

The background of the slide is a photograph of a wind farm at sunset. The sky is a mix of blue, orange, and yellow, with the sun low on the horizon. Several wind turbines are visible, their silhouettes dark against the bright sky. The turbines are of varying heights and are scattered across the landscape. The bottom half of the slide is a solid blue color with a white curved border separating it from the photograph above.

2016 Resource Plan Stakeholder Working Group Update – Scenarios

December 14, 2016

Topics to Review



- Scenarios
 - Sensitivities
 - Descriptions

- Data Requests (Page 36-39 of Generation task force report)



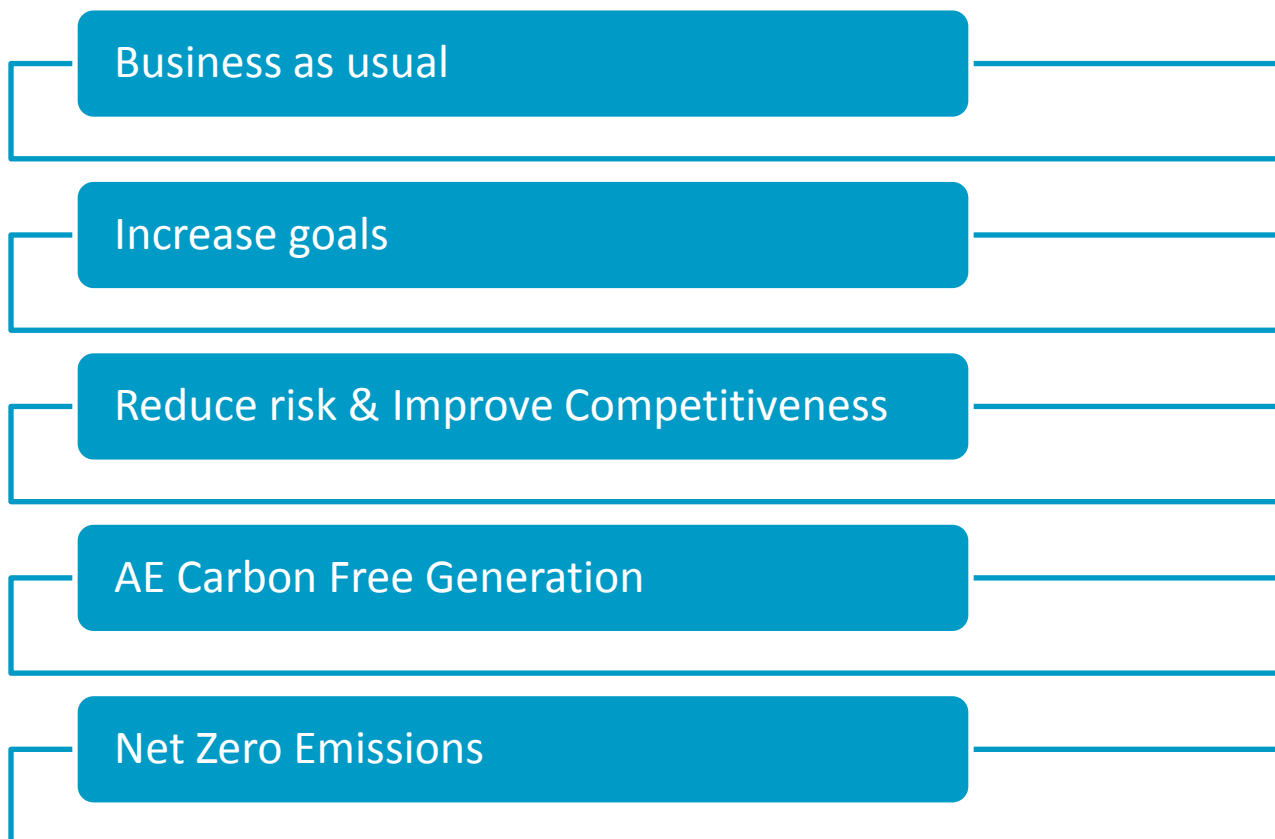
Scenarios & Sensitivities

- Scenarios cover a wide range of values for key uncertainties
- Planning horizon covers from 2018 to 2027 with end effects considered
- Assume PPA for future resources as long as it is more economical than ownership on a levelized cost basis
- 5 broad strategies:
 - 1) Business as usual
 - 2) Increase Goals
 - 3) Reduce risk and improve competitiveness
 - 4) AE Carbon Free Generation by 2030
 - 5) Net Zero Emissions by 2030
- In total:
 - 22 scenarios including variations
 - Sensitivities to ERCOT-wide market conditions:
 - Carbon cost
 - Natural gas cost
 - Demand level
- The top plans are further studied for high solar penetration & high ancillary services requirements



Strategies & Scenarios

Five broad Strategies with different themes



Scenarios Descriptions



		Strategies				
		Business As Usual	Increase Goals	Reduce risk & Improve Competitiveness	AE Carbon Free Generation by 2030	Net Zero Emissions by 2030
Attributes of Scenarios	No New Commitments	Yes				
	Current Goals (55% Renewables, 950 MW Solar, 900 MW DSM, Reduce/Retire FPP, 10 MW Battery Storage)	Yes	Yes	Yes	Yes	Yes
	Renewable credits	To meet Goals				100%
	Additional 100 MW Local Solar		Yes			
	Additional renewable goal		75%	65%		75%
	Additional DSM		100-300 MW			
	Battery at Decker		125 - 300 MW			
	Gas Turbines / Reciprocating Engines at Decker			300 MW		
	Combine Cycle at Decker			500 MW		
	Compressed Energy Storage		300 MW			
	Local distributed Storage		20 MW			
	Retirement of Gas Units	Decker	Decker	Decker	Sand Hill & Decker	Decker



Scenario Descriptions

■ Strategy 1: Business As Usual

- SC1 – Current system, no new additions, PPAs expire per term (Does not meet goals)
- SC1-A – Current system, no new additions, PPAs expire per term, **meet renewable goals** using RECs
- SC1-B – Current Council goals: reduce/retire FPP, retire Decker in 2021, 900 MW DSM, 55% renewable, 200 MW PV (100 MW local) by 2025

■ Strategy 2: Increase Goals

- SC2-A – Current goals + 100 MW additional local PV
- SC2-B – Current goals + 65% renewables by 2027
- SC2-C – Current goals + 100 MW additional DSM
- SC2-D – Current goals + 75% renewables by 2027
- SC2-E – Current goals + 75% renewables by 2027 + 100 MW additional DSM
- SC2-F – Current goals + 75% renewables by 2027 + double local storage goal to 20 MW
- SC2-G – Current goals + 300 MW CAES
- SC2-H – Current goals + 300 MW additional DSM + double local storage goal to 20 MW
- SC2-I – SC2-E + 75% renewables by 2027
- SC2-J – SC2-F + 300 MW CAES
- SC2-K – Current goals + 75% renewables by 2027 + 125 – 175 MW Battery Storage at Decker
- SC2-L – Current goals + 75% renewables by 2027 + 300 MW Battery Storage at Decker



Scenario Descriptions (Cond..)

- Strategy 3: Reduce Risk & Improve Competitiveness
 - All additions of gas units occur after Decker retirement in 2021
 - SC3-A – Current goals + 300 MW new natural gas (NG) peakers (GTs)
 - SC3-B – Current goals + 500 MW (new 2x1) NG combined cycle (CC)
 - SC3-C – SC3-A + 65% renewables by 2027
 - SC3-D – SC3-B + 65% renewables by 2027
- Strategy 4: AE Carbon Free Generation by 2030
 - SC4-A – Current goals + Retire all Gas units by 2030
- Strategy 5: Net Zero Carbon Emissions by 2030
 - SC5-A – Current system, no new additions, PPAs expire per term, **meet 100% renewable goals** using RECs
 - SC5-B – Current system + 75% renewables (100 % load through renewables & STP)

Austin Energy Generation Overview Sorted by Fuel



Resource/PPA	Rating	Fuel	Ownership/PPA	Install year / First year of commercial operation	PPA expiration date
STP1	218	Nuclear	16% Ownership	1988	
STP2	218	Nuclear	16% Ownership	1989	
FPP1	302	Coal	50% Ownership	1979	
FPP2	300	Coal	50% Ownership	1980	
Decker ST1	315	Gas	100% Ownership	1970	
Decker ST2	420	Gas	100% Ownership	1977	
Decker GT1	48	Gas	100% Ownership	1988	
Decker GT2	48	Gas	100% Ownership	1988	
Decker GT3	48	Gas	100% Ownership	1988	
Decker GT4	48	Gas	100% Ownership	1988	
Sand Hill GT1	45	Gas	100% Ownership	2001	
Sand Hill GT2	45	Gas	100% Ownership	2001	
Sand Hill GT3	45	Gas	100% Ownership	2001	
Sand Hill GT4	45	Gas	100% Ownership	2001	
Sand Hill CC	300	Gas	100% Ownership	2004	
Sand Hill GT6	45	Gas	100% Ownership	2010	
Sand Hill GT7	45	Gas	100% Ownership	2010	
Nacogdoches	100	Biomass	PPA	2012	2032
Webberville	30	Solar	PPA	2011	2036
Sweetwater2	92	Wind	PPA	2005	2017
Sweetwater3	35	Wind	PPA	2006	2017
Whirlwind	60	Wind	PPA	2007	2027
Hackberry	166	Wind	PPA	2008	2023
LosVientos II	202	Wind	PPA	2013	2037
Whitetail	92	Wind	PPA	2013	2037
Los Vientos III	200	Wind	PPA	2015	2040
Jumbo Road	300	Wind	PPA	2015	2033
Los Vientos IV	200	Wind	PPA	2016	2041
Roserock Solar	157	Solar	PPA	2016	2036
East Pecos Solar	118	Solar	PPA	2017	2031
Upton Solar	150	Solar	PPA	2017	2042
Midway Solar	170	Solar	PPA	2018	2043

Emission by Unit



CO2 emissions by unit in metric tonnes per year

Unit	2014	2015
Decker 1	75,756	122,643
Decker 2	129,681	219,459
Decker GT1	9,419	13,267
Decker GT2	7,977	10,784
Decker GT3	6,656	7,403
Decker GT4	2,991	4,964
SHEC 1	23,607	31,946
SHEC 2	20,259	35,256
SHEC 3	25,049	23,817
SHEC 4	23,177	23,826
SHEC 5	393,075	558,350
SHEC 6	24,548	26,165
SHEC 7	20,126	31,785
FPP 1	1,532,298	1,764,799
FPP 2	1,994,326	1,558,234

CO2 emissions by facility in metric tonnes per year

Unit	2014	2015
Decker Creek (Gas)	232,480	378,520
Sand Hill (Gas)	529,841	731,145
Fayette Power Project (Coal)	3,526,624	3,323,033
Total	4,288,945	4,432,698

Austin Energy Historical Generation for 2015



Resource /PPA	Rating	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Capacity Factor
STP1	218	159,969	144,132	159,227	153,430	155,870	150,337	154,098	153,791	149,579	83,538	-	31,185	1,495,155	78%
STP2	218	160,168	144,274	142,597	-	106,793	150,179	154,105	153,808	149,924	154,940	149,157	154,667	1,620,614	85%
FPP1	302	97,680	102,884	136,227	129,978	142,455	178,532	192,424	179,321	169,009	144,788	127,018	112,175	1,712,490	65%
FPP2	300	116,956	108,267	154,064	126,555	103,374	179,665	193,824	180,729	171,167	46,460	-	3,144	1,384,205	53%
Decker ST1	315	(0)	-	-	-	-	27,160	57,141	68,566	47,054	10,297	-	-	210,217	8%
Decker ST2	420	-	-	10,902	8,455	2,503	40,026	63,244	88,512	57,878	35,648	28,386	11,071	346,625	9%
Decker GT1	48	213	1,521	2,221	612	2,201	1,144	2,048	3,374	1,542	224	1,077	662	16,841	4%
Decker GT2	48	60	1,353	2,196	485	1,190	831	1,607	3,183	1,435	82	904	548	13,873	3%
Decker GT3	48	41	811	1,698	312	867	410	922	2,465	989	29	585	236	9,365	2%
Decker GT4	48	-	525	442	140	-	-	946	2,399	583	-	566	155	5,757	1%
Sand Hill GT1	45	1,015	2,921	3,575	3,837	4,456	5,560	8,209	10,539	6,311	3,928	4,511	4,316	59,180	15%
Sand Hill GT2	45	1,052	3,191	3,950	4,847	5,893	6,947	9,072	10,633	7,240	3,677	4,084	4,349	64,936	16%
Sand Hill GT3	45	789	2,362	2,197	2,797	3,414	6,239	9,455	10,096	5,487	207	-	1,840	44,883	11%
Sand Hill GT4	45	919	1,196	-	0	0	5,565	9,750	10,760	7,092	3,196	3,681	2,831	44,990	11%
Sand Hill CC	300	79,285	73,808	32,921	91,084	163,247	161,834	170,782	171,539	161,673	79,676	28,548	142,318	1,356,716	52%
Sand Hill GT6	45	693	2,301	3,873	3,656	3,401	5,139	8,114	10,172	5,766	2,522	3,363	1,817	50,816	13%
Sand Hill GT7	45	1,197	3,219	4,735	5,203	5,526	6,481	8,648	9,969	6,949	3,154	3,393	2,570	61,043	15%
Nacogdoches	100	-	22,948	-	-	-	-	-	34,052	15,063	-	-	24,681	96,743	11%
Webberville	30	3,060	3,244	4,183	4,535	4,400	5,943	6,916	6,296	5,482	4,721	2,129	2,820	53,728	20%
Sweetwater2	92	16,866	23,445	17,822	27,104	30,382	18,391	26,263	19,807	20,974	21,472	30,723	28,655	281,905	35%
Sweetwater3	35	8,024	8,847	6,389	10,033	10,818	6,169	8,368	7,023	7,439	7,865	10,735	10,228	101,939	33%
Whirlwind	60	18,106	17,137	15,548	20,869	16,441	16,649	18,440	13,894	17,921	14,296	19,536	21,056	209,893	40%
Hackberry	166	36,130	37,125	29,633	45,026	42,685	31,144	39,353	32,725	30,810	33,595	39,411	43,672	441,309	30%
Penascal	196	30,358	32,828	26,523	33,708	57,704	31,487	57,056	34,181	23,999	32,366	41,091	43,496	444,798	26%
Los Vientos II	202	42,834	45,048	34,895	44,416	63,400	35,652	54,367	36,463	25,901	33,165	42,525	38,746	497,413	28%
Whitetail	92	15,778	18,320	15,022	18,348	31,441	22,487	36,007	22,286	17,284	22,731	18,148	25,363	263,215	33%
Los Vientos III	200		1,517	11,899	36,008	77,485	25,785	39,030	56,132	33,359	41,859	55,787	51,191	430,053	25%
Jumbo Road	300			24,748	86,376	70,016	37,349	66,067	58,127	73,379	59,497	88,501	90,606	654,667	25%

Historical Fuel Cost by Type



- Costs allowed in the fuel tariff include fuel for generation, transportation, renewable purchase power agreements, purchase power to serve retail customers, ERCOT fees and hedging.

Fuel Cost	FY2011	FY2012	FY2013	FY2014	FY2015
Gas	\$190,320,211	\$148,047,838	\$114,096,518	\$104,981,588	\$97,189,713
Coal	\$88,068,421	\$85,032,243	\$72,637,969	\$83,030,951	\$68,066,571
Nuclear	\$18,295,747	\$14,087,793	\$16,359,128	\$16,646,703	\$17,868,515
Fuel Oil	\$2,698,718	\$897,703	\$912,889	\$1,062,854	\$951,298
Bilaterals	\$57,820,582	\$10,831,546	\$13,408,348	\$18,818,855	\$4,489,538
ERCOT	\$66,372,518	\$69,831,165	\$71,546,000	\$98,379,271	\$76,936,494
Renewable	\$48,212,653	\$97,167,511	\$166,314,243	\$178,672,934	\$178,033,027
Total	\$471,788,849	\$425,895,800	455,275,095	\$501,593,156	\$443,535,156