

**Clean And Affordable Power:  
Updated Cost Analysis For Meeting  
A 20% Renewables Portfolio Standard By 2017  
At The Los Angeles Department Of Water And Power**

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## EXECUTIVE SUMMARY

This briefing paper outlines how the goal of acquiring 20% renewable energy at the Los Angeles Department Water and Power (DWP) by 2017 can be reasonably acquired at prices comparable to the cost of conventional generation. For conservative planning, this paper provides worst-case estimates showing that reaching this baseline goal of 20% renewable energy by 2017 would cost no more than an average of 66 cents per month on the average residential electric bill assuming all costs associated with the increase in renewable energy were passed along to the consumer – only one of several options available to the City of Los Angeles as summarized here.

### Cost Comparisons

The chart below summarizes the best-case scenario for conventional energy and worst-case scenario for renewable energy resources (**in bold**) while providing estimates provided by the DWP and the Legislative Analyst office.

	10 Year Levelized (\$/MWh)	20 Years Levelized (\$/MWh)	30 Years Levelized (\$/MWh)	Best-Case Conventional /Worst-Case Renewable (1)	CEC	DWP (2, 3)	CLA (3)
New Coal	\$ 50 (4)	\$ 50 (4)	\$ 50 (4)	<b>\$ 45</b>	N/A	\$ 40-60	\$ 20-40 (5)
New Gas	\$ 47 (6)	\$ 54 (6)	\$ 62 (6)	<b>\$ 55</b>	\$ 52	\$ 35-60 (5)	\$ 35-60 (5)
Wind	\$ 50 (7)	\$ 51 (7)	\$ 52 (7)	<b>\$ 57 (8)</b>	\$ 49	\$ 42-65	\$ 45-65
Geothermal	\$ 51 (9)	\$ 52 (9)	\$ 53 (9)	<b>\$ 63</b>	\$ 58	\$ 55-90	\$ 45-90
Landfill	\$ 38 (10)	\$ 41 (10)	N/A	<b>\$ 60</b>	N/A	\$ 55-90	\$ 55-90
Renewable Average	\$ 46	\$ 48	\$ 52	<b>\$ 60 (11)</b>	\$ 54	\$ 51-82	\$ 48 - 82
Renew. Above Coal (12)				<b>\$ 15 (13)</b>		\$ 11 - 22	\$ 28 - 42
Renew. Above Gas				<b>\$ 5 (13)</b>	\$ 2	\$ 16 - 22	\$ 13 - 22
Renew. Above Coal/Gas Mix				<b>\$ 10 (13)</b>		\$ 14 - 22	\$ 21 - 22

(1) Includes additional potential costs for transmission.

(2) These figures come from a cost analysis chart provided to the Clean Energy Coalition during a meeting held summer of 2003.

(3) For the renewable cost estimates, it is assumed that the added transmission costs range the same for renewables as for conventional resources as was agreed upon during this meeting with DWP. In other words, it is just as likely for new renewable capacity to be located along one of DWP's existing transmission lines as it is for a new coal plant or natural gas plant thereby having no additional transmission costs.

(4) These estimates involve the construction of a third unit at Intermountain in Utah. Cost data on this unit are confidential. However, if we assume that the unit costs approximately the same as the existing units, escalated for inflation, the cost will be in excess of \$50/MWh by the time it could come on line in 2008. These costs don't include potential future carbon fees that are as high as \$8/ton according to a CEC estimate.

(5) The low range number of \$20/MWh for coal and \$35/MWh for natural gas are misleading. These figures either equate to the ongoing fuel and O&M costs for an existing coal and gas plant or, in with the gas figures, assume that the cost of natural gas drops to \$2-3/mmBTU which energy analysts consider unlikely. The purpose of this spread sheet is to compare new capacity to new capacity which is relevant since growing energy needs at DWP will require new capacity be built in the next five to ten years.

(6) Based on Magnolia Project, unhedged prices. DWP is conducting several repowers of existing plants, some of which appear more expensive. The addition of 180 MW of capacity at the Valley Station was projected to cost \$238 million, considerably more than Magnolia.

(7) Wind project costs for a utility-owned project, starting with the capital costs of the Pine Tree project currently under development for LADWP include capital costs of \$1350/kW (2004\$), O&M, conservative costs of \$25.85/kW-year (2004 \$), capacity factor of 35%.

(8) \$57/MWh is extremely conservative given the ability for other municipal and investor owned utilities to acquire new wind capacity at a much lower rate. SDG&E, for example, signed up 156 MW of wind in fall 2002. In its filing before the CPUC seeking approval of these contracts, it stated that all the deals are priced no higher than 5.37 cents/kWh (\$53.7/MWh). In addition, the California Power Authority held a solicitation in 2002 and signed letters of intent with 1845 MW of new wind capacity. Prices ranged from 4-5 cents/kWh over 20 years. The City of Pasadena recently signed a deal to buy wind from Solano County for 5.35 cents/kWh. It's important to emphasize that the SDG&E and Pasadena projects are not in Tehachapi, which is clearly California's best wind resource area with developable sites that can produce capacity factors in excess of 35% -- which means prices between 4-5 cents/kWh. The problem with developing in Tehachapi is transmission. But LADWP has its own transmission line that is underutilized and can take power from Tehachapi wind and bring it down to LA. So LADWP is in prime position to get reasonably-priced power from that region.

(9) Capital costs for flash geothermal steam are \$1988/kW (2004 \$; \$1444/kW (1997 \$), escalated at 2.5%/year to 2004 plus 10% development fee for project built under municipal ownership plus \$100/kW for transmission interconnection, O&M of 2.15 cents/kWh (2004 \$; 2.0 cents/kWh (2001 \$; escalated at 2.5% per year to 2004.), royalty fee of 3.5% of gross revenue, capacity factor of 92%.

(10) Landfill gas, is even cheaper, but is available in relatively small quantities. Its cost data come largely from information provided by the EPA. A small royalty fee to the landfill was included. Financing was assumed over only 20 years instead of the 30-year period for other technologies. Capital costs of \$1314/kW (2004 \$; Capital cost (midrange of \$1100/kW in 2000 \$) escalated to 2004, plus \$100/kW for transmission interconnection), O&M costs of 1.82 cents/kWh (2004 \$; O&M cost (midrange of 1.65 cents/kWh in 2000\$) escalated to 2004.), royalty fee of 3.5% of gross revenue, annual capacity factor of 85%. Total levelized over 20 years is \$41/MWh.

(11) \$60/MWh is a conservative number in light of recent evidence that California's investor-owned utilities have been able to recently acquired significant new renewable capacity (San Diego Gas & Electric acquired up to 4% of their load) for less than \$54/MWh.

(12) It is highly unlikely that 100% of DWP's new capacity needs will be met with coal making this cost analysis too high.

(13) Worst/best estimates based on today's prices and assume the cost of natural gas remains the same, that a carbon fee isn't applied to coal, and that the cost of renewable energy doesn't lower further. It is likely that in 10 years coal and gas increase, while renewable energy resources become cheaper.

## WORST-CASE SCENARIO: RENEWABLES ABOVE NEW GAS

Average monthly bill increase of 22 cents, highest monthly bill increase of 35 cents; 0.4% average rate increase

	Total Annual Energy Sales (GWh)	New Renewable Load (GWh)	Cumulative Renewable Load (GWh)	Renewable % of Annual Energy Sales	Cumulative New Renewable Capacity (MW) (1)	Annual Above Market Costs (\$'000) (2)	Cumulative Above Market Costs (\$'000)	Cumulative NPV Above Gas (\$'000) (6%) (3)	Above Costs \$/MWh	Above Costs Cents/kWh	Additional Charge per Monthly Bill (4)	Rate Increase (5)
2003	22,926	323	323	1%	74	\$1,616	\$1,616	\$1,570	\$0.07	\$0.007	\$0.05	0.07%
2004	23,357	343	666	3%	152	\$3,332	\$4,948	\$4,623	\$0.14	\$0.014	\$0.10	0.14%
2005	23,848	350	1,017	4%	232	\$5,083	\$10,031	\$9,017	\$0.21	\$0.021	\$0.10	0.20%
2006	24,231	356	1,373	6%	313	\$6,863	\$16,894	\$14,614	\$0.28	\$0.028	\$0.15	0.27%
2007	24,629	362	1,734	7%	396	\$8,672	\$25,566	\$21,286	\$0.35	\$0.035	\$0.20	0.34%
2008	25,042	368	2,012	8%	459	\$10,511	\$36,077	\$28,915	\$0.42	\$0.042	\$0.20	0.40%
2009	25,408	373	2,475	10%	565	\$12,377	\$48,454	\$37,390	\$0.49	\$0.049	\$0.25	0.47%
2010	25,737	378	2,853	11%	651	\$14,266	\$62,720	\$46,605	\$0.55	\$0.055	\$0.25	0.53%
2011	25,977	382	3,235	12%	739	\$16,174	\$78,894	\$56,462	\$0.62	\$0.062	\$0.30	0.60%
2012	26,201	385	3,620	14%	826	\$18,099	\$96,993	\$66,897	\$0.69	\$0.069	\$0.35	0.66%
2013	26,454	380	4,008	15%	915	\$18,425	\$115,418	\$76,860	\$0.70	\$0.070	\$0.35	0.67%
2014	26,690	392	4,400	16%	1,005	\$18,670	\$134,088	\$86,412	\$0.70	\$0.070	\$0.35	0.67%
2015	26,918	395	4,796	18%	1,095	\$18,896	\$152,984	\$95,533	\$0.70	\$0.070	\$0.35	0.67%
2016	27,187	399	5,195	19%	1,186	\$19,113	\$172,097	\$104,237	\$0.70	\$0.070	\$0.35	0.67%
2017	27,471	404	5,599	20%	1,278	\$19,321	\$191,418	\$112,537	\$0.70	\$0.070	\$0.35	0.67%
2018	27,770	-	-	-	-	\$17,482	\$208,900	\$119,622	\$0.63	\$0.063	\$0.30	0.60%
2019	28,073	-	-	-	-	\$15,616	\$224,516	\$125,593	\$0.56	\$0.056	\$0.25	0.53%
2020	28,382	-	-	-	-	\$13,727	\$238,243	\$130,545	\$0.48	\$0.048	\$0.25	0.46%
2021	28,731	-	-	-	-	\$11,819	\$250,062	\$134,566	\$0.41	\$0.041	\$0.20	0.39%
2022	29,094	-	-	-	-	\$9,895	\$259,957	\$137,743	\$0.34	\$0.034	\$0.15	0.33%
2023	29,451	-	-	-	-	\$7,952	\$267,909	\$140,151	\$0.27	\$0.027	\$0.15	0.26%
2024	29,796	-	-	-	-	\$5,991	\$273,900	\$141,863	\$0.20	\$0.020	\$0.10	0.19%
2025	29,922	-	-	-	-	\$4,014	\$277,914	\$142,945	\$0.13	\$0.013	\$0.10	0.13%
2026	30,227	-	-	-	-	\$2,018	\$279,932	\$143,458	\$0.07	\$0.007	\$0.05	0.06%

(1) Assumes 50% capacity factor; (2) Assumes Renewables Cost \$5/MWh more than a new gas plant for the first 10 yrs levelized over 24 yrs; (3) Net Present Value - shows total cost of achieving 20% RPS in today's dollars. (4) Average electric usage of 443 kWh/month; rounded up 5 cents to account for differences in losses and load factor between residential and other customer classes; (5) \$10.44/kWh current residential rate

## WORST-CASE SCENARIO: RENEWABLES ABOVE GAS/COAL MIX

**Average monthly bill increase of 44 cents, highest monthly bill increase of 70 cents;  
0.8% average rate increase**

	Total Annual Energy Sales (GWh)	New Renewable Load (GWh)	Cumulative Renewable Load (GWh)	Renewable % of Annual Energy Sales	Cumulative New Renewable Capacity (MW) (1)	Annual Above Market Costs (\$'000) (2)	Cumulative Above Market Costs (\$'000)	Cumulative NPV Above Gas (\$'000) (6%) (3)	Above Costs \$/MWh	Above Costs Cents/kWh	Additional Charge per Monthly Bill (4)	Rate Increase (5)
2003	22,926	323	323	1%	74	\$3,232	\$3,232	\$3,140	\$0.14	\$0.014	\$0.10	0.14%
2004	23,357	343	666	3%	152	\$6,664	\$9,896	\$9,247	\$0.29	\$0.029	\$0.20	0.27%
2005	23,848	350	1,017	4%	232	\$10,166	\$20,062	\$18,034	\$0.43	\$0.043	\$0.20	0.41%
2006	24,231	356	1,373	6%	313	\$13,726	\$33,788	\$29,228	\$0.57	\$0.057	\$0.30	0.54%
2007	24,629	362	1,734	7%	396	\$17,344	\$51,132	\$42,573	\$0.70	\$0.070	\$0.40	0.67%
2008	25,042	368	2,012	8%	459	\$21,022	\$72,154	\$57,829	\$0.84	\$0.084	\$0.40	0.80%
2009	25,408	373	2,475	10%	565	\$24,754	\$96,908	\$74,781	\$0.97	\$0.097	\$0.50	0.93%
2010	25,737	378	2,853	11%	651	\$28,532	\$125,440	\$93,209	\$1.11	\$0.111	\$0.50	1.06%
2011	25,977	382	3,235	12%	739	\$32,348	\$157,788	\$112,924	\$1.25	\$0.125	\$0.60	1.19%
2012	26,201	385	3,620	14%	826	\$36,198	\$193,986	\$133,794	\$1.38	\$0.138	\$0.70	1.32%
2013	26,454	380	4,008	15%	915	\$36,850	\$230,836	\$153,721	\$1.39	\$0.139	\$0.70	1.33%
2014	26,690	392	4,400	16%	1,005	\$37,340	\$268,176	\$172,823	\$1.40	\$0.140	\$0.70	1.34%
2015	26,918	395	4,796	18%	1,095	\$37,792	\$305,968	\$191,067	\$1.40	\$0.140	\$0.70	1.34%
2016	27,187	399	5,195	19%	1,186	\$38,226	\$344,194	\$208,475	\$1.41	\$0.141	\$0.70	1.35%
2017	27,471	404	5,599	20%	1,278	\$38,642	\$382,836	\$225,073	\$1.41	\$0.141	\$0.70	1.35%
2018	27,770	-	-	-	-	\$34,964	\$417,800	\$239,245	\$1.26	\$0.126	\$0.60	1.21%
2019	28,073	-	-	-	-	\$31,232	\$449,032	\$251,187	\$1.11	\$0.111	\$0.50	1.07%
2020	28,382	-	-	-	-	\$27,454	\$476,486	\$261,091	\$0.97	\$0.097	\$0.50	0.93%
2021	28,731	-	-	-	-	\$23,638	\$500,124	\$269,132	\$0.82	\$0.082	\$0.40	0.79%
2022	29,094	-	-	-	-	\$19,790	\$519,914	\$275,487	\$0.68	\$0.068	\$0.30	0.65%
2023	29,451	-	-	-	-	\$15,904	\$535,818	\$280,302	\$0.54	\$0.054	\$0.30	0.52%
2024	29,796	-	-	-	-	\$11,982	\$547,800	\$283,727	\$0.40	\$0.040	\$0.20	0.39%
2025	29,922	-	-	-	-	\$8,028	\$555,828	\$285,890	\$0.27	\$0.027	\$0.20	0.26%
2026	30,227	-	-	-	-	\$4,036	\$559,864	\$286,916	\$0.13	\$0.013	\$0.10	0.13%

(1) Assumes 50% capacity factor; (2) Assumes Renewables Cost \$10/MWh more than a mixture of new gas and new coal for the first 10 years; levelized over 24 years; (3) Net Present Value shows cost of achieving 20% RPS in 2004 dollars; (4) Average electric usage of 443 kWh/ month; rounded up 5 cents to account for differences in losses and load factor between residential and other customer classes; (5) \$10.44/kWh current residential rate

## WORST-CASE SCENARIO: RENEWABLES ABOVE NEW COAL

**Average monthly bill increase of 66 cents, highest monthly bill increase of \$1.05; 1.2% average rate increase**

	Total Annual Energy Sales (GWh)	Annual New Renewable Load (GWh)	Cumulative Renewable Load (GWh)	Renewable % of Annual Energy Sales	Cumulative New Renewable Capacity (MW) (1)	Annual Above Market Costs (\$'000) (2)	Cumulative Above Market Costs (\$'000)	Cumulative NPV Above Coal (\$'000) (6%) (3)	\$/MWh Above Market Costs	Cents/kWh Above Market Costs	Additional Charge per Monthly Bill (4)	Rate Increase (5)
2003	22,926	323	323	1%	74	\$4,848	\$4,848	\$4,710	\$0.21	\$0.02	\$0.15	0.01%
2004	23,357	343	666	3%	152	\$9,996	\$14,844	\$13,870	\$0.43	\$0.04	\$0.30	0.41%
2005	23,848	350	1,017	4%	232	\$15,249	\$30,093	\$27,051	\$0.64	\$0.06	\$0.30	0.61%
2006	24,231	356	1,373	6%	313	\$20,589	\$50,682	\$43,842	\$0.85	\$0.08	\$0.45	0.81%
2007	24,629	362	1,734	7%	396	\$26,016	\$76,698	\$63,859	\$1.06	\$0.11	\$0.60	1.01%
2008	25,042	368	2,012	8%	459	\$31,533	\$108,231	\$86,744	\$1.26	\$0.13	\$0.60	1.21%
2009	25,408	373	2,475	10%	565	\$37,131	\$145,362	\$112,171	\$1.46	\$0.15	\$0.75	1.40%
2010	25,737	378	2,853	11%	651	\$42,798	\$188,160	\$139,814	\$1.66	\$0.17	\$0.75	1.59%
2011	25,977	382	3,235	12%	739	\$48,522	\$236,682	\$169,386	\$1.87	\$0.19	\$0.90	1.79%
2012	26,201	385	3,620	14%	826	\$54,297	\$290,979	\$200,691	\$2.07	\$0.21	\$1.05	1.98%
2013	26,454	380	4,008	15%	915	\$55,275	\$346,254	\$230,581	\$2.09	\$0.21	\$1.05	2.00%
2014	26,690	392	4,400	16%	1,005	\$56,010	\$402,264	\$259,235	\$2.10	\$0.21	\$1.05	2.01%
2015	26,918	395	4,796	18%	1,095	\$56,688	\$458,952	\$286,600	\$2.11	\$0.21	\$1.05	2.02%
2016	27,187	399	5,195	19%	1,186	\$57,339	\$516,291	\$312,712	\$2.11	\$0.21	\$1.05	2.02%
2017	27,471	404	5,599	20%	1,278	\$57,963	\$574,254	\$337,610	\$2.11	\$0.21	\$1.05	2.02%
2018	27,770	-	-	-	-	\$52,446	\$626,700	\$358,867	\$1.89	\$0.19	\$0.90	1.81%
2019	28,073	-	-	-	-	\$46,848	\$673,548	\$376,780	\$1.67	\$0.17	\$0.75	1.60%
2020	28,382	-	-	-	-	\$41,181	\$714,729	\$391,636	\$1.45	\$0.15	\$0.75	1.39%
2021	28,731	-	-	-	-	\$35,457	\$750,186	\$403,698	\$1.23	\$0.12	\$0.60	1.18%
2022	29,094	-	-	-	-	\$29,685	\$779,871	\$413,230	\$1.02	\$0.10	\$0.45	0.98%
2023	29,451	-	-	-	-	\$23,856	\$803,727	\$420,454	\$0.81	\$0.08	\$0.45	0.78%
2024	29,796	-	-	-	-	\$17,973	\$821,700	\$425,590	\$0.60	\$0.06	\$0.30	0.58%
2025	29,922	-	-	-	-	\$12,042	\$833,742	\$428,835	\$0.40	\$0.04	\$0.30	0.39%
2026	30,227	-	-	-	-	\$6,054	\$839,796	\$430,374	\$0.20	\$0.02	\$0.15	0.19%

(1) 50% capacity factor; (2) Assumes Renew. Cost \$15/MWh more than coal for first 10 yrs lev. over 24 yrs (3) Net Present Value shows cost of achieving 20% RPS in 2004 dollars. (4) Average elec. use of 443 kWh/mo. as quoted by DWP; rounded up 5 cents to account for diff. in losses and load factor between res. and other customer classes; (5) \$10.44/kWh rate.

## Addressing Worst-Case Scenario RPS Costs Without Raising Rates

Los Angeles has a number of options for addressing the limited amount of Worst-Case Scenario RPS costs as summarized below.

### Public Goods Funding

The entire public goods charge need *not* be used to fund RPS costs thereby canceling beneficial solar photovoltaic and energy efficiency programs. Instead, DWP can charge to the public goods fund for only the excess cost of renewables over conventional energy as is being done at the state level. The amount of public benefit funding required under this scenario is limited to around 14% at current rate levels.

### Use \$67 Million Profit from Mohave Sale to Fund Half of the Worst-Case Scenario Costs

LADWP received a \$67 million book profit from selling a 10% share of the Mohave power plant to the Salt River Project.<sup>1</sup> This non-operating profit is equal to almost half of the net present value of the excess cost under the Worst-Case Scenario of \$143 million. In other words, LA could pay for almost half of the above market price of the RPS under the Worst-Case Scenario with the profits from its sale of Mohave.

### Operations and Maintenance Productivity Savings

LADWP's Operations and Maintenance (O&M) budget (excluding fuel and purchased power) has increased from \$525 million in 1999-2000 to \$545 million in 2000-2001 to \$598 million in 2001-2002.<sup>2</sup> The worst-case excess renewable cost would require additional O&M productivity of only 0.13% per year over the next 23 years.

### Debt Payoff and Refinancing Creates Room to Pay for Worst-Case Scenario Costs

LADWP has a goal of reducing its generation-related debt to zero by the end of 2003, and is within \$1 billion of that goal as of the latest reported information in August 2002.<sup>3</sup> The reduction in debt and refinancing of bonds will reduce LADWP's expenses by well over \$100 million per year.<sup>4</sup> Any potential Worst-Case Scenario costs from the RPS are an order

of magnitude less than the savings already realized through the refinancing and defeasance of debt.

### Change Line Extension Policy to Raise Revenue and Stop Rewarding High Electric Use

LADWP's line extension allowances (amounts that utility ratepayers must pay for new construction) promote the use of electricity in inefficient applications such as space heating, water heating, and cooking by giving greater allowances to developers who install these electric uses. LADWP's allowances also give developers incentives to install inefficient air conditioners, by tying the allowance to the amount of connected air conditioning load.<sup>5</sup> A change in LADWP's line extension policy would raise several million dollars per year of additional revenue to offset the worst-case cost of the RPS, while improving overall environmental quality by ending rewards to customers that encourage increased electricity use.

### Reduced equity return

LADWP's equity return, after payment to the City of Los Angeles was \$257 million in 2001-2002.<sup>6</sup> Paying for the worst-case RPS cost would average about \$11 million per year over the next 23 years and about \$7 million per year through 2010. These figures are 4.5% and 3.1% respectively of the year 2001-2002 equity return.

### Conclusion

Rising and uncertain fossil fuel costs combined with declining renewable prices make renewable energy a smart investment for Los Angeles. Even if renewable prices do exceed those of conventional energy in the short term, DWP can meet Worst-Case Scenario costs without raising rates or, if it decides to pass along all costs to the ratepayer, the average bill would increase by less than one dollar a month. Given these factors, and the many benefits that renewables have regarding job creation, reliability, environmental performance and energy independence, LADWP should establish a renewable portfolio standard of 20% by 2017.

<sup>1</sup> Energy Services, Department of Water and Power, City of Los Angeles, "Report and Financial Statements and Required Supplementary Information," Fiscal Year Ending June 30, 2002, p. 14.

<sup>2</sup> Id., p. 17.

<sup>3</sup> "LADWP to Sell \$400 Million of Variable Rate Bonds. Press Release, August 20, 2002. <http://www6.ladwp.com/whatnew/dwpnews/082002.htm>

<sup>4</sup> \$4 billion in debt multiplied by 5% average interest rate would be \$200 million annually.

<sup>5</sup> <http://www6.ladwp.com/rules/RULES96.htm#Rule15>.

<sup>6</sup> It is recognized that LADWP both had \$67 million of unusual income (from the Mohave sale) in 2001-2002 and increased its payment to the City of Los Angeles from about \$120 million in 2000-2001 to about \$190 million in 2001-2002. Therefore the net comparison

**The Los Angeles Clean Energy Campaign includes:**

Center for Energy Efficiency and Renewable Energy Technologies

Coalition for Clean Air

The Coalition on the Environment and Jewish Life of Southern California

EarthDayLA.org

Environment California Research and Policy Center

Global Green USA

The Los Angeles Interfaith Environmental Council

Physicians for Social Responsibility

Union of Concerned Scientists