



# Emerging Trends Report

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## Nuclear Tide

by

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### EXECUTIVE SUMMARY

American culture is utterly dependent on cheap, abundant energy.

The price of oil, however, has risen relentlessly for the last seven years to the point we now send one-half billion dollars abroad each day to pay for our needs.<sup>1</sup> We spend at least another ten billion dollars each month to ensure access to it.

Natural gas burns more cleanly and is more thermally efficient than oil or coal. But like oil, our reserves are finite, and natural gas is found in countries whose interests are not necessarily aligned with our own.

Coal is plentiful and has been our primary workhorse for base load electrical generation for more than a century and will continue to play a significant role for decades to come. But coal is also filthy; it can be cleaned, indeed will be cleaned, but it is a difficult and expensive process.

Emissions from these fossil fuels are threatening climate changes we try not to imagine.

Renewable energy sources' promise will remain as secondary, additive sources of power.

Nuclear energy is perceived to be expensive, inefficient, hazardous, and fraught with danger.

*...and within two generations will become America's primary source of energy.*

The march of thermal efficiency, defined here as the ratio of usable energy output to energy input, has improved consistently from coal to oil to natural gas, with each producing fewer emissions of carbon dioxide and the like than its predecessor.<sup>2</sup> The next evolutionary step that will be taken in the decades ahead will be the development of dual-use nuclear power: base load electrical generation coupled with the electrolysis of water to produce either hydrogen, a carbon-neutral fuel posited as the clean replacement for fossil fuels, or potable water. There will be a dire need for both in the years ahead.

A changing, threatening world seems to be conspiring against us. Even the weather seems increasingly antagonistic.

Aging power stations near the end of their operational lives: hard choices must be made.

A groundswell is gathering momentum and awaits but the right catalyst to unite Americans behind the idea of being fed up with the stranglehold imported fossil fuels has on our lives. We will demand that something be done.

Energy Security.

Global Warming.

Nuclear energy: because it is time to end our reliance on imported fossil fuels.

<sup>1</sup> Pizer, Willaim A.: "Setting Energy Policy in the Modern Era: Tough Challenges Lie Ahead": Resources For the Future: p. 8, Winter 2005.

[http://www.rff.org/rff/Documents/RFF\\_Resources\\_156.pdf](http://www.rff.org/rff/Documents/RFF_Resources_156.pdf)

<sup>2</sup> Hoffert, M., et al: "Advanced Technology Paths to Global Climate Stability: Energy for a Greenhouse Planet"; Science: Vol. 298. no. 5595, p. 983; 1-11-2002.

With a third of the world's power stations being more than 30 years old,<sup>3</sup> a number of countries, principally those in eastern Asia, have arrived at this very conclusion. They are choosing to shoulder the higher capital costs of building nuclear power plants today, in effect fixing the price of electricity for decades to come, in order to lessen the impact of higher energy costs tomorrow. Over the next 25 years, it is estimated the number of nuclear power plants worldwide will increase by about forty percent.<sup>4</sup>

A year ago when we began compiling research for this report, there were no reactors planned in the United States. We did not think this situation could last and said so in our October report, "Coalescence."<sup>5</sup> As we go to press, 18 utilities have notified the Nuclear Regulatory Commissions of their interest in building new nuclear reactors.<sup>6</sup>

*The Emerging Trends Report (ETR) believes this is but a hint of what is to come, and the ensuing nuclear build-out will exceed the Manhattan Project in urgency, the Apollo Program in scope-- and both in cost. It will involve a generational reshaping of major aspects of the American economy, and it will prove prodigiously profitable for those who recognize the turn of the Nuclear Tide.*

**EDITOR'S NOTE:** *Certain technical aspects of this paper would not have been possible without the patience and guidance of the following people: George S. Stanford, PhD., reactor physicist (ret.) at the US Argonne National Laboratory; L. John Perkins, PhD. at the Lawrence Livermore National Laboratory; and Glenn Catchpole, M.S., P. Eng. Thank you.*

**DETAIL 1:** "...and you may ask yourself-- 'well... how did I get here?'"<sup>7</sup>

A couple years ago, we were struck by a friend's comment to the effect that within five years only high school kids would be driving SUVs. As we go to press in July of 2006, oil is over \$70 per barrel, and gasoline is fluctuating around \$3.00 per gallon in California. People watch the pump with sick fascination, budgetary ruination unfolding before their very eyes. \$50 doesn't fill many cars' tanks these days, and people are beginning to wonder if it ever will again.

There is a mounting, pervasive edginess in our national psyche today: history is rhyming. Another hubristic administration is running low on credibility after generally running amok. Worldwide, political instability is spreading like wildfire, and regardless of intention our government seems as much part of the problem as the solution. Our foreign entanglements and the expense of maintaining them are becoming less palatable by the day. The inflation that Wall Street salesmen and government statisticians claim doesn't exist certainly does for the vast majority of Americans who have experienced the double whammy of real wage contraction over the last five years<sup>8</sup> coupled with decreased buying power. We are left to ponder how things could have changed so little since the 1970's when energy vulnerability was first revealed to be our Achilles Heel.

<sup>3</sup> Bream, Rebecca: "Power: Talkin' 'bout my generation"; the Financial Times: 29-05-2006.  
[http://news.ft.com/cms/s/fb8c7d70-ef04-11da-b435-0000779e2340,dwp\\_uuid=843ad722-ecd8-11da-a307-0000779e2340.html](http://news.ft.com/cms/s/fb8c7d70-ef04-11da-b435-0000779e2340,dwp_uuid=843ad722-ecd8-11da-a307-0000779e2340.html)

<sup>4</sup> World Nuclear Association (WNA): "The New Economics of Nuclear Power: WNA: p.6, 2005.  
<http://www.world-nuclear.org/economics.pdf>

<sup>5</sup> "Coalescence" is available free of charge on our website, [www.emergingtrendsreport.com](http://www.emergingtrendsreport.com).

<sup>6</sup> Gertner, Jon: "Atomic Balm?"; New York Times Magazine: 16-07-2006.  
[http://www.nytimes.com/2006/07/16/magazine/16nuclear.html?\\_r=1&oref=slogin](http://www.nytimes.com/2006/07/16/magazine/16nuclear.html?_r=1&oref=slogin)

<sup>7</sup> Byrne, David: "Once in a Lifetime"; EMI Records : Talking Heads: Once in a Lifetime, 1984.

<sup>8</sup> Bloomberg: "Weekly wages adjusted for inflation fell 0.7% last month and are down 0.2% over the past year... Pay has been flat or declined in more than half of the 65 months since January 2001." Bulletin: 20-06- 2006.

Although Energy Security makes regular appearances on the Sunday morning talk show circuit, thirty years on politicians have yet to formulate a cohesive energy policy geared toward reducing, and then ending, our reliance on foreign oil. In fact, during the 1990's when oil was cheap, the government actually closed promising programs.<sup>9</sup> The result of all this dithering has been that nothing has changed. If anything, ignoring the problem has made it worse: during the 1975-2005 time span, as American oil production *declined* from approximately 3 billion barrels per year (Bbl/y) to 1.9 billion Bbl/y,<sup>10</sup> imports of foreign oil *increased* from approximately 1.5 billion Bbl/y to 3.6 billion Bbl/y.<sup>11</sup> When oil was cheap and plentiful, no one cared; now that the price has increased nearly 700% off the 1998 low and there is increased competition for supply, concerns about energy vulnerability have resurfaced and people are casting a jaundiced eye on the behavior of politicians. Employing tactics reminiscent of the tobacco industry regarding the relationship between cigarette smoking and lung cancer, the last two administrations have consistently denied, dismissed or denigrated the science behind Global Warming, thereby avoiding the economic consequences of having to respond to it. This in effect has maintained the status quo, which has benefited the Oil & Gas Industry and the Electrical Industry, the two largest businesses on the planet, both of which are opposed to carbon accountability.

But there's no conspiracy here, folks: it's all right out in the open. The control or accumulation of energy resources dominates the political landscape today. Pick an oil or natural gas exporting nation and the odds are good it is either causing or suffering civil strife of one sort or another.<sup>12</sup> Judging by the way permanent members of the UN Security Council trade protectionist vetoes for energy supply, things are clearly going to deteriorate further in countries like Sudan, Nigeria, Myanmar, Chad, Equatorial Guinea, and Iran, to name but a few.

This is demonstrative of the new urgency in the Grand Game. Alliances are shifting, rebalancing the global energy structure. The US is starting to be excluded from markets we have long taken for granted, such as those in South America where leftist rhetoric has led to a wave of quasi- and de facto nationalizations.

In the last few years China has made use of its surfeit of American dollars to purchase energy all over the globe, striking deals for long term supply in Angola, Ecuador, Egypt, Indonesia, Iran, Kazakhstan, Kuwait, Libya, Myanmar, Nigeria, Oman, Peru, Russia, Saudi Arabia, Sudan, Thailand, Venezuela, and Yemen. Unless something changes soon, growth projections place the combined US-Chinese oil demand accounting for 60 to 70% of world output, a clearly untenable situation.<sup>13</sup> Hamstrung by environmental regulations and popular opposition, neither the US nor Europe is building the refining and infrastructure capacity needed to meet the ever-rising demand of the years ahead, which can only result in increased reliance on Middle Eastern supplies and OPEC.<sup>14</sup>

<sup>9</sup> Stanford, George, S.: "Integral Fast Reactors: Source of Safe, Abundant, Non-Polluting Power"; National Policy Analysis: no.378, December 2001. <http://nationalcenter.org/NPA378.html>

<sup>10</sup> Energy Information Agency: "U.S. Crude Oil Field Production"; Department of Energy, 12-06-2005. <http://tonto.eia.doe.gov/dnav/pet/hist/mcrfpus1a.htm>

<sup>11</sup> Energy Information Agency: "U.S. Crude Oil Imports from All Countries"; Department of Energy, 12-06-2006. <http://tonto.eia.doe.gov/dnav/pet/hist/mcrimus1a.htm>

<sup>12</sup> Organization for Economic Co-operation and Development (OECD): "Multinational Enterprises in Situations of Violent Conflict and Widespread Human Rights Abuse"; OECD: May, 2002. <http://www.oecd.org/dataoecd/46/31/2757771.pdf>

<sup>13</sup> Ridley, Bill: "China and the Final War for Resources"; [jameswinston.com](http://jameswinston.com): 09-02-2005. <http://www.321energy.com/editorials/winston/winston020905html>

<sup>14</sup> Hoyos, Carola: "Will the lights go off?"; the Financial Times: 29-05-2006. [http://news.ft.com/cms/s/df156012-ef04-11da-b435-0000779e2340,dwp\\_uuid=843ad722-ecd8-11da-a307-0000779e2340.html](http://news.ft.com/cms/s/df156012-ef04-11da-b435-0000779e2340,dwp_uuid=843ad722-ecd8-11da-a307-0000779e2340.html)

A nightmare in the making, as far as US interests are concerned, is the Shanghai Cooperation Organization (SCO), whose charter members include China, Russia, Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan. The SCO is apparently inducting Iran this year and plans to invite India, Pakistan and Mongolia to join in the future, promoting a "gas-and-oil arc" across Asia.<sup>15</sup> This puts the US and especially its allies Japan, South Korea and Taiwan, and to a lesser extent Australia, between a rock and the proverbial hard place in the quest for Energy Security.

The rapid emergence and voracious appetites of developing countries in Asia has taken the developed world by surprise. The United States and Europe have been outmaneuvered in a number of oil and natural gas deals recently, which has sparked a mad scramble to secure supply. The ETR maintains the increases in fossil fuel prices thus far are as much a reflection of monetary inflation and excess liquidity as increased global demand; when the third element of supply shortage is eventually factored into the equation, the price increases will astonish. This is currently being underestimated by the powers that be in Washington but promises to keep a bid under oil prices, indeed all energy prices, for the foreseeable future. Add in the premium attached to oil prices due to political instability, terrorism, monetary inflation, and the threat of pre-emptive invasion and regime change, and higher prices begin to assume a more permanent nature. Indeed, at the moment, the only way the ETR can envision energy prices retreating significantly would be as a result of a global recession induced by runaway energy costs.

**DETAIL 2:** "It was as clear as mud but it covered the ground...."<sup>16</sup>

Aside from conservation, for which the American culture appears to be singularly ill-suited, there is little we can do to lessen our dependence on imported oil for transportation purposes simply because there are presently no alternatives. Thankfully, relatively little oil is used in the generation of electrical power in the US. That is not to say oil does not factor in a discussion of base load electrical generation for strangely enough it is still a driving force. Increases in the price of oil shift emphasis to sibling fossil fuels, natural gas and coal, and when their prices increase sufficiently, there is cause for a re-evaluation of nuclear energy. If Energy Security and Global Warming are indeed considerations, no discussion can legitimately exclude nuclear energy simply because, for all of its faults, it has few drawbacks in these regards.

Unfortunately, nuclear energy is the most polemic issue of our time. Entire careers, indeed the founding and rise of entire organizations, have been built on debunking or promoting nuclear energy. The issue is highly charged not least because of the staggering "inherent economic stakes,"<sup>17</sup> as James Hansen puts it: electrical power generation in the United States in 2004 produced gross revenues of more than 193 billion dollars,<sup>18</sup> a sum greater than the gross national product of Denmark.<sup>19</sup> With so much money on the table, spurious as well as specious claims abound. Dueling experts and biased polls present agendas as facts or popular opinion. The politics of fear are applied

<sup>15</sup> Heinberg, Richard: "Energy Geopolitics 2006"; Energy Bulletin: 22-06-2006.

<http://www.energybulletin.net/16393.html>

<sup>16</sup> Belafonte, Harry and Rollins, Jack K: "Man Piaba"; RCA: 1954.

<sup>17</sup> Hansen, James: "Defusing the Global Warming Time Bomb"; Scientific American: pp. 68-77, March 2004.

<sup>18</sup> Energy Information Administration: "Electric Power Annual 2004"; Department of Energy: DOE/EIA-0348(2004), p. 6, November 2005.

<http://www.eia.doe.gov/cneaf/electricity/epa/epa.pdf#page=13>

<sup>19</sup> Central Intelligence Agency (CIA): "The World Factbook: 'Rank Order-GDP'"; CIA: undated.

<http://www.cia.gov/cia/publications/factbook/rankorder/2001rank.html>