Annual Analysis of Wind Power Generation Costs

For the first time in over 20 years, the installed costs of wind plant went up rather than down over the course of a year, making our annual comparison of power generation costs particularly relevant this time around. The 2005 price hike is primarily due to increases in wind turbine prices, caused by rises in the price of energy, steel, copper and blade materials, a shortage of wind turbines and the need for manufacturers to increase the wafer-thin margins on which many had been operating. As a result, the average cost of wind power plant installed in 2005 was about 20% higher than in 2004.

The higher prices do not necessarily translate directly to higher wind power generation costs, as our five page analysis in the current issue reveals. While the installed cost of wind plant was going up, longer term power purchase contracts for wind electricity were coming in, particularly in Canada and the United States, pushing down the cost of finance. A 20% increase in installed cost raises the cost of wind generation by about 16%, but extending capital repayment periods from the 15 years common today to the 22 years found in the best contract terms wipes out the increase.

Higher wind generation costs have not made wind power less competitive with gas — generally the option of choice for new generation — than it was last year. Increases in the price of gas during 2005 pushed up generation costs for new plant by more than 25%.

Coal generation remains a tough competitor, even though the price of the fuel went up 10% during 2005. Much of the time coal can beat wind on cost at wind's prices today, especially in markets where fossil fuels do not yet carry a carbon penalty. But those markets are getting fewer each year — and even without carbon penalties on coal, in areas where winds blow strongly and wind plant can be installed relatively cheaply, it is often the least cost option.

Nuclear the competitor to beat

But it is not coal and gas that wind is increasingly being measured against these days, but nuclear. Challenged by evidence that global warming is happening and is man-made, governments are being persuaded (some say panicked) to believe that renewable energy is a limited technical solution to controlling carbon emissions. According to the nuclear industry, only it can save the world — and to do so it claims it needs less government support than wind.

In the six months since our in-depth comparison of the full costs of adding wind or nuclear to the power generation mix, little has changed to make the outrageous claims of the nuclear industry any more true. As this column pointed out at the time, wind can provide the same reliable flows of electricity that nuclear can provide — and in the process will often save money for the consumer. If anything, authoritative sources have strengthened the arguments for wind in the past half year, not weakened them.

Nuclear's claimed upside as a provider of "firm power" compared with wind is nonsense. Power generation plant of the so-called firm power variety have a habit of tripping off-line about once a month. Anything up to 1300 MW of nuclear capacity can disappear instantaneously — and does. The UK transmission link to the French nuclear fleet is out of action every fourth week or so. The chance of an entire fleet of wind turbines stopping in its tracks is negligible. When the wind dies or increases, it does so gradually — and the system operator has advance warning. The reserves scheduled for a (sudden) nuclear trip only need to be increased slightly to cover for wind — and barely at all until wind is supplying a significant proportion of a system's needs.

Never before has our annual comparison of power generation costs found it necessary to consider nuclear as a serious potential competitor. As an expensive technology that has never lived up to expectations, comparing

nuclear's theoretical cost with wind's proven economics did not seem worth the bother — especially as wind can do nuclear's job without the production of lethal waste, often for less money, and with far faster build rates.

But with governments on both sides of the Atlantic Ocean, particularly those of Britain and the United States, pushing nuclear forward as the competitor that wind has to beat, Windpower Monthly found it necessary this year to give serious consideration to nuclear's generation cost along with that of gas, coal and wind. We have done so with scrupulous fairness, accepting nuclear's claims about its installed cost at face value, even though they are based on government support of a massive 8 GW of capacity. Whether any government will shoulder that amount of risk for nuclear to achieve such economies of scale is unknown.

Breakdown of Operating Wind Capacity (Megawatts)			
EUROPE	**Start 2004**	**Start 2005**	**Watts per capita**
Germany	14609	16628	202.8
Spain	6202	8263	209.7
Denmark	3115	3118	588.3
Italy	891	1265	22
Netherlands	912	1078	68.2
UK	704	897	15.2
Austria	415	607	75.9
Portugal	299	523	52.3
Greece	398	466	44.4
Sweden	399	442	49.7
France	240	390	6.4
Ireland	225	353	95.4
Norway	112	160	35.6
Belgium	68	97	9.5
Finland	47	82	15.8
Poland	58	58	1.5
Ukraine	51	57	1.1
Luxembourg	16	35	87.5
Latvia	24	26	10.8
Turkey	20	20	0.3

Czech Republic	10	17	1.7
Switzerland	5	8	1.1
Russia	7	7	0
Estonia	5	6	4.3
Hungary	2	6	0.6
Lithuania	0	6	1.7
Croatia	0	6	1.3
Slovakia	0	5	0.9
Cyprus	0	2	2.5
Romania	1	1	0
Bulgaria	0	1	0.1
Total	**28,835**	**34,630**	
NORTH AMERICA			
USA	6352	6752	23.6
Canada	326	444	14.3
Total	**6678**	**7196**	
ASIA			
India	2120	2983	2.9
China	566	764	0.6
Taiwan	8	16	0.7
South Korea	8	8	0.2
Sri Lanka	3	3	0.2
Total	**2705**	**3774**	
LATIN AMERICA			
Costa Rica	71	71	17.8
Caribbean	13	55	
Brazil	29	48	0.3
Argentina	26	26	0.7
Columbia	20	20	0.5
Mexico	5	5	0
Chile	2	2	0.1
Total	**166**	**227**	
PACIFIC REGION			
Japan	644	940	7.4
Australia	198	380	19.7
New Zealand	38	170	42.5
Pacific Islands	0	11	
Total	**880**	**1501**	
MIDDLE EAST & AFRICA			

Egypt	69	145	2.1
Morocco	54	54	1.8
Tunsia	20	20	2
Iran	11	11	0.2
Israel	8	8	1.3
Africa & Cape Verde	3	3	7.5
South Africa	3	3	0.1
Jordan	2	2	0.4
Total	**170**	**246**	