Business & Society Conference
TUCK SCHOOL OF BUSINESS AT DARTMOUTH

Oil and Water: Business Opportunities to Fuel our Future

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The old proverb “Oil and water don’t mix” was certainly dispelled at the sixth-annual Business & Society Conference, hosted by the Tuck School of Business at Dartmouth. Aptly titled "Oil and Water: Business Opportunities to Fuel our Future," the conference brought together over 25 energy, water stewardship, and sustainability experts from around the globe. Over three days, January 16-18, 2008, they hashed out the economic and environmental challenges and opportunities presented by these two vital resources to an audience of 456 with 61% of the Tuck student body in attendance.

The experts were drawn from such Fortune 500 companies as General Electric, Coca-Cola Enterprises, CSX Corporation, and the PG&E Corporation, as well as from world-class consultant groups, developers, investment firms, and non-profits, including Climate Counts and the Aquaya Institute. Conducted in a panel format, conference topics ranged from the financial risk of climate change to clean tech investing strategies, from sustainable water solutions in developing nations to realizing significant cost efficiencies through water stewardship. There were also two very relevant keynote speeches: one by John Brock, CEO of Coca-Cola Enterprises, who discussed his company’s sustainability program; and the other by Matthew Simmons, founder and chairman of Simmons & Company International, the world’s largest energy investment banking firm, who provided incisive insight into the oil industry. Ultimately, the conference offered a direction forward and clear action items that will indeed improve a company’s bottom line while addressing resource and environmental issues.

It might seem an odd mix, but the pairing of oil and water makes good sense when you consider that both resources are critical to civilization and that it will take cooperation from all sectors to protect them. There was a time when we believed that oil and water had an endless supply. That view on oil ended with the gas lines of the 1970s, but not until recently did our delusional perspective on water begin to change as the scarcity issue has hit the popular press. Although, if you were to visit verdant gated communities in places like Phoenix, Arizona, you might come to the same conclusion as panelist Gary Lawrence: He stated bluntly that it is “insane” to think that water is an unlimited, abundant resource.

It’s well past the time to start thinking of both oil and water as strategic assets that are intertwined with each nation’s national security. Perhaps melodramatic, perhaps not, but more than one geopolitical expert has made the

claim that the next great war will be over water. In spite of the foreboding assessments, Tuck student and conference Chair Dave Adams, T'08, says, "It is the belief of many that over the next 30 years the issues and challenges created by these two commodities will yield the greatest opportunities to drive earnings, implement conservation programs, and enact social good." He's talking triple bottom line, a model gaining momentum in the business world. It's about pursuing opportunities that are (1) simultaneously profitable, (2) socially responsible, and (3) environmentally sustainable.

One of the stated goals of Tuck is to be a thought leader when it comes to responsible business practices, which Tuck Dean Paul Danos emphasized in his introduction to John Brock. Danos noted how proud the school is of the conference and the importance of the triple bottom line approach to business: "Its topics dovetail with what we try to do at Tuck to help students create a leadership profile that's sensitive to the environment but at the same time, of course, aiming at growth and productivity and profitability for their firms. So that great interface is what we're looking for and the conference always helps us think about that."

Attitudes Toward the Environment: Do We Care Enough?

To fully grasp the business opportunities in oil and water, it is first necessary to survey people's attitudes toward the environment and climate change, because those attitudes will influence how we use oil and water. Facts and figures surrounding global warming can be debated until you're blue in the face, but what matters is perception; and the perception is that global warming is fact. A number of the panelists noted that it is indeed documented: average temperatures are up; polar caps are receding; and CO2 concentrations and carbon emissions have risen dramatically. "The science of global warming is real," says Ruth H. Silman, a partner with Nixon Peabody LLP who specializes in environmental issues. "It's here. It's everywhere."

In response, consumers have become more environmentally conscious. As an example, Paul Argenti, a professor of corporate communication at Tuck and panel moderator, cited a study that revealed 71% of all consumers say it is important to buy eco-friendly products. His number jived with that quoted by Sienna N. Rogers T'06 and associate at the PG&E Corporation, who reported that 70% of their customers believe they are environmentalists.

To better understand and quantify attitudes toward the environment around the globe, in September 2007, McKinsey & Co. surveyed more than 7,500 consumers and more than 2,600 business executives respectively. The results were presented by Greg Hintz T'05, an engagement manager with the firm. Of those consumers who responded, 88% are either somewhat or very worried about global warming and climate change. In addition, 88% believe that it is the responsibility of public and private corporations to "generate high returns to investors but balance this with contributions to the greater good." Surprisingly, executives were not far behind at 84%. When executives were asked what issues are likely to have an impact on shareholder value, environmental and climate change topped the list in Europe and developing markets, and was

second only to healthcare and other benefits in the U.S. and Canada, with 41% citing it as an issue in these latter markets.

There is an undisputable public awareness that environmental issues and climate change will impact consumers and businesses alike, and consumer attitudes will certainly drive change. As we will also discover, herein lies the real business opportunity of cutting costs through conservation and efficiency, and the entrepreneurial opportunity of pursuing cleaner energy alternatives and eco-friendly products.

The Need to Anticipate Climate Change & Financial Risk

While businesses face many unknowns, there are some very basic knowns associated with climate change that were echoed by a number of panelists: It will result in rising ocean levels and drought, and will cause changes in wind patterns and cloud coverage. In turn, these changes will impact coastal assets, river plants producing electricity, and the wind and solar power industries. Compounding the problem, there is no technology to predict where and when these changes will occur. One area of opportunity echoed by panelists is more investment in research to obtain good data.

Regardless, the financial risks are real and acknowledged by all sectors. Hank Schilling, managing director of environmental support at General Electric, emphasizes that climate change “poses significant financial risk” to GE investments, such as those in wind power. Wood Turner, a project director at the non-profit environmental watchdog Climate Counts, notes, “Water scarcity presents a tremendous and obvious risk to business, particularly manufacturing.” And Josh Stirling, vice president of the Hanover Insurance Group, says insurance companies face certain financial risk as climate patterns change. As an example, Stirling points to the demographic trend of retirees moving to the coasts as local governments offer incentives to developers. Insurance companies, however, face great risk in states like Florida that play host to hurricanes. It will only become worse as the current warming cycle leads to more hurricane activity.

The specter of these climate change risks has resulted in keen pressure on companies to curb CO2 emissions, a situation companies must start planning for now. Ruth Silman of Nixon Peabody, notes that the pressure on companies is coming from all angles: federal and state legislation, state initiatives, state securities laws, permit proceedings, litigation, and shareholder resolutions. Therefore, all companies have to assess and anticipate the impact of climate change. Silman provided a brief list of those impacts: “higher fuel and electricity prices; more stringent (and more costly) fleet vehicle efficiency and emission standards; more stringent SEC disclosure requirements; and higher insurance premiums for coastal facilities.” There will also be “higher construction costs for plants and facilities and tougher permitting requirements for new GHG emitting facilities.”

Hintz of McKinsey & Company believes that climate related issues have “to be discussed as part of corporate strategy” and opportunities that lead to a

competitive edge and product differentiation must be pursued. Unfortunately, not all executives are looking at it this way. The McKinsey survey of business executives discovered that executives view environmental issues and climate change “as risks rather than as opportunities.”

Environmental Issues Create Business Opportunities

It is time for all business sectors to realize that for strategic reasons it is necessary to implement sustainability initiatives. We acknowledge there will always be stockholders who see green initiatives as being outside the company’s mission or core business, but when framed in terms of efficiency, cost savings and goodwill, the business argument is sound. Companies need to look at their energy use, transportation networks, waste, packaging and supply chain for cost savings that ultimately lead to conservation.

“Long term profits for the General Electric Company turn on getting smart about the environment and climate change,” says Schilling. Toward that end, GE introduced Ecomagination in 2005, a strategic initiative to drive financial and environmental performance together, whether it be building more efficient diesel powered engines, investment in solar and wind technology, or reducing the carbon footprint of its operations. “Our products are driven by efficiency,” says Schilling. “That’s really tightly wrapped with climate change.”

He also touted GE’s Ecomagination as a credible environmental movement. One of the goals is to reduce their absolute greenhouse gas (GHG) emissions by 1% by 2012 — a relatively aggressive target for a company that continues to grow. The company has also committed to reducing the intensity of its GHG emissions 30% by 2008 and to improving energy efficiency 30% by the end of 2012. To gauge their performance, in the first quarter of each year GE measures its GHG data for the previous year from over 500 locations around the world, and then posts the results on the company's Web site. Schilling admits that Ecomagination was a big change for GE — but one that excited many GE employees in the affected business. While the 1-30-30 reductions work well for GE’s industrial businesses, they do not apply easily to financial investments where GE has no control (either because the investment is debt or because the output of a power plant, and thus its GHG emissions, is controlled by the power purchaser.) He says, “In an industrial/financial conglomeration there can be some tension.”

At a company like CSX Corporation, an international transportation company that runs as many as 1,200 trains a day over 21,000 miles of rails, business managers are encouraged to seek opportunities for efficiency. It naturally fits with their business model as they seek to move freight at the lowest possible price. Sustainability allows them to be better organized overall, explains Louis Renjel, the company’s director of government and environmental affairs. Energy efficiency simply cuts costs. One of their objectives is to be an environmental leader, which generates goodwill and pays off when CSX wants to expand its network and needs public buy-in. More than one panelist pointed out the benefits of goodwill on the public relations front. Transparency alone on these

issues bolsters a company's reputation and deepens customer loyalty. "You get goodwill, then profits follow," says Silman.

The Cost & Benefits of Green Buildings

As companies like GE strive to reach energy reduction goals, its executives need to think about green buildings. The green building sector is growing rapidly as people realize the cost premium to build green is negligible and has significant monetary benefits. Buildings can be designed to use 30% less energy and 30 to 50% less water, so businesses and consumers can realize savings, explains Tommy Linstroth, who is head of sustainability initiatives at Melaver, Inc., a private sustainable real estate firm. The company has carved out a profitable niche for itself developing, acquiring, renovating, and managing sustainable commercial and residential real estate. Green can be homes, offices, shopping centers, or renovated historic structures. The firm has also put its money where its mouth is: Melaver's headquarters in Savannah, Georgia, is green.

One of the roadblocks to more green buildings is the assumption that it comes with a significant premium — many inexperienced architects assume it will cost 10 to 20% more. However, Linstroth says, from their experience the premium is just 0 to 2%, so going green absolutely makes financial sense. He lists a number of reasons for building green: "negligible first cost up-charge, market differentiation, growing number of incentives across the nation such as tax breaks, expedited permitting, increased density, energy and water savings of over 30%, and institutional investors such as GE Real Estate and CalPERS are demanding it." In addition, a good work environment with clean air and natural light can boost productivity 2 to 18%.

Two of the more frustrating challenges are local code officials who are behind the times and design professionals who aren't educated when it comes to green buildings. Linstroth gave an example of how they wanted to use filtered runoff water to supply the toilets in an office building — a brilliant solution they thought — but local officials nixed the idea because they had no codes governing such use of runoff.

Another issue facing the industry is certification. Who determines the standards for being green and then who certifies that a building is indeed green? There are a number of third party organizations that handle such certification, but Melaver relies on a system developed by the U.S. Green Building Council (USGBC), a non-profit organization that promotes sustainable building practices. Their system is called the Leadership in Energy and Environmental Design (LEED) Green Building Rating System, which sets benchmarks for designing, building and operating green buildings. Developers don't have the greatest reputation, Linstroth admits, so adopting LEED ensures quality, reassures customers, and offers transparency.

Peak Oil: Is It Here?

As we pursue more efficient energy solutions, whether green buildings or corporations seeking cost efficiencies, we must evaluate future energy options: coal, solar, wind, hydroelectricity, or nuclear in addition to oil. Oil is a certain resource that is crucial to the transportation sector, a resource that literally drives civilization.

"Oil is the industrial oxygen of our society," says Matt Simmons, whose keynote speech was a highlight. Simmons points out that oil accounts for 95% of our transportation energy and its by-product goes into making thousands of other products. "The future growth in oil demand appears inexhaustible," he says. And he makes a strong argument that not only will supply fail to match demand, but we are about to reach peak oil, if we haven't already. When the supply can no longer grow, he explains, we have reached peak oil, a concept people don't understand very well or simply deny or say it is decades away, but Simmons is convinced that it will have a profound impact on our lives.

To begin, just look at the rise in price per gallon. Some pundits have blamed it on a variety of factors: "an aberration, hedge fund driven trading, or war fears creating a 'fear premium" among others. But this conventional wisdom is wrong, Simmons says. He argues that prices shot up because, "to begin with, it was far too cheap;" and, "in a nut shell, demand grew too fast." In 2007 consumption was 85.7 million barrels per day (mb/d), up from 70 million mb/d in 1995. Then there is the India/China factor as both countries will really drive future growth in demand. China's oil imports alone will increase from 3.5 to 13 mb/d by 2030. Meanwhile, production appears to have peaked at 74 mb/d, which has created a gap between supply and demand, and he fears production could be as low as 65 mb/d by 2012.

Another indicator of peak oil is falling production at key fields. While Simmons acknowledges there is a need for better field-by-field production data, we do know that the North Sea has experienced rapid decline rates, and at Mexico's Cantarell oil field — the world's second largest by output — production has declined 41% since peaking in 2005. There is also anecdotal evidence that suggests "peak oil" is here. For example, Indonesia is a large producer of oil but now imports; in Iraq, oil managers are gloomy about future production; and no new discoveries have yielded a bonanza. "Bits and pieces of data all point to peaking of oil supply," concludes Simmons.

Simmons is not alone in his assessment. "There is a gap between consumption and resource reserves," says Bruce Everett, former executive with Exxon Mobil and adjunct associate professor at the Fletcher School, Tufts University. He believes the next 30 years should be fairly interesting as we will probably consume more oil than in the last 150 years: "Even if the oil is there, we may not be able to make it fast enough." Everett believes that there is plenty of oil out there as well as alternate sources such as natural gas, coal shale, and methane hydrates — the issue is getting at these resources. Access is prevented by technology constraints, economics, politics, and environmental concerns.

So, what's the bottom line? To ensure the world has the capacity to meet demand, according to the International Energy Agency, there needs to be a $22 trillion investment, and we need to create additional production of 32 mb/d by 2030. Like a gambler, Simmons enjoyed providing odds on what he believes the future holds:

- Creating the additional 32 mb/d by 2030 = <.001% chance;
- Staying at "undulating plateau" or flat production that would not meet additional demand = 40% chance;
- Production decline of 5% per annum = 35% chance;
- Nightmare case of a production decline of 10% per annum = 25% chance.

"Odds are high" that peak oil will occur, Simmons concludes, and the exploding growth in demand suggests it will happen sooner rather than later. When it does, "declines could be swift" and lead to social chaos. Both Simmons and Everett suggest there is no simple alternative to oil, but is their view shared by others? And what are the prospects of finding scalable alternate energy sources?

Alternate Energy Sources

As for opportunities in alternate energies, all must be taken with a grain of salt because the reality of deploying them faces one huge hurdle: a massive amount of investment. To overcome energy obstacles we need a balanced approach, says Scott Brown, CEO of New Energy Capital, an investment firm, rather than a policy that merely seeks independence from Mideast oil. Much of the onus is on the government, which needs to have a policy that includes incentives to spur alternative energy investment, according to several panelists. Hank Schilling of GE is seeing lots of work with solar power in Europe, which is commendable, but he believes there is a limit to how much power can come from renewable sources. For example, even though there has been an enormous amount of innovation in the solar arena, it is still too costly and is optimal for only certain sun-rich geographies. Nevertheless, both solar and wind remain favorites among many of the conference's panelists. Once touted corn-based ethanol "is a nonstarter," according to Andrew Friendly of Advanced Technology Ventures (ATV), an investment firm. Ethanol is energy intensive to make, and there is the thorny food versus fuel debate.

To anchor alternative energies in reality, Simmons provides a set of criteria: "need to scale to be relevant, need to be non-energy intensive to produce, and need to be available on global basis." Subsequently, his list of options is pretty short. There is nuclear, but it is very water intensive and politically sensitive. Converting coal to liquid is exceptionally expensive. Solar and wind hardly replace oil for transportation. Non-conventional oil is another option but it is very energy and water intensive.

Oceans are one resource Simmons believes is worth researching. "Ocean energy is a sleeper," he says and points out that this powerful force covers 70% of the globe and with 60% of humanity living within about 50 miles of oceans, it has scalability. The possibilities for energy are vast: There are tides, waves,

currents, thermal energy, and aquatic biofuels to investigate. “We know more about Mars than below the surface of our oceans”, Simmons concludes.

Cleantech Investing

The panelists agreed that the push into renewable energy adds up to big opportunity for innovation and value creation. The venture capitalists’ challenge is to figure out how to create real value while solving energy, environmental, and climate problems. To make sense of the burgeoning alternative energy technologies, one of the keys is to build a knowledge map, says Kurzman, to learn all about a technology and its boundaries, and then ask, What takes you to those boundaries?

The intellectual capital factor remains critical. For Andrew Friendly of ATV that means finding creative, intelligent people who are seeking massive change. For example, rather than investing in a relatively efficient light bulb, ATV wants to invest in a business seeking to turn 100% electricity into light. In addition, his firm seeks out companies with proprietary, defensible innovations that have an advantage of at least several cycles of innovation into the future, and address really big markets, say, a billion dollars through a single market channel.

A sampling of companies ATV has invested in include: CaliSolar, an early stage company developing solar products; Coskata, which takes biomass waste to create ethanol; GreatPoint Energy, which is developing advanced coal gasification technologies; and Sub-One Technology, which is developing more efficient valves and pipes for oil and gas distribution. As Friendly points out, these carbon-based energies aren’t going away so we might as well figure out how to use them more efficiently.

Nick Sinai, a Principal with Lehman Brothers Venture Partners, commented that when the firm invests, they look carefully at the quality of the management team but they also seek an active role, with either a seat on the board or a formal observer position. As a mid-stage investor, the typical investment is $5-15 million in privately held firms that have developed a product gaining traction with customers. The firm’s analysts study the basics such as supply and demand, and then target companies with products involving both cheap and clean energy, not one or the other. They are diversified across technology sectors, and they look for firms with a sustainable competitive edge operating in an underserved segment with fewer established competitors.

Massive Capital Required

“Technology is going to be the ultimate resolution to climate change,” observes Schilling. That is most likely true but the capital required to develop and deploy that technology will be tremendous. It might be time to ante up. According to Kurzman, we are out of time — an incremental approach won’t work. Scott Brown of New Energy Capital agrees: If we want to change the direction of climate change, we need to deploy cleantech now. He notes that a new CO2

spewing coal plant comes online in China every week or so, which has a cumulative impact on the environment.

Another driver of cleantech, Brown says, is the “falling cost associated with these technologies. We still wouldn’t be employing a lot of green technologies if they were not fundamentally cost competitive.” But even as the cost of the technology and renewable energy drops, Brown has learned that it still takes an enormous amount of capital to deploy that technology. Traditionally, the energy sector has not been a dynamic business, Brown says, so people are going to have to “take a fundamentally different approach to how capital is deployed” and adjust the timeframe required to employ the technology. Remember, we’re talking about an industry where it can take ten years to build a major new power plant from conception to finish.

To speed the pace, the consensus among panelists is that the government needs to play a critical leadership role in funding early stage technology companies. The carrot and the stick method of motivation — tax credits, rebates, and mandates — is important to push forward.

The opportunities will be there. The Energy Information Administration predicts that over the next 20 years about 30% additional energy capacity will come from renewable sources, which, Browns says, “is a big fundamental shift.” By the year 2020, the market will be $100 to 150 billion. Brown believes that range is merely a floor, because 25 states already have renewable energy standards and mandates that will require about $110 billion in investment alone. Venture capitalists and investment banks are beginning to wade in. There was approximately $2.6 billion in venture capital investment in cleantech in the first three quarters of 2007.

Is Water the Next Oil?

Water faces many of the same issues as energy, including a top priority for an injection of massive capital to bolster the infrastructure. Whether it is the next oil or not was the subject of spirited debate at the Tuck conference. On one issue there is consensus: The water bubble has burst — like oil, it can no longer be treated as having an endless supply. However, water efficiency and conservation expert Amy Vickers hates the question, Is water the next oil? She answers both no and yes. “No, if we get our act together and use it efficiently;” or, she says, “Yes, if we treat it as a commodity only.” Vickers argues that water is not just a commodity; it has “multiple identities and functions.” In the final analysis, she believes the U.S. suffers from a water efficiency problem, not a water shortage problem.

When you study the drought map in the U.S. it looks dire, but it’s not as bad as it seems, says Vickers. Water shortages are more of a result of human activity than irreversible climate patterns. She quotes best selling author and social activist Frances Moore Lappe: “We’re creating scarcity. We’re creating the thing we fear.” As an example she points to Massachusetts where 70% of the streams are under medium high stress even though the population of the state has remained stable. The reason: lawn irrigation. On average, 58% of a U.S.

home's water use is dedicated to the outdoors. Fortunately, indoor use is down thanks to high efficiency fixtures and appliances; however, Vickers notes ominously, "Half of all U.S. homes that will exist by 2030 have not yet been built. Recent studies show that new homes are using 12% to 60% more water than existing homes." It's also important to note that U.S. usage is way above our European counterparts. For example, in Denver the residential water use is 159 gallons per capita per day, whereas in London it is just 39 gallons. We have room for much improvement. Of course, any U.S. troubles are dwarfed by those in China, which has 20% of the world's population and only 5% of the fresh water — and most of it is polluted.

In using water for agriculture there is also a negligent attitude as though water has an endless supply: In the U.S., micro irrigation is only 4% of the total irrigation, whereas in Israel it is 70%. Mass irrigation results in significant waste. Repairing the infrastructure in systems around the globe to prevent water leaks would also go a long way toward averting disaster, Vickers explains. In the U.S. alone it is estimated that 10 to 30 % of the water supplied is lost to leaks. In France it is as high as 50% but in Japan it is a mere 5%. "Do we really have a water shortage, or do we have water waste?" she again asks. To answer the original question, it would certainly appear, for now, that water is the next oil.

Privatize or Regulate?

The discussion on whether water should be privatized or regulated resulted in the most heated debate of the conference as panelists were polarized at times and found little middle ground. Clearly pro-regulation, Vickers believes that government mandates will help conserve water. To make her point she referred to a University of Colorado study of eight cities in 2002 that discovered voluntary water restrictions did not help much. However, restricting lawn irrigation to every third day resulted in 14% water savings and mandatory once-a-week restrictions resulted in 53% savings.

She warns against relying on market pricing to dictate demand because she believes market pricing for water is a weak and unproven tool. She cited a number of reasons: the rate basis is for cost of service only, most states prohibit water utilities from raising excess revenues, there are PUC profit ceilings on private water suppliers, and users are insensitive to the price. In Dallas, for example, the top 10% of customers use 34% of the water and are price insensitive. An average home there uses a whopping 300 gallons a day, with the top dog using 30,000. In places like Dallas, "they don't care what the price is. They're going to use that water."

On the other side of the privatize versus regulate debate, Tracy Mehan, a principal with the Cadmus Group, an environmental consulting firm, is not opposed to "prudent regulation" when it comes to water management, but he believes the market has to sort out supply, demand and pricing issues. "We need to open up the water markets. It may not be fair, may not be equitable, but we have to do everything we can to facilitate opening of markets." Everett sided with Mehan, suggesting that if you let the market work, it will optimize inputs. When

regulated by the government, he warns, it becomes politicized and caters to special interest groups.

There is a role for markets, even in developing countries where “the poor are willing to pay for safe, affordable water and sanitation,” says Yasmina Zaidman, director of portfolio strategies at the Acumen Fund, a global nonprofit venture fund. But she warns, “The water sector faces many distortions, including corruption, supply-side subsidies, and political rhetoric,” adding, “Successful private sector engagement requires strong institutions among government and civil society.” Zaidman warns that in her experience she has never seen “the markets” work on their own in solving problems for those at the bottom of the economic pyramid.

Those people at the bottom of the pyramid are not the only ones who suffer at the hands of a free market. Olivia Zink, field director for PrioritiesNH, a group opposed to water privatization, illustrated examples of market forces going awry in New Hampshire. The water supply for the towns of Hampton and North Hampton was purchased by Aquarion, Zink explains, which is owned by the Kelda Group, a British firm. The water rights were then sold to Macquarie Utilities, which is a member of the Macquarie Group, an Australian investment bank. The towns are naturally concerned that an investment bank isn’t qualified to run a water company, and one based in Australia has little vested interest in a U.S. town, except for increasing rates and maximizing profits. The citizens have engaged in rate battles and are trying to win back control.

Zink feels strongly that laws should be strengthened to protect communities and for the public good. “The human right to drinking water is fundamental to life and health,” concludes Zink, a thought echoed by others.

Full Cost Pricing for Infrastructure

To prevent future water shortages in the U.S. and around the globe, a massive investment in the infrastructure is required — as with alternate energy — but the money is currently not there. As Mehan points out, the reason that such a huge cash infusion is needed is because water has traditionally been subsidized and under priced, and we have failed to recapture the costs of capital invested in it.

As for the wacky valuation or lack thereof that consumers put on water infrastructure, Mehan says consider that the average household spends $707 annually on soda but only $474 on waste water plant fees. And in India consumers spend more money on bottled water than the government spends on water infrastructure. “So we have a tremendous infrastructure gap,” he concludes.

Russell Stepp, CEO of the engineering firm R.W. Beck, Inc., says elected officials are hesitant to raise water rates to cover infrastructure improvements because it will annoy their constituency, the voters. Water has simply been subsidized for too long, and he estimates the increase would need to be almost 30%. The consensus is that water subsidies are the wrong direction. For both water and energy, a resounding conclusion voiced at the conference is to put a

true value on the infrastructure and other externalities. Pricing has to include capital improvements, and, perhaps, conservation and pollution costs should be factored into the equation.

Water Pollution & Scarcity Cost to Society

Worldwide, societies pay a high price for water pollution. Consider that more than 2 million children around the world die from diarrheal disease due to poor water quality, as well as from the lack of hygiene and clinical care, which is a very powerful statistic, says Jeff Albert, co-founder of the Aquaya Institute, a nonprofit dedicated to improving health through clean water. Meanwhile, 1.1 billion people lack access to improved but not necessarily safe water sources. In Kenya half the population does not have access to safe water, and in rural areas women will spend 2 to 6 hours a day just to access water, and often girls are pulled from school to help.

Compounding the issue, the pace of building municipal infrastructure is not keeping up with population growth. All of this “puts a limit on human development and education,” says Albert. Subsequently, regions face handicapped economic development and significant health costs that are a drag on the existing economy.

Polluted African water sources are a particularly sad situation, says Clarice Odhiambo, founder of the Africa Center for Engineering Social Solutions, because the solutions are so simple. As she observed, preventing water borne illnesses does not require rocket science. Education on sanitation to inspire behavior change goes a long way. One success story she lauded is Coca-Cola’s Africa water partnerships. The company has partnered with USAID, among other organizations and corporations, to improve water supply, water storage, hygiene, watershed management, and small-scale garden irrigation in Africa and developing nations. Part of the program’s effort also includes the sharing of best practices, and raising global visibility and support.

Not nearly on the scale of Africa’s troubles, water pollution is also an issue in the U.S., with one of the chief culprits being runoff. “Proper management of urban runoff will improve the overall health of streams, lakes, wetlands, and wildlife,” explains Stepp. “New approaches attempt to restore natural functions, restore previously piped streams, and allow runoff to infiltrate. Methods that best replicate natural pre-developed conditions are considered to be the most ‘sustainable.’”

R. W. Beck worked with the City of Seattle in applying a low impact approach to a residential development that involved 1,600 housing units set within 120 acres. To control runoff they designed it to have “rain gardens, swales, reduced impervious surfaces, and porous pavements to encourage infiltration and minimize runoff,” Stepp explains. Such a design “works in concert with a traditional drainage system to provide greater benefit and a more liveable development.” Smart water stewardship conserves water and protects the water table levels. In this arena, there remains plenty of opportunity for innovation and implementation.

Water and Entrepreneurial Opportunities

For all the grim news on water scarcity and quality, there are business opportunities to be realized, and it does indeed help to talk about water within an economic and financial context so issues like conservation are taken more seriously. In particular, entrepreneurs and inventors should see scarce or compromised resources as opportunities to innovate, including product design, delivery, pricing, and financing.

In surveying markets of developing nations, a major hurdle to encouraging entrepreneurial activity to solve water scarcity is that two-thirds of the world's population is making less than $4 a day — and many of these people are potential customers. The challenge is how to encourage entrepreneurs to serve this market segment so they can purchase affordable water and other products, explains Yasmina Zaidman, of the Acumen Fund.

"The poor want to participate in fair markets," Zaidman says, but she points out, "Markets alone have not delivered critical goods and services." Government programs and non-profits cannot fill the entire void, so Acumen has developed a unique model to seed and nurture businesses that serve the poor. There are six phases to the model: raise philanthropic money from individuals and institutions, identify enterprises, invest loans and equity, provide managerial assistance, re-invest returns, and share successes and lessons.

In determining which enterprises to support, Acumen uses investment criteria similar to that used by alternate-energy investors when evaluating the business and its product:

(1) Does it address a significant social problem with unmet needs?
(2) Is the approach financially sustainable?
(3) Is there scalability potential, e.g., can be rolled out to reach 1 million people in 5 years?
(4) Does the enterprise exhibit outstanding leadership?
(5) Does it fit with Acumen's philosophy?

To date, the fund has invested $27 million in the water, health, housing, and energy industries of 25 countries.

Zaidman cited several success stories. In 2004 the fund invested $600,000 in equity and then two years later provided a $294,000 loan guarantee to WaterHealth International. The CFO happens to be David Katz, who graduated from Dartmouth College with a BA in economics and mathematics. Among other products, WaterHealth International makes mini water filtration plants that use UV rays and serve about 5,000 people each in India. To date, the company has impacted some 500,000 people. Another investment is in IDG India, which developed drip irrigation equipment that cost $20-$40 — a price affordable to small farmers. Being able to use that method of irrigation translates to a two to four fold increase in crop yield.

Other examples of successfully serving the poor include water filters made of porous ceramic and hand pumps developed by UNICEF, the use of which have spread quickly in places like Cambodia, China, India, and Latin America.

Without requiring a major investment, such point-of-use water solutions can be successful, whether they be water purification pills, filters, or treadle pumps.

Much more innovation is needed, says Zaidman. However, she warns that many poor communities have a mistrust of a private sector approach to solutions, which hinders economic development. Another roadblock is the entrepreneur who is reluctant to assume all the risk in developing solutions. She espouses risk-sharing between the private, public, and nonprofit sectors.

Intellectual Capital Needs & Technology Transfer

In addition to risk, another roadblock to seeding businesses in developing nations is the lack of intellectual capital. Clarice Odhiambo, a Kenyan and chemical engineer who studied at the University of Rhode Island, Brown University, and the Massachusetts Institute of Technology, observes that it is difficult to get those educated abroad to return. Her Africa center's mission is to seek breakthrough solutions, develop models of sustainability, and "connect the needy with those who can provide to the needy." To achieve that vision Odhiambo must be able to enlist local talent.

Zaidman agrees that more "indigenous leadership" is needed. Toward that end, the Acumen Fund started a Fellows Program, which "selects young professionals each year and provides them with the chance to effect real social change through Acumen portfolio organizations in Kenya, Tanzania, South Africa, India and Pakistan." For a full year the fellows work with the Acumen team and local entrepreneurs.

Yet another hurdle is the ability to share technological solutions that work within the constraints of available local resources. Technology transfer is especially a problem in rural areas. For example, homemade irrigation solutions in India that use steel are not ideal for Africa where there simply is no steel. Or, it does little good to install a foreign made pump that will require special order parts to fix. Local communities need the ability to make repairs and be self-reliant. An example of a success is a treadle pump for micro irrigation that was invented in Indonesia using bamboo, then adapted and imported to Africa by the nonprofit organization KickStart, which aids farmers in Kenya, Tanzania, and Mali.

Corporate Responsibility and Sustainability at Coca-Cola Enterprises

Discovering real business opportunities in water stewardship, conservation, and alternative energy is not limited to entrepreneurs or developing nations. An ideal case study is Coca-Cola Enterprises Inc. (CCE), which is the largest bottler of Coca-Cola beverages in the world. CCE uses some 36 gigaliters of water in distributing about 2 billion cases, consumes a huge amount of plastic and other resources in over 400 North American facilities, and has a massive fleet of more than 20,000 delivery vehicles. That's no small carbon footprint, so integrating the triple bottom line or a corporate responsibility and sustainability program (CRS) into the strategic plan can greatly improve net income.

When John Brock, Chairman and CEO of CCE, joined the Fortune 120 company two years ago, the company had recently begun to increase its emphasis on its sustainability program, which previously was focused on community involvement and philanthropy. Also at that time, growth for CCE was flat. They were losing to Pepsi and the market was tough as new products like vitamin water took hold and obesity concerns dampened sales of full-calorie sparkling drinks.

To re-energize the company, Brock helped create the company's first global operating framework with the goal of being the best beverage sales and customer service company. He made it a goal for CCE to have the number 1 or 2 beverage in each category in which they compete. He was also determined to institute a cutting edge sustainability program that included a board level CRS committee to create oversight and accountability throughout the organization. It encompassed five areas of focus: water stewardship; sustainable packaging/recycling; energy conservation/climate change; product portfolio/well-being; and diverse and inclusive culture.

Brock's goal for water stewardship is aggressive. CCE is working to establish a water sustainable operation in which they use one liter of water for every liter of product they produce — what they call water neutrality. He aims to reduce CCE's plant water use ratio by 10% by 2010. In achieving such goals, CCE is transferring best practices from plant to plant, working on protecting and preserving watersheds, partnering with the communities within which they operate to promote sustainability, and cooperating with government agencies, NGOs and non-profits. Brock believes there is much more cooperation today than five years ago.

Packaging offers opportunities for conservation and cost-cutting. In bottling their Dasani water, CCE has introduced a plastic reduction project using proprietary technology that has resulted in using 30% less plastic than five years ago. On the consumer side, Brock is concerned that U.S. recycling rates are not going up, and will rely on Coca-Cola Recycling, a subsidiary of CCE launched in 2007, to focus on recovering and recycling the equivalent of 100 percent of their packaging, thus helping to increase recycling rates. He touted The Coca-Cola Company and the New United Resource Recovery Corporation (NURRC) for building the largest recycling facility in the world in Spartanburg, South Carolina, which is slated to be fully operational in 2009. It should be noted, however, that the Spartanburg facility was built partly due to years of pressure from environmental groups. It is now expected that over the next ten years the Spartanburg facility will eliminate one million metric tons of carbon dioxide emissions — essentially the same as removing 215,000 cars from the road.

Other conservation programs CCE is putting in place include the reduction of CO2 emissions at bottling plants, more efficient in-store display coolers that use on average 20% less energy, and an expanded hybrid truck rollout plan. The dilemma CCE faces with coolers is that the open display model sells much more product than the more efficient closed-door one, but Brock says they are working on ways to make all sales and marketing equipment more energy efficient. As for hybrid trucks, since 2003 CCE has put more than 140 of them on the road that

use 37% less fuel and create 32% fewer emissions. By the end of 2008, CCE will have the largest heavy-duty delivery fleet on the road in North America. However, one of the roadblocks to rolling out more such vehicles — and a theme heard throughout the conference — is the higher cost associated with buying them.

While health and well-being may seem tangential to sustainability, it is indeed intertwined because of the high cost of health care associated with obesity. Brock is determined to offer a balanced portfolio of products that offers a wide variety of beverages for consumers to choose from. The company is also participating in a program to cap the caloric content for all beverages sold in schools. “It’s tough to figure out how to sell fewer drinks, but it’s the right thing to do,” says Brock. The program is also generating goodwill among consumers, which pays dividends.

To execute the CRS program, as well as achieve strategic priorities, Brock needs good people who feel like they are making a contribution — that is where the final piece of creating a diverse and inclusive culture fits in.

CRS programs are gaining traction among the corporate giants, Brock claims. For example, in the fall of 2007 Wal-Mart hosted a summit meeting for its top 300 suppliers to promote CRS, particularly cutting down on packaging waste and to use more eco-friendly materials. Considering that Wal-Mart is CCE’s biggest customer, selling 19% of their products, Brock is very open to working with the giant retailer to lower their carbon footprint. As Brock will tell you, “Sustainability is a journey, not a destination.”

Transparency and Shareholder Resolutions

No CRS program will catch on unless there is transparency, a notion that was echoed throughout the conference. Investors are also demanding greater disclosure on responses to and strategies for climate-related business trends. Silman explains, “In 2007, a record 42 climate-related shareholder resolutions were filed with the SEC, while three years ago there were only 20.” The 42 companies represent $200 billion in assets. Fifteen companies, including ConocoPhillips, Wells Fargo, and Hartford Insurance, took positive action on climate change, with seven establishing specific GHG reduction targets for operations and products.

NGOs like Climate Counts, which annually scores companies’ efforts to address climate change, aid in improving transparency. Climate Counts looks at criteria within four major benchmarks: reviewing/measuring impact, reducing emissions, taking a policy stance; and reporting. Wood Turner of Climate Counts believes that “consumers are busy, overwhelmed and need help making sense of what’s happening.” Another factor in improving transparency is the new media age that includes the internet, which disperses information faster and more widely than ever before.

Schilling of GE pledges that his company will be transparent in how and to what degree GE reduces its carbon footprint. For three years GE has been reporting greenhouse gas emissions. When it comes to meeting standards and

reporting accurately, Schilling says, “Why give your enemies another stick to beat you with by not doing this?” At PG&E, Sienna Rogers faces the same situation. As an energy company with a sizeable carbon footprint, they must act in good faith, because consumers hold them accountable.

To improve corporate transparency, CSX’s Renjel believes companies need to join organizations like U.S. Climate Action Partnership (USCAP) or programs sponsored by the EPA. After all, when companies claim to be green the public wants proof, and third parties can help provide it. The consensus is that third party review goes a long way toward keeping companies honest. In turn, to keep third parties honest, there needs to be strict guidelines and standardization when appropriate for evaluating greenness.

What is required to disclose “is a minefield,” says Silman. We are in a period of limbo and some companies are looking to the SEC to take the lead, but it has yet to respond, according to Silman. Potential requirements include disclosure only for sectors immediately impacted by GHG regulation or climate change that presents a material risk, and the publication of sustainability reports. Insurance companies, for example, face serious financial risk as climate patterns change, so investors must be made aware of their exposure. In the oil industry transparency concerning oil field reserves and production is one of Simmons’s pet peeves. He believes it must be “mandated ASAP.” Unfortunately oil producing countries and companies want the competitive edge or the power of controlling information. “We need a big cultural revolution to change people’s mindset,” says Simmons, when it comes to sharing data.

A Balanced Approach to Solutions

Any solutions to climate change and scarcity of resources will require a balanced, realistic approach because there is an obvious tension between conservation and profits. It is a serious challenge for companies like GE to balance environmental policies with profits. For example, GE has a gas-fired cogen power plant in Linden, New Jersey, that produces the highest level of CO2 emissions in the state. Under the current business model, Schilling says, the power contractor is “incentivized” to buy more power for resale regardless of the carbon emissions.

All energy companies face the same tension, so this link between usage and profits needs to be de-coupled and there is a movement afoot to do just that. Public utility commissions need to come up with new rules to eliminate this inherent tension that includes incentives for companies to encourage consumers to use less. Silman explains that currently there is “no creativity about recapturing money for utilities if there’s a push for efficiency and conservation.” Again, balance must be achieved.

There is also the issue of many companies already having a huge investment in existing, less-efficient power plants that they just can’t walk away from. Schilling explains that GE will balance its coal-fired power plant investments with renewable energy, cleantech investing, and GHG emissions cuts. In its search for solutions, GE has joined USCAP, which is comprised of

corporations and NGOs. The company realizes that these voluntary efforts will be a catalyst for regulatory changes so it might as well be onboard and ahead of the game. As Schilling bluntly put it, “It is better to be at the table than on it.”

One of the topics USCAP is tackling is a cap and trade program that would set a mandatory nationwide limit, or cap, on carbon dioxide emissions and create a market in which those allowances could be traded. Cap and trade legislation is being kicked around in the U.S. Congress with the goal to have a bill ready by the end of 2008. The issues being debated include sector vs. economy-wide cap timing, the percent reductions, allocation vs. auction of allowances, and additional incentives for research and development. Certain members of USCAP are pushing for cap and trade to apply to all business sectors and are seeking a 10-30% reduction in GHG in 15 years and 60-80% by 2050. There will be costs associated with such reductions, of course, so the next great debate is who should be responsible for picking up the tab?

Another consideration is changing basic business models and behavior. Simmons questions the wisdom of the “globalized” manufacturing of products in terms of the oil required to ship them. “Grow foods at home. Make goods locally,” he says. “To change how we consume oil, you can’t just get your book club together and say, hey, let’s do this.” It will require massive change and international cooperation on the scale of the Marshall Plan.

Personal Behavior Must Change

Behavior change is the last piece of the puzzle. Clearly, there is an undisputable awareness that environmental issues and climate change will impact us all, but the big question is, Will consumers change their behavior and do their share to improve conservation, reverse climate change, and generally act in an environmentally responsible way?

“Why can’t we climate activists change the 21st century the way anti-apartheid activism changed the 20th century?” challenges Wood Turner. He desires to energize the consumer because the consumer has the power to force companies to change, but that means consumers have to change.

“Consumers don’t want to solve or pay for solutions,” says Hintz of McKinsey. “There is a disconnect here.” When it comes to eco-friendly products, for example, they are reluctant to pay premiums. Part of the problem is that, whatever the product, people have to see the value, the health and environmental implications, in concrete terms. For example, the natural household products maker Seventh Generation charges a premium, and you won’t find their products in Wal-Mart. Gregor Barnum, director of corporate consciousness, at Seventh Generation, acknowledges that this might have to change for eco-friendly products to truly go mainstream.

“People don’t react until they’re faced with a disaster,” offers Linstroth. Schilling of GE also takes the gloomy perspective that consumers won’t change their behavior, generally speaking, which raises the question of whether the government will have to force change. But here Silman warns, “When you start regulating personal behavior, it’s a political football that’s very difficult.” To

mitigate peak oil, Simmons's common sense argument is to indeed rely on behavior change to use less oil because substitution by other energy sources is unlikely. His list was topped by "travel less." He suggests a lifestyle reengineering of sorts that involves "less long distance commuting" by liberating the workforce. The liberation comes in the form of "pay by productivity" so that people can adopt flexible work rules and hours governing where and when they work. Gary Lawrence of Arup notes, "We need a consistent message. We need to make it a national security issue, and people need to demand policy change."

A conclusion that a number of panelists voiced is that we need a new framework of thinking when addressing oil and water problems. "We can't get to a more sustainable future by asking the same questions and providing the same answers," says Lawrence. "We have to be aggressive about thinking what cities are for— what urban centers are for — and how they best serve society."

Gregor Barnum believes our eco-friendly state of mind is still sitting in the 1990s, and we need to think about what is needed to get to the next level. Barnum wants the kind of thinking, for example, that goes beyond improving upon energy efficient washing machines to clothes that clean themselves. It's about challenging existing frameworks. How do you really do more with less? The answer involves untangling complex issues, but from the Tuck conference, one answer concerning sustainability became clear: We all need to act, and we all need to act now.