



Drumbeat: October 19, 2009

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Topic: [Miscellaneous](#)

[Shifting the world to 100 percent clean, renewable energy as early as 2030 - here are the numbers](#)

Most of the technology needed to shift the world from fossil fuel to clean, renewable energy already exists. Implementing that technology requires overcoming obstacles in planning and politics, but doing so could result in a 30 percent decrease in global power demand, say Stanford civil and environmental engineering Professor Mark Z. Jacobson and University of California-Davis researcher Mark Delucchi.

To make clear the extent of those hurdles – and how they could be overcome – they have written an article that is the cover story in the November issue of *Scientific American*. In it, they present new research mapping out and evaluating a quantitative plan for powering the entire world on wind, water and solar energy, including an assessment of the materials needed and costs. And it will ultimately be cheaper than sticking with fossil fuel or going nuclear, they say.

The key is turning to wind, water and solar energy to generate electrical power – making a massive commitment to them – and eliminating combustion as a way to generate power for vehicles as well as for normal electricity use.

[Reuters.com/article/bondsNews/idUSN1939479420091019?rpc=401&">U.S. MMS approves Shell's 2010 Beaufort Sea plan](#)

ANCHORAGE, Alaska (Reuters) - Royal Dutch Shell's (RDSa.L) plan to drill two wells on leases in Alaska's Beaufort Sea next year won approval on Monday from the U.S. Minerals Management Service.

The exploration plan calls for Shell to drill two wells on leases located 16 and 23 miles offshore from Point Thomson and would replace an earlier, never-executed program in which Shell was proposing to drill a dozen or more wells over three years at Sivulliq and elsewhere in the Beaufort.

[EPA: Indiana must rewrite BP refinery air permit](#)

INDIANAPOLIS (AP) -- Federal officials ordered Indiana on Monday to rewrite an air permit for BP PLC's Whiting refinery, concluding the state may not have fully assessed all the new emissions a big expansion of the refinery will produce.

[DOE buys geothermal plant in Wyoming](#)

CASPER, Wyo. -- The U.S. Energy Department has bought a geothermal plant north of Casper for an undisclosed amount.

Ormat Technologies, of Reno, Nev., built the test plant at the Teapot Dome oil field to prove the technical feasibility of using hot water associated with oil production to generate electricity.

The plant was designed to produce 250 kilowatts of electricity. It has been operating for over a year, providing electricity to operate the oil wells.

[Sustainability 'is key' in rural communities' survival fight](#)

Rural communities are being urged to fast-forward their plans for sustainability and self-sufficiency if they are to survive and thrive in the future.

The Warwickshire Rural Community Council is hosting an event to help people share information and find solutions about how to become more sustainable.

[The GOOD 100: The Oil Drum](#)

We're running out of oil, but search for the phrase "peak oil" on the websites of 31 major U.S. newspapers, and you'll get a mere 941 hits, total. That's the kind of thing the Oil Drum would like to address. The online think tank, launched in 2005, is filling that void with grounded writing on natural resources and energy.

[Margaret Atwood On Tour](#)

Looming over all of this peppy tech chat is the Shadow That Must Not Be Named. It's actually two shadows. First, the servers that make the Web run are now emitting a huge amount of heat and a big pile of carbon from the energy used to run and cool them. But Iceland is standing by, with carbon-free geothermal power in a cool climate.

The second shadow isn't specific to the Web: it's Peak Oil, which will be followed by a decline in cheap plastic, without which none of these online goodies can survive. But meanwhile, the technobookotronobiblioagonosphere will be making lulz while the sun shines.

[Shifting the world to 100 percent clean, renewable energy as early as 2030 - here are the numbers](#)

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[Reflections from Colin Campbell on Peak Oil and ASPO](#)

Question: Please reflect on the evolution of ASPO and your evolution of peak oil thinking. Maybe you can start by touching on your studies while in the industry.

Campbell: My interest in peak oil goes back a long time. Of course it was not initially identified as peak oil. I was asked by the company I worked for to make a study of Columbia in 1966 and in the course of doing that I looked all the different basins of Columbia. I saw how many wells had been drilled, what they had found, what the underlying geology delivered and even then, as long ago as 1966, it was evident that there were certain limits. Some areas not yet fully explored were very promising and indeed they've turned out to be productive. Others you could say just didn't have what it took, nor have they delivered since. So, that was my first understanding of this subject. But in those days I had no global feeling in any way. It was just what I thought about a small country in Latin America.

[Report examines hidden costs of energy production and use](#)

WASHINGTON -- A new report from the National Research Council examines and, when possible, estimates "hidden" costs of energy production and use -- such as the damage air pollution imposes on human health -- that are not reflected in market prices of coal, oil, other energy sources, or the electricity and gasoline produced from them. The report estimates dollar values for several major components of these costs. The damages the committee was able to quantify were an estimated \$120 billion in the U.S.

in 2005, a number that reflects primarily health damages from air pollution associated with electricity generation and motor vehicle transportation. The figure does not include damages from climate change, harm to ecosystems, effects of some air pollutants such as mercury, and risks to national security, which the report examines but does not monetize.

Requested by Congress, the report assesses what economists call external effects caused by various energy sources over their entire life cycle -- for example, not only the pollution generated when gasoline is used to run a car but also the pollution created by extracting and refining oil and transporting fuel to gas stations. Because these effects are not reflected in energy prices, government, businesses and consumers may not realize the full impact of their choices. When such market failures occur, a case can be made for government interventions -- such as regulations, taxes or tradable permits -- to address these external costs, the report says.

[China, The Global Carry Trade and Oil](#)

What really caused the oil price to collapse? Philip Treick says it's not what everybody believes.

Conventional thinking believes the oil price collapsed because of the dropping global demand from a worldwide recession sparked by the US sub-prime fallout.

Treick, founder and principal of Thermopolis Partners LLC, has a slightly different view. He explains how everything – the oil price collapse, the global economy collapse – started with an unannounced policy change in China towards its currency.

[Asian Catalyst Spurs Oil's Renewed Advance](#)

A year ago, Asian exports were falling off a cliff, and economists were predicting the worst recession in 50 years. But the winds have turned quickly and Asia now appears to be experiencing its fastest recovery in 50 years. This is already affecting oil prices and will do so even more in coming months.

Just as Asian demand drove oil prices up in the boom years, a new wave of Asian demand will probably push prices higher again, economists say.

[Iraq picks up pace on oil deals, elections loom](#)

ISTANBUL (Reuters) - Iraq is poised in the coming weeks to sign a series of deals that promise to lure the tens of billions of dollars it needs to become one of the world's elite oil producers.

In addition to signing contracts already being negotiated, the world's largest energy

companies will face off in December in a second fierce competition to develop some of the country's largest untapped oilfields.

[Exxon Found Liable for Fouling New York City Water](#)

(Bloomberg) -- Exxon Mobil Corp. was ordered to pay \$104.7 million in damages after a jury found the company liable for poisoning New York City water wells with a gasoline additive meant to improve air quality.

A federal jury in New York ruled in the city's favor today. New York accused Exxon Mobil, the biggest U.S. oil company, of contaminating five wells in and near the Jamaica area of the borough of Queens with methyl tertiary butyl ether, or MTBE.

The city sought \$250.5 million to treat the water.

[Seminole school employees get short summer work week](#)

Every energy crisis has its silver lining. Just ask the oil companies as they count their profits.

For Seminole school district employees it will be a four day work week again next summer.

[Technology environmentally cleaner; Fuel cells answer to energy crisis](#)

As the world searches for a solution that would balance the energy crisis and global warming, Dr Ayman Al-Qattan returns to a very old technology, which was at the time of its inception upstaged by the more impressive steam power.

Fuel cells, says Al-Qattan, are the answer to the crises. However, there are challenges, principally that of costs, to make this proven technology a reality. There are also other solutions such as collective power generation, where every house would contribute power generated from rooftops to a centralized grid to meet the energy needs of a whole nation. A sort of cottage industry in electricity production.

[Utilities Take a Shine to Solar Power](#)

Solar energy, such as the 250 MW SunPower PV facility, increasingly is being developed at utility scale. Bolstered by lower costs (due in part to market imbalances that currently favor buyers), state renewable portfolio standards, federal incentives and even a bit of creative thinking, solar energy is gaining a foothold in many utility

companies' generation portfolios.

[Energy Firms Are Split on Bill to Battle Climate Change](#)

WASHINGTON — As the Senate prepares to tackle global warming, the nation's energy producers, once united, are battling one another over policy decisions worth hundreds of billions of dollars in coming decades.

Producers of natural gas are battling their erstwhile allies, the oil companies. Electrical utilities are fighting among themselves over the use of coal versus wind power or other renewable energy. Coal companies are battling natural gas firms over which should be used to produce electricity. And the renewable power industry is elbowing for advantage against all of them.

[The Oceans are Coming](#)

And what of that lodestone, global sea level? This happens to be a very interesting question, because ocean levels are set to rise dramatically. According to UCLA scientists, the last time carbon dioxide levels were as high as they are today was 15 million years ago. At that time, the sea level was between 20 and 36 metres higher (75 to 120 feet), there was no permanent ice cap in the arctic, and very little ice in Antarctica or Greenland. That is where we are headed. The only remaining question is, How long will it take us to get there?

[Energy Star Appliances May Not All Be Efficient, Audit Finds](#)

WASHINGTON — The Energy Department has concluded in an internal audit that it does not properly track whether manufacturers that give their appliances an Energy Star label have met the required specifications for energy efficiency.

[A tale of how it turned out right](#)

Western governments, including the UK's, are desperate to restore the global economy along "business as usual" lines. But, argues Andrew Simms, that is a short-sighted approach; a radical, green-tinged redevelopment would bring much bigger environmental, social and economic benefits.

[\\$70 a Barrel: A New Floor for the Oil Industry?](#)

NEW YORK — After years of volatility, oil prices have found a level that seems to satisfy producing nations, oil companies and major consumers.

But in the wake of the economic crisis and the collapse in demand, a new reality has also set across the petroleum industry. Today's price of around \$70 a barrel is increasingly viewed as a new floor for the industry.

Below that level, oil executives warn that they will find it difficult to expand production or invest in new exploration projects.

Few petroleum executives imagine returning to a world where oil prices trade at \$20 a barrel, their average throughout the 1990s. In fact, many are saying that spending in the industry has been crimped and projects have been delayed since oil prices dropped from last year's highs.

Companies are feeling the crunch throughout the industry. ConocoPhillips, for example, said recently that it would cut its capital budget by 12 percent next year, and planned to sell assets worth \$10 billion over the next two years to reduce its debt ratios.

[Chevron's CEO Warns of Possible Oil Shortage in Next Decade](#)

Chevron Corp. Chairman and Chief Executive David O'Reilly on Sunday warned of a potential oil supply shortfall midway through the next decade that could potentially trigger a substantial increase in prices.

While reiterating Chevron's 2009 capital spending budget of US \$22.8 billion, O'Reilly said there is enough output capacity either on line or coming on line to prevent a supply imbalance in the near term.

But the world could face a supply challenge beyond the next three-to-five years if companies don't invest enough in production as the global population rises and living standards improve, he said.

[Russia Gains at OPEC's Expense](#)

MOSCOW — While OPEC members limped through a period of painful production cuts this year, Russian oil companies enjoyed an extraordinary run.

The year that has gone by since Russian officials floated — and then retracted — a proposal to coordinate production limits with the Organization of the Petroleum Exporting Countries illustrates why the Kremlin is unlikely ever to actually do so.

Already the world's largest oil producing nation, Russia, pumping prodigiously through the downturn, this summer passed another milestone. As Saudi Arabia tightened its belt to live by OPEC cuts, Russia surpassed it to become the world's largest exporter.

[Algeria Struggles to Realize Natural Gas Potential](#)

PARIS — Despite ambitious plans to expand natural gas exports, Algeria risks seeing its share of the European market dwindle as it struggles to develop new fields and attract foreign investment, analysts say.

[Barron's: Africa's Fields of Dreams](#)

Until relatively recently, big oil gave little thought to sub-Saharan Africa beyond the coast of Nigeria and Angola. That's changing rapidly after a significant find off the Atlantic coast of Sierra Leone, where both Anadarko Petroleum and U.K.-based Tullow have exploration licenses, and another strike in Uganda, where Tullow operates.

[The Dilemma of Aging Nuclear Plants](#)

Contractors generally designed plants to last for 40 years — a standard enshrined in the United States in the adoption by the Nuclear Regulatory Commission, or N.R.C., of a 40-year licensing regime.

A large part of the world's installed nuclear power capacity is now coming to the end of that designed life span.

[Considering Thorium as an Alternative Fuel for Nuclear Energy](#)

PARIS — For decades, scientists have dreamed about turning thorium — an element that is less radioactive and produces less nuclear waste than uranium — into an alternative fuel for nuclear energy. Recent technological developments may be bringing the dream closer to reality.

[API: Study Shows Canadian Oil Sands a Boon to US Economy](#)

The economic impact of oil sands development in neighboring Canada is a boon for the U.S. economy and is expected to lead to the creation of more than 342,000 new U.S. jobs between 2011 and 2015, a new study by the Canadian Energy Research Institute (CERI) finds.

[Global warming fund faces cuts](#)

ALBANY -- The organizer of a global effort to fight climate change said Gov. David Paterson's raid of millions of dollars from a state climate change program sends "a terrible message" just weeks before world leaders meet to discuss the issue.

With the international climate change summit set in early December in Copenhagen, "we can only hope that the rest of the world has not been paying attention to what has just

happened in New York," said environmental author Bill McKibben, who is organizing a global campaign that will host events around the world to urge political leaders to embrace dramatic greenhouse gas reductions.

[Supply and Debate](#): *Peak oil advocates Matthew Simmons and Kjell Aleklett say Daniel Yergin has the future of energy all wrong.*

Daniel Yergin muses that oil, celebrating its 150th birthday this year, has never been in better shape ("It's Still the One," September/October 2009). He argues that the world's endowment of oil is larger than ever, despite a century and a half of constant use and a world consumption of more than 85 million barrels daily.

How terrific the world's outlook would be if Yergin's argument had even a touch of reality! Sadly, however, if one ignores opinion and simply adheres to well-documented facts, it quickly becomes clear that his assertions are utterly without substance.

[Eastern economic promise holds little hope for western growth](#)

A world of diminished expectations is going to come as quite a shock, especially if, as some believe, the trend is permanent. Writing in the latest New Left Review, Gopal Balakrishnan muses on the advent of the Stationary State, concluding that the "Indian summer of reflatd American power" has come to an end, with nothing to take its place.

In a bleak assessment, Balakrishnan dismisses the idea that China or Europe can become the new driving force behind a reinvigorated capitalism. "We are entering into a period of inconclusive struggles between a weakened capitalism and dispersed agencies of opposition, within delegitimated and insolvent political orders. The end of history could be thought to begin when no project of global scope is left standing, and a new kind of 'worldlessness' and drift begins." That's all a roundabout way of saying we've reached the end of the road.

Those of a more cheerful disposition might prefer the latest piece from the New Economics Foundation, *The Great Transition*, published today. NEF says the crisis marks not the end but a fork in the road, with the choice between the climate change disaster and social catastrophe of a return to business as usual, and policies designed to deliver fairness, sustainability and well-being.

[The Pickens Plan: What Went Wrong](#)

A lot has happened since we taped our interview with billionaire oil and wind tycoon T. Boone Pickens on our show "Intelligent Investing With Steve Forbes" Sept. 2, 2008. Unfortunately, not much of it was good. Now, in honor of his upcoming second visit with Steve Forbes we revisit what happened to T. Boone Pickens and his plan.

[The Coming Boom in Oil Recovery](#)

I believe that the peak oil argument has been oversimplified to the point that adherents can't comprehend any outcome except for a disastrous global oil shortage. Ever-rising Chinese automobile sales might lead us down that path but I see some innovative solutions that don't require much exploration.

I spoke about the coming boom in enhanced oil recovery at several conferences last year, but this big-picture concept is moving to the forefront. We know that, on average, only one-third of the original oil in place (OOIP) found in oil fields is produced. The other two-thirds is stranded.

[Shale speculation off base](#)

At a time when we are seeking solutions to our long-term energy questions, it is too bad that progress can be clouded by misinformation.

"Gas shale's future is uncertain" (Associated Press business story, Oct. 13) cast inexplicable doubt on a new resource that has changed the landscape of our energy future. Geological consultant Arthur Berman has been making a name for himself recently by writing columns and giving speeches that question the long-term viability of shale as a source of natural gas.

[Oil retreats from one-year high above \\$79](#)

LONDON (Reuters) - Oil hit a year-high above \$79 a barrel on Monday, driven by bullish sentiment across financial markets, but later slipped back as traders questioned whether ample fuel supplies justified current price levels.

U.S. crude for November delivery touched a session high of \$79.05 in early trade, the strongest since October last year, before paring gains to \$78.30 by 1111 GMT, down 23 cents from the previous close.

[Could rising oil prices stunt stock rally?](#)

Investors may be pleased to see stock prices hitting highs this year, but there's something else soaring that's a bit scary: oil prices.

Oil prices are storming higher because investors anticipate stronger global demand as factories, cars and idled production facilities creak back to life.

Gains in oil prices are head-turning. The price of a barrel of oil has jumped to more than \$78, a high this year and a staggering 76% rise in 2009. That gain dwarfs stocks' 20.4%

increase this year as measured by the Standard & Poor's 500.

Most troubling, though, is that the last time oil started spiking was late 2007. That jump in energy prices helped start a decline that knocked stocks into the worst bear market since the Depression.

[Angolan Crude Exports Scheduled to Drop in December](#)

(Bloomberg) -- Angola's daily crude oil shipments are scheduled to drop a second month in December, bringing exports closer to the country's OPEC quota.

[Felipe Calderon's power play](#)

Dissolving a state-run electricity utility was either a cynical political move or a financially sound decision.

[Dual approach is route to cheaper power](#)

Finding the cheapest gas and electricity supply has become more urgent than ever as regulator Ofgem has predicted that fuel bills could soar by as much as 60% over the next seven years.

This is due to a combination of factors, including a lack of investment in alternative fuels as well as dwindling gas and coal reserves.

[Kuwait to revive \\$14 billion refinery project](#)

Kuwait's development minister says the government will revive the \$14 billion project to build its fourth oil refinery, which was scrapped in March on corruption allegations.

[Oil sands get 'disproportionate' bad reputation](#)

WASHINGTON - Canada's new ambassador to the United States said Alberta's oil sands are facing a "disproportionate amount" of criticism in the climate-change debate -- arguing North America risks missing "the big picture" on global warming if Canadian oil is singled out as the chief carbon emissions culprit.

[China May Stumble in Race With Rivals for African Oil](#)

(Bloomberg) -- China's plans to buy into oil fields in Africa may suffer a third setback in

as many months if Exxon Mobil Corp. succeeds in snapping up drilling rights in Ghana, one of the continent's newest oil nations.

[Russian pipeline intact after bomb attack](#)

An explosion injured a man but did not damage gas pipeline yesterday in a series of attacks on Russia's southern regions.

The bomb exploded as a man tried to plant it under the gas pipeline, tearing off his arms at the wrists, Itar-Tass news agency reported citing local security officials.

[Nigeria Offers Delta Residents 10% of Oil Projects, FT Reports](#)

(Bloomberg) -- Nigeria proposes to give 10 percent of its oil and gas ventures in the Niger Delta to the area's inhabitants in a bid to stem rebel attacks that restricted oil production by sub-Saharan Africa's biggest energy supplier, the Financial Times reported.

[Iran pushes South Pars deadline on Turkey](#)

Tehran has given state oil company Turkish Petroleum a one-month deadline to finalise a \$3.5 billion deal to develop part of the world's largest gas field in Iran, according to reports.

[Managing Through the Forces of Change](#)

What are the factors affecting fueling? Start with the notion of peak oil; whether you believe in a practical geological peak or not (this author does not), there is little doubt we have a political peak being orchestrated by Washington. Corporate Average Fuel Economy will cut into total annual consumption by at least 20 billion gallons over the next 10 years. Combine that with some sort of carbon legislation that will surely add between 40 cents and \$1 per gallon to the price of oil, and even the normal 2-percent growth in average annual mileage driven experienced in non-recessionary times will be overwhelmed by both mandated and price-induced rationing.

[Our biggest environmental challenge](#)

For many people, the most critical environmental challenge facing our beautiful, blue planet is climate change. For others, it's peak oil, that scenario where we run out of the fossil fuels that make life as we know it possible. For still others, it's access to clean, healthy water.

They're all valid finalists, but if truth be acknowledged, none of these qualify as our biggest challenge. To find that, we need to look upstream at what's behind each of these issues.

The answer we find there is likely no more palatable to you than it is to me.

The problem is us, collectively - or more precisely our exploding population and insatiable consumption.

[Do Increased Energy Costs Offer Opportunities for a New Agriculture?](#)

One of the great missteps in most of the future energy scenarios propagated in the popular media is the notion that we can transition to “alternative, renewable energy” and thereby “wean ourselves from Mideast oil.” The underlying assumptions in this scenario seem to be that energy supply is an isolated challenge that can be solved without major systemic changes, that we can meet that challenge by simply switching from one energy source to another — from fossil fuels to wind, solar, biofuels or a host of other alternatives — and that our current industrial culture and economy then can continue on the present course.

Probably nothing could be farther from the truth. As Richard Heinberg points out, “Making existing petroleum-reliant communities truly sustainable is a huge task. Virtually every system must be redesigned — from transport to food, sanitation, health care, and manufacturing.”

['Britain an ideal location for new nuclear power'](#)

A nuclear renaissance in the UK presents a tremendous opportunity. It has the potential to supply us with substantial amounts of home-grown, low-carbon, reliable and relatively cheap energy. That is why the government is facilitating a new generation of nuclear power: removing regulatory barriers, making the planning system fairer and faster, and creating more certainty for communities and industry.

Climate change and the need to replace ageing power stations mean this is the right thing to do. It is in our long-term national interest. We need to transform our energy sector, replacing old infrastructure with high-tech, low-carbon energy sources. Nuclear energy, alongside a tenfold increase in renewables and investing in clean coal, will be central.

[Nations Leave 91% of Green Stimulus Funds Unspent](#)

(Bloomberg) -- The U.S., China and major economies around the world are still holding about 91 percent of the \$177 billion in stimulus money promised for clean-energy development because most projects haven't been evaluated, a report showed.

Administrative hurdles remain for the majority of developers, with just 9 percent of the total funds having been disbursed from economic-stimulus programs designed to pull economies out of recession, according to the study by New Energy Finance, a London-based consulting firm.

[Australia's three-way squeeze](#)

Three momentous changes will make 2010 another turning point in Australian history: the Aussie dollar at parity, the preparation for emissions trading to start in 2011 and surging population.

[British children worst for not switching off the lights and leaving television on standby](#)

British children are the worst in Europe for switching out lights and saving electricity, despite knowing the most about climate change, according to a new study.

[Econ Drum: 5 Low-Carbon Foods](#)

If you're curious about whether the deliciousness of your favorite foods are worth their emissions, check out the online carbon calculator created by Bon Appétit, a corporate catering company. Simply drag your treat of choice into the frying pan, and a thermometer on the right tells you how many emissions "points" the food is worth.

[Voluntary Carbon Markets to Gain, New Energy Says](#)

(Bloomberg) -- Voluntary carbon-emissions markets, such as in Europe, parts of the U.S. and planned for Australia, may gain in importance as December's climate talks in Copenhagen are unlikely to deliver a global agreement, an expert said.

"We are unlikely to see a huge breakthrough and it (Copenhagen) will not be a win-win situation for all," said Michael Liebreich, chairman of New Energy Finance, a climate change consultant and researcher, in a telephone interview from London. "We may see some sort of a statement on direction."

[Climate Policies Won't Limit Warming to 2 Degrees, U.S. Says](#)

(Bloomberg) -- Current policies to fight climate change in China, India, the U.S. and other major carbon-dioxide emitters aren't enough to limit global temperature increases to 2 degrees Celsius (3.6 degrees Fahrenheit), a U.S. envoy said.

Major developing countries are moving in the right direction to contain global warming,

Todd Stern, the U.S. delegate to a 17-nation conference on limiting climate change, told reporters today in London. Even so, the trend in greenhouse gas emissions is still too high, Stern said.

[World must shift to low-carbon economy by 2014 or face dangerous climate change, says WWF](#)

The world must start a "complete" shift to a low carbon economy by 2014 — or risk making dangerous climate change almost inevitable, a report warned today.

The study for conservation charity WWF showed that waiting until after 2014 to fully develop the clean industries needed to reduce greenhouse gas emissions, such as renewable energy, would leave it too late to halt temperature rises of more than 2C.

[World faces 'catastrophe' if no climate deal: PM](#)

LONDON (AFP) – Prime Minister Gordon Brown on Monday warned the planet faced "catastrophe" if action to tackle climate change is not agreed at a key UN conference on global warming in December.

Brown told a meeting of 17 major developed and developing countries in London that the costs of failing to address global warming would be greater than the impact of two world wars.



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