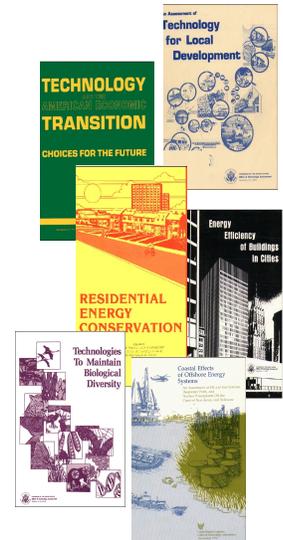


## INSIDE THE GLOBAL GREEN TRANSITION

by Hazel Henderson © 2012

Overview from [Green Transition Scoreboard® 2012: From Expanding Cleantech Sectors To Emerging Trends In Biomimicry](#)

In Q3 2011, the Green Transition Scoreboard® totaled private investments in green sectors since 2007 worldwide at \$2.4 trillion. Our new total of **\$3,306,051,439,680** confirms our view that this transition is on track to reach the \$10 trillion we project by 2020. This global transition follows many earlier phases of human societies' evolution as our technologies evolved from the Iron and Bronze Ages through the energy transitions from wood to coal, whale oil to petroleum. As I noted in our [2011 update](#), this current transition from fossil fuels to greater efficiency and renewable energy and resources is simply the next stage in human knowledge and scientific progress. This has been forecast since the 1970s by the US Office of Technology Assessment.<sup>1</sup> As OECD Secretary-General Angel Gurría recently stated, "Green growth strategies focus on ensuring that natural assets can deliver their full economic potential."<sup>2</sup>



This and our review of over 100 studies since 2010 was the basis for our recommendation that pension funds and other institutional investors shift at least 10% of their assets to green

**As this report went to press, the Dutch pension fund APG announced a \$1billion investment in a windfarm in Mexico**

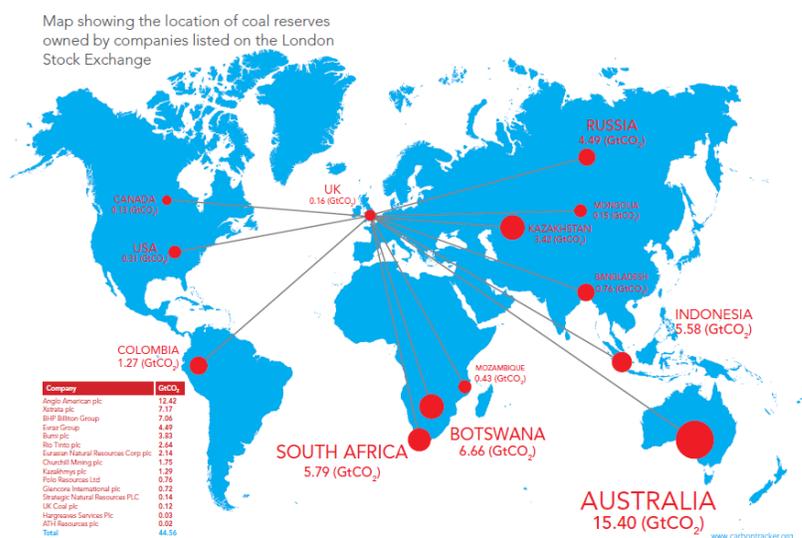
investments. The Mercer report of February 2011 recommended a shift of 40%: half to hedge against climate and environmental risk and half to capitalize on opportunities in green sectors. Mercer's follow-up survey of 14 asset-owner partners found more than half had already conducted the process of or planning to review their holdings, based on the report's findings.<sup>3</sup>

*Responsible Investor,*

Edinburgh, Scotland, have seen a marked increase, since our 2011 Green Transition Scoreboard® (GTS) report, of concern by governments and United Nations agencies in promoting the global green transition.<sup>4</sup> Private markets and financial sectors rode roller-coasters and global geopolitical risks, many self-inflicted: from political wrangling in the USA to the failure of EU politicians to address the travails of the euro. All this fueled rising civic anger over bailouts of too-big-to-

fail banks while imposing cuts and austerity on their citizens, echoed worldwide in the 99% facing the concentrated power of the 1%, verified by ETH.<sup>5</sup> January 2012 saw a new level of concern by institutional investors at the CERES-UN Foundation [Investor Summit on Climate Risk and Energy Solutions](#) at the United Nations in New York. Secretary-General Ban Ki Moon commissioned a high-level panel on Global Sustainability which endorsed his Sustainable Energy For All By 2030 in its report "Resilient People: Resilient Planet: A Future Worth Choosing," 2012.<sup>6</sup> Moon urged these investors, representing some \$10 trillion assets under management, to step up their investments in renewable energy and greater efficiency since governments were struggling with budget cuts "while there is no lack of capital in the world."

Speakers from Deutsche Bank, Goldman Sachs, GE, Bank of America and other mainstream financiers previously have spoken little about the green transition. Risks of investments in coal reserves of companies comprising 25% of London's FTSE Index are rising as they are seen less as assets than future liabilities in a carbon-constrained world. A high-



level group has warned the Bank of England and the European Central Bank that these are now "sub-prime" assets, posing a systemic risk to pension funds and economic stability.<sup>7</sup> While many other institutional investors have focused on climate risk (mostly pension funds, endowments and mutual funds), they now have made the leap to seeing the opportunities in the global retooling for the inevitable green transition, estimated by venture capitalists and others as a \$45 trillion new global market.<sup>8</sup> Thus, our GTS thermometer is calibrated for a realistic annual global private investment of \$1 trillion until 2020, so as to secure this transition.

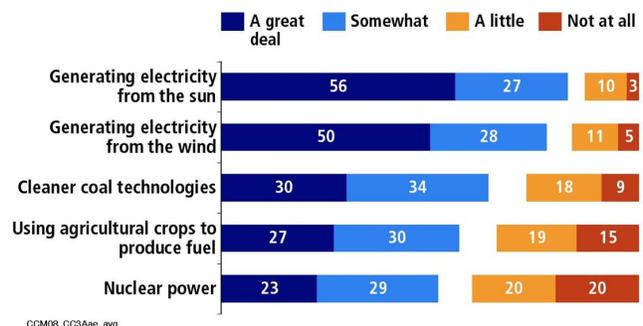
Meanwhile, global geopolitical shifts rearranged power toward Asia, particularly India, China, Indonesia and the rising influence of developing countries, especially Brazil – the natural resource-rich "green giant" now the world's 7<sup>th</sup> industrial economy. The mature economies of Europe and North America stagnated along with Japan, all on various forms of life-support from their central banks and rebellious citizens. Nature added an unprecedented series of crises:

Japan, Chile and New Zealand suffered earthquakes followed by tsunamis in Japan and Chile, both situated on the Pacific Ocean's Ring of Fire. Pakistan, Thailand and Australia suffered devastating floods, while the USA experienced droughts, a wave of destructive tornados, massive flooding along the Mississippi basin and in the Northeast from unusual hurricanes. The loss of life and disruption of production was massive as were the costs estimated by Munich Re – \$378 billion for 2011.<sup>9</sup> Intimidation by those denying scientific consensus on Darwin, evolution and anthropogenic (i.e., human) effects on our planet's biosphere (including the 75 members of the US Congress) was confirmed by 360.org which found US citizens behind 26 other advanced countries in their belief in evolution. No wonder that media and public debate was muted on the need in the USA to shift to a more ecologically sustainable, socially just, cleaner, greener economy. Thus, Ethical Markets Media's reporting in our Green Transition Scoreboard® came as a surprise to most mainstream media and public opinion driven by advertising revenues from incumbent fossil-fueled sectors.

At the same time, in China, India, South Korea, Brazil and many other countries, even including the beleaguered European investors and companies, were advancing apace in shifting to greener economies. The Asian Development Bank-UNESCAP report sees Asia emerging as a green economy leader.<sup>10</sup> Pew research found that among the G-20 the USA lagged far behind.<sup>11</sup> Momentum, for the global green transition was accelerated by the OECD group of 37 advanced economies and their [Towards Green Growth](#) reports and many others indicating greater efforts to "de-carbonize" their economies and grow green sectors simply to modernize, create jobs and invest in more energy and resource efficiency.<sup>12</sup> The International Monetary Fund's working paper: "Who's Going Green and Why?" appeared in December, 2011 (see Appendix 3).

Mainstream financial markets were confronted with "[Pricking the Finance Carbon Bubble](#)," based on a report from [Carbon Tracker](#) showing that some 40% of companies listed in London's FTSE Index had foolishly over-invested in "proven reserves" of fossil fuels that likely will never be exploitable. Such mal-investment

illustrates again the need for new metrics, both to internalize externalities in prices and investment models, as well as to correct GDP. We were pioneers with Calvert in 2000 with our dashboard: the Calvert-

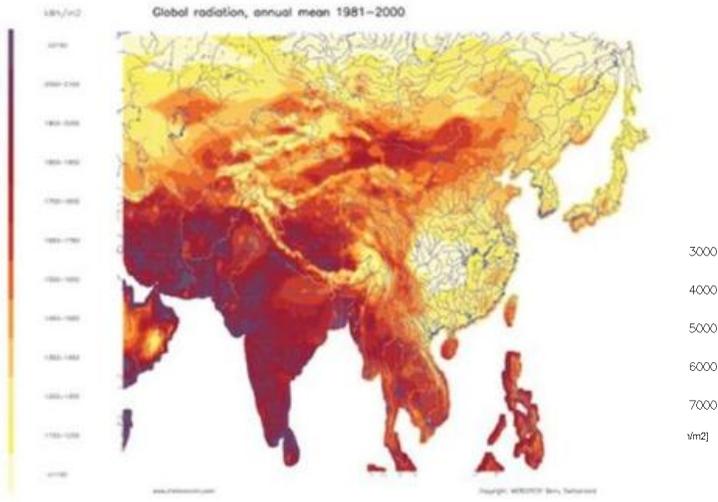
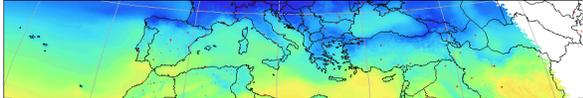


Henderson Quality of Life Indicators, regularly updated at [www.calvert-henderson.com](http://www.calvert-henderson.com) and emulated by the OECD in their new [Better Life Index](#). Since 2008, large majorities in 22 countries agree that the move to , renewable energy is critical to prevent climate change.<sup>13</sup> The [Green Growth Knowledge Platform](#) launched January 2012 by OECD, UNEP and the World Bank will help governments design and implement green growth policies.

In 2012, the impetus for green growth also is coming from the United Nations as its 193 member nations submit their plans for the green transition to the UN Commission on Sustainable Development (UNCSD) for the UN Summit, Rio+20 in Rio de Janeiro, Brazil, June 20-22, 2012 ([Zero Draft](#)). Only two countries remain skeptical about this global transition to a green economy: Venezuela and Bolivia, both seeing it as a capitalist takeover of environmental resources to commodify them for private profit. Indeed, agricultural land is described as the newest "asset class" in an April 2012 conference for hedge funds, sovereign wealth funds and other institutional investors ([www.globalaginvesting.com](http://www.globalaginvesting.com)). Pakistan, Mexico, Ghana, Egypt and Argentina expressed reservations that poor people and the social dimensions of development would be shortchanged. Some smaller Caribbean states and Honduras as yet have no policy positions – unlike Costa Rica, a green economy leader. Meanwhile, 27 European Union countries increased their share of renewable energy consumption from 11.5% in 2009 to 12.4% in 2010.<sup>14</sup> A GlobeScan survey of experts found 72% saying that the green economy is the right theme for Rio+20 while 76% agreed that socially responsible investors would be the most important influencers, along with NGOs (69%) and labor unions (57%).<sup>15</sup>

As shown in the graphics on the next page, the developing countries of the South have specific advantages in the race to green the world's economies.<sup>16</sup> UNEP-FI reports on financing renewable energy in developing countries focus on Africa.<sup>17</sup> India and Africa are rich in solar resources. All these countries have fewer legacy, incumbent industries in fossilized sectors, less obsolescent infrastructure and fewer stranded assets (e.g., aging nuclear plant decommissioning, mal-investments in proven fossil-fuel reserves which are unlikely to be recovered for multiple reasons: net energy costs, prices, additional pollution, etc.). Thus, the "technological leapfrog" strategies are preferred, particularly by China, Brazil, India and many other emerging giants, including the DESERTEC initiative in North Africa.

Global horizontal irradiation (1985-2004)  
(annual average of daily sums, Gh)

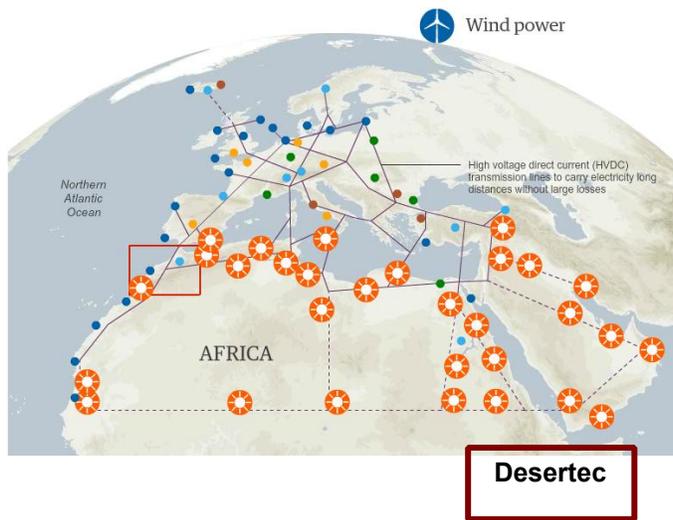


...y additions  
(prognosis)  
(2010)



...etwork for wind)

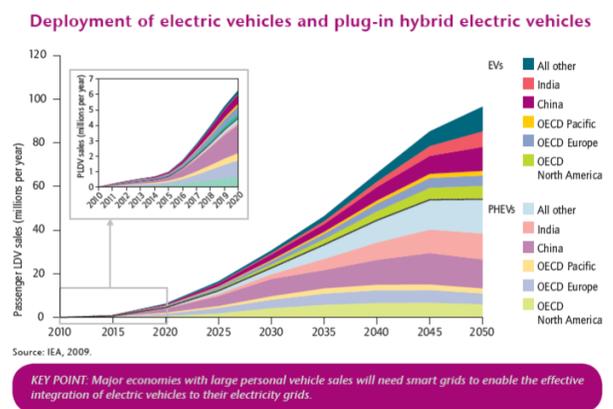
...frog"



This "leapfrog" takes many forms: e.g., mobile phones, leapfrogging costly landlines; distributed, local solar, wind, geothermal, low-head hydro leapfrogging wasteful national grids and costly centralized power plants; more energy and resource efficiency leading to re-designing of cities for pedestrians, cycles and mass transit, LED-municipal lighting and locally-sourced solar and wind generators. As noted in many studies,<sup>18</sup> not only do developing countries now have these "leapfrog" advantages, costs are lower, allowing the 1.6 billion people living far from electricity grids to enjoy simple solar electricity thanks to such innovators as Swiss-based [DT Power](#).<sup>19</sup> Many joined us in pointing out that most developing countries cannot afford nuclear power or big central power plants and grid systems while they are abundant in solar and renewable resources and culturally attuned to conservation and efficiency.

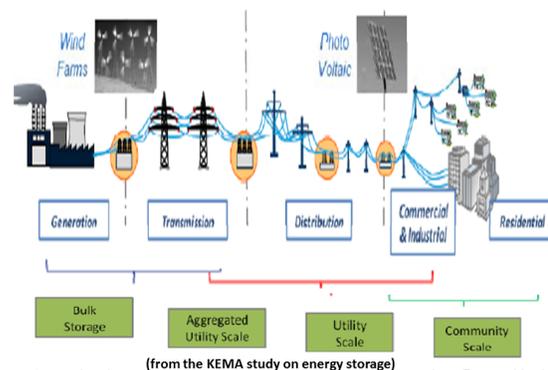
As our team has tracked all these geopolitical changes since our 2011 Green Transition Scoreboard® update, we are emphasizing research into how green technologies are being developed and deployed in more decentralized ways and in these developing regions. Smart grid technologies can be centralizing or decentralizing. We continue to exclude from the Green Transition Scoreboard® many technologies touted by legacy and incumbent industries as "cleaner" or "greener" including: nuclear power (also disqualified on costs alone now that local solar PV and wind power are cheaper)<sup>20</sup>; coal and CCS (still unproven, costly and imposing a huge thermodynamic burden making coal-electricity generation some 40% less efficient); biofuels, particularly derived from food crops, those wasting productive land and water (since we believe that electrifying liquid-fueled transport using renewables is more efficient).

We expand our focus on R&D and deals below \$100 million, and will be tracking the growing interest in recycling,<sup>21</sup> as well as geothermal, both for base-load electricity and for shallow uses in heating. The January 2012 Geothermal Energy Finance Forum projected continued



(from the IEA Smart Grid Technology Roadmap)

**Benefits of Energy Storage along the Electricity Value Chain**



growth in the US and worldwide for this overlooked resource.<sup>22</sup> Energy storage is key, particularly for solar and wind generation's intermittent features. In addition to current and mature technologies: pumped water storage, compressed air and lead-acid batteries, new systems: flywheels, super-capacitors, lithium-ion, sodium-sulfur, flow batteries are in early market adoption stages.<sup>23</sup>

A key issue concerns potentials for job-creation. The issue of jobs has been politicized, as in the postponed USA-Canada XL Pipeline project, with wide discrepancies in estimates of job creation, fears of environmental damage and revelations that the oil would likely be exported from the USA. Meanwhile, most studies we reviewed on the green transition cite net new jobs in the millions.<sup>24</sup>

A US Department of Energy study found, in August 2010, 46,500 permanent workers in solar energy alone.<sup>25</sup> The conceptual and political confusion over the jobs issue is rooted in special interests and obsolete economic theories ("[Jobs: Let's Get Real](#)"). A report in California from [Next 10](#) found that green jobs losses in the US recession were 3% compared with 7% losses in the rest of the economy (GreenBiz.com). "Making It Happen," a report by the OECD, covers "green and decent" jobs, estimating that China will have 4.5 million jobs in wind and solar by 2020.<sup>26</sup>

We are now including research on the most efficient technologies of all: those employing the science of biomimicry (see, for example, our cover and computer optimization for solar power plants, *The Economist*).<sup>27</sup> These new technologies mimic Nature's designs for producing materials, conserving energy – optimized over 3.8 billion years of experimentation! Biomimicry design is also helping re-design many industrial methods and products such as dyeing fabrics using CO<sub>2</sub> instead of water.<sup>28</sup> Helping companies re-tool offers safe biomimicry alternatives in many areas, including those in nanotechnologies, not yet assessed for their possible social and environmental impacts. Ethical Markets Media, LLC, itself is deeply involved in the accelerating green transition and, for full disclosure, our principals are also personal investors in many green technologies.<sup>29</sup> We are also partnering with the [Biomimicry Guild](#) in furthering its research

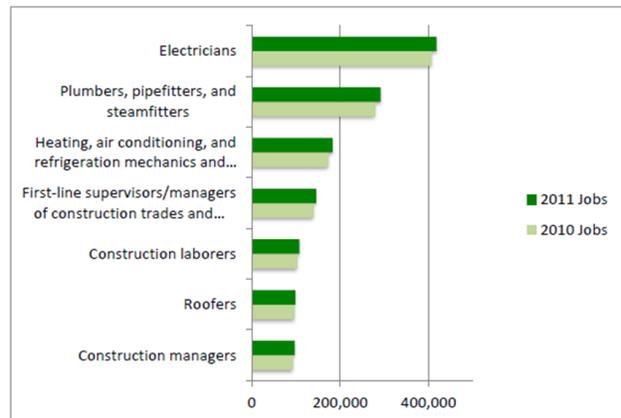


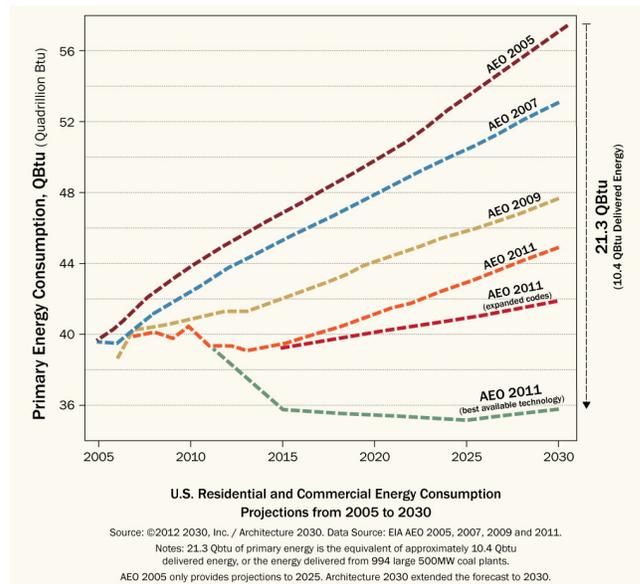
Figure 5. Twelve-month occupational growth in traditional industries related to solar installations

(from NREL's *Solar Installation Labor Market Analysis*)

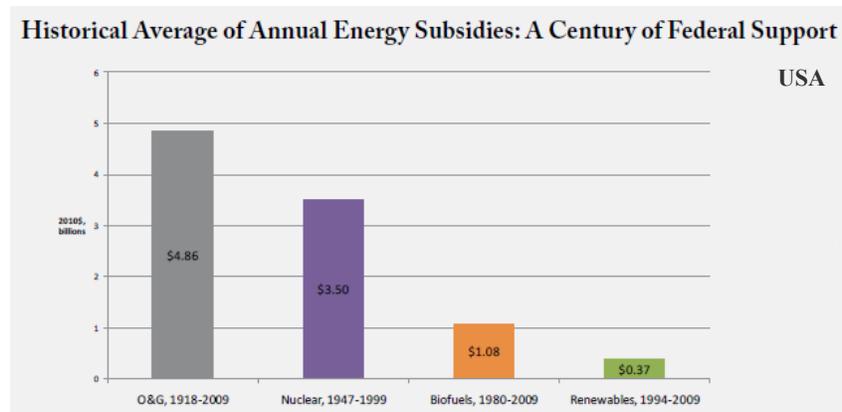
on ways to embed this new science in products and services (offered as a 2-year Masters degree in seven universities).<sup>30</sup> With Biomimicry's scientists, Ethical Markets Media, LLC, will be developing Ethical Biomimicry Investing© protocols and criteria for investors in biomimicry companies, while promoting sustainable agriculture, forest and fisheries. Globally, companies are turning toward biomimicry methods in production.<sup>31</sup> We are partners in the [Green Economy Coalition](#) and contributing to its presentations, particularly to the [Rio+20](#) process and in reviewing [OECD Towards Green Growth](#) reports. A useful overview, "State of Green Business 2012" covers all the key sectors, the new start-ups, including the emerging "mesh" generation of young companies, some for profit, others non-profits.<sup>32</sup>

Energy efficiency and reducing material throughput in all national economies target the lowest-entropy goals. For example, the potential of 120 million buildings in the USA could triple or quadruple their energy productivity with an average return of 33%.<sup>33</sup> Projections by the US Department of Energy, based on best available technology, show reductions in primary energy consumption are possible by 2030.

Demonstrable progress has been made in many countries as we reported in 2011 and the potentials for huge efficiency improvements still exist worldwide. [ACEEE](#), [ECEEE](#) and the US Energy Information Administration's "Annual Energy Outlook: Early Release Overview 2012" see energy use per capita declines at an average rate of 0.5% per year from 2010 to 2030.<sup>34</sup>



Rearguard fossil industry opposition to the green transition is still potent, particularly in the USA,



as shown below, and Canada's fossil fuel-focused government as well as the global problem of over \$400 billion of annual subsidies both to producers and consumers.

Even the goals of more energy and resource efficient societies have come under attack! Status quo pleaders often employ the theories proposed by British economist Stanley Jevons in 1865 in his well-known "rebound effect" in 19<sup>th</sup> century England: that using coal more efficiently which saved money, often led to more use or spending on other energy-related goods or services. Jevons sensible observation in the 1800s cannot be extrapolated to vastly different, more complex national economies in the 21<sup>st</sup> century.<sup>35</sup> The CO2 Scorecard provides a [careful refutation](#) of a recent energy "rebound" study with both analysis and ample documentation of the concrete evidence of the successful reduction of energy use (and CO<sub>2</sub> emissions) across the USA and Canada.<sup>36</sup>

A positive note on the advance of energy and materials efficiency is the report "Long-term Efficiency Potential"<sup>37</sup> which compares the 2050 USA energy-use forecast of 220 quads<sup>38</sup> with an Advanced Scenario using only 70 quads and the super-efficient Phoenix Scenario using a mere 50 quads which requires deeper "re-design."

These offer a net savings of \$255 billion per year and net 1.3 million jobs in the Advanced Scenario and net 1.9 million jobs in the Phoenix Scenario.



How significant are the following in your organization's energy efficiency decisions?

2010 Global	2011 Global	Drivers of efficiency	Europe	India	China	US/CA
1	1	Energy cost savings	1	1	1	1
4	2	Gov't/utility incentives/rebates	2	3		2
3	3	Enhanced brand or public image				3
N/A	4	Increasing energy security	3	2	2	
2	4	Greenhouse gas reduction				
6	6	Existing policy			3	

(from the Johnson Controls survey on Energy Efficiency implementation)



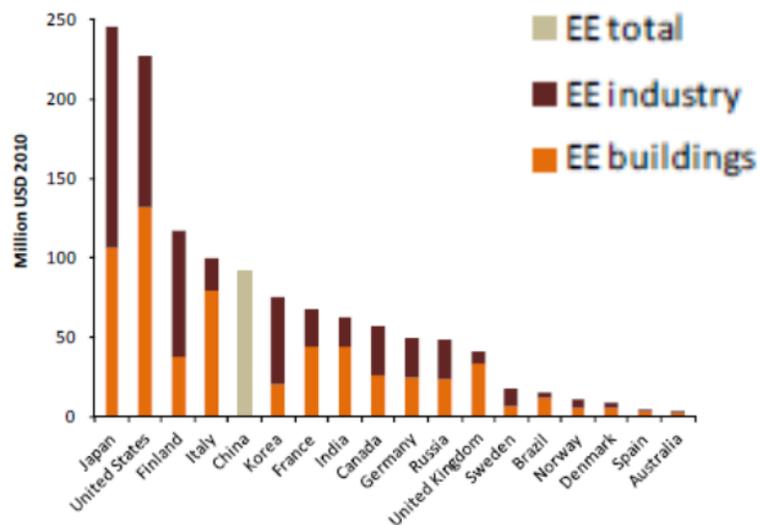
Energy-efficiency and information technologies are closely-related, not only in monitoring use and smart grids, as analyst Jeremy Rifkin describes.<sup>39</sup> The competition between Intel and British upstart ARM (Advanced RISC Machines) seeks to increase the energy-efficiency of computer chips and the server racks housed in computer server farms.<sup>40</sup> Their inefficiency has been likened to giant refrigerators full of racks of hot ovens! ARM chips are less powerful

than Intel's but use 1/10 of the power of current server systems and cost 60% less. Gartner Research notes that "power consumption will become more and more critical."<sup>41</sup> A useful tool is the Green Electronics Survey.<sup>42</sup> Since many electronic products require rare earth elements, no longer produced in the USA, the Congressional Research Service's "Rare Earth Elements: The Global Supply Chain," released in September 2011, examines the current global dependence on China.<sup>43</sup> Naturally, a key variable in energy and resource consumption is population growth – but as studies show, continuing the "dematerializing" and delinking of energy and material consumption from GDP and population growth is even more critical going forward. Progress in US electric efficiency in 2010 saved 112 TWh, enough to power over 9.7 million homes for one year while avoiding 78 million tons of CO<sub>2</sub> emissions.<sup>44</sup>

News on subsidies for fossil fuels and nuclear power shows some progress in the debate as the G-20 and the OECD countries consider and implement cuts.<sup>45</sup> The key issue remains cutting of producer subsidies rather than those to consumers. While more opposition has come from fossil industries protecting their production subsidies, the protests over cuts to consumer subsidies on oil led to huge demonstrations in Nigeria, which destabilized its government. We still support the phaseout of production subsidies for fossil fuels and nuclear power, which is proving more costly then ever after the Fukushima meltdown in Japan. It is clear that merely returning these huge subsidies to the world's taxpayers will help restore squeezed budgets and level the playing field for a more rapid transition.

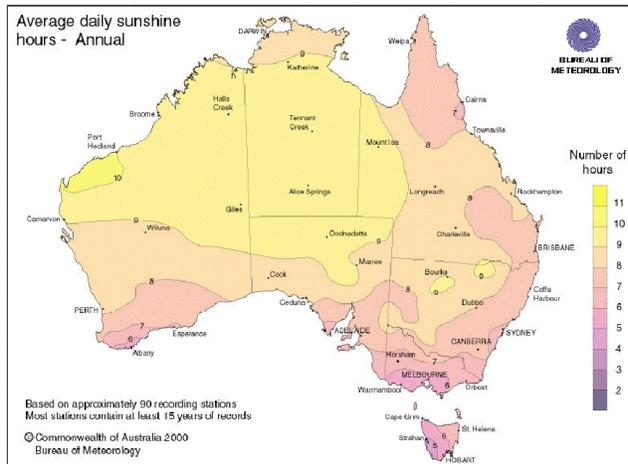
However, cutting subsidies to consumers, especially in developing countries, can cause real hardship unless offset by government policies to lower costs in other key services to promote more sustainable development. The problem is widespread distrust of governments as recent Nigerian protests evidenced,

Public spending on energy efficiency in buildings and industry  
**CEM countries' annual spending, 2010**



(from the IEA's Clean Energy Progress Report)

which forced the partial restoration of the fuel subsidies. Meanwhile, in OECD countries, energy efficiency in buildings and industry is led by Japan.<sup>46</sup>



Clearly, in spite of recessions caused by the financial crises, the goal of a global green transition from fossilized sectors is underway. China is now the global market leader in low-carbon technologies in which they include nuclear. In spite of this, it provides a positive scenario for stabilizing the global climate beyond the disappointments of focusing only on carbon emission reduction. The UN and the IPCC now promote the green economy<sup>47</sup> as well as focusing on other pollutants such as methane and soot which can slow global warming more cheaply and quickly while bringing positive health benefits.<sup>48</sup> We will be watching coal-dependent countries, particularly India and Australia, both of which have abundant solar resources (prices for solar cells fell 51% in 2011, to 88¢), for signs of transition.

Thus, our Green Transition Scoreboard® 2012 update clearly shows how this global trend is accelerating in our new total of \$3.3 trillion – all explained and documented in this report.