APPENDIX D:

SUMMARY OF REGIONAL INITIATIVES AND STATE PLANS FOR SOLAR ENERGY DEVELOPMENT AND TRANSMISSION DEVELOPMENT TO SUPPORT RENEWABLE ENERGY DEVELOPMENT

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A number of regional and state initiatives have been started in the six-state study area evaluated in the "Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States" (Solar PEIS) whose mission is to facilitate development of renewable energy resources and necessary expansion of the electricity transmission system. These include efforts by the Western Governors' Association (WGA) to identify optimal areas for renewable energy development and transmission expansion. They also include state-level efforts, such as the passage of Renewable Portfolio Standards (RPSs) requiring that specific amounts of a state's electricity capacity be supplied by renewable resources, renewable energy resource assessments, and energy transmission planning efforts. Additional regional and state-level efforts are underway that are relevant to, although not specifically focused on, renewable energy development (e.g., state-level wildlife action plans, the California essential Habitat Connectivity Project).

This appendix provides an overview of the regional and state initiatives that specifically address renewable energy development in the six-state study area. It also includes maps depicting how these efforts relate to the solar-energy-related designations being proposed by the U.S. Department of the Interior (DOI) Bureau of Land Management (BLM) in the Solar PEIS, including lands proposed by the BLM as being available for solar energy development (BLM Lands Available) and as solar energy zones (SEZs). In addition, a recent initiative by the U.S. Department of Defense (DoD) regarding solar energy potential on major DoD installations is discussed.

D.1 WESTERN GOVERNORS' ASSOCIATION WESTERN RENEWABLE ENERGY ZONE INITIATIVE

The WGA is an association of governors from 19 western states and three Pacific Islands. The WGA works to identify and address policy and governance issues related to natural resource management, the environment, human services, economic development, and more. The organization supports governors in developing strategies to manage complex, long-term issues facing the region. More information about the WGA is available on its Web site (http://www.westgov.org).

One of the WGA initiatives that is especially pertinent to solar power development is the establishment of Western Renewable Energy Zones (WREZs), areas within the Western Interconnection that have high potential for utility-scale renewable energy development with

relatively low or easily mitigated environmental impacts.[1] The scope of the WREZ initiative includes solar, wind, biomass, geothermal, and hydropower resources. The initiative, which is being conducted jointly with the U.S. Department of Energy (DOE), is intended to facilitate the construction of utility-scale renewable energy facilities and expansion of the electricity transmission system needed to deliver the energy to load centers across the Western Interconnection.

The WREZ initiative consists of a broad-based process involving federal agencies (U.S. Department of the Interior, U.S. Department of Agriculture, Federal Energy Regulatory Commission), Canadian provincial premiers, and other stakeholders representing renewable energy developers, Tribal interests, utilities, environmental groups, and government policymakers. The work is being conducted in four phases, the first of which was documented in the June 2009 Phase 1 Report (WGA and DOE 2009).

D.1.1 WREZ Initiative Phase 1 Results

The WREZ Phase 1 Report (WGA and DOE 2009) identifies and maps the preliminary WREZs and describes the criteria and methodology used to define these areas. The multistep process presented in the Phase 1 report included the following:

- Identifying renewable energy resources within the Western Interconnection with the potential for utility-scale development;

- Identifying Candidate Study Areas (CSAs) as those areas with the highest quality and most cost-effective renewable resources within each state or province; and

- Screening CSAs to identify Qualified Resource Areas (QRAs) as those areas with potential generation capacity to justify the construction of new regional transmission while excluding lands on the basis of statutory or regulatory limitations and existing conflicts. (The QRAs identified in the Phase 1 Report will be further analyzed in the next phase of work and, ultimately, may be designated as WREZs.)

To support this Phase 1 work, a Zone Identification and Technical Analysis (ZITA) working group was formed. The ZITA group developed the initial set of resource characteristics and criteria to be used in defining the WREZs. These criteria included land use restrictions (including engineering aspects), regulatory limitations, and environmental factors.

[1] The Western Interconnection is the name of the electricity grid, overseen by the Western Electricity Coordinating Council, that serves the states of Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming; part of west Texas; the Canadian provinces of Alberta and British Columbia; and a small portion of northern Mexico in Baja California.

Two additional working groups were formed and tasked with supporting roles for zone identification. The Environmental and Lands (E&L) working group categorized the resource potential of zones on the basis of land use, wildlife, and environmental considerations and identified specific lands to be excluded from the QRAs. U.S. federal lands where renewable energy development is precluded by law, such as national parks, national monuments, federally designated Wilderness Areas, and U.S. Forest Service primitive areas, are a few examples. Similar information from the appropriate Canadian federal and provincial ministries and state land management agencies was incorporated. Additional lands, including BLM Areas of Critical Environmental Concern, state parks, and state wildlife management areas, were excluded to avoid other existing conflicts. The Generation and Transmission Modeling (G&TM) working group was responsible for (1) developing a model to evaluate generating costs, delivered costs, and the relative economic "attractiveness" of renewable energy generated by development of specific zones and (2) engaging with the Western Electricity Coordinating Council in an evaluation of transmission requirements to move power from the zones to load centers.

QRAs were defined primarily on the basis of the potential for utility-scale solar or wind resources. If other renewable energy resources (e.g., biomass, geothermal, and hydropower) were present within these same areas, their potential development was also assessed; however, QRAs were not defined on the basis of these resources alone. For the purpose of defining WREZs on the basis of solar energy resources, the ZITA working group initially eliminated any location that received less than 6.5 kWh/m^2/day of direct normal insolation (DNI) and had a slope greater than 5%. The slope minimum was further refined to 2% when the QRAs were identified. These criteria represent the minimum conditions that were assumed in order for an area to be developable at the utility scale for either solar thermal or photovoltaic technologies. Details about the criteria for defining other renewable energy resources (e.g., wind, biomass, geothermal, or hydropower) are outlined in the Phase 1 report, and the report also provides additional details on the process and criteria for developing CSA areas, as a prelude to identifying QRA areas.

The Phase 1 Report also describes the tools developed by the G&TM working group that can be used to estimate (1) delivery costs (including transmission costs) for delivering renewable energy from specific WREZs to specific load centers (the Generation and Transmission Model [GTM]) and (2) the theoretical supply curves for any given load center that could be supplied from the entire list of WREZs (the Peer Analysis Tool [PAT]). The models are publicly available from the WGA's WREZ Initiative Web site (http://www.westgov.org/index.php?option=com_content&view=article&catid=102%3Ainitiatives&id=220%3Awrez-transmission-model-page&Itemid=81).

Figure D-1 shows the QRAs that were designated through the Phase 1 effort. These areas define the geographic extent of the renewable energy resources meeting the QRA parameters. The potential total amount of electricity in terawatt-hours (TWh) that could be produced over the course of 1 year using the resources within general areas of high renewable resource concentrations, referred to as "Hubs," is also shown in Figure D-1. Table D-1 presents the potential renewable energy generation in gigawatt-hours per year (GWh/yr) calculated for each of the Hubs by state, with separate calculations for each type of renewable energy resource present. Similarly, Table D-2 shows the potential renewable capacity in MW calculated for each of the Hubs by state, with separate calculations for each type of renewable energy resource

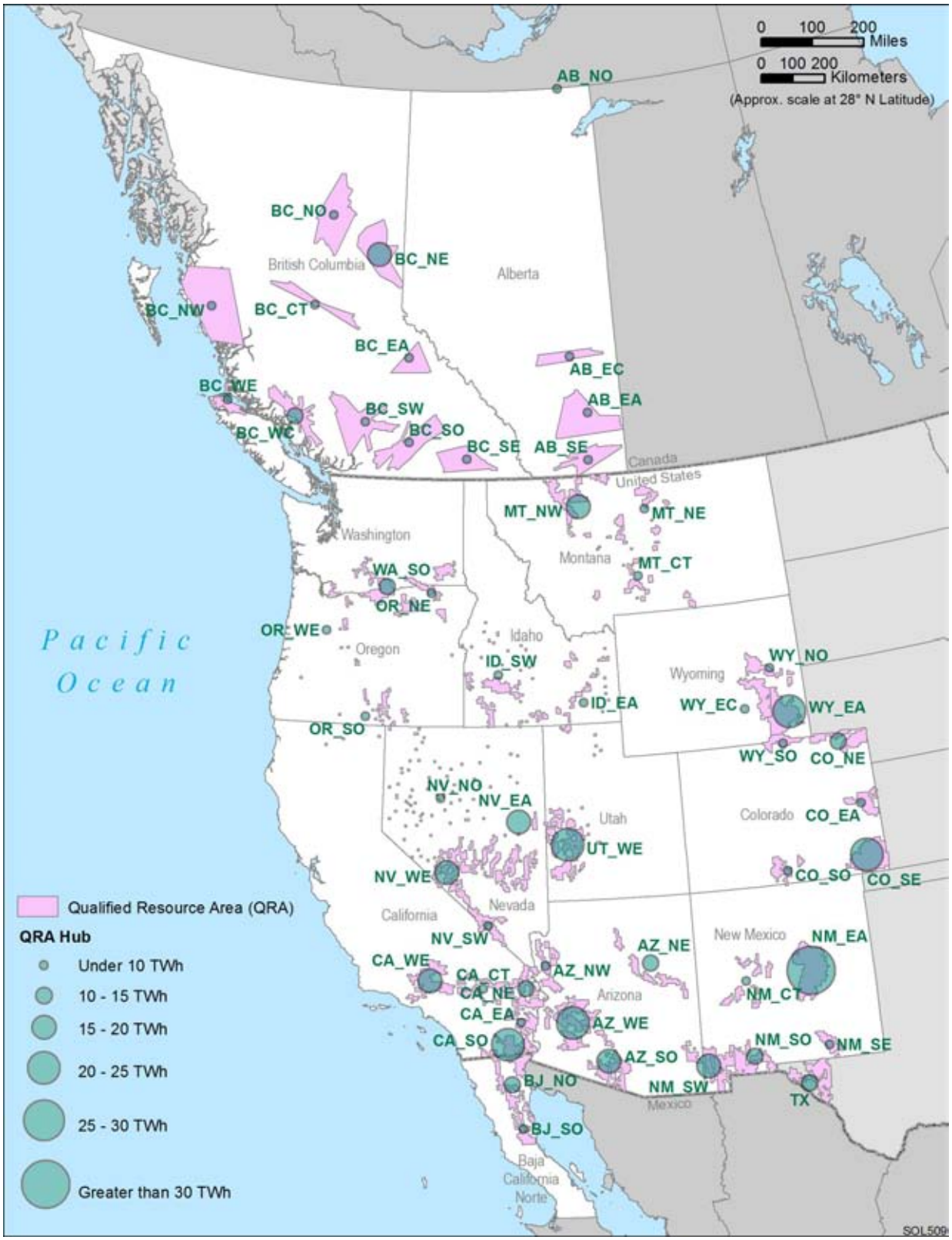

FIGURE D-1 WREZ Initiative Phase 1 Qualified Resource Areas and Hubs (based on WGA and DOE 2009)

TABLE D-1 Potential Renewable Energy Generation for WREZ Initiative Phase 1 Hubs (GWh/yr)

		Solar Thermal GWh/yr by DNI Level (kWh/m^2/day)[a]						Wind GWh/yr by Wind Power Class[a]				Geothermal GWh/yr				Total GWh/yr
Hub State/Prov.	Hub Name	6.5–6.75	6.75–7.0	7.0–7.25	7.25–7.5	7.5+	Solar Total	3	4	5+	Wind Total	Discov-ered	Undis-covered[b,c]	Hydro GWh/yr[d]	Biomass GWh/yr	WREZ-Only
AZ	AZ NE	[e]	[e]	[e]	696	0	696	8,107	371	182	8,661	0	[e]	0	1,903	11,260
AZ	AZ NW	[e]	[e]	84	6,595	1,505	8,184	512	19	5	536	0	[e]	0	127	8,847
AZ	AZ SO	[e]	[e]	[e]	15,607	0	15,607	[e]	[e]	[e]	[e]	0	[e]	0	59	15,665
AZ	AZ WE	[e]	[e]	[e]	18,912	3,790	22,702	[e]	[e]	[e]	[e]	0	[e]	0	350	23,051
AZ Total		0	0	84.32473	41,809	5,295	47,188	8,619	390	188	9,197	0	7,309	0	2,438	58,824
CA	CA CT	[e]	[e]	1,191	2,123	2,069	5,383	2,850	561	134	3,545	0	[e]	0	83	9,011
CA	CA EA	[e]	[e]	2,375	3,615	158	6,148	522	53	14	589	0	[e]	0	83	6,821
CA	CA NE	[e]	[e]	2,836	6,693	1,407	10,937	1,199	202	7	1,407	0	[e]	0		12,344
CA	CA SO	[e]	[e]	6,937	915	83	7,934	1,170	376	429	1,976	11,074	[e]	8	142	21,134
CA	CA WE	[e]	[e]	1,139	2,984	2,717	6,840	3,093	2,239	3,282	8,615	0	[e]	0	786	16,241
CA Total		0	0	14,477	16,330	6,434	37,241	8,834	3,432	3,867	16,132	11,074	79,471	8	1,095	65,550
CO	CO EA	[e]	[e]	0	0	0	0	[e]	6,640	0	6,640	0	[e]	0	50	6,689
CO	CO NE	[e]	[e]	0	0	0	0	[e]	10,904	623	11,527	0	[e]	0	94	11,621
CO	CO SE	[e]	[e]	0	0	0	0	[e]	23,836	109	23,944	0	[e]	0	120	24,065
CO	CO SO	[e]	[e]	4,617	326	0	4,943	[e]	303	299	602	0	[e]	0	875	6,421
CO Total		0	0	4,617	326	0	4,943	0	41,683	1,031	42,714	0	7,744	0	1,139	48,796
ID	ID EA	[e]	[e]	[e]	[e]	[e]	0	1,515	182	38	1,735	1,034	[e]	0	1,936	4,704.756
ID	ID SW	[e]	[e]	[e]	[e]	[e]	0	2,189	36	4	2,229	1,079	[e]		728	4,036.080
ID Total		0	0	0	0	0	0	3,705	217	43	3,965	2,113	13,119	0	2,663	8,741
MT	MT CT	[e]	[e]	[e]	[e]	[e]	0	[e]	[e]	8,224	8,224	0	[e]	0	570	8,794
MT	MT NE	[e]	[e]	[e]	[e]	[e]	0	[e]	[e]	7,429	7,429	0	[e]	0	32	7,461
MT	MT NW	[e]	[e]	[e]	[e]	[e]	0	[e]	[e]	16,932	16,932	0	[e]	0	494	17,427
MT Total		0	0	0	0	0	0	0	0	32,585	32,585	0	5,403	0	1,097	33,682
NM	NM CT	[e]	[e]	6,126	1,049	0	7,175	[e]	[e]	[e]	[e]	0	[e]	0	823	7,998
NM	NM EA	[e]	[e]	183	0	0	183	[e]	26,768	4,427	31,196	0	[e]	0	330	31,708
NM	NM SE	[e]	[e]	0	0	0	0	[e]	3,632	1,748	5,381	0	[e]	0	162	5,542
NM	NM SO	[e]	[e]	7,317	2,850	0	10,167	[e]	[e]	[e]	[e]	0	[e]	0	92	10,258
NM	NM SW	[e]	[e]	4,298	10,515	0	14,814	[e]	[e]	[e]	[e]	0	[e]	0	254	15,067
NM Total		0	0	17,924	14,414	0	32,338	0	30,400	6,176	36,576	0	10,400	0	1,659	70,573

TABLE D-1 (Cont.)

Hub State/Prov.	Hub Name	Solar Thermal GWh/yr by DNI Level (kWh/m^2/day)[a] 6.5–6.75	6.75–7.0	7.0–7.25	7.25–7.5	7.5+	Solar Total	Wind GWh/yr by Wind Power Class[a] 3	4	5+	Wind Total	Geothermal GWh/yr Discovered	Undiscovered[b,c]	Hydro GWh/yr[d]	Biomass GWh/yr	Total GWh/yr WREZ-Only
NV	NV EA	e	e	9,076	7,354	952	17,382	e	e	e	e	168	e	0	995	18,546
NV	NV NO	e	e	e	e	e	e	e	e	e	e	7,799	e	9	991	8,799
NV	NV SW	e	e	840	2,760	4,316	7,916	520	42	19	581	0	e	0	88	8,584
NV	NV WE	e	e	4,916	9,655	2,170	16,741	391	73	39	503	2,074	e	0	161	19,479
NV Total		0	0	14,832	19,769	7,438	42,039	911	115	58	1,083	10,041	30,583	9	2,235	55,408
OR	OR NE	e	e	e	e	e	e	3,619	1,259	325	5,204	0	e	0	2,892	8,095
OR	OR SO	e	e	e	e	e	e	951	188	181	1,320	3,550	e	0	876	5,747
OR	OR WE	e	e	e	e	e	e	481	244	191	916	2,596	e	16	1,040	4,567
OR Total		0	0	0	0	0	0	5,051	1,691	698	7,439	6,146	13,266	16	4,808	18,409
TX	TX	1,001	8,275	15	0	0	9,291	510	639	197	1,346	0	e	0	26	10,663
TX Total		1,001	8,275	15	0	0	9,291	510	639	197	1,346	0	0	0	26	10,663
UT	UT WE	10,147	4,618	503	0	0	15,268	3,718	361	95	4,174	1,594	e	0	674	21,711
UT Total		10,147	4,618	503	0	0	15,268	3,718	361	95	4,174	1,594	10,260	0	674	21,711
WA	WA SO	e	e	e	e	e	0	6,295	1,635	295	8,225	0	e	2,531	754	11,509
WA Total		0	0	0	0	0	0	6,295	1,635	295	8,225	0	2,102	2,531	754	11,509
WY	WY EA	e	e	e	e	e	0	e	e	24,570	24,570	0	e	0	35	24,605
WY	WY EC	e	e	e	e	e	0	e	e	8,801	8,801	0	e	0	0	8,801
WY	WY NO	e	e	e	e	e	0	e	e	9,606	9,606	0	e	0	41	9,647
WY	WY SO	e	e	e	e	e	0	e	1,670	4,457	6,126	0	e	0	41	6,168
WY Total		0	0	0	0	0	0	0	1,670	47,434	49,104	0	1,219	0	117	49,221
AB	AB EA	e	e	e	e	e	0	f	f	f	4,044	0	e	0	713	4,757
AB	AB EC	e	e	e	e	e	0	f	f	f	2,146	0	e	0	907	3,053
AB	AB NO	e	e	e	e	e	0	f	f	f	0	0	e	6,307	1	6,308
AB	AB SE	e	e	e	e	e	0	f	f	f	7,389	0	e	0	376	7,765
AB Total		0	0	0	0	0	0	0	0	0	13,579	0	0	6,307	1,997	21,883

TABLE D-1 (Cont.)

Hub State/Prov.	Hub Name	Solar Thermal GWh/yr by DNI Level (kWh/m^2/day)[a] 6.5–6.75	6.75–7.0	7.0–7.25	7.25–7.5	7.5+	Solar Total	Wind GWh/yr by Wind Power Class[a] 3	4	5+	Wind Total	Geothermal GWh/yr Discovered	Undiscovered[b,c]	Hydro GWh/yr[d]	Biomass GWh/yr	Total GWh/yr WREZ-Only
BC	BC CT	e	e	e	e	e	0	f	f	f	1,953	0	e	10	905	2,868
BC	BC EA	e	e	e	e	e	0	f	f	f	0	224	e	437	250	911
BC	BC NE	e	e	e	e	e	0	f	f	f	11,389	112	e	4,953	811	17,265
BC	BC NO	e	e	e	e	e	0	f	f	f	5,730	0	e	420	588	6,738
BC	BC NW	e	e	e	e	e	0	f	f	f	3,159	224	e	1,984	632	5,999
BC	BC SE	e	e	e	e	e	0	f	f	f	252	224	e	508	447	1,432
BC	BC SHPC	g	g	g	g	g	g	g	g	g	g	g	g	g	g	15,797[g]
BC	BC SO	e	e	e	e	e	0	f	f	f	4,786	224	e	630	815	6,455
BC	BC SW	e	e	e	e	e	0	f	f	f	3,630	112	e	717	1,204	5,663
BC	BC WC	e	e	e	e	e	0	f	f	f	0	1,419	e	12,546	949	14,914
BC	BC WE	e	e	e	e	e	0	f	f	f	3,205	0	e	167	393	3,766
BC Total		0	0	0	0	0	0	0	0	0	34,104	2,540	0	22,372	6,994	66,010
BJ	BJ NO	e	e	7,026	2,218	30	9,274	e	2,058	3,110	5,169	0	e	e	e	14,443
BJ	BJ SO	e	e	1,022	1,218	117	2,357	e	1,668	2,078	3,745	0	e	e	e	6,102
BJ Total		0	0	8,048	3,436	146	11,631	0	3,726	5,188	8,915	0	0	0	0	20,545
Grand Total		11,147	12,893	60,500	96,085	19,313	199,939	37,642	85,959	97,853	269,138	33,509	180,876	31,243	27,698	561,527

[a] Only the best classes of wind and solar resources in each state were quantified. Quantifications for wind resources represent each state's minimum wind power class and higher, and for solar resources each state's minimum direct normal insolation level and higher. In Canada, renewable energy resources were quantified using a different methodology. It assessed resources at the site level as opposed to using raw resource data; therefore, the "best in state" criteria were not applied and Canadian resources were not discounted. Wind potential was not quantified in QRAs with less than 100 MW of total wind resource potential. Additional information is available on the Web at http://www.westgov.org/wga/initiatives/wrez/zita/index.htm.

[b] Undiscovered geothermal resources are believed to exist in certain areas because of the presence of geologic systems that have been correlated with geothermal resource potential in other areas. This undiscovered potential has not yet been quantified at specific locations where a geothermal plant could be built, but it can be estimated at the state level with different levels of confidence. As a result, these resources are not quantified at the QRA level or included in the economic modeling of QRAs. When undiscovered geothermal potential is believed to exist in a QRA, it will be noted, even though it will not be quantified. The mean estimated potential from these resources by state is quantified in this table by state and province. It is not captured in the QRA MW total, because these resources are not being quantified at the QRA level. U.S. estimates are from the U.S. Geological Survey (USGS), and Canadian estimates are from the Canadian Geothermal Energy Association.

[c] Data on undiscovered geothermal resources were not available for Baja California Norte and Texas at the time of publication.

[d] Small and large hydropower are quantified in Canada. Incremental additions to powered or non-powered dams are quantified in the United States.

Footnotes continued on next page.

TABLE D-1 (Cont.)

[e] These resources may exist, but they are not quantified in this study.

[f] As noted above, a different resource assessment methodology was used to quantify the MW of renewable energy resources available in Canada. Data on the wind power class in British Columbia and Alberta are not available from this assessment. As a result, only the total potential of wind resources is shown here and is not broken down into different wind class categories.

[g] British Columbia voluntarily provided a hub on the British Columbia–Washington border to the WREZ process. This represents a 16,000 GW-hour per year shaped energy product that British Columbia could provide to load-serving entities (LSEs) at the border. The intention of this additional hub and associated cost curve is not to represent a specific product offered to LSEs at the border, but to illustrate the benefits of a shaped and firmed decarbonized energy product to encourage further discussion. This hub and its energy and production profile will be selectable when using the Generation and Transmission Modeling tool. The energy resources that make up this cost curve are not specified; therefore, they are not broken down by resource type or class. The generation available from this additional QRA is not included in the B.C. subtotal or the grand total in this table.

Source: WGA and DOE (2009).

1
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TABLE D-2 Potential Renewable Capacity for WREZ Initiative Phase 1 Hubs (Total MW)

		Solar Thermal MW by DNI Level (kWh/m^2/day)[a]						Wind MW by Wind Power Class[a]				Geothermal MW				Total MW
Hub State/Prov.	Hub Name	6.5–6.75	6.75–7.0	7.0–7.25	7.25–7.5	7.5+	Solar Total	3	4	5+	Wind Total	Discov-ered	Undis-covered[b,c]	Hydro MW[d]	Biomass MW	WREZ-Only
AZ	AZ NE	[e]	[e]	[e]	309	0	309	3,305	137	57	3,499	0	[e]	0	256	4,064
AZ	AZ NW	[e]	[e]	36	2,841	648	3,525	209	7	2	217	0	[e]	0	17	3,760
AZ	AZ SO	[e]	[e]	[e]	6,623	0	6,623	[e]	[e]	[e]	[e]	0	[e]	0	8	6,631
AZ	AZ WE	[e]	[e]	[e]	7,766	1,558	9,322	[e]	[e]	[e]	[e]	0	[e]	0	47	9,369
AZ Total		0	0	36.324947	17,539	2,204	19,780	3,514	144	59	3,717	0	1,043	0	327	23,824
CA	CA CT	[e]	[e]	500	891	868	2,259	1,162	207	41	1,410	0	[e]	0	11	3,680
CA	CA EA	[e]	[e]	1,035	1,575	69	2,679	213	20	5	237	0	[e]	0	11	2,927
CA	CA NE	[e]	[e]	1,213	2,862	602	4,676	489	74	2	565	0	[e]	0	0	5,241
CA	CA SO	[e]	[e]	2,977	392	36	3,405	477	139	129	744	1,434	[e]	2	19	5,604
CA	CA WE	[e]	[e]	508	1,331	1,212	3,050	1,261	825	1,000	3,085	0	[e]	0	106	6,241
CA Total		0	0	6,232	7,051	2,786	16,069	3,602	1,264	1,176	6,042	1,434	11,340	2	147	23,693
CO	CO EA	[e]	[e]	0	0	0	0	[e]	2,445	0	2,445	0	[e]	0	7	2,452
CO	CO NE	[e]	[e]	0	0	0	0	[e]	4,016	203	4,218	0	[e]	0	13	4,231
CO	CO SE	[e]	[e]	0	0	0	0	[e]	8,777	36	8,813	0	[e]	0	16	8,829
CO	CO SO	[e]	[e]	2,151	152	0	2,303	[e]	112	92	203	0	[e]	0	118	2,624
CO Total		0	0	2,151	152	0	2,303	0	15,350	330	15,679	0	1,105	0	153	18,135
ID	ID EA	[e]	[e]	[e]	[e]	[e]	0	618	67	12	696	125	[e]	0	260	1,081
ID	ID SW	[e]	[e]	[e]	[e]	[e]	0	893	13	1	907	154	[e]	8	98	1,167
ID Total		0	0	0	0	0	0	1,510	80	13	1,603	279	1,872	8	358	2,249
MT	MT CT	[e]	[e]	[e]	[e]	[e]	0	[e]	[e]	2,527	2,527	0	[e]	0	77	2,604
MT	MT NE	[e]	[e]	[e]	[e]	[e]	0	[e]	[e]	2,337	2,337	0	[e]	0	4	2,341
MT	MT NW	[e]	[e]	[e]	[e]	[e]	0	[e]	[e]	5,194	5,194	0	[e]	0	66	5,261
MT Total		0	0	0	0	0	0	0	0	10,059	10,059	0	771	0	147	10,206
NM	NM CT	[e]	[e]	2,679	459	0	3,138	[e]	[e]	[e]	[e]	0	[e]	0	110	3,249
NM	NM EA	[e]	[e]	83	0	0	83	[e]	9,857	1,433	11,290	0	[e]	0	44	11,418
NM	NM SE	[e]	[e]	0	0	0	0	[e]	1,338	557	1,894	0	[e]	0	22	1,916
NM	NM SO	[e]	[e]	3,128	1,219	0	4,347	[e]	[e]	[e]	[e]	0	[e]	0	12	4,359
NM	NM SW	[e]	[e]	1,784	4,365	0	6,149	[e]	[e]	[e]	[e]	0	[e]	0	34	6,183
NM Total		0	0	7,675	6,042	0	13,718	0	11,195	1,989	13,184	0	1,484	0	223	27,124

TABLE D-2 (Cont.)

		Solar Thermal MW by DNI Level (kWh/m^2/day)[a]						Wind MW by Wind Power Class[a]				Geothermal MW				Total MW
Hub State/Prov.	Hub Name	6.5–6.75	6.75–7.0	7.0–7.25	7.25–7.5	7.5+	Solar Total	3	4	5+	Wind Total	Discov-ered	Undis-covered[b,c]	Hydro MW[d]	Biomass MW	WREZ-Only
NV	NV EA	[e]	[e]	4,079	3,305	428	7,812	[e]	[e]	[e]	[e]	24	[e]	0	134	7,970
NV	NV NO	[e]	[e]	[e]	[e]	[e]	[e]	[e]	[e]	[e]	[e]	1,048	[e]	2	133	1,183
NV	NV SW	[e]	[e]	369	1,212	1,895	3,475	212	16	6	233	0	[e]	0	12	3,720
NV	NV WE	[e]	[e]	2,142	4,207	946	7,294	160	27	12	198	296	[e]	0	22	7,810
NV Total		0	0	6,590	8,724	3,268	18,582	371	42	18	431	1,368	4,364	2	300	20,683
OR	OR NE	[e]	[e]	[e]	[e]	[e]	[e]	1,476	464	104	2,043	0	[e]	0	388	2,431
OR	OR SO	[e]	[e]	[e]	[e]	[e]	[e]	388	69	54	511	501	[e]	0	118	1,130
OR	OR WE	[e]	[e]	[e]	[e]	[e]	[e]	196	90	57	343	331	[e]	3	140	817
OR Total		0	0	0	0	0	0	2,059	623	215	2,897	832	1,893	3	646	4,378
TX	TX	461	3,809	7	0	0	4,277	208	235	64	507	0	[e]	0	3	4,787
TX Total		461	3,809	7	0	0	4,277	208	235	64	507	0	0	0	3	4,787
UT	UT WE	4,786	2,178	237	0	0	7,202	1,516	133	29	1,678	225	[e]	0	91	9,196
UT Total		4,786	2,178	237	0	0	7,202	1,516	133	29	1,678	225	1,464	0	91	9,196
WA	WA SO	[e]	[e]	[e]	[e]	[e]	0	2,566	602	92	3,260	0	[e]	544	101	3,905
WA Total		0	0	0	0	0	0	2,566	602	92	3,260	0	300	544	101	3,905
WY	WY EA	[e]	[e]	[e]	[e]	[e]	0	[e]	[e]	7,257	7,257	0	[e]	0	5	7,262
WY	WY EC	[e]	[e]	[e]	[e]	[e]	0	[e]	[e]	2,594	2,594	0	[e]	0	0	2,594
WY	WY NO	[e]	[e]	[e]	[e]	[e]	0	[e]	[e]	3,063	3,063	0	[e]	0	5	3,069
WY	WY SO	[e]	[e]	[e]	[e]	[e]	0	[e]	615	1,324	1,939	0	[e]	0	6	1,945
WY Total		0	0	0	0	0	0	0	615	14,239	14,854	0	174	0	16	14,869
AB	AB EA	[e]	[e]	[e]	[e]	[e]	0	[f]	[f]	[f]	1,319	0	[e]	0	96	1,415
AB	AB EC	[e]	[e]	[e]	[e]	[e]	0	[f]	[f]	[f]	700	0	[e]	0	122	822
AB	AB NO	[e]	[e]	[e]	[e]	[e]	0	[f]	[f]	[f]	0	0	[e]	1,800	0	1,800
AB	AB SE	[e]	[e]	[e]	[e]	[e]	0	[f]	[f]	[f]	2,410	0	[e]	0	51	2,461
AB Total		0	0	0	0	0	0	0	0	0	4,429	0	0	1,800	268	6,497

TABLE D-2 (Cont.)

Hub State/Prov.	Hub Name	Solar Thermal MW by DNI Level (kWh/m²/day)[a] 6.5–6.75	6.75–7.0	7.0–7.25	7.25–7.5	7.5+	Solar Total	Wind MW by Wind Power Class[a] 3	4	5+	Wind Total	Geothermal MW Discovered	Undiscovered[b,c]	Hydro MW[d]	Biomass MW	Total MW WREZ-Only
BC	BC CT	e	e	e	e	e	0	f	f	f	902	0	e	4	122	1,027
BC	BC EA	e	e	e	e	e	0	f	f	f	0	32	e	1,076	34	1,142
BC	BC NE	e	e	e	e	e	0	f	f	f	4,081	16	e	1,006	109	5,212
BC	BC NO	e	e	e	e	e	0	f	f	f	2,176	0	e	87	79	2,342
BC	BC NW	e	e	e	e	e	0	f	f	f	1,285	32	e	572	85	1,974
BC	BC SE	e	e	e	e	e	0	f	f	f	138	32	e	165	60	396
BC	BC SHPC	g	g	g	g	g	g	g	g	g	g	g	g	g	g	21,600[g]
BC	BC SO	e	e	e	e	e	0	f	f	f	2,300	32	e	196	109	2,638
BC	BC SW	e	e	e	e	e	0	f	f	f	1,744	16	e	196	162	2,119
BC	BC WC	e	e	e	e	e	0	f	f	f	0	180	e	2,737	127	3,044
BC	BC WE	e	e	e	e	e	0	f	f	f	1,318	0	e	50	53	1,421
BC Total		0	0	0	0	0	0	0	0	0	13,943	340	0	6,092	939	21,315
BJ	BJ NO	e	e	3,015	952	13	3,980	e	758	925	1,684	0	e	e	e	5,664
BJ	BJ SO	e	e	439	523	50	1,012	e	614	639	1,253	0	e	e	e	2,264
BJ Total		0	0	3,454	1,475	63	4,991	0	1,372	1,564	2,937	0	0	0	0	7,928
Grand Total		5,247	5,988	26,382	40,982	8,322	86,921	15,347	31,654	29,846	95,219	4,478	25,810	8,452	3,720	198,789

[a] Only the best classes of wind and solar resources in each state were quantified. Quantifications for wind resources represent each state's minimum wind power class and higher, and for solar resources each state's minimum direct normal insolation level and higher. In Canada, renewable energy resources were quantified using a different methodology. It assessed resources at the site level as opposed to using raw resource data; therefore, the "best in state" criteria were not applied and Canadian resources were not discounted. Wind potential was not quantified in QRAs with less than 100 MW of total wind resource potential. Additional information is available on the Web at http://www.westgov.org/wga/initiatives/wrez/zita/index.htm.

[b] Undiscovered geothermal resources are believed to exist in certain areas because of the presence of geologic systems that have been correlated with geothermal resource potential in other areas. This undiscovered potential has not yet been quantified at specific locations where a geothermal plant could be built, but it can be estimated at the state level with different levels of confidence. As a result, these resources are not quantified at the QRA level or included in the economic modeling of QRAs. When undiscovered geothermal potential is believed to exist in a QRA, it will be noted, even though it will not be quantified. The mean estimated potential from these resources by state is quantified in this table by state and province. It is not captured in the QRA MW total, because these resources are not being quantified at the QRA level. U.S. estimates are from the USGS, and Canadian estimates are from the Canadian Geothermal Energy Association.

[c] Data on undiscovered geothermal resources were not available for Baja California Norte and Texas at the time of publication.

[d] Small and large hydropower are quantified in Canada. Incremental additions to powered or non-powered dams are quantified in the United States.

[e] These resources may exist, but they are not quantified in this study.

Footnotes continued on next page.

TABLE D-2 (Cont.)

[f] As noted above, a different resource assessment methodology was used to quantify the MW of renewable energy resources available in Canada. Data on the wind power class in British Columbia and Alberta are not available from this assessment. As a result, only the total potential of wind resources is shown here and is not broken down into different wind class categories.

[g] British Columbia voluntarily provided a hub on the British Columbia–Washington border to the WREZ process. This represents a 16,000 GWh/yr shaped energy product that British Columbia could provide to LSEs at the border. The intention of this additional hub and associated cost curve is not to represent a specific product offered to LSEs at the border, but to illustrate the benefits of a shaped and firmed decarbonized energy product to encourage further discussion. This hub and its energy and production profile will be selectable when using the Generation and Transmission Modeling tool. The energy resources that make up this cost curve are not specified; therefore, they are not broken down by resource type or class. The generation available from this additional QRA is not included in the B.C. subtotal or the grand total in this table.

Source: WGA and DOE (2009).

1
2
3

present. Maps showing the location of the QRAs and Hubs with respect to BLM-administered lands and lands proposed by the BLM as being available for solar energy development (BLM Lands Available) and as SEZs are shown for Arizona, California, Colorado, Nevada, New Mexico, and Utah in Figures D-2 through D-7, respectively.

D.1.2 WREZ Initiative Next Steps

The Phase 1 Report identified the next steps to be taken under the WREZ initiative:

- Complete Phase 1: Defining the WREZs. The QRAs identified in the Phase 1 Report have not yet been identified as WREZs and analyses of these areas are ongoing. In particular, the QRAs still need to be filtered for wildlife considerations.

- Phase 2: Forging Transmission Plans. The modeling tool developed by the G&T Modeling working group will be finalized and used in regional transmission planning efforts to identify logical transmission corridors and rights-of-way between the WREZs and regional load centers.

- Phase 3: Coordinating Energy Purchasing from the WREZs. Phase 3 is expected to facilitate coordination among stakeholders, such as utility commissions, utilities, and generators, to aid in development of region-wide energy markets for the renewable resources.

- Phase 4: Fostering Interstate Cooperation for Renewable Energy Generation and Transmission. In Phase 4, efforts will be undertaken to enhance interstate cooperation for renewable energy generation and transmission. This phase will address political and regulatory obstacles that often occur in permitting when projects such as transmission-line construction or installation of renewable energy projects involve cross-jurisdictional approvals.

D.2 ARIZONA PLANNING ACTIVITIES

D.2.1 Arizona's Renewable Portfolio Standard

In November 2006, Arizona adopted a mandatory RPS that calls for 15% of total electricity sales from investor-owned utilities (IOUs), rural cooperatives, and retail suppliers to be derived from renewable sources by the year 2025. The standards specify annual targets leading up to the 15% requirement. For 2010, the target is 2.5%, increasing in 0.5% increments through the year 2015 (5.0% in that year), and then increasing in 1.0% increments to the 15% goal in the year 2025. This target of 15% by 2025 was established under rules adopted by the Arizona Corporation Commission contained in the *Arizona Administrative Code*, Title 14, Chapter 2, Article 18, "Renewable Energy Standard and Tariff."

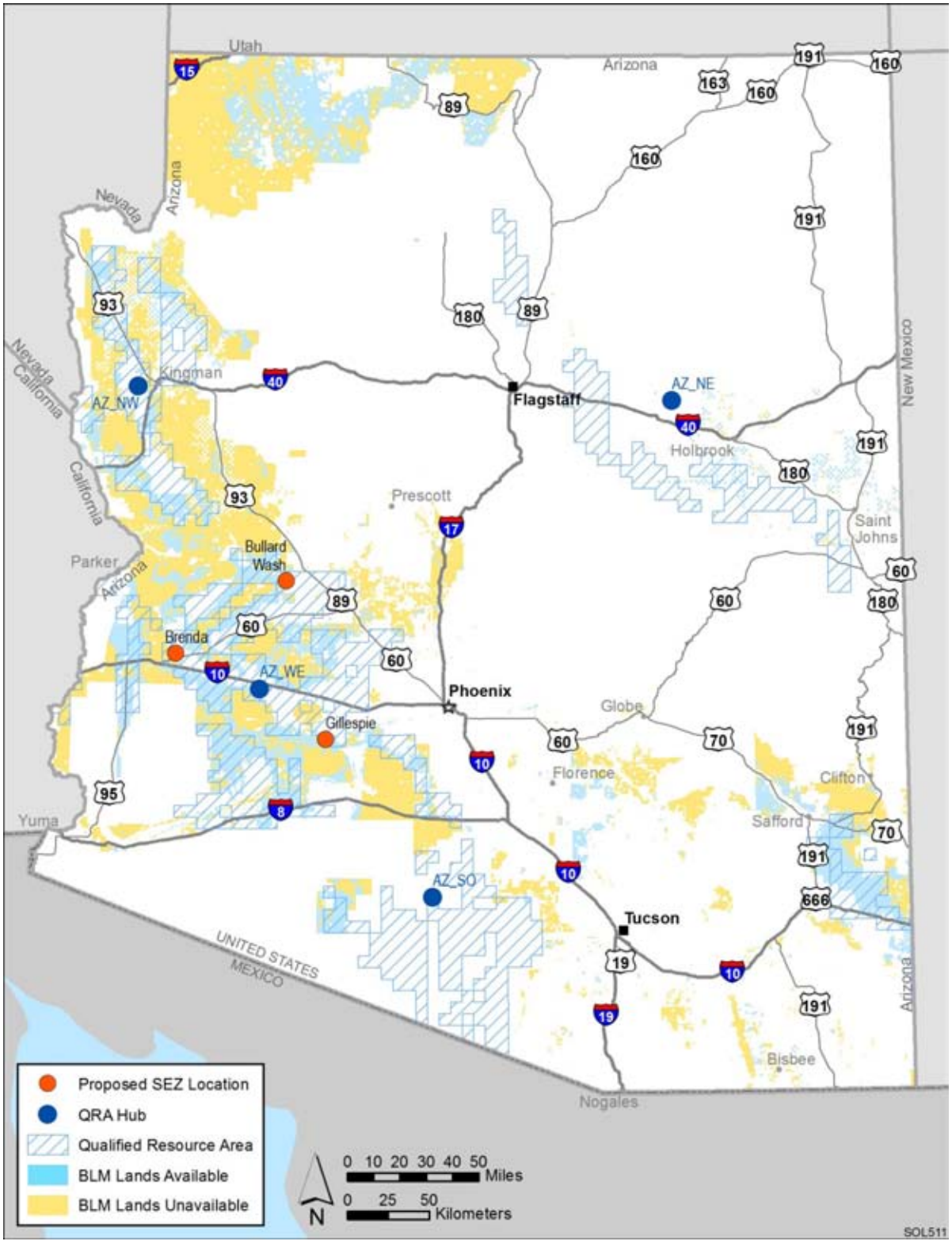

FIGURE D-2 WGA QRAs and Hubs in Arizona and BLM-Administered Lands and Proposed BLM Lands Available for Solar Energy Development and SEZs (Source for WGA units: WGA and DOE 2009)

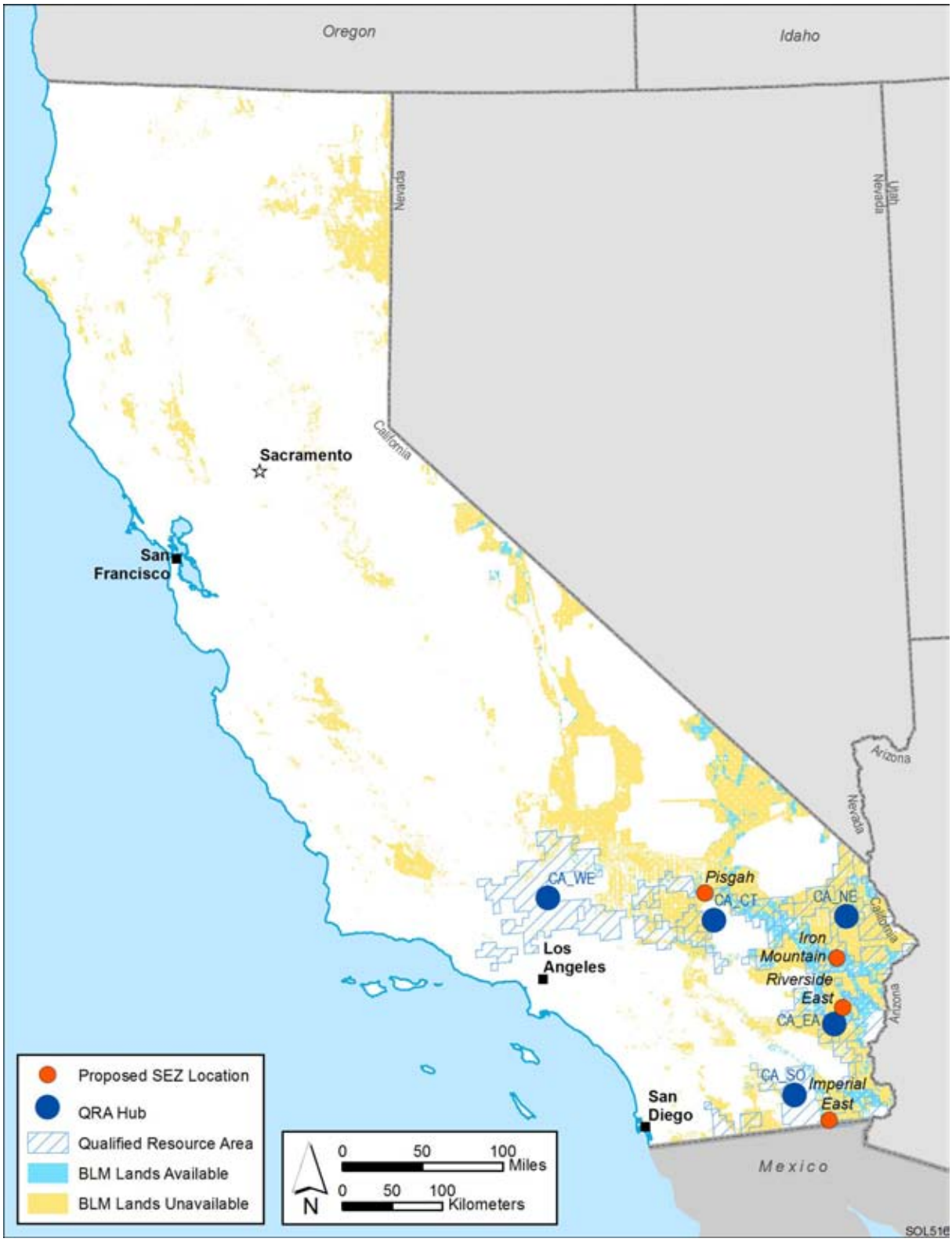

FIGURE D-3 WGA QRAs and Hubs in California and BLM-Administered Lands and Proposed BLM Lands Available for Solar Energy Development and SEZs (Source for WGA units: WGA and DOE 2009)

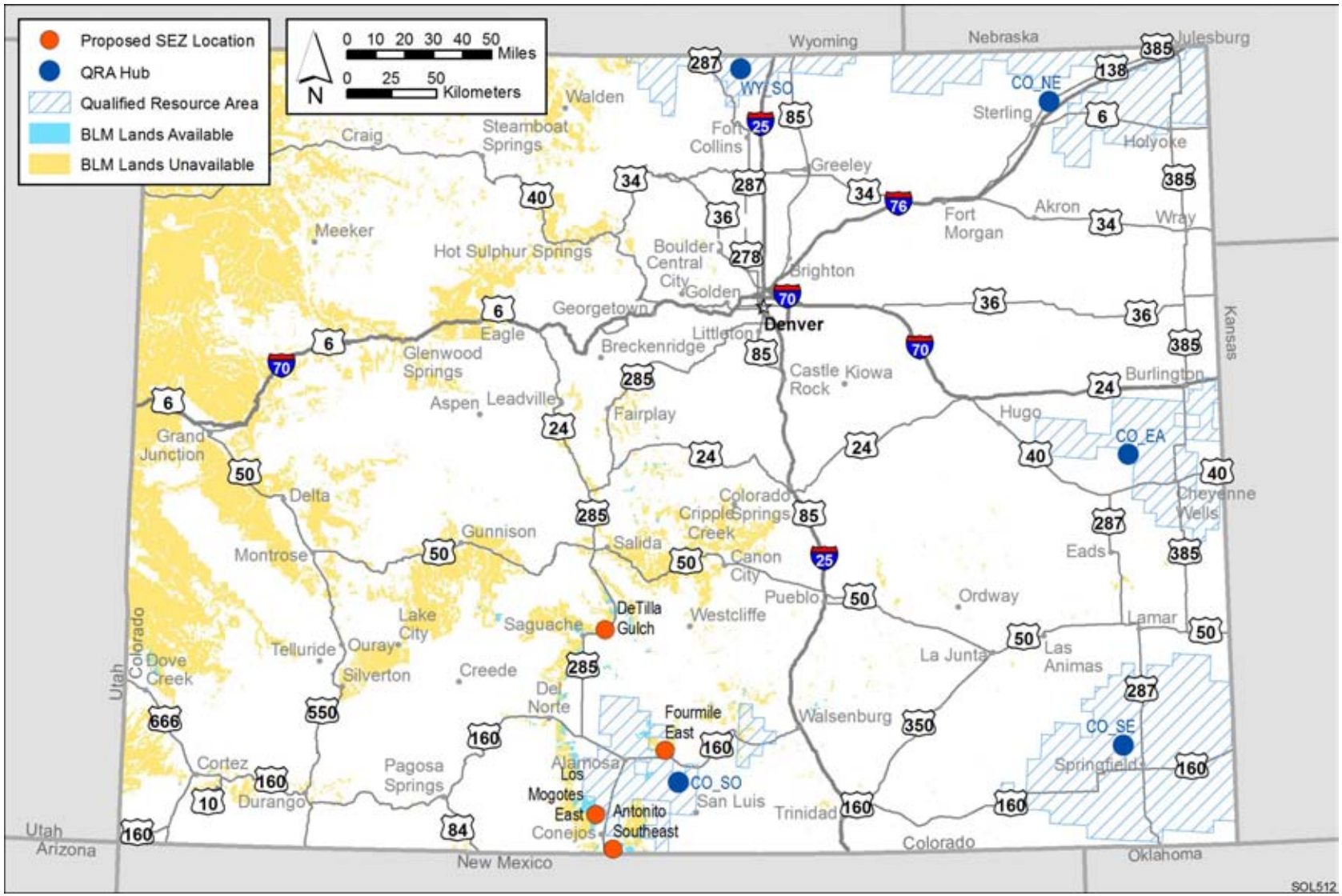

FIGURE D-4 WGA QRAs and Hubs in Colorado and BLM-Administered Lands and Proposed BLM Lands Available for Solar Energy Development and SEZs (Source for WGA units: WGA and DOE 2009)

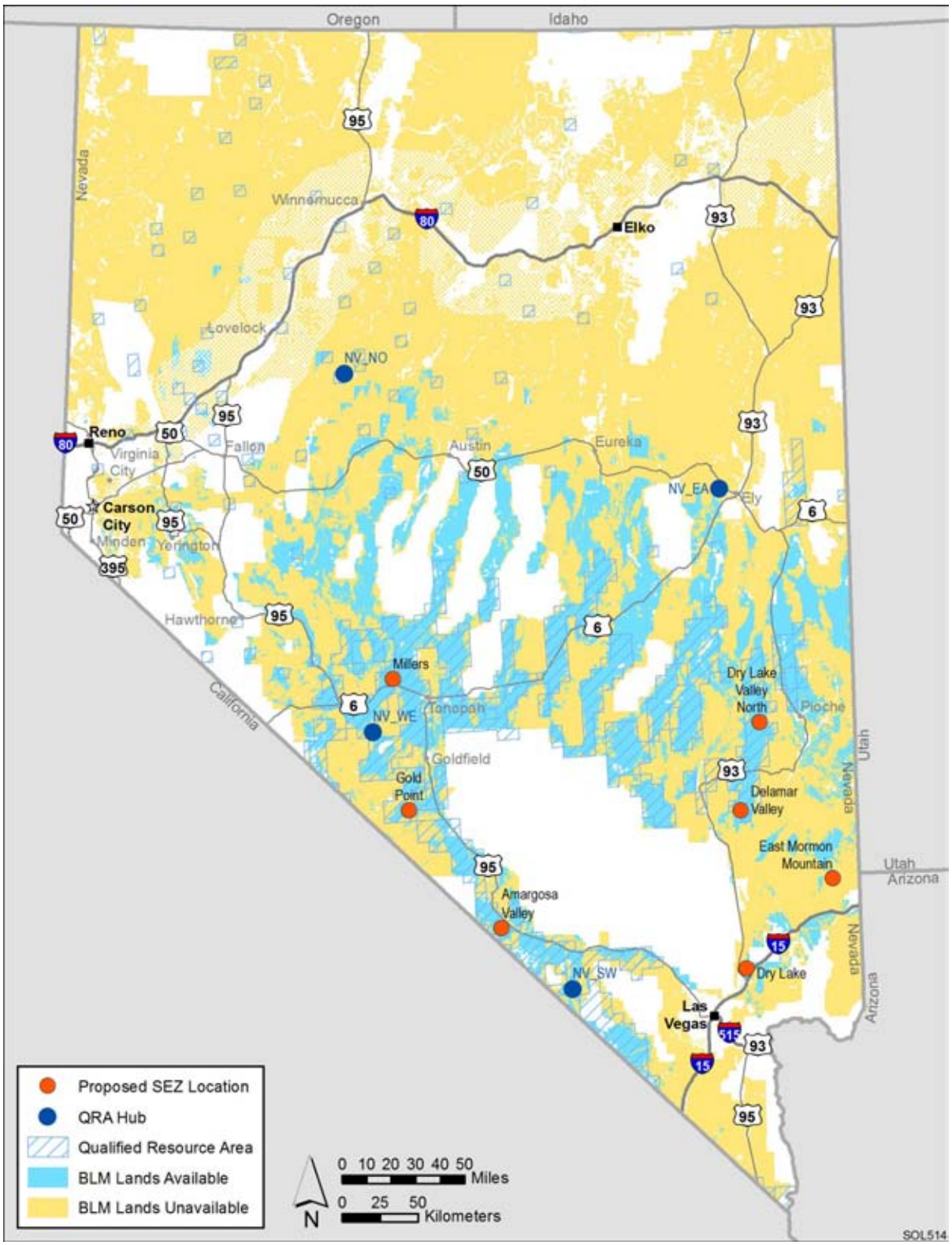

FIGURE D-5 WGA QRAs and Hubs in Nevada and BLM-Administered Lands and Proposed BLM Lands Available for Solar Energy Development and SEZs (Source for WGA units: WGA and DOE 2009)

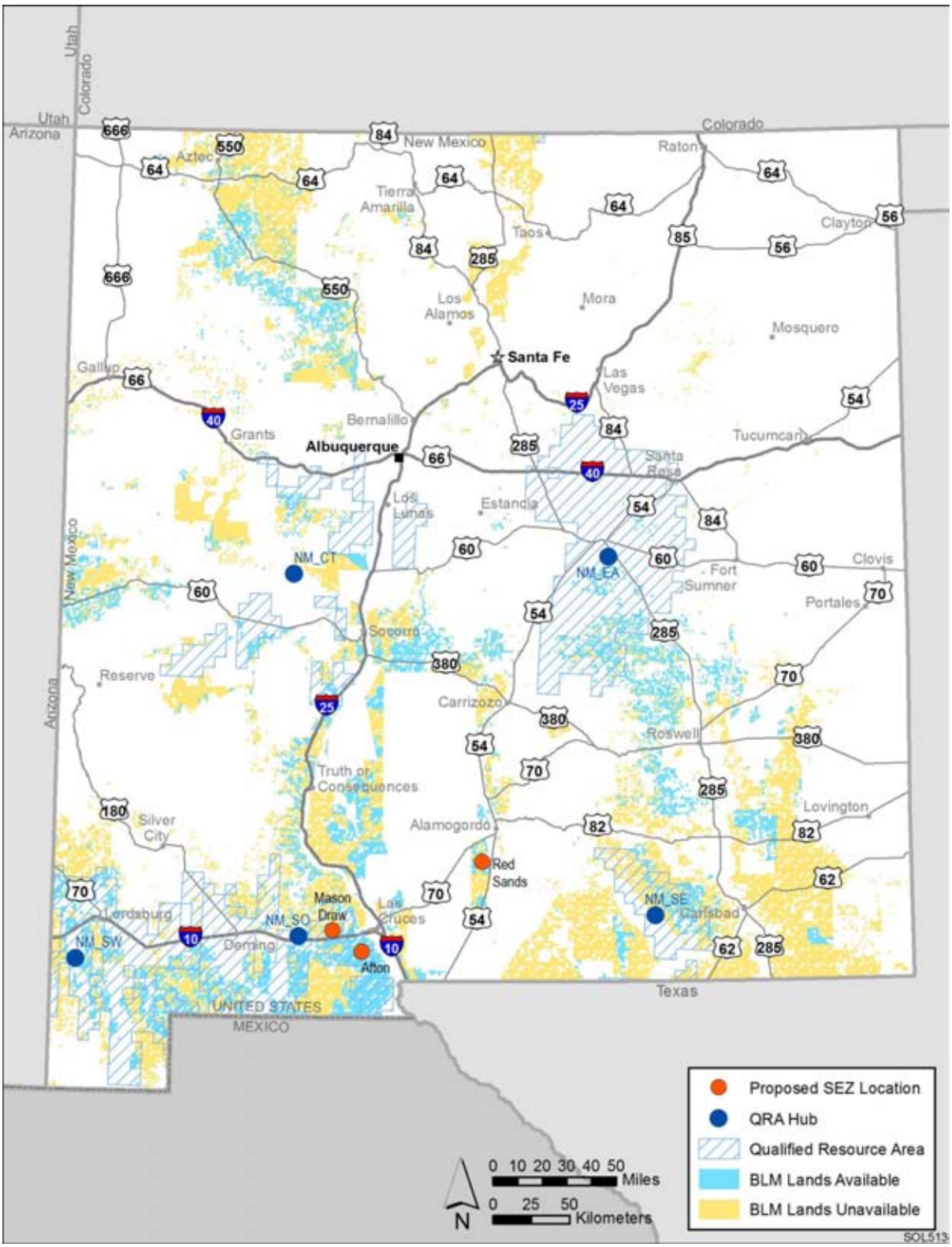

FIGURE D-6 WGA QRAs and Hubs in New Mexico and BLM-Administered Lands and Proposed BLM Lands Available for Solar Energy Development and SEZs (Source for WGA units: WGA and DOE 2009)

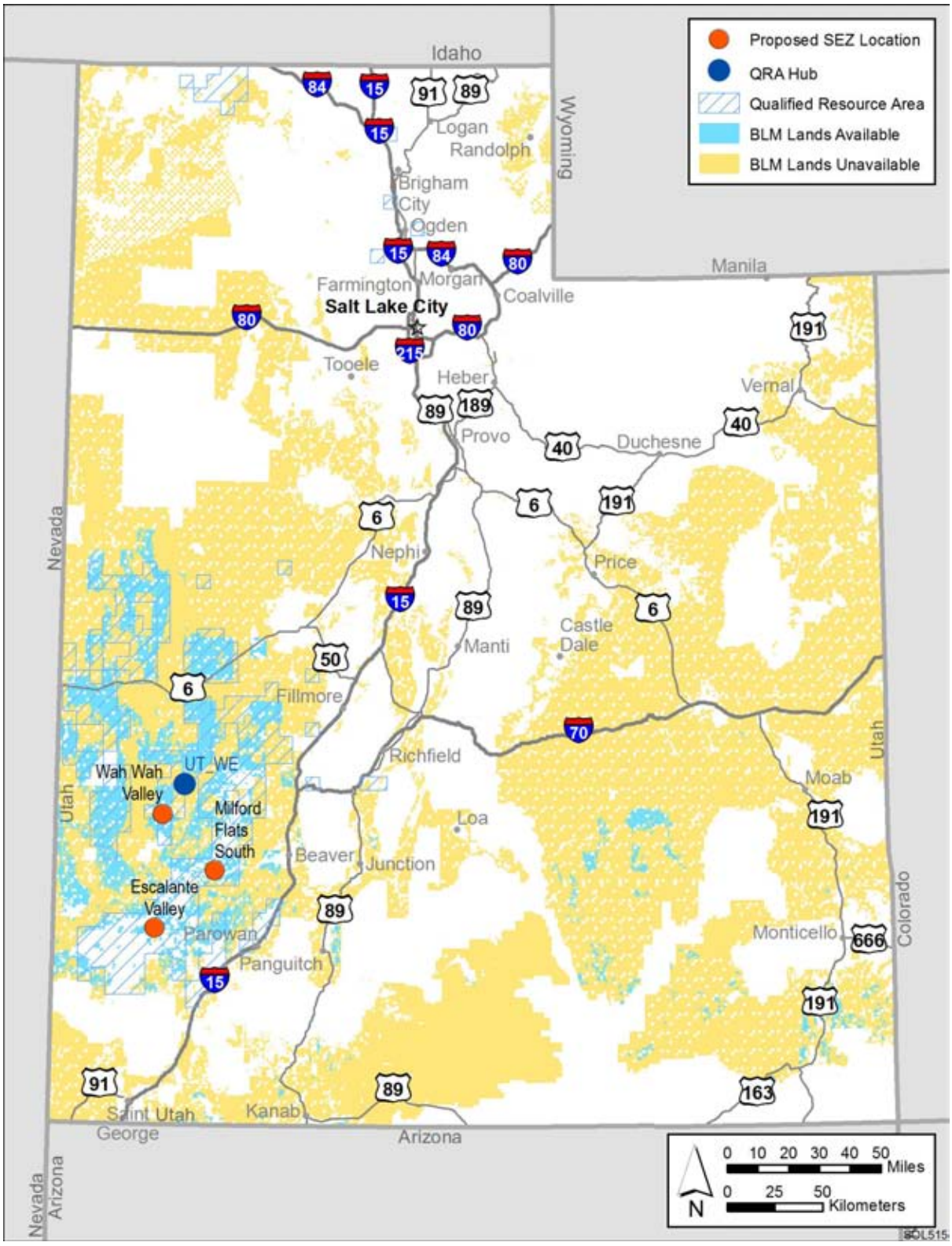

FIGURE D-7 WGA QRAs and Hubs in Utah and BLM-Administered Lands and Proposed BLM Lands Available for Solar Energy Development and SEZs (Source for WGA units: WGA and DOE 2009)

Arizona further specifies that a portion of the renewable energy generation must originate from distributed energy technologies. By 2012, the portion from distributed generation must reach 30%, which is equivalent to 4.5% of total retail electricity sales, and this level must be maintained through 2025. While hydroelectric sources are included as qualifying renewable technologies, the contributions must in general be from newer/smaller installations (e.g., facilities installed prior to January 1, 1997, are not eligible).

Table D-3 summarizes these RPS specifications for Arizona and for each of the other five states in the study area.

TABLE D-3 Renewable Portfolio Standard Requirements Summary as of July 2010

RPS Specification[a]	Arizona	California	Colorado	Nevada	New Mexico	Utah
Designated RPS year	2025	2020	2020	2025	2020	2025
Primary RPS specifications						
Total renewables (% of sales)	15%	33%[b]	–[c]	–	–	20%
Total renewables for IOUs (% of sales)	–	–	30%	25%	20%	–
Total renewables for POUs (% of sales)	–	–	10%	–	10%	–
Additional RPS specifications						
Distributed generation (% of sales)	4.5% (by 2012)	–	3% (IOUs)	–	0.6% (IOUs by 2015)	–
Wind (% of sales)	–	–	–	–	4% (IOUs)	–
Solar (thermal and photovoltaic) (% of sales)	–	–	–	1.5% (IOUs)	4% (IOUs)	–
Biomass and geothermal (% of sales)	–	–	–	–	2% (IOUs)	–
Mandatory (M) or voluntary (V)	M	M	M	M	M	V
Requirements for hydroelectric sources to be new/small (Y/N)	Y	Y	N	Y	Y	N

[a] Where presented, % of sales refers to % of electricity sales.

[b] The 33% standard is a goal established in 2009 by Governor Schwarzenegger in E.O. S-21-09 and has not been adopted by law or regulation as a requirement.

[c] A dash indicates no standard has been established for this specification.

Abbreviations: IOU = investor-owned utility; POU = publicly owned utility.

Source: Database of State Incentives for Renewables & Efficiency (North Carolina Solar Center and Interstate Renewable Energy Council 2010).

D.2.2 Arizona Renewable Resource and Transmission Identification Subcommittee

The Arizona Renewable Resource and Transmission Identification Subcommittee (ARRTIS) was created in January 2009 in response to a decision by the Arizona Corporation Commission to explore methods for developing new transmission projects. Participants in the subcommittee included utilities, renewable energy developers, federal and state land and resource management agencies, environmental advocacy groups, consultants, and other stakeholders. The purpose of ARRTIS was to collect, review, and map renewable resources for Arizona and, on the basis of those data, locate areas of technically ideal conditions for solar and wind resource development, locate environmentally sensitive areas, and identify other exclusion areas on the basis of existing laws and statutes. The ARRTIS efforts were intended to support the Renewable Transmission Task Force (RTTF), a component of the Southwest Area Transmission (SWAT) Subregional Planning Group.

The ARRTIS analyses produced a four-tier system for categorizing areas in Arizona within which solar and wind energy development might be constrained (AARTIS 2009). The categorizations are (1) Exclusion Areas, (2) High Sensitivity Areas, (3) Moderate Sensitivity Areas, and (4) Low Sensitivity Areas. The AARTIS participants agreed that the Exclusion Areas represent areas where "utility-level" development would have very low to no probability for permitting. However, the report indicates that the viability of a specific renewable energy project should not be based on its location in any of the four constraint regions.

The ARRTIS final report includes maps showing the solar and wind resources in Arizona along with the environmental exclusion and sensitivity areas for solar and wind energy development (AARTIS 2009). The final report also includes a map of the areas not excluded from solar energy development, which encompasses all lands not designated as an Exclusion Area. Approximately half of Arizona falls outside Exclusion Area designations. More information about the ARRTIS, including the final report and accompanying maps, is available at http://www.westconnect.com/planning_swat_rttf_arrtis.php.

D.3 CALIFORNIA PLANNING ACTIVITIES

California is involved in a large number of planning activities with respect to renewable energy development. Three of the most pertinent efforts are discussed below; they include (1) the establishment of a RPS, (2) the Renewable Energy Transmission Initiative (RETI), (3) the California Transmission Planning Group, (4) the California Desert Renewable Energy Conservation Plan (DRECP), and (5) the California Interim Mitigation Strategy.

D.3.1 California's Renewable Portfolio Standard

California has adopted a mandatory RPS specifying quantities of electrical power sales that must originate from renewable energy sources in future years. The RPS was first established in 2002 under Senate Bill 1078, requiring that 20% of the state's electrical power sales be from renewable energy by 2017. The RPS was accelerated in 2006 under Senate Bill 107 to push the

date forward, requiring 20% renewable energy by 2010. The program is jointly implemented by the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC).

In 2008, California Governor Arnold Schwarzenegger issued Executive Order (E.O.) S-14-08 establishing a new goal of 33% renewable energy by 2020. In 2009, Governor Schwarzenegger signed E.O. S-21-09 directing the California Air Resources Board (ARB) to adopt regulations increasing the state's RPS to 33% by 2020. In September 2010, the ARB adopted regulations placing the highest priority on the development of renewable resources located in California and throughout the Western Interconnection that could provide significant environmental benefits and support reliable, efficient, and cost-effective electricity system operations. For more information please visit: http://www.arb.ca.gov/energy/res/res.htm.

Solar power represents one of many qualifying renewable sources, which also include hydroelectric, wind, geothermal, and biomass technologies. The RPS established for California under E.O. S-14-08 is specified for the year 2020, and does not identify specific fractions of each type of qualifying source. Table D-3 presents the specified RPS values. As shown in this table, California has not included distinctions or assigned portions for IOUs or publicly owned utilities (POUs). Because solar-specific fractions of the 33% RPS have not been specified, it is difficult to make definitive estimates of likely solar power contributions.

In support of the California RPS goals, the Global Warming Solutions Act of 2006 (AB 32) established a first-in-the-world comprehensive program of regulatory and market mechanisms to achieve real, quantifiable, cost-effective reductions of greenhouse gas emissions. The law will reduce carbon emissions in California to 1990 levels by 2020. Mandatory caps will begin in 2012 for significant sources and become more stringent to meet the 2020 goals. The Governor has also called for the state to reduce carbon emissions to 80 percent below 1990 levels by the year 2050.

D.3.2 California Renewable Energy Transmission Initiative

In August 2007, California launched the RETI as a statewide initiative to identify transmission projects needed to accommodate its RPS goals, support future energy policy, and facilitate energy transmission corridor planning and project siting and permitting. The RETI includes (1) an assessment of renewable energy resources in California and, possibly, in neighboring states to identify potentially developable zones where renewable energy can be developed in the most cost-effective and environmentally benign manner and (2) transmission development planning to support energy development in these zones. The RETI is jointly supervised by the CPUC, CEC, California Independent System Operator, and POUs. More information about the RETI, including access to all related publications, is available on its Web site (http://www.energy.ca.gov/reti/index.html).

The RETI effort involves three phases:

- Phase 1: Identification, characterization, and ranking of Competitive Renewable Energy Zones (CREZs) in California and neighboring regions;

- Phase 2: Development of a statewide conceptual transmission plan to access priority CREZs, based on more detailed analysis of CREZs; and

- Phase 3: Development of detailed plans of service for priority components of the statewide transmission plan.

The Phase 1A Final Report, released in April 2008, describes the methodology, assumptions, and resource information used in the Phase 1 efforts to identify, characterize, and rank CREZs in California and neighboring regions and broadly identify transmission requirements to access these CREZs (RETI 2008). The Phase 1B Final Report, released in January 2009, presents the results of a high-level screening assessment of renewable energy resources to group potential projects into CREZs based on geographical proximity, development time frame, shared transmission constraints, and additive economic benefits (RETI 2009a). The CREZs are ranked according to cost-effectiveness, environmental concerns, development and schedule certainty, and other factors.

The Phase 2A Final Report, released in September 2009, describes the planning process and the steps taken to further define and rank the CREZs, including (1) an expanded evaluation and re-ranking of CREZs initially described in Phase 1 and (2) development of a statewide conceptual transmission expansion plan to access the CREZs (RETI 2009b). The first of these tasks re-examined ranking and screening criteria used to identify CREZs in Phase 1, and incorporated a wide spectrum of environmental considerations, including the concerns of local citizen groups, water districts, agricultural interests, counties, utilities, renewable power developers, transmission owners/developers, Native American Tribes, state agencies, and the U.S. military. The Phase 2A Final Report acknowledges limitations of environmental screening criteria, recognizing that the screening factors were applied at a high level and that significant environmental impacts could occur within the designated CREZs. Thus, any of the areas would require more detailed investigation to assure compliance with environmental regulations and considerations. The CREZ development process used qualitative and quantitative measures for environmental and economic factors, assigning scores for some measures and relative indicators for other factors. Based on a matrix of scores and measures, the CREZs were defined and revised through various phases of development. The process is described in more detail in the Phase 2A Final Report.

The second task in Phase 2A focused on development of a conceptual transmission plan to facilitate meeting the state's 33% RPS goal by 2020. In this planning process, RETI recognized and acknowledged that the transmission plan is not strictly driven by, nor dedicated to, renewable energy development objectives, but rather, accommodates a full array of future electrical power needs. The RETI transmission planning efforts have been "conceptual," and they do not address critical engineering considerations, such as energy flows in specific line segments, reliability issues, or other dynamic operational issues. The RETI Phase 2A Final Report reiterates many times that the current conceptual transmission plan is a work in progress and is likely to change over time. However, the report states that within these acknowledged limitations, one of the noteworthy conclusions was a consensus on the need for two sets of major transmission lines to deliver renewable energy and provide important additional benefits to the grid. The report also concluded that there is a clear need for a transparent and objective

process to evaluate transmission service for renewable energy that involves a broad range of stakeholders.

The transmission plan describes three types of enhancements that would be pursued: (1) renewable foundation lines, (2) renewable delivery lines, and (3) renewable collector lines. The first two categories represent major upgrades to the California grid, with the goal of increasing capacity of the grid and allowing energy to flow north and south to load centers as needed. Some of the new lines are designated "least-regrets" additions, since they would likely be needed in future grid developments regardless of the role or extent of renewable power implementation. The third category of lines, namely "collector" lines, are defined as those that would provide access to adjacent CREZ areas.

The RETI will include continuing efforts to refine and update initial findings, as it proceeds with Phase 2B and beyond. The planned efforts will include (1) reducing and prioritizing the number of transmission lines identified in Phase 2A, (2) re-examining capacities and economies of out-of-state resources, and (3) identifying near-term measures that would facilitate renewable energy grid connections in the next few years (i.e., prior to completion of more extensive grid enhancements). These efforts can be expected to result in changes in the CREZ area definitions, as well as the conceptual transmission upgrade plans. The RETI Phase 2B Final Report, issued in May 2010, documents changes made to the economic model, technology assumptions, CREZs, and out-of-state resources (RETI 2010).

Figure D-8 shows the areas currently included in the CREZs as part of the Phase 2B efforts to refine these areas' boundaries. The figure also shows the transmission lines proposed in the Phase 2A transmission plan. Table D-4 identifies the CREZs included in the Phase 2B Final Report along with the estimated capacity potential. Figure D-9 shows the locations of the CREZs with respect to the BLM-administered lands and lands proposed by the BLM as being available for solar energy development (BLM Lands Available) and as SEZs.

D.3.3 California Transmission Planning Group

The California Transmission Planning Group (CTPG) is a forum for conducting joint transmission planning and coordination in transmission activities to meet the needs of California, consistent with Federal Energy Regulatory Commission Order 890. The CTPG includes transmission owners and transmission operators with the technical capability to perform detailed transmission planning. CTPG is committed to developing a California state-wide transmission plan to meet the state's 33% by 2020 renewable portfolio standard goal. This transmission plan will leverage a diverse portfolio of renewable energy generation technologies (wind, geothermal, hydro-electric, biomass, and solar) available to supply projected electricity demand in California from now to beyond 2020. In this effort, CTPG is utilizing the RETI conceptual plan as a starting point. For more information please visit: http://www.ctpg.us/public/index.php.

FIGURE D-8 California Renewable Energy Transmission Initiative CREZs and Transmission Segments (Note: The CREZ boundaries reflect decisions made as part of Phase 2b efforts, while the transmission segments were defined as part of Phase 2A.) (Source: Snyder 2010)

TABLE D-4 CREZ Designations with Estimated Potential Capacity

	Capacity (MW)				
CREZ	Biomass	Geothermal	Solar Thermal	Wind	Total
Barstow			1,400	936	2,336
Carrizo North			1,600		1,600
Carrizo South			3,000		3,000
Cuyama			400		400
Fairmont	138		1,800	712	2,650
Imperial East			1,500	74	1,574
Imperial North-A		1,370			1,370
Imperial North-B	30		1,800		1,830
Imperial South	36	64	3,570	45	3,715
Inyokern			2,145	287	2,432
Iron Mountain			4,800	62	4,862
Kramer		24	6,185	203	6,412
Lassen North				1,467	1,467
Lassen South				410	410
Mountain Pass			780	178	958
Owens Valley			5,000		5,000
Palm Springs				333	333
Pisgah			2,200		2,200
Riverside East			10,550		10,550
Round Mountain-A		384			384
Round Mountain-B				132	132
San Bernardino – Baker			3,350		3,350
San Bernardino – Lucerne	91		1,540	599	2,230
San Diego North Central				200	200
San Diego South				678	678
Santa Barbara				433	433
Solano				894	894
Tehachapi	37		7,195	3,193	10,425
Twentynine Palms			1,805		1,805
Victorville			1,200	436	1,636
Westlands			5,000		5,000
Grand total	332	1,842	66,820	11,273	80,267

Source: RETI (2010).

D.3.4 California Desert Renewable Energy Conservation Plan

In response to Governor Schwarzenegger's November 2008 E.O. S-14-08 and associated Memorandum of Understanding (MOU) among several state and federal agencies, joint federal and state cooperation on renewable energy development commenced with the forming of the Renewable Energy Action Team (REAT). Using the foundation of the March 2009 Secretary of the Interior's Secretarial Order 3285 and the previous agreements, an October 2009 MOU between Governor Schwarzenegger and Secretary of the Interior Ken Salazar formally launched

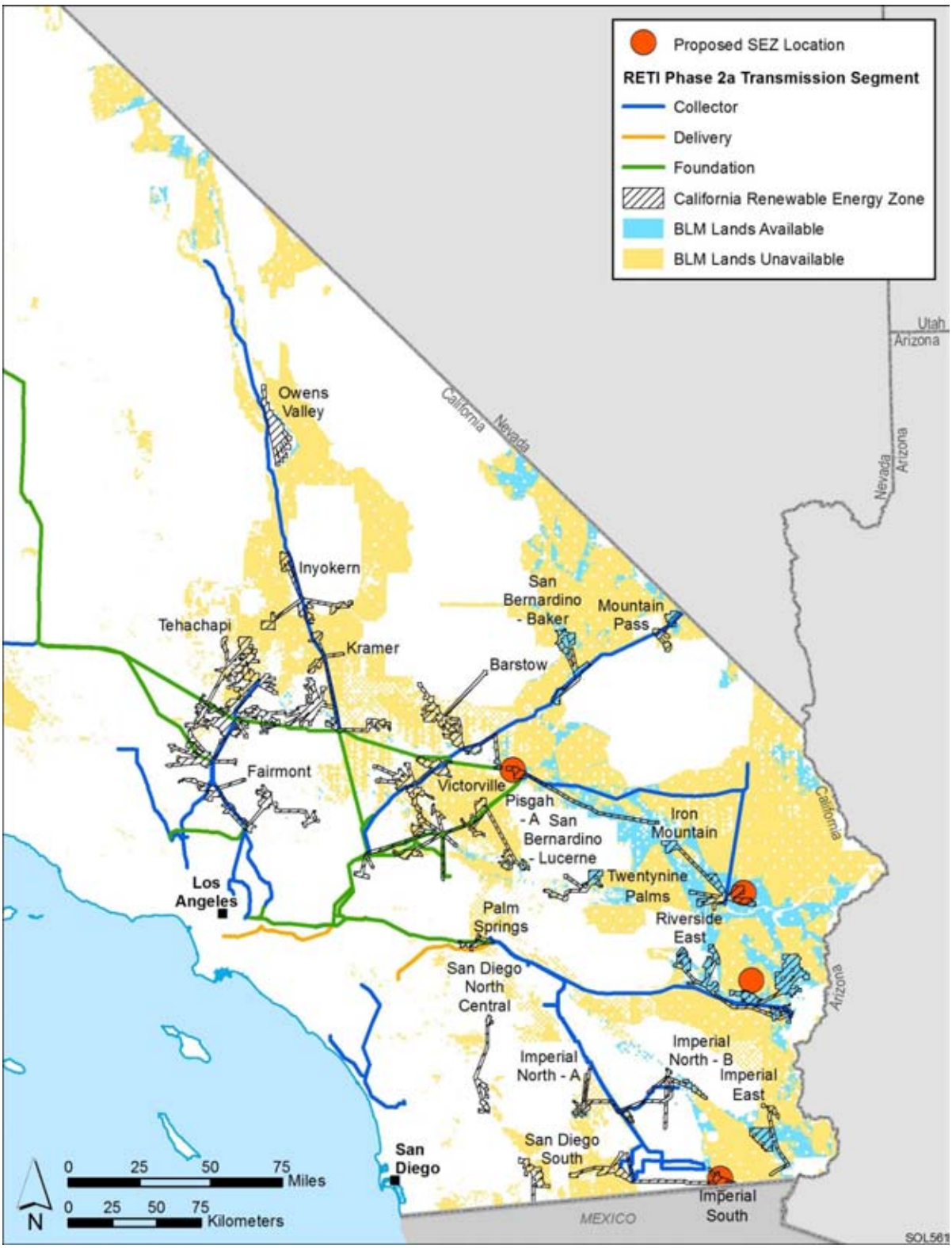

FIGURE D-9 California Renewable Energy Transmission Initiative CREZs and Transmission Segments and BLM-Administered Lands and Proposed BLM Lands Available for Solar Energy Development and SEZs (Source for CREZs and Transmission Segments: Snyder 2010)

the DRECP initiative. The October 2009 MOU also created the Renewable Energy Policy Group (REPG). For the full text of the MOU, please visit: http://gov.ca.gov/pdf/press/2009-CA-INTERIOR-MOU.pdf.

The DRECP is intended to advance state and federal natural resource conservation goals in the Mojave and Colorado desert regions of southern California, while also facilitating the timely and streamlined permitting of renewable energy projects. The DRECP will include a strategy that identifies and maps areas for renewable energy development and areas for long-term natural resource conservation. The plan is being developed under California's Natural Communities Conservation Planning Act and the Endangered Species Act, Section 10, habitat conservation planning program. More information about the REAT is available on the CEC Web site (http://www.energy.ca.gov/33by2020/index.html); more information about the DRECP is available at http://www.drecp.org.

As part of the DRECP effort, in March 2010, the federal and state agencies developed a preliminary "starting point" map that includes "starting point" renewable energy Study Areas and Conservation Opportunity Areas for discussion with DRECP stakeholders and the public. The intent of this preliminary mapping exercise was to foster the deliberative process. The "starting point" Study Areas are those areas with the potential for utility-scale renewable energy development and where sensitive biological resource values were estimated to be lower than other areas. Other factors (e.g., land ownership, land use planning and zoning requirements, archaeological resources, visual resources, and recreation use) were not considered in developing the starting point Study Areas.

The "starting point" Conservation Opportunity Areas are those areas with known or estimated high biological value that support key populations or connections between key populations. The intent of identifying Conservation Opportunity Areas is not to preclude development in those areas, but rather, to highlight the potential conflicts between development and resource conservation and the resultant need, potentially, for greater mitigation and longer permit processing time.

In August 2010, the DRECP Independent Science Advisors (ISAs) submitted a report that among other items, found flaw with the "starting point" maps (Desert Renewable Energy Conservation Plan Independent Science Advisors, 2010). Their primary input was that the maps should be improved with more careful use of existing data, increased transparency in methods, and more rigorous application of reserve-design principles and models. Based on new data, the DRECP ISA comments, and comments from stakeholders, the REAT is beginning the process of creating the next version of the map.

Figure D-10 shows the DRECP "Starting Point" Study Areas and Conservation Opportunity Areas within the DRECP boundary along with the lands proposed by the BLM as being available for solar energy development (BLM Lands Available) and as SEZs.

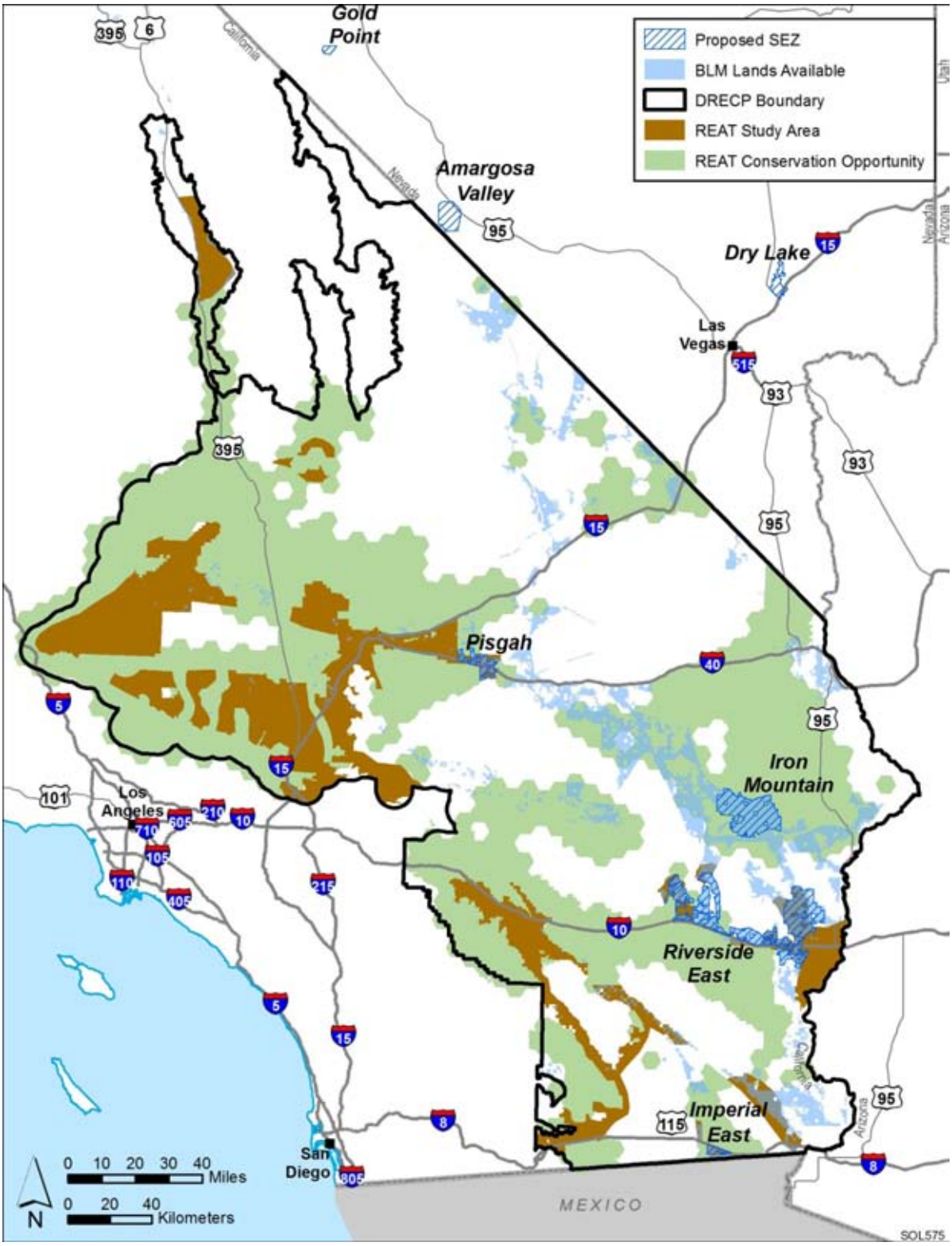

FIGURE D-10 "Starting Point" Study Areas and Conservation Opportunity Areas in the DRECP and BLM-Administered Lands and Proposed BLM Lands Available for Solar Energy Development and SEZs (Source for DRECP boundary and "Starting Point" areas: Marks 2010)

D.3.5 California Interim Mitigation Strategy

Senate Bill X8 34 (Padilla) (SB 34), was enacted on March 22, 2010 to facilitate project mitigation actions for certain proposed renewable energy projects in the California desert that are seeking federal American Recovery and Reinvestment Act funding. Among other provisions, the bill allows eligible project developers to pay in-lieu fees that would then be used by the California Department of Fish and Game (CDFG) to acquire and restore habitat lands as mitigation for project impacts on species listed as endangered, threatened, and candidate species under the California Endangered Species Act (CESA). The bill authorizes CDFG, in consultation with the CEC, BLM, and the U.S. Fish and Wildlife Service, to design and implement advanced mitigation actions, including the purchase of land and conservation easements to protect, restore, and enhance the habitat of CESA-listed plants and animals, consistent with an Interim Mitigation Strategy (IMS). The purpose of the IMS is to develop and articulate a conceptual approach to conservation investments (land acquisition, enhancements, restoration) that guides the implementation of project mitigation required of eligible renewable energy projects. The intent is to pool financial resources from eligible renewable energy projects needing to mitigate impacts on listed and candidate species and target conservation investments to maximize protection of habitat values, connectivity, and ecological processes in the California desert region. Eight areas within the DRECP boundary were identified as generalized target sub-regions within which to target mitigation for initial priority acquisition under the IMS and were developed through collaboration between desert land trust experts, BLM, and CDFG biologists.

D.4 COLORADO PLANNING ACTIVITIES

D.4.1 Colorado's Renewable Portfolio Standard

Colorado has adopted a mandatory RPS. Colorado voters passed the first RPS in November 2004 through Amendment 37, which required large utilities to purchase 10% of their retail electricity sales from renewable energy sources. In March 2007, the legislature enacted House Bill 07-1281, which increased the RPS to 20% by 2020 and made other modifications. In March 2010, House Bill 10-1001 further increased the RPS, calling for 30% of total sales from IOUs and 10% of sales from POUs to be derived from renewable sources by 2020 (see Table D-3). The standards specify additional time-stepped targets at various intervals leading up to the 30% requirement. For example, for the years 2011 to 2014, the requirement is 12% for IOUs, and for 2015 to 2019 the target is 20% for IOUs.

Colorado further specifies that 3% of the IOU's electric sales in 2020 must come from distributed energy technologies. The distributed energy requirements are also time-stepped up to the year 2020. In contrast to some of the other states, Colorado does not require hydroelectric sources to originate from newer/smaller installations. So it appears that all hydroelectric generation in the state qualifies as contributing to the RPS totals. (Utah is the one other state in the PEIS six-state study area that has adopted this convention for hydroelectric resources.)

D.4.2 Colorado Renewable Energy Development Infrastructure

The Colorado Governor's Energy Office has sponsored work intended to facilitate renewable energy development in Colorado. An initial report, titled *Connecting Colorado's Renewable Resources to the Markets*, presented maps of renewable resources in Colorado and identified Generation Development Areas for utility-scale wind and solar projects (Colorado Governor's Energy Office 2007). A subsequent report, referred to as the *Renewable Energy Development Infrastructure* (REDI) report, focused on options for achieving the state's carbon emission reduction goals (a 20% reduction by 2020 from 2005 baseline) with particular emphasis on utility-scale renewable energy development and high-voltage transmission. More information about these efforts is available on the Colorado Governor's Energy Office Web site (http://rechargecolorado.com/index.php/programs_overview/utilities_and_transmission/renewable_energy_development_infrastructure).

The REDI report specifically addresses baseline and historical information on generation and transmission infrastructure, roles of various supply and demand resources and options, regional financial and regulatory transmission issues, high-voltage transmission expansion plans, permitting and siting processes, and opportunities and options to improve connectivity for renewables. Discussions of transmission expansion options are included along with maps identifying environmentally sensitive areas, wildlife habitat areas, regional (interstate) transmission limitations, airport and military constraints, solar energy study areas, and current ownership.

The report cites an abundance of renewable resources within the state and focuses on development of high-voltage transmission infrastructures to convey the available power to appropriate demand areas. The report concludes that the lines in or near the identified Generation Development Areas for wind or solar are largely constrained with little capacity to accommodate new electricity development. Figure D-11 shows Colorado's primary wind and solar Generation Development Areas with respect to the location of BLM-administered lands and lands proposed by the BLM as being available for solar energy development (BLM Lands Available) and as SEZs.

D.5 NEVADA PLANNING ACTIVITIES

D.5.1 Nevada's Renewable Portfolio Standard

Nevada has adopted a mandatory RPS that calls for 25% of total electricity sales from IOUs to be derived from renewable sources by the year 2025 (see Table D-3). The standard specifies time-stepped targets at various intervals leading up to the 25% requirement. For example, for the years 2011 to 2012, the requirement is 15% for IOUs, and for 2015 to 2019 the target is 20% for IOUs. Nevada's RPS was first established in 1997 and increased in 2001, requiring 15% by 2013. The current standard of 25% by 2025 was established in 2009 by Senate Bill 358.

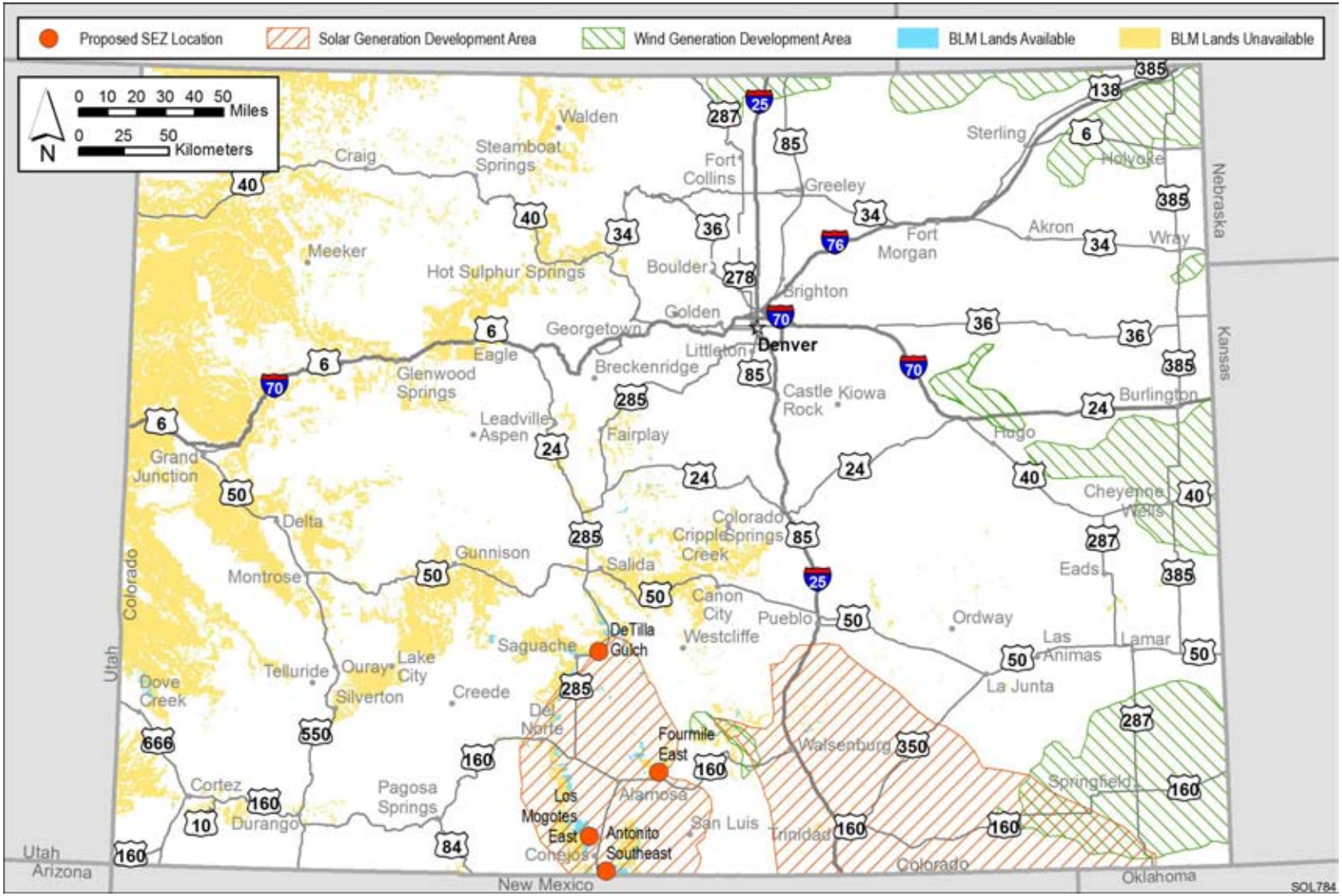

FIGURE D-11 Colorado Wind and Solar Generation Development Areas and BLM-Administered Lands and Proposed BLM Lands Available for Solar Energy Development and SEZs (Source for Generation Development Areas: Colorado Governor's Energy Office 2007 and 2009)

Nevada's RPS specifies that through the year 2015, 5% of the renewable energy must be derived from solar technologies, equal to 1.2% of total electricity sales. For the years 2016 through 2025, solar technologies must account for 6% of renewable energy or 1.5% of total sales. Nevada requires hydroelectric sources to originate from newer/smaller installations in order to qualify for RPS contributions.

D.5.2 Nevada Renewable Energy Transmission Access Advisory Committee

The Nevada Renewable Energy Transmission Access Advisory Committee (RETAAC) was established by an executive order issued by Nevada's governor in May 2007. The purpose of the RETAAC is to propose recommendations for improving access to the electricity transmission system specifically to support renewable energy development. In its Phase I report, the committee identified Renewable Energy Zones for solar, wind, geothermal, and biomass resources, identified potential constraints to development, and recommended numerous potential transmission routes to connect renewable power resources with load centers (State of Nevada 2007).

In June 2008, the governor issued another executive order launching Phase II of the RETAAC with the objectives of determining the power potential for the Renewable Energy Zones identified in Phase I; examining environmental, land use, and permitting constraints to renewable energy development; identifying construction "corridors" that could avoid such constraints; and examining revenue issues for construction requirements. The Phase II report, issued in July 2009, summarizes the process and findings of this work (State of Nevada 2009). One key finding of the RETAAC was that additional evaluation of potential environmental and land use constraints did not reveal any "fatal flaws" for the proposed transmission interconnections. In addition, the Phase II report ranked the Phase I Renewable Energy Zones on the basis of economic feasibility and identified which transmission routes would be needed to access electricity developed in those zones. (More information about the RETAAC is available at http://www.retaac.org.)

Figure D-12 shows the RETAAC Renewable Energy Zones and recommended transmission routes based on the Phase II report with respect to the location of BLM-administered lands and lands proposed by the BLM as being available for solar energy development (BLM Lands Available) and as SEZs. Additional maps in the Phase I and Phase II reports show potential constraints, energy export alternatives, and potential development phases.

D.6 NEW MEXICO PLANNING ACTIVITIES

D.6.1 New Mexico's Renewable Portfolio Standard

In March 2007, New Mexico passed Senate Bill 418, adopting a mandatory RPS that calls for 20% of total electricity sales from IOUs and 10% of sales from rural cooperatives to be derived from renewable sources by the year 2020 (see Table D-3).

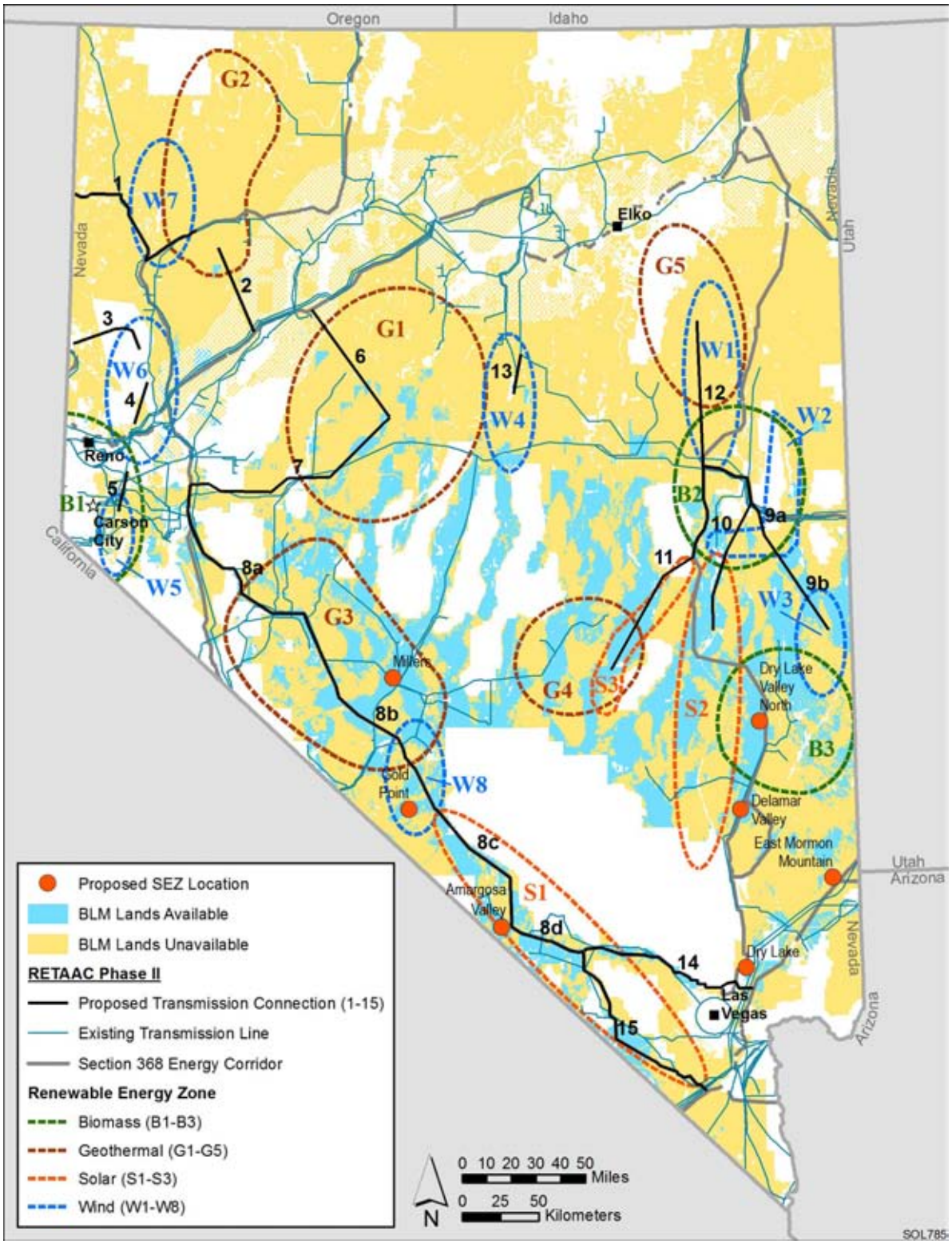

FIGURE D-12 Nevada RETAAC Renewable Energy Zones and Proposed Transmission Interconnections and BLM-Administered Lands and Proposed BLM Lands Available for Solar Energy Development and SEZs (Source for RETAAC designations: State of Nevada 2009)

New Mexico further specifies for IOUs that 20% of the renewable energy generation must come from solar generation by 2020, equal to 4% of total sales. In addition, 20% must come from wind generation (4% of total sales); 10% from biomass, hydro, and "other" renewables (2% of total sales); and, by 2015, 3.0% from distributed energy technologies (equal to 0.6% of total sales). New Mexico requires hydroelectric sources to originate from newer/smaller installations in order to qualify for RPS contributions.

D.6.2 New Mexico Renewable Energy Transmission Authority

The New Mexico Renewable Energy Transmission Authority (RETA), which was formed in response to House Bill 188, the Renewable Energy Transmission Authority Act of 2007, focuses on developing new transmission projects that will promote renewable energy development in the state. Specific responsibilities of RETA include mapping existing transmission lines and renewable energy resources, coordinating with other agencies to prioritize regions with minimal land development conflicts, and prioritizing the best options for new transmission corridors. To support this objective, the Transmission Corridor Committee (TCC) of RETA has published maps showing proposed new transmission corridors with overlays for solar, wind, and geothermal resources. The TCC also acknowledges that, in addition to establishing new corridors, existing transmission lines could be upgraded without requiring new corridors or rights-of-way. Additional information about RETA is available on its Web site (http://www.nmreta.com).

Figure D-13 shows the TCC's proposed corridors as of August 2010, along with existing transmission lines and the location of BLM-administered lands and lands proposed by the BLM as being available for solar energy development (BLM Lands Available) and as SEZs. The RETA is soliciting comments from its stakeholders and anticipates releasing final corridors in late 2010.

D.7 UTAH PLANNING ACTIVITIES

D.7.1 Utah's Renewable Portfolio Standard

Utah, unlike the other five states, has adopted a voluntary RPS that recommends 20% of adjusted retail electricity sales be derived from renewable sources by 2025 (see Table D-3). This was enacted in March 2008 by Senate Bill 202. Like Colorado, and in contrast to the other four states, Utah does not require hydroelectric sources to originate from newer/smaller installations. So it appears that all hydroelectric generation in the state qualifies as contributing to the RPS totals.

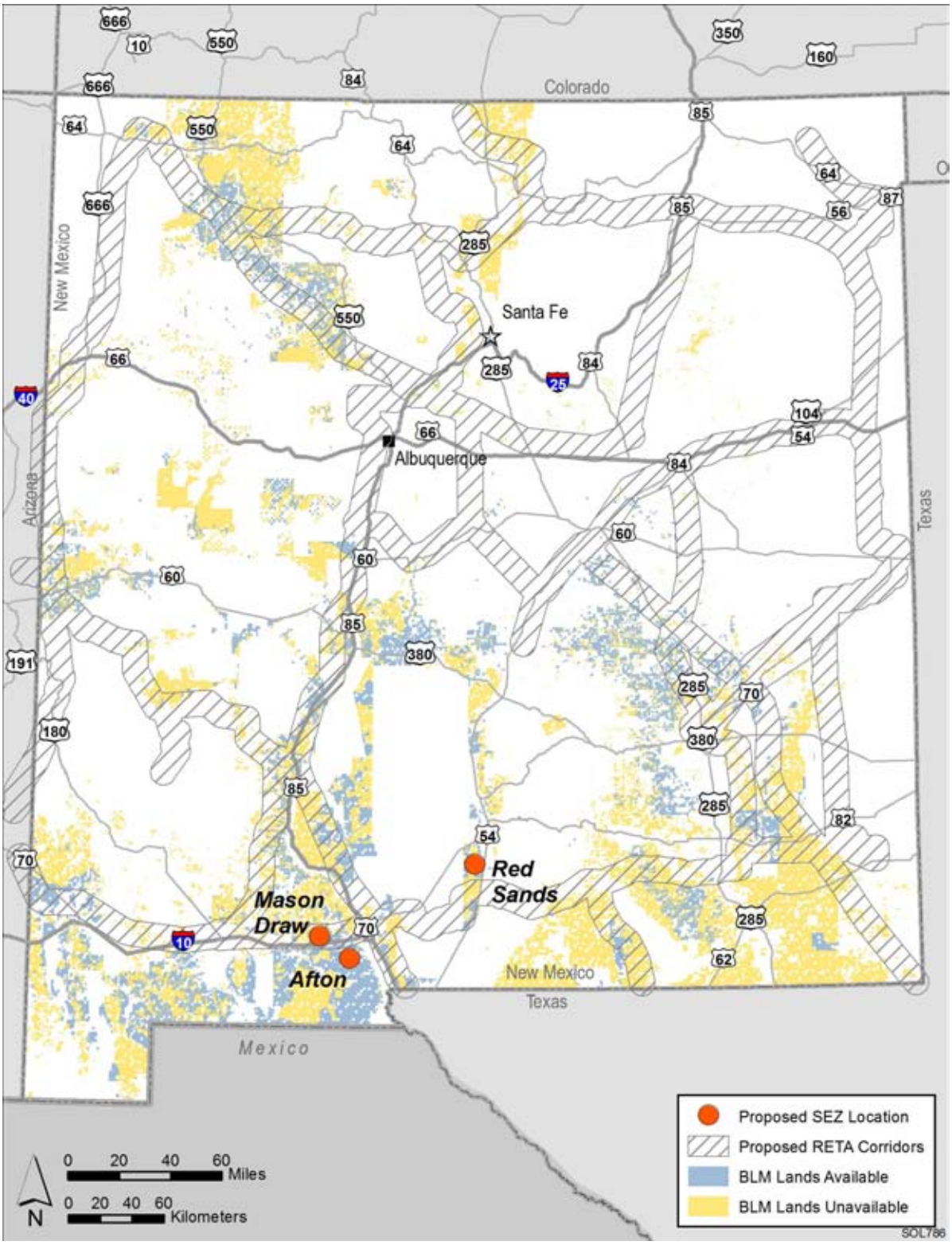

FIGURE D-13 New Mexico RETA Proposed Transmission Corridors, Existing Transmission in New Mexico, and BLM-Administered Lands and Proposed BLM Lands Available for Solar Energy Development and SEZs (Source for RETA designations and existing transmission: Albrecht 2010a,b)

D.7.2 Utah Renewable Energy Zone Selection Working Group

The Utah Renewable Energy Zone (UREZ) Task Force was established in 2008 to promote renewable energy development and help utilities meet the state's RPS goal of 20% by 2025. Specifically, the Task Force is responsible for identifying renewable energy zones and resource areas, identifying policies to support the development of renewable resources, and facilitating transmission planning and permitting to connect renewable resources with demand areas. (More information about the UREZ Task Force is available at http://geology.utah.gov/sep/renewable_energy/urez/index.htm.)

The UREZ work was divided into two phases. In Phase I, the emphasis was on identifying REZs and determining which areas inside and outside of the REZs have the greatest potential for larger-scale energy production (Berry et al. 2009). In Phase II, the Task Force focused attention on ways to facilitate transmission planning and permitting processes, including quantifying cost-effective renewable generation potential and transmission needed to realize the potential. With respect to solar energy development, in Phase II, the solar zones were further refined by choosing solar resources with DNI levels of 6–6.5 kWh/m^2/day for terrain with slopes ≤1%, and with DNI levels of 6.5–7.25 kWh/m^2/day for terrain with slopes ≤3% (State of Utah 2010).

The Phase II analysis found approximately 25,000 MW of renewable resource capabilities in 27 REZs in Utah, with significant resources also present outside of these zones. REZs were defined as being large enough to justify new transmission construction for bringing the power to the power grid and load centers and were ranked according to estimated costs and economic value of the available resources, and assumptions about anticipated transmission costs. The Task Force analyzed multiple scenarios and defined a conceptual transmission grid that would convey renewable energy production to Utah customers and other Western Interconnection customers.

Figure D-14 shows the REZs and the conceptual transmission grid with respect to and the location of BLM-administered lands and lands proposed by the BLM as being available for solar energy development (BLM Lands Available) and as SEZs.

D.8 SOLAR ENERGY POTENTIAL AT DOD INSTALLATIONS IN THE COLORADO AND MOJAVE DESERTS

The DoD has been tasked with determining the extent to which solar energy generation can be sited within the boundaries of eight military installations located in the Mojave and Colorado deserts of southern California and Nevada. First, the study will evaluate the technical and economic feasibility of locating solar energy generation within the military installations and identify potential areas for solar energy development. Second, the study will assess the potential policy barriers to developing on-installation solar energy facilities, including evaluating potential limitations on the use of solar energy because of military mission, environmental, and jurisdictional constraints, as well as identifying potential policy drivers and restrainers created by the federal, California, and Nevada governments. Third, the study will assess the pertinent siting

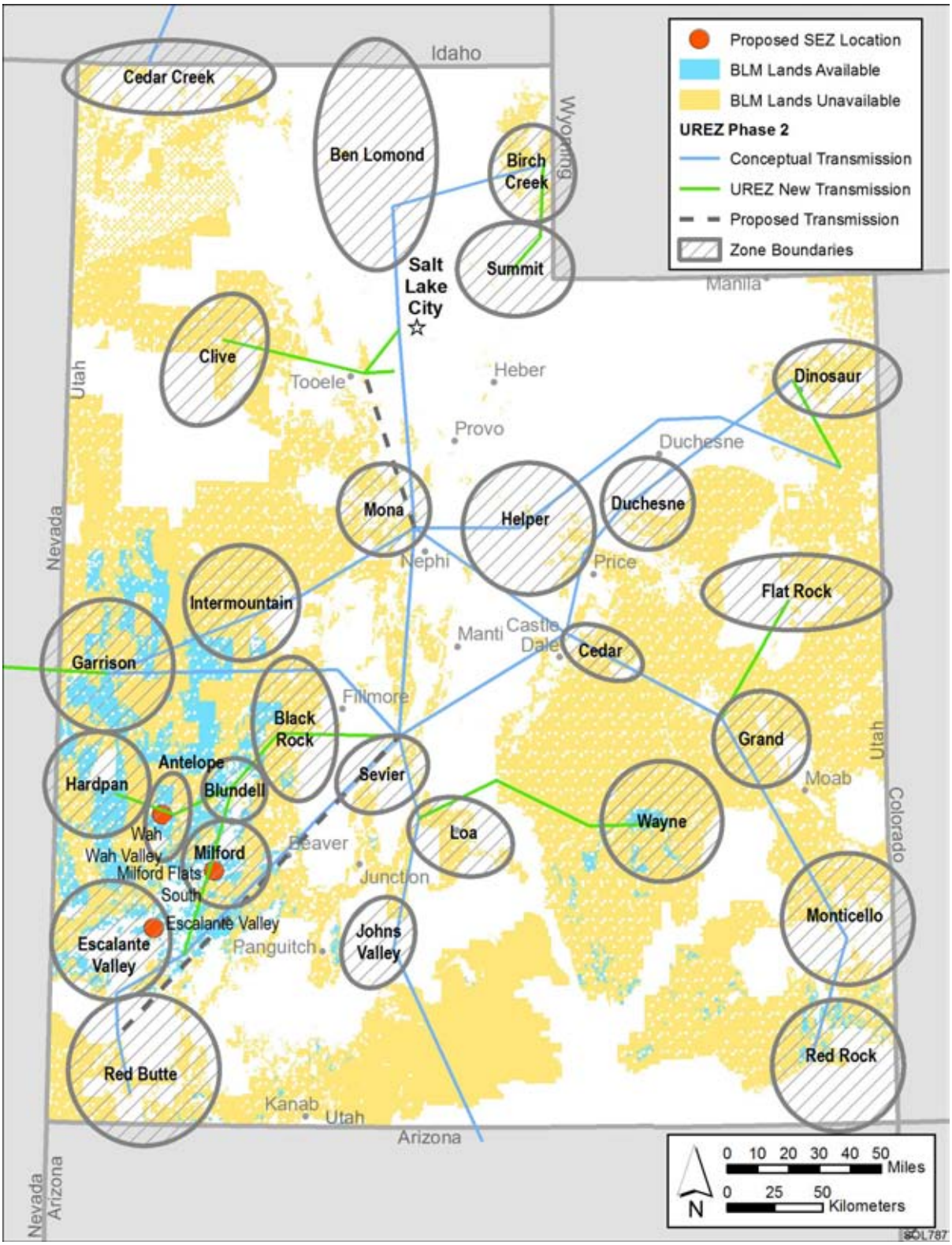

FIGURE D-14 Utah Renewable Energy Zone Task Force Proposed REZs and Conceptual Transmission Grid and BLM-Administered Lands and Proposed BLM Lands Available for Solar Energy Development and SEZs (Source for UREZ designations: State of Utah 2010)

and permitting standards for on-installation solar energy generation and compare these standards with those used for solar energy development on private and other public lands. This study will also analyze the feasibility and potential for on-installation solar energy generation to provide additional security benefits for the military installations. Finally, the study will provide recommendations for how on-installation solar energy opportunities can be encouraged and the development process streamlined.

D.9 REFERENCES

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this PEIS. It is likely that at the time of publication of this PEIS, some of these Web pages may no longer be available or their URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this PEIS.

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