDITIONS

1. THE PROPOSED CONTRACT COMPLIES WITH D.08-04-009, D.08-08-028 AND D.10-03-021

The Proposed Amendment complies with D.08-04-009, D.08-08-028 and D.10-03-021. The Proposed Amendment contains standard terms and conditions as authorized by the Commission in D.04-06-014 issued on June 9, 2004 and R.06-02-012 issued on October 29, 2008. Commission decision D.04-06-014 originally adopted standard contract terms and conditions for use in the RPS and more recently updated the requirements in D.08-04-009, D.08-08-028 and D.10-03-021. The decisions labeled some terms and conditions as being non-modifiable. All non-modifiable terms and conditions remain intact in the Proposed Amendment and are used in the appropriate context. A summary of major contract provisions is provided in Confidential Appendix D, paragraph D. Copies of the Proposed Amendment and supporting documentation are provided in Confidential Appendix F.

2. SPECIFIC PAGE AND SECTION NUMBER WHERE THE COMMISSION'S NON-MODIFIABLE TERMS ARE LOCATED IN THE PPA.

The locations of non-modifiable terms are indicated in the table below:

Non-Modifiable Term	Document/Section & Page Number
D.08-04-009 / D.08-08-028	
CPUC Approval	Cover Sheet, Section 1.67, p. 9
RECs and Green Attributes	Cover Sheet, Section 1.69, p. 9 & 10, Confirm, Section 10, p. 9
Eligibility	Cover Sheet, Section 10.2 (xiii), p. 15
Applicable Law	Cover Sheet, Section 10.6, p. 16
D.10-03-021	
STC REC-1	Cover Sheet, Section 10.2 (xiii), p. 15

Non-Modifiable Term	Document/Section & Page Number
STC REC-2	Cover Sheet, Section 3.6, p. 12

3. REDLINE OF THE CONTRACT AGAINST SDG&E'S COMMISSION-APPROVED PRO FORMA RPS CONTRACT.

A redline of the Proposed Amendment against SDG&E's Commission-approved pro forma RPS contract is provided in Confidential Appendix E of this advice letter.

E. UNBUNDLED RENEWABLE ENERGY CREDIT (REC) TRANSACTIONS

The Proposed Amendment complies with D.06-10-019, which does not allow unbundled REC transactions for RPS compliance. The contract is for bundled purchase of energy and RECs.

Additionally, the Proposed Amendment complies with D.10-03-021 and includes purchases of a bundled product (power, renewable attributes and other attributes), is located within the state and has no firming or shaping associated with it.

F. MINIMUM QUANTITY

MINIMUM CONTRACTING REQUIREMENTS APPLICABLE TO SHORT TERM CONTRACTS WITH EXISTING FACILITIES

1. THE PROPOSED CONTRACT DOES NOT TRIGGER THE MINIMUM QUANTITY REQUIREMENT SET FORTH IN D.07-05-028.

In D.07-05-028, the Commission indicated that the ability to count short term contracts (less than ten years) toward SDG&E's RPS Compliance goal will be dependent upon satisfying Commission-established requirements for minimum quantities of long-term contracts (with new or existing facilities) and/or short-term contracts with newer facilities.

The Proposed Amendment does not trigger the minimum quantity requirement because it is an amendment of an existing long term contract.

2. THE EXTENT TO WHICH SDG&E HAS SATISFIED THE MINIMUM QUANTITY REQUIREMENT

The Proposed Amendment does not trigger the minimum quantity requirement because it is an amendment of an existing long term contract.

G. TIER 2 SHORT-TERM CONTRACT "FAST TRACK" PROCESS

SDG&E is not seeking approval for the Proposed Amendment via a tier 2 and the "fast track" process set forth in D.09-06-050.

H. MARKET PRICE REFERENCE (MPR)

1. CONTRACT PRICE RELATIVE TO THE MPR.

The pricing included in the Proposed Amendment is above the 2009 MPR. The exact pricing and relation to the MPR is discussed in detail in confidential appendix D.

2. TOTAL COST RELATIVE TO THE MPR.

This Proposed Amendment has pricing that is above the MPR, however, it is still within the competitive range of the 2009 RPS RFO Shortlist. The total contract costs and how it compares to the MPR is discussed in more detail within confidential Appendix D.

I. ABOVE MARKET FUNDS (AMFS)

1. ELIGIBILITY FOR AMFS UNDER PUBLIC UTILITIES CODE 399.15(D) AND RESOLUTION E-4199

The Proposed Amendment is a bilateral contract and is therefore not eligible for AMFs.

2. THE STATUS OF THE UTILITY'S AMFS LIMIT.

SB 1036 establishes five explicit criteria for the award of AMFs and states that once AMFs reach a cap that is equal to the maximum SEPs that would have been allotted to SDG&E, SDG&E is no longer required to procure renewable energy at above market prices. SDG&E's Commission approved contracts have exhausted SDG&E's AMFs and, therefore, SDG&E is no longer required to procure renewable energy at above market prices[7].

3. EXPLAINING WHETHER SDG&E VOLUNTARILY CHOOSES TO PROCURE AND INCUR THE ABOVE-MPR COSTS.

SDG&E will voluntarily incur the above MPR costs of this Proposed Amendment only if recovery all such costs are approved by the Commission. Discussions regarding SDG&E's procurement of above MPR contracts and related considerations regarding above market costs, if applicable, are contained in confidential Appendix D.

J. INTERIM EMISSIONS PERFORMANCE STANDARD
COMPLIANCE WITH D.07-01-039, WHERE THE COMMISSION ADOPTED A GREENHOUSE GAS EMISSIONS PERFORMANCE STANDARD (EPS) APPLICABLE TO CONTRACTS FOR BASELOAD GENERATION, AS DEFINED, WITH DELIVERY TERMS OF FIVE YEARS OR MORE.

1. EXPLAIN WHETHER OR NOT THE CONTRACT IS SUBJECT TO THE EPS.

[7] *See* Letter from Energy Division Director, Julie Fitch, dated May 28, 209 stating that SDG&E's AMF balance is zero.

The Proposed Amendment is not subject to the EPS as it is for as-available, solar energy with a capacity factor less than 60%.

2. HOW THE CONTRACT IS IN COMPLIANCE WITH D.07-01-039

N/A, not subject to the EPS

3. HOW SPECIFIED BASELOAD ENERGY USED TO FIRM/SHAPE MEETS EPS REQUIREMENTS (ONLY FOR PPAS OF FIVE OR MORE YEARS AND WILL BE FIRMED/SHAPED WITH SPECIFIED BASELOAD GENERATION.)

The Proposed Amendment, as a project that is directly connected to the CAISO grid, has no firming or shaping associated with it.

4. UNSPECIFIED POWER USED TO FIRM/SHAPE WILL BE LIMITED SO THE TOTAL PURCHASES UNDER THE CONTRACT (RENEWABLE AND NONRENEWABLE) WILL NOT EXCEED THE TOTAL EXPECTED OUTPUT FROM THE RENEWBLE ENERGY SOURCE OVER THE TERM OF THE CONTRACT. (ONLY FOR PPAS OF FIVE OR MORE YEARS.)

The Proposed Amendment, as a project that is directly connected to the CAISO grid, has no firming or shaping associated with it.

5. SUBSTITUTE SYSTEM ENERGY FROM UNSPECIFIED SOURCES

a. A SHOWING THAT THE UNSPECIFIED ENERGY IS ONLY TO BE USED ON A SHORT-TERM BASIS

The Proposed Amendment will not use substitute system energy from unspecified sources and the Proposed Amendment only deals with the metered output of the facility. Therefore in hours (or intervals) when the plant may under deliver relative to its schedule and the CAISO makes up any differences, SDG&E is not paying for that 'substitute' energy or counting this 'unspecified' energy as RPS procurement..

b. THE UNSPECIFIED ENERGY IS ONLY USED FOR OPERATIONAL OR EFFICIENCY REASONS;

See answer to part a, above.

c. THE UNSPECIFIED ENERGY IS ONLY USED WHEN THE RENEWABLE ENERGY SOURCE IS UNAVAILABLE DUE TO A FORCED OUTAGE, SCHEDULED MAINTENANCE, OR OTHER TEMPORARY UNAVAILABILITY FOR OPERATIONAL OR EFFICIENCY REASONS

See answer to part a, above.

d. THE UNSPECIFIED ENERGY IS ONLY USED TO MEET OPERATING CONDITIONS REQUIRED UNDER THE CONTRACT, SUCH AS PROVISIONS FOR NUMBER OF START-UPS, RAMP RATES, MINIMUM NUMBER OF OPERATING HOURS.

See answer to part a, above.

K. PROCUREMENT REVIEW GROUP (PRG) PARTICIPATION

1. PRG PARTICIPANTS (BY ORGANIZATION/COMPANY).

SDG&E's PRG is comprised of over fifty representatives from the following organizations:

a. California Department of Water Resources
b. California Public Utilities Commission – Energy Division
c. California Public Utilities Commission – Division of Ratepayers Advocate
d. The Utility Reform Network
e. Union of Concerned Scientists
f. Coalition of California Utility Employees (CCUE)

2. WHEN THE PRG WAS PROVIDED INFORMATION ON THE CONTRACT

SDG&E provided the PRG information about this Proposed Amendment including summaries of contract negotiation progress and major commercial terms and conditions. Specifically, SDG&E provided the PRG information about the Proposed Amendment during the following regularly scheduled PRG meetings:

August 20, 2009
September 25, 2009
October 23, 2009
March 19, 2010

3. SDG&E CONSULTED WITH THE PRG REGARDING THIS CONTRACT

SDG&E consulted with the PRG regarding the Proposed Amendment throughout the negotiation process. SDG&E provided information regarding pricing, potential pricing changes, timing, permitting, financing and other project issues.

4. WHY THE PRG COULD NOT BE INFORMED (FOR SHORT-TERM CONTRACTS ONLY)

Not applicable. The PRG was briefed as described above.

L. INDEPENDENT EVALUATOR (IE)
THE USE OF AN IE IS REQUIRED BY D.04-12-048, D.06-05-039, 07-12-052, AND D.09-06-050

1. NAME OF IE

P.A. Consulting Group

2. OVERSIGHT PROVIDED BY THE IE

PA Consulting Group has been heavily involved in all aspects of SDG&E's 2009 RPS RFO process including, but not limited to: reviewing RFO document development and creation of evaluation criteria, reviewing and monitoring of all received bids, involvement in bid evaluation for conformance and ranking, conducting the LCBF analysis, monitoring

of all communications and negotiations with affiliated parties. Besides being involved in the process, the IE independently presented to the PRG on the progress/evaluation of RFOs and expressed its opinions on negotiations.

An IE report was issued regarding the Proposed Amendment and is attached in its entirety in Confidential Appendix C. A public version of this report is attached below.

SDG&E closely worked with its IE during the evaluation of the Proposed Amendment. The IE has reviewed the major contract terms and SDG&E's method of comparing the projects to bids received from the 2009 RFO and agrees with the analysis presented by SDG&E.

3. IE FINDINGS PRESENTED TO THE PROCUREMENT REVIEW GROUP

The IE did not provide any specific findings related to the Proposed Amendment to the PRG.

4. PUBLIC VERSION OF THE PROJECT-SPECIFIC IE REPORT

See Appendix H.

III. PROJECT DEVELOPMENT STATUS

A. COMPANY/DEVELOPMENT TEAM

1. RELEVANT EXPERIENCE OF PROJECT DEVELOPMENT TEAM AND/OR COMPANY PRINCIPALS

TSNA CEO: Robert Lukefahr. Mr. Lukefahr previously worked at BP as the President of BP Wind Energy and as the President of Power Americas. While at BP he was responsible for the construction of 1,000MW of wind power and created a development pipeline of 20,000MW. His business also added 750MW to BP's co-generation fleet.

TSNA COO: Marcelo Figueira. Mr. Figueira has nearly 30 years of industry experience, including serving as the Executive Vice President for Econergy where he was responsible for the oversight of all construction, operations and management of clean energy assets in Latin and North America. He has also served as the Executive Vice President of Asset Management/Operations for PetraSolar.

TSNA CFO: Gerritt Ewing. Mr. Ewing has more than 30 years of experience in energy finance, including experience as Assistant Treasurer for Energy Future Holdings, where he had primary responsibility for structured finance activities in the nuclear, renewable energy and gas gathering businesses.

TSNA VP / General Counsel: Brent Bailey. Mr. Bailey (who also serves as Vice Corporate Secretary) has more than 25 years of experience in energy law, including experience as Group Vice President and General Counsel for Duke Energy Americas and Senior Counsel at Enron, where he focused on power plant development, finance and construction.

TSNA VP of Market Strategy and Regulatory Affairs: Sean Gallagher. Mr. Gallagher previously worked as the Director of the Energy Division of the California Public Utilities Commission, where he was charged with implementing Commission policy affecting energy utilities, including Resource Adequacy and Procurement, the Renewable Portfolio Standard, the California Initiative, Energy Efficiency programs, Demand Response Programs and transmission planning and permitting.

TSNA VP of Development / Imperial Solar development team lead: Howard Taylor. Mr. Taylor has worked in the power and utility industry for more than 20 years. He previously held the position of Vice President of Renewable Power Development at LS Power, where he focused on solar thermal development, and as Senior Counsel in the Office of Policy Development at the Texas Public Utility Commission during the de-regulation period.

TSNA VP of Development: Felicia Bellows. Ms. Bellows also serves as Vice President of Development and has more than 25 years of experience in energy development. Most recently she was Executive Vice President of Development for Econergy, where she developed hydroelectric plants in Brazil and Chile. She has also held executive positions as Alliant Energy Holdings do Brasil and Alliant Energy International, where she successfully developed and operated thermal power, hydroelectric power and T&D systems.

TSNA Senior Director of Development: Marc Van Patten. Mr. Van Patten has more than 25 years of experience in the power industry, both in engineering and in business/project development. He has previously served as Vice President of Development at Calpine Corporation, where he led the development of more than 4,300MW of simple and combined cycle projects from early development through financing and construction.

2. SUCCESSFUL PROJECTS (RENEWABLE AND CONVENTIONAL)

In January 2010, TSNA opened its first commercial solar plant using the SES SunCatcher technology in Peoria, Arizona. The Maricopa Solar plant consists of 60 SunCatcher dishes with a total power output of 1.5MW. The plant is located next to the Agua Fria Generating Station, a power plant owned and operated by Arizona-based public power utility Salt River Project ("SRP"). All of the power generated by the project is sold through a long-term power purchase agreement with SRP. The project was completed on time and on budget.

In addition to the Imperial Valley Solar project, TSNA is also currently developing Calico Solar, an 850MW facility near Barstow, California, and Western Ranch Solar, a 27MW facility near Marfa, Texas, that has a signed power purchase agreement with San Antonio's municipal energy provider CPS Energy.

NTR, Tessera Solar and SES' parent company, has more than 30 years of development experience. NTR and its group of companies have financed and developed projects across the renewable energy and infrastructure spectrum, including some of the largest wind farms and biofuel plants in the world. In addition to Tessera Solar and SES, NTR's group of companies includes Greenstar, one the largest privately owned recyclers in the U.S. and the U.K., Green Plains Renewable Energy, one of the largest "pure play" U.S.

ethanol companies, and Wind Capital Group, a North American Wind Energy Developer with 3,000MW in near term development. NTR has also previously held interest in Airtricity, a European and North American wind business. At the time of its sale, Airtricity had 373MW of capacity in operation, a significant construction portfolio of 1,132MW and a total development pipeline of 10,052MW.

B. TECHNOLOGY

1. TECHNOLOGY TYPE AND LEVEL OF TECHNOLOGY MATURITY

a. THE TYPE AND STAGE OF THE PROJECT'S PROPOSED TECHNOLOGY

The development history of SES' SunCatcher begins with the series of prototype dish/Stirling engine systems designed, built and tested by McDonnell Douglas Aircraft Corporation ("MDAC") in 1984. In addition, the SunCatcher's Solar Stirling Engine technology draws on substantial design and development work done by Kockums AB from the 1980's through 2002.

In 2004, SES began construction of the 0.025MW SunCatcher pilot plant at Sandia National Laboratories, which comprises 10 SunCatcher systems, six of which have been in operation since 2005, and four new generation systems that were installed and commissioned in 2009. The pilot plant has been a platform for testing new hardware, software, procedures and concepts that are now being employed in the commercial SunCatcher system, and as a platform for hands on training of SES personnel.

In addition to the substantial early stage technical development work undertaken on the Stirling engine (estimated at 150,000 hours on sun and test cell) and dish concentrator (estimated at 100,000 hours on sun) by McDonnell Douglas, Kockums and others, the SunCatcher pilot plant operating experience on-sun is in excess of 30,000 hours.

b. COMMERCIAL DEMONSTRATION

There is limited operational data associated with the commercial facility (Maricopa Solar plant) due to its very recent completion. However, the data that is available indicates preliminarily that the plant is operating at approximately 92% availability (target is 98%) and at 95% commercial capacity factor (target is 100%).

Additionally, extensive data has been gathered at SES' Sandia test facility in Albuquerque, NM and from other test sites:

✓ **PCU: 180,285 hours on-sun and test cell**

- 115,000 hours at Kockums (1980s)
- 10,000 hours at Kockums (Dish Engine Critical Component ("DECC") Program 1998-2002)
- 55,285 hours on-sun (1985 to present)

✓ **Dish Concentrator: 121,419 hours on-sun**

• Huntington Beach—Unit A (1984-1992)	7 years	22.7 years
• Huntington Beach—Unit B (1984-1992)	5 years	
• Huntington Beach—high-temp. testing (1993-1997)	3.5 years	
• Switzerland (1985-1986)	1.5 years	
• Southern California Edison ("SCE") Daggett Test Site (1985-1988)	3.2 years	
• Georgia Utility (1985-1986)	1 year	
• Arizona (1991-1992)	1.5 years	

- 80,373 hours prior to DECC Program (22.7 years x 3,540 hrs/year of sun)
- 38,590 hours on SES DECC Program and testing at Sandia

✓ **Complete Systems: 56,329 hours on-sun**

- 13,852 hours at McDonnell Douglas Aircraft Corporation ("MDAC") and SCE
- 11,872 hours on SES DECC Program
- 28,149 hours SES testing at Sandia

c. THE CONFIGURATION AND POTENTIAL ISSUES AND/OR BENEFITS CREATED BY THE HYBRID TECHNOLOGY.

The technology associated with the Proposed Amendment is not a hybrid technology.

2. QUALITY OF RENEWABLE RESOURCE

a. THE QUALITY OF THE RENEWABLE RESOURCE THAT THE PROJECT WILL RELY UPON.

The project's solar resource performance is based on the Imperial Typical Metrological Year ("TMY") data set, which is based on 15 years of ground station meteorological data obtained at the Imperial County Airport.

TMY data is typically used to assess the solar resource in a particular area. The Imperial TMY data set shows that the project's area is expected to receive a total annual amount of Direct Normal Insolation ("DNI") of 2,640 kWh/m^2/yr (7.23 kWh/m^2/day), with a peak DNI level of 970 W/m^2, a peak temperature of 114.8°F (46°C), and a peak wind speed of 36.9 mph (16.5 m/s).

According to the Western Renewable Energy Zones - Phase 1 Report, dated June 2009, the DNI for this locale surpasses the threshold potential of renewable solar energy, which is 6.50 kWh/m^2/day. Furthermore, according to this same report, this area is shown to have the second largest potential for installed solar capacity in the state of California.

TMY data can be found at the National Renewable Energy (NREL) lab website: http://rredc.nrel.gov/solar/old_data/nsrdb/1991-2005/tmy3/

b. FUEL RESOURCE ANALYSIS AND THE DEVELOPER'S FUEL SUPPLY PLAN (FOR BIOMASS PROJECTS ONLY)

Not applicable; the Proposed Project is not a biomass facility.

c. CONFIDENCE THAT THE PROJECT WILL BE ABLE TO MEET THE TERMS OF THE CONTRACT GIVEN SDG&E'S INDEPENDENT UNDERSTANDING OF THE QUALITY OF THE RENEWABLE RESOURCE.

The outstanding quality of the solar resource within the Imperial Valley of California is well documented. SDG&E is confident that the solar resource at the project site is of sufficient quality to allow the counterparty to fully meet its contractual obligations as detailed in the Proposed Amendment.

3. OTHER RESOURCES REQUIRED

a. OTHER FUEL SUPPLY (OTHER THAN THE RENEWABLE FUEL SUPPLY DISCUSSED ABOVE) NECESSARY TO THE PROJECT AND THE ANTICIPATED SOURCE OF THAT SUPPLY;

This Proposed Amendment will not depend upon any other fuel supply other than the renewable fuel supply discussed above.

b. EXPLAIN WHETHER THE DEVELOPER HAS SECURED THE NECESSARY RIGHTS FOR WATER, FUEL(S), AND ANY OTHER REQUIRED INPUTS TO RUN THE PROJECT.

Water needs are discussed in the next section; fuel needs are not applicable (solar thermal plant). Construction power to the project site facility will be provided by mobile diesel-driven generator sets and a permanent 12,470 volt circuit connected to the local utility, the Imperial Irrigation District.

c. ESTIMATED ANNUAL WATER CONSUMPTION OF THE FACILITY (GALLONS OF WATER/YEAR)

Water on the site is necessary for on-site personnel and for washing the SunCatchers' mirrors; water is not necessary for power generation. Annual consumption is estimated at 6.517 million gallons a year. Because a majority of the water will be utilized for mirror washing, most of this water will be released to the environment. The mirror wash water is deionized before use so it is considered to be better quality than the water entering into the site. The sink and toilet water is treated before release to the environment.

The preferred water supply source is treated waste water from the Seeley Waste Water Treatment Facility, which is located in Seeley, California, with which Imperial Valley Solar has a long-term purchase agreement for up to 200,000 gallons per day of their reclaimed water. A potential interim backup is water truck supply to the project (up to 13 million gallons per year); however, this option is only considered a short-term supply option if the main supply source is interrupted or delayed in its

construction. The source of water for trucking would be the Seeley Waste Water Treatment Facility or a local commercial well in the city of Ocotillo, California.

d. CONFIDENCE THAT THE PROJECT WILL BE ABLE TO MEET THE TERMS OF THE CONTRACT GIVEN SDG&E'S INDEPENDENT UNDERSTANDING OF THE ADEQUACY OF THE ADDITIONAL FUEL OR ANY OTHER NECESSARY RESOURCE SUPPLY.

SDG&E is confident that the counterparty will be able to meet its contractual obligations in light of SDG&E's understanding of the adequacy of the necessary resource supplies available to the project.

C. DEVELOPMENT MILESTONES

1. SITE CONTROL STATUS

a. SITE CONTROL TYPE (E.G. OWNERSHIP, LEASE, BLM, ETC.)

The project site is located on approximately 6,571 acres of land, of which approximately 6,215 acres is federal land managed by the Bureau of Land Management ("BLM") and 320 acres is private land. Imperial Valley Solar is in the process of securing an exclusive grant from the BLM to use the project site for the purpose of constructing and operating a renewable power project. The process is expected to conclude in August 2010 with a grant from the BLM.

The grant from the BLM will be under a long-term lease arrangement between Imperial Valley Solar and the BLM. Private land will also be under a long-term lease arrangement between Imperial Valley Solar and each private landowner, of which there are three. Imperial Valley Solar has executed options to lease all three parcels of private land.

i. DURATION OF SITE CONTROL AND ANY EXERCISABLE EXTENSION OPTIONS (LEASE ONLY)

Once the BLM Right of Way ("ROW") grant is received for site access, Imperial Valley Solar will have site control for at least 40 years. There is a possibility to extend the ROW if the land is still being used for its intended purpose. In regard to private land, Imperial Valley Solar will have 20-year lease agreements, each of which can be extended for two additional 10-year terms.

ii. LEVEL OR PERCENT OF SITE CONTROL ATTAINED – IF LESS THAN 100%, DISCUSS SELLER'S PLAN FOR OBTAINING FULL SITE CONTROL

Imperial Valley Solar is well into the permitting process with the BLM and does not anticipate any difficulties in obtaining the ROW grant for site access. Imperial Valley Solar anticipates receiving the ROW grant in August 2010. Imperial Valley Solar has site control on all three private parcels comprising the project site.

2. EQUIPMENT PROCUREMENT STATUS

a. STATUS OF THE PROCUREMENT OF MAJOR EQUIPMENT (E.G. EQUIPMENT IN-HAND, CONTRACTS EXECUTED AND EQUIPMENT IN DELIVERY, NEGOTIATING CONTRACTS WITH SUPPLIER(S), ETC.).

SES will provide all of the SunCatcher equipment to the project; SES is the sole manufacturer of the SunCatcher and holds intellectual property rights to the SunCatcher technology. Further information regarding confidential status of equipment procurement is contained in confidential appendix A, Project Development Status section, paragraph C.2. (Equipment Procurement). To summarize, the vast majority of the project supply agreements have been executed.

b. THE DEVELOPER'S HISTORY OF ABILITY TO PROCURE EQUIPMENT.

Tessera Solar procured the SunCatcher and associated equipment for the Maricopa Solar project from SES and the same group of sub-suppliers that it intends to use for the 300MW / 12,000 dish Imperial Valley Solar plant. Tessera gained valuable experience leading up to and during the construction of the Maricopa plant that it will leverage for the larger deployment, and equipment for Maricopa was delivered on time and was of satisfactory quality for successful plant construction.

c. IDENTIFIED EQUIPMENT PROCUREMENT ISSUES, SUCH AS LEAD TIME, AND THEIR EFFECT ON THE PROJECT'S DATE OF OPERABILITY.

The key raw materials necessary for manufacturing the various SunCatcher components are standard construction materials and there are no foreseeable risks in obtaining these resources in a timely or cost-efficient manner. Further (confidential) information on this topic is contained in confidential appendix A, Project Development Status section, paragraph C.2. (Equipment Procurement).

The only long-lead procurement item necessary for the project is the main step-up transformer that has historically taken up to 18 months to be delivered after an order has been placed (the transformer is necessary to step up each medium voltage collector system voltage of 34.5 kV to the transmission voltage of 230kV). However, the transformer has been ordered and purchased for the Imperial Valley Solar project and is expected to be delivered to the project site on time in early 2011.

3. PERMITTING / CERTIFICATIONS STATUS

a. STATUS OF THE PROJECT'S RPS-ELIGIBILITY CERTIFICATION FROM THE CEC. EXPLAIN IF THERE IS ANY UNCERTAINTY REGARDING THE PROJECT'S ELIGIBILITY.

The project was pre-certified by the California Energy Commission ("CEC") as being Renewable Portfolio Standard ("RPS")-eligible on 04/06/2007. The certification number is 60566C.

Full RPS certification by the CEC should not be an issue due to the nature of the technology.

b. THE FOLLOWING TABLE DESCRIBES THE STATUS OF ALL MAJOR PERMITS OR AUTHORIZATIONS NECESSARY FOR DEVELOPMENT AND OPERATION OF THE PROJECT.

Including, without limitation, CEC authorizations, air permits, CPCN or permits to construct (PTC) for transmission, distribution, or substation construction/ expansion, land use permits, building permits, water use or discharge authorizations, Federal Aviation Administration authorizations, military authorizations, and Federal Communication Commission authorizations.

Permitting status and information is located in Confidential Appendix A, Project Development Status, paragraph C.3 (Permitting Status).

c. PRODUCTION TAX CREDIT (PTC) / INVESTMENT TAX CREDIT (ITC) - IF APPLICABLE

This project will depend on a Renewable Energy Cash Grant in lieu of ITC, which is made available through the American Reinvestment and Recovery Act of 2009.

d. THE PROJECT'S POTENTIAL ELIGIBILITY FOR TAX CREDITS BASED ON THE TECHNOLOGY OF THE PROJECT AND CONTRACT OPERATION DATE.

As a renewable energy generation project, Imperial Valley Solar is eligible for the Investment Tax Credit ("ITC") under Section 48 of the U.S. Internal Revenue Code. However, as noted in more detail in the following section (e. Whether the developer intends to seek PTCs/ITCs...), the project will not seek this tax credit.

e. WHETHER THE DEVELOPER INTENDS TO SEEK PTCs/ITCs, ANY PLANS FOR OBTAINING THE PTCs/ITCs, AND ANY CRITERIA THAT MUST BE MET.

The American Recovery and Reinvestment Act of 2009 ("ARRA") created a new Renewable Energy ("RE") Grant program (Energy Grants in Lieu of Tax Credits) ("RE Grant") through the Department of Treasury, which provides grants to project sponsors equal to 30 percent of the cost of solar properties that begin construction prior to January 1, 2011 and that are completed and placed into service prior to January 1, 2017.

This grant is in lieu of the ITC that otherwise would have been available for the Project under Section 48 of the U.S. Internal Revenue Code. Entities receiving the RE Grant are not eligible for the Section 48 ITC.

f. PARTY (SDG&E OR DEVELOPER) BEARING THE RISK IF THE ANTICIPATED TAX CREDITS ARE NOT OBTAINED.

A discussion of the contractual terms and implications surrounding the anticipated tax credits is located in Confidential Appendix A, Project Development Status, paragraph D (PTC/ITC).

4. TRANSMISSION

a. STATUS OF THE PROJECT'S INTERCONNECTION APPLICATION, WHETHER THE PROJECT IS IN THE CAISO OR ANY OTHER INTERCONNECTION QUEUE, AND WHICH TRANSMISSION STUDIES ARE COMPLETE AND/OR IN PROGRESS.

The project participated in the California Independent System Operator (CAISO) interconnection queue and all required transmission studies are complete. A fully executed Large Generator Interconnection Agreement (LGIA) is in place for the project (and provided in Confidential Appendix A).

b. STATUS OF THE INTERCONNECTION AGREEMENT WITH THE INTERCONNECTING UTILITY (E.G., DRAFT ISSUED, EXECUTED AND AT FERC, FULLY APPROVED).

A fully executed Large Generator Interconnection Agreement (LGIA) is in place for the project.

c. REQUIRED NETWORK AND GEN-TIE UPGRADES AND THE CAPACITY TO BE AVAILABLE TO THE PROJECT UPON COMPLETION, INCLUDING PROPOSED CURTAILMENT SCHEMES.

A gen-tie of sufficient capacity will be constructed in order to support the interconnection of the project. Remedial Action Scheme (RAS) are already in existence for the Imperial Valley Substation, and interconnection of this project will impact the RAS. Further detail, including contractual curtailment schemes, are included in Confidential Appendix A, Project Development Status, paragraph E (Transmission).

d. REQUIRED SUBSTATION UPGRADES OR CONSTRUCTION.

There are required substation upgrades and details are included in Confidential Appendix A, Project Development Status, paragraph E. 2. (Transmission).

e. TIMING AND PROCESS FOR ALL TRANSMISSION-RELATED UPGRADES, INCLUDING CRITICAL PATH ITEMS AND POTENTIAL CONTINGENCIES IN THE EVENT OF DELAYS.

Sufficient transmission related upgrades are expected to be completed prior to summer, 2011 to allow interconnection and delivery of test energy beginning at that time. Further details on transmission upgrades are included in Confidential Appendix A, Project Development Status, paragraph E.2. (Transmission).

f. ISSUES RELATING TO OTHER GENERATING FACILITY PROJECTS IN THE TRANSMISSION QUEUE AS THEY MAY AFFECT THE PROJECT.

Given that the Imperial Valley Solar project already has an executed Large Generator Interconnection Agreement (LGIA's) associated with the project, TSNA does not anticipate any issues with other projects in the transmission queue affecting the project, however, see Confidential Appendix A, Project Development Status section, paragraph E.3. (Attributes of the Contract Such as Congestion Risk, Impact on the Status of Reliability-Must-Run (RMR) Generators, and Resource Adequacy Requirements) for further (confidential) discussion of this issue.

g. DEPENDENCY ON TRANSMISSION THAT IS LIKELY TO BE CONGESTED AT TIMES, LEADING TO A PRODUCT THAT IS LESS THAN 100% DELIVERABLE FOR AT LEAST SEVERAL YEARS AND HOW SDG&E FACTORED THE CONGESTION INTO THE LCBF BID ANALYSIS.

The project is dependent on transmission that could be congested at times. Analysis regarding congestion has been completed included in the LCBF all-in ranking value. See confidential appendix A, paragraph C.1. (LCBF).

h. ALTERNATIVE TRANSMISSION ARRANGEMENTS AVAILABLE AND/OR CONSIDERED TO FACILITATE DELIVERY OF THE PROJECT'S OUTPUT.

Alternate transmission arrangements have not been a major consideration for the project at this point, given the advanced stage of transmission planning and executed LGIA that is in place.

D. FINANCING PLAN

1. DEVELOPER'S MANNER OF FINANCING (E.G. PROJECT FINANCING, BALANCE SHEET FINANCING, UTILITY TAX EQUITY INVESTMENT, ETC.)

Imperial Valley Solar will be project financed through a combination of debt, equity and the RE Grant. Cash flow is expected to be generated during the construction period, as SunCatcher groups are placed in service, connected to the grid and begin providing power. This cash flow will be reinvested into the project to reduce the external equity requirement.

2. DEVELOPER'S GENERAL PROJECT FINANCING STATUS.

Work associated with the financing for Imperial Valley Solar remains underway. Equity will be raised from SES Limited and its affiliates, including NTR (NTR plc – is an international renewable energy group that builds and runs green energy and resource-sustaining businesses; it is headquartered in Dublin, Ireland and has interests across Ireland, the UK and North America), as well as potential third party equity investors. Project development activities already in progress are currently being funded on an equity basis by SES Limited and its affiliates. TSNA has retained Goldman Sachs and Standard Chartered as project advisors, and both are actively engaged in the process to attain equity.

IV Solar is currently seeking debt funding through the Department of Energy ("DOE") Loan Guarantee Program, which provides guaranteed debt financing for renewable energy projects in the U.S. that utilize new or significantly improved technologies and commence construction on or before September 30, 2011. Imperial Valley Solar has made significant progress in the application process. Part I of the application was submitted in September 2009 and Part II was submitted in December 2009. IV Solar has thus far received positive feedback from the DOE concerning its application for debt funding and a decision is expected prior to year end, 2010.

3. THE EXTENT (%)THE DEVELOPER RECEIVED FIRM COMMITMENTS FROM FINANCERS (BOTH DEBT AND EQUITY), AND HOW MUCH FINANCING IS EXPECTED TO BE NEEDED TO BRING THE PROJECT ONLINE.

TSNA has received a firm equity commitment from NTR and Stirling Energy Systems Limited; however, according to IV Solar, potential equity investment by third parties remains a strong possibility. Debt financing remains in progress. Imperial Valley Solar is seeking significant DOE financing (confidential detail is included in confidential appendix A, Project Development Status section, paragraph F (financing plan).

4. GOVERNMENT FUNDING OR AWARDS RECEIVED BY THE PROJECT.

To date, the project has not received government funding or awards. The project does, however, remain in the application and review process for the RE Grant and DOE loan guarantee program.

5. CREDITWORTHINESS OF ALL RELEVANT FINANCIERS.

At present, Imperial Valley Solar does not intend to obtain financing from sources other than the Federal Financing Bank ("FFB"). As a government corporation under the supervision of the Department of Treasury, the FFB has a very low risk of default.

6. DEVELOPER'S HISTORY IN PROCURING FINANCING.

Tessera Solar is currently being equity funded by investments from NTR. NTR and its affiliates have a significant project financing history, including:

- Airtricity (former NTR affiliate): Financed more than 40 individual projects involving $250 million of equity and $4 billion of debt.
- NTR: N25 Waterford Bypass- Project financed with equity of approximately $36.5 million from NTR, $73 million from other project equity sponsors and debt capital of approximately $282 million. Lenders include Banco Bilbao Vizcaya, Banco Santander Central Hispano and the European Investment Bank.
- Green Plains Renewable Energy: Ethanol Grain Processors Plant- Project finance comprised a $60 million amortizing term loan, a $37.4 million revolving term loan, a $2.6 million revolving line of credit and a $49.5 million in equity finance.

- Green Plains Renewable Energy: Indiana Bio-Energy Plant- Project financing comprised a $70 million amortizing term loan, a $20 million revolving term facility, a $22 million revenue bond and $51.1 million in equity finance.
- NTR: M1 Dundalk Western Bypass- Financing comprised $53 million of sponsor equity and $201 million in debt financing provided by a consortium of lenders, including Societe General, KBC/IIB, Depfa Bank, AIB plc, Instituto de Credito Oficial and the European Investment Bank.

7. PLANS FOR OBTAINING SUBSIDIES, GRANTS, OR ANY OTHER THIRD PARTY MONETARY AWARDS (OTHER THAN PRODUCTION TAX CREDITS AND INVESTMENT TAX CREDITS) AND HOW THE LACK OF ANY OF THIS FUNDING WILL AFFECT THE PROJECT.

The project will not receive subsidies, grants or other third party monetary awards other than the RE Grant. While the project has applied for guaranteed debt financing from the FFB through the DOE loan guarantee program, this does not qualify as a subsidy.

IV. CONTINGENCIES AND/OR MILESTONES

A. MAJOR PERFORMANCE CRITERIA AND GUARANTEED MILESTONES.

See confidential appendix D, paragraph D. (Major Contract Provisions).

B. OTHER CONTINGENCIES AND MILESTONES (I.E. 500 KV LINE, INTERCONNECTION COSTS, GENERATOR FINANCING, PERMITTING)

See confidential appendix D, paragraph D. (Major Contract Provisions).

V. PROCEDURAL MATTERS

A. REQUESTED RELIEF

SDG&E respectfully requests that the Commission review and approve the Proposed Amendment through the issuance of a resolution no later than August 12, 2010. This 127 day / approximately four (4) month review period is critical to ensuring that the Proposed Amendment remains viable and on-track for financing and construction. Project financing is dependent on a new RE Grant program created through the American Recovery and Reinvestment Act of 2009 ("ARRA"). This new RE Grant program (Energy Grants in Lieu of Tax Credits) is provided through the Department of Treasury, and provides grants to project sponsors equal to 30 percent of the cost of solar properties that begin construction prior to January 1, 2011 and that are completed and placed into service prior to January 1, 2017. Timely review and approval of the Proposed Amendment is critical in meeting these timing requirements.

The Proposed Amendment is conditioned upon "CPUC Approval." SDG&E, therefore, requests the following Commission findings in its approval of the PPA:

1. The Proposed Amendment is consistent with SDG&E's CPUC-approved RPS Plan and procurement from the proposed amendment will contribute towards SDG&E's APT starting in 2011.[8]

2. SDG&E's execution of the Proposed Amendment and the terms of such Proposed Amendment are reasonable; therefore, all payments to be made by SDG&E under the Proposed Amendment, including those for energy, green attributes and resource adequacy included in the Proposed Amendment are fully recoverable in rates over the life of the Proposed Amendment, subject to Commission review of SDG&E's administration of the Proposed Amendment.

3. All procurement and administrative costs associated with the Proposed Amendment shall be deemed reasonable per se and recoverable in rates as provided in Public Utilities Code § 399.14

4. Approval of the Proposed Amendment, in its entirety, including approval of full cost recovery in rates through the Energy Resource Recovery Account (ERRA) mechanism of all payments to be made by SDG&E from the commencement of deliveries forward in association with this Proposed Amendment, subject to Commission review of SDG&E's administration of the Proposed Amendment[9].

5. Issuance of a finding that any generation procured pursuant to the Proposed Amendment constitutes generation from an eligible renewable energy resource for purposes of determining SDG&E's compliance with any obligation that it may have to procure eligible renewable energy resources pursuant to the California Renewables Portfolio Standard program (Public Utilities Code §§ 399.11, et seq. or other applicable law) and relevant Commission decisions.

6. The confidential appendices as well as the confidential portions of the advice letter, should not be made public upon Commission approval of this resolution.

7. The PPA is consistent with the Commission-adopted RPS standard terms and conditions and includes those deemed "non-modifiable."

[8] If SDG&E, by way of output from other RPS-eligible resources, already meets its APT, SDG&E will bank all output from the Proposed Agreements for use in future years.
[9] *Id.* R. 06-02-012, at p.

B. PROTEST

Anyone may protest this advice letter to the California Public Utilities Commission. The protest must state the grounds upon which it is based, including such items as financial and service impact, and should be submitted expeditiously. The protest must be made in writing and received within 20 days of the date this advice letter was filed with the Commission. There is no restriction on who may file a protest. The address for mailing or delivering a protest to the Commission is:

CPUC Energy Division
Attention: Tariff Unit
505 Van Ness Avenue
San Francisco, CA 94102

Copies should also be sent via e-mail to the attention of Honesto Gatchallian (jnj@cpuc.ca.gov) and Maria Salinas (mas@cpuc.ca.gov) of the Energy Division. It is also requested that a copy of the protest be sent via electronic mail and facsimile to SDG&E on the same date it is mailed or delivered to the Commission (at the addresses shown below).

Attn: Megan Caulson
Regulatory Tariff Manager
8330 Century Park Court, Room 32C
San Diego, CA 92123-1548
Facsimile No. 858-654-1788
E-Mail: MCaulson@semprautilities.com

C. EFFECTIVE DATE

SDG&E believes that this Advice Letter is subject to Energy Division disposition and should be classified as Tier 3 (effective after Commission approval) pursuant to GO 96-B. SDG&E respectfully requests that the Commission issue a resolution approving this advice letter on or before August 12, 2010.

D. NOTICE

In accordance with Section III.G of General Order No. 96-A, a copy of this filing has been served on the utilities and interested parties shown on the attached list, including interested parties in R.08-08-009, by either providing them a copy electronically or by mailing them a copy hereof, properly stamped and addressed.

Address changes should be directed to SDG&E Tariffs by facsimile at (858) 654-1788 or by e-mail to SDG&ETariffs@semprautilities.com.

RON VAN DER LEEDEN
Director – Rates, Revenues and Tariffs

CALIFORNIA PUBLIC UTILITIES COMMISSION

ADVICE LETTER FILING SUMMARY
ENERGY UTILITY

MUST BE COMPLETED BY UTILITY (Attach additional pages as needed)

Company name/CPUC Utility No. **SAN DIEGO GAS & ELECTRIC (U 902)**

Utility type:
☒ ELC ☐ GAS
☐ PLC ☐ HEAT ☐ WATER

Contact Person: Joff Morales
Phone #: (858) 650-4098
E-mail: jmorales@semprautilities.com

EXPLANATION OF UTILITY TYPE
ELC = Electric GAS = Gas
PLC = Pipeline HEAT = Heat WATER = Water

(Date Filed/ Received Stamp by CPUC)

Advice Letter (AL) #: 2161-E

Subject of AL: Request for Approval of Renewable Power Purchase with Imperial Valley Solar, LLC.

Keywords (choose from CPUC listing): Procurement, Power Purchase Agreement

AL filing type: ☐ Monthly ☐ Quarterly ☐ Annual ☒ One-Time ☐ Other

If AL filed in compliance with a Commission order, indicate relevant Decision/Resolution #: N/A

Does AL replace a withdrawn or rejected AL? If so, identify the prior AL: None

Summarize differences between the AL and the prior withdrawn or rejected AL[1]: N/A

Does AL request confidential treatment? If so, provide explanation: Yes. Contains confidential procurement information. See attached declaration.

Resolution Required? ☒ Yes ☐ No Tier Designation: ☐ 1 ☐ 2 ☒ 3

Requested effective date: 8/12/2010 No. of tariff sheets: 0

Estimated system annual revenue effect: (%): N/A

Estimated system average rate effect (%): N/A

When rates are affected by AL, include attachment in AL showing average rate effects on customer classes (residential, small commercial, large C/I, agricultural, lighting).

Tariff schedules affected: None

Service affected and changes proposed[1]: None

Pending advice letters that revise the same tariff sheets: None

Protests and all other correspondence regarding this AL are due no later than 20 days after the date of this filing, unless otherwise authorized by the Commission, and shall be sent to:

CPUC, Energy Division
Attention: Tariff Unit
505 Van Ness Ave.,
San Francisco, CA 94102
mas@cpuc.ca.gov and jnj@cpuc.ca.gov

San Diego Gas & Electric
Attention: Megan Caulson
8330 Century Park Ct, Room 32C
San Diego, CA 92123
mcaulson@semprautilities.com

[1] Discuss in AL if more space is needed.

STATE OF CALIFORNIA
California Energy Commission

In the Matter of: The Application for Certification for the Imperial Valley Solar Project (formerly known as SES Solar Two)	Docket No. 08-AFC-5

PROOF OF SERVICE

I, Bonnie Heeley, declare that on July 21, 2010, I served and filed copies of the attached **CALIFORNIA UNIONS FOR RELIABLE ENERGY JULY 21, 2010 REBUTTAL TESTIMONY.** 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/solartwo/Imperial_Valley_POS.pdf. 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 via email and by U.S. Mail with first-class postage thereon, fully prepaid and addressed as provided on the Proof of Service list to those addresses NOT marked "email preferred." An original paper copy and one electronic copy, mailed and emailed respectively, were sent to the Docket Office.

I declare under penalty of perjury that the foregoing is true and correct. Executed at South San Francisco, CA on July 21, 2010.

_____/s/_____
Bonnie Heeley

CALIFORNIA ENERGY COMMISSION
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