**ITER Forum Website update 10/12**
B.J.Green (16/10/12)

**1.**

# Tide of opinion lacks 1000 years of proof

http://theaustralian.newspaperdirect.com/epaper/viewer.aspx
CLIMATE change moves at a glacial pace, according to an Australian researcher whose work has been recognised with one of the world's richest science prizes.

Kurt Lambeck, who was yesterday awarded the $765,000 Balzan Prize, said there was no evidence in geological records of rapid sea level changes.

But he said the scientific jury was still out on whether the world's major glaciers would become unstable, causing sea levels to rise quicker than the 1000-year timeframes records showed had happened. .

The Australian National University professor of geophysics and former president of the Australian Academy of Science will use half of the prizemoney to assemble a team of young scientists to continue the search for answers to what has become one of the most pressing questions in science today. The Balzan Prize is considered one of the world's most prestigious awards, alternating between various fields, including science, history, culture and the humanities. Former recipients include Mother Teresa of Calcutta and Pope John XXIII.

Professor Lambeck's scientific career started in space, not ice, but it was his time spent tracking satellites to determine the earth's gravity that ultimately led him to glaciers, a field of study at the forefront of climate change science. His main finding has been that ice sheets — also known as continental glaciers — are much more complex than initially thought.

''We have been able to establish that ice sheets can be very dynamic,'' Professor Lambeck said yesterday.

''They don't just passively sit on the earth surface and melt away but they can become unstable and start to flow quite rapidly.

''One of the important things our work has shown is the role of Antarctica has been much more important than most people had thought.

''During the last interglacial period when situations were similar to today, sea levels were generally several metres higher than (they are) today,'' Professor Lambeck said.

‘‘The important question to my mind is how quickly did that rise above present-day levels occur. I think the jury is still out on that.

‘‘The observational evidence is not as good as a lot of people would like it to be,’’ Professor Lambeck said.

He said there were two conflicting outcomes from recent studies of ice sheets at times when the climate was similar to today.

One was that at the times when climate was changing substantially, the sheets could become unstable.

This led to what Professor Lambeck described as ‘‘fairly substantial changes in the ice-sheet configurations over geological timescales of 1000 years or so’’.

‘‘I would be very reluctant on the basis of what we know from the past records to suggest that this could happen on much shorter timescales,’’ he said.

‘‘We don’t see evidence in the geological record of such rapid changes — at least, we don’t have the resolution in our observational records.’’

He said there was evidence of a rise in sea level of about 40mm a year about 10,000 years ago, which was fast in geological terms. ‘‘But they can only happen if there is an intrinsically unstable situation,’’ he said. ‘‘The question is whether the current ice sheet can become unstable.’’

# 2. 'Smart' gases boost global warming

BY: JONATHAN LEAKE From:The Times September 17, 2012 12:00AM

http://www.theaustralian.com.au/news/world/smart-gases-boost-global-warming/story-fnb64oi6-1226475215129

**THE "smart" gases created by scientists to help save the Earth's ozone layer have turned out to have a devastating side effect: they have boosted global warming by up to 20 per cent.**

A new study has shown that the gases, although present in just tiny amounts, can be thousands of times stronger than CO2 at retaining heat in the atmosphere.

Many are far longer-lived, some having lifetimes of thousands of years. This means that if emissions continue they will accumulate in the atmosphere.

"There are about 30 of these gases being emitted into the atmosphere," said Johannes Laube, an atmospheric scientist at the University of East Anglia. "Levels are very low, but many are very strong greenhouse gases, and the amounts of some are rising each year. Our calculations suggest that they are responsible for 18 per cent of the global warming we are experiencing."
The introduction of many such gases dates back to the 1980s, when British scientists found a huge hole forming in the ozone layer over Antarctica.

The ozone layer is vital in allowing life to survive on Earth as it traps more than 97 per cent of the sun's ultraviolet radiation. The cause of the hole was determined to be chlorofluorocarbons (CFCs), gases used as refrigerants, in air-conditioning and in aerosols as propellants.

That discovery galvanised the world into signing its first and most successful global environmental treaty, the 1987 Montreal protocol, to replace CFCs with something less damaging.

These included hydrofluorocarbons (HFCs) such as HFC-23 and HFC-134a, which are widely used in fridges and air-conditioning.

A separate group are the perfluorocarbons (PFCs), used in the semiconductor and other industries, for non-stick pans and stain retardants.

In his research, recently presented at a conference, Dr Laube collected air from some of the world's remotest places, such as Cape Grim in Tasmania, Greenland and the high Alps.

These were chosen because there was no local pollution and because they had strong winds from all directions.

Those samples were analysed to measure levels of HFCs, PFCs and other novel gases.

Dr Laube said gases occurred in "parts per trillion" - a level that might sound too low to have much effect. But what it actually meant was that every cubic metre of air on Earth now contains 70 trillion molecules of HFCs plus 50 trillion molecules of PFCs.

Their effect comes from their ability to retain heat from the Earth's

surface, preventing it from radiating away into space.

"The concentrations sound tiny, but they are very powerful greenhouse gases," said Dr Laube.

"Many of them, especially the PFCs, do not break down, so if we keep emitting them they will remain in the atmosphere and then there is no way back."

Dr Laube calculates that 300,000 tonnes of the five main PFCs have been emitted - but this relatively tiny amount causes as much global warming as 750m tonnes of CO2. Britain's annual greenhouse emissions equal about 600m tonnes of CO2.

Neil Harris, an atmospheric scientist at Cambridge University who specialises in such chemicals, said: "Concentrations of many of these gases are growing, which means they are going to be very important in global warming in coming years. If there were international action now, we could stop these increases. The problem is how to make people realise the urgency."

Another problem is that many companies have huge commercial interests in such chemicals.

David Leloup of Corporate Europe Observatory, which monitors EU lobbying, said: "Industry lobbyists are targeting the EU so they can continue with business as usual, regardless of the fact that safe, cost-effective alternatives are available, and regardless of the devastating impacts."

*THE SUNDAY TIMES*

## *3.* Where there's smoke

Matt Ridley
22 September 2012 06:00 AM

The birth of environmentalism and a strange link to the belief that smoking doesn't cause cancer
**http://www.spectator.co.uk/issues/22-september-2012/89b65bd6-92c1-4141-ae18-eb1540cc6731**

Rachel Carson's *Silent Spring*, published 50 years ago this month, effectively marked the birth of the modern environmental

movement. '*Silent Spring* came as a cry in the wilderness, a deeply felt, thoroughly researched, and brilliantly written argument that changed the course of history,' wrote Al Gore in his introduction to the 1994 edition.

Mr Gore reprised this theme on his website earlier this year, proudly comparing Carson's call to arms over pesticides to his own campaigning on the issue of climate change. He frequently compares the resistance he meets, and Carson met, to that which impeded the battle to establish the link between cancer and cigarette smoking. He accuses industry of 'sowing doubt [about global warming] even more effectively than the tobacco companies before them'.

The tobacco companies, said Mr Gore last year, 'succeeded in delaying the implementation of the surgeon general's report for 40 years — 40 years! In every one of those 40 years the average number of Americans killed by cigarettes each year exceeded the total number of Americans killed in all of World War II: 450,000 per year. My sister was one of them ... It was evil, evil, evil.'

To read more requires payment of money!

4. 28 September 2012, 6.28am AEST

# Ocean power making waves in Australia's clean energy future

CSIRO recently announced that energy from the ocean could supply 11% of Australia's demand by 2050. That is enough to power a city the size of Melbourne. It is a bold claim, but it's time for Australia to look at the sea differently. The World Energy Council recognised the potential several years ago...

**AUTHOR**

**Jenny Hayward** Research Scientist, Energy Economist at CSIRO

**DISCLOSURE STATEMENT**

Jenny Hayward does not work for, consult to, own shares in or receive funding from any company or organisation that would benefit from this article, and has no relevant affiliations.

Could waves and ocean currents hold a key to a renewable energy future?
http://theconversation.edu.au/ocean-power-making-waves-in-australias-clean-energy-future-9689

CSIRO **recently announced** that energy from the ocean could supply 11% of Australia's demand by 2050. That is enough to power a city the size of Melbourne.

It is a bold claim, but it's time for Australia to look at the sea differently.

The World Energy Council recognised the potential several years ago when it listed Australia's southern coastline as one of the world's best sources of wave energy.

Predictability and power are what make the ocean competitive with wind as a

power source. It also makes it the new frontier for renewable energy exploration.

The federal government has set a target of 20% renewable electricity generation by 2020. CSIRO modelling shows the potential for ocean energy to make up a significant part of this figure.

Our investigation used engineers, oceanographers and economists to review what devices are being developed, trialled and commercialised around the world. We consulted with Australian companies already working in this area of exploration, and examined potential environmental and social impacts.

## What types of ocean energy are there?

Tidal energy is where the sun and moon pulls at the ocean and fills bays and estuaries every day. Placing tidal turbines individually or in a row would take advantage of these vast water movements. Likely sites include northern and western regions and the Banks Strait off the east coast of Tasmania.

Ocean thermal energy uses the temperature difference between the surface and deep ocean. This disparity can be used to condense and vaporise a working fluid to drive a turbine. A prime location would be off the Queensland coast which has a differential of about 10 degrees between surface and abyss.

There are deep water currents in the ocean which might be captured using enormous turbines anchored to the sea floor. Such currents exist off the east coast.

There are also thousands of kilometres of coastline in Australia where waves dump the concentrated energy of the ocean.

And it is this – wave energy – which holds the greatest potential for Australia.

## Catching the wave

Australia has an advantage as an island that borders the Southern Ocean. This plays home to the largest global source of surface waves which are constantly being generated night and day, summer and winter, under its powerful storm systems.

To supply 20% of Australia's total electricity demands by 2050 it would be necessary for wave energy power stations to produce 46TWh. Depending on the technology, this could take as little as 150km of coastline – or more if wave energy extraction was reduced to avoid any changes to undersea sand and rock movement.

Our study selected seven possible areas, each stretching 50km along the southern coast.

The CSIRO identified Western Australia, Victoria, South Australia and Tasmania as having the best wave resources. These also happen to be near our largest energy markets. However in these areas there are differing demographics and existing energy resources which may affect take-up of wave energy.

## Finding the right state for ocean power

Tasmania's west coast alone is nearly 300km of constant waves which produce more than 12 times the state's current consumption of energy each year. But its population size and the existence of hydroelectric sources mean that it's not likely to need wave energy. That is unless it's as an industry that can be linked via Bass Link, the high voltage DC line to the mainland.

Victoria, though it lacks the powerful wave resource of Tasmania's west coast, is predicted by CSIRO modelling to have the greatest amount of wave energy. Victoria has high energy demands and needs to replace its brown-coal fuelled electricity supply with low-emission energy sources by 2050.

Consideration of environmental impact will be important in calculating the spread and mix of wave farms. Little research has been done to look at the effects both negative and positive on the ocean environment.

The size, number and distribution of large-scale wave farms would depend on the availability of the coastline. It would be in competition with protections in place for a variety of reasons. Marine protected areas, native title and land rights, shipping, tourism, recreation and real estate, aquaculture and fisheries, mineral exploration and mining, and defence and security would all come into consideration.

Wave farms on remote coastlines could supply power and promote mineral exploration in as yet un-mined regions. Farms could help calm waters near off-shore oil rigs, they might also promote fish breeding or protect coastline from erosion.

## Predictable and reliable

What makes wave energy particularly worth investigation is that it's much less intermittent than wind, and is more predictable. Waves arriving on our coasts were generated hundreds of kilometres away and days ago, by storms that we can track.

To maximise that advantage, it will be important to assess the cost of transmitting the energy on-shore. It's also critical to reduce the cost of ongoing maintenance of equipment that must operate in tough ocean conditions, in the face of corrosion and bio-fouling.

The economics of energy extraction, storage and transmission will decide the take up of ocean energy, assuming environmental and social impacts are acceptable.

Photovoltaic solar arrays and wind turbines have permanently changed our landscape and the way we see the sun and the wind. Wave energy will change the way we look at the sea.

# 5. Cheap imports a blow for locals

BY:BRENDAN NICHOLSON From: The Australian October 01, 2012 12:00AM

http://www.theaustralian.com.au/national-affairs/climate/cheap-imports-a-blow-for-locals/story-e6frg6xf-1226484942467

**THE head of a Victorian company that manufactures giant towers for wind turbines says it could go out of business because it cannot compete with cheaper imports from Korea and China, and has called for an import tariff to protect green industries in Australia from dumping.**

Steve Garner, of Keppel Prince Engineering in Portland, told The Australian he feared his company had missed out on a $30 million contract to build 64 turbine towers for a wind farm near Ballarat. Mr Garner said it appeared the turbine supplier, REpower, had given the contract for the towers that supported its technology to a Korean company able to undercut his firm's tender.

Mr Garner said the wind industry had lobbied hard to persuade the Labor government to set the 20 per cent Renewable Energy Target several years ago with an assurance that it would create many jobs in Australia. But he said that, while some developers made a point of buying Australian, he understood that REpower had this time opted to buy from Korea.

Mr Garner said three companies in Australia manufactured the towers and they could all go out of business if the towers were bought overseas. "For us the long-term implications is that we could potentially face closure," he said.

Mr Garner said the US recently introduced a tariff to protect its emerging renewable companies from cheap competition from countries which kept costs down by paying very low wages. "But there is no such protection for the Australian industry," he said.

Mr Garner said major companies in the renewable industry were preparing to lobby the government hard for some form of protection. He said that while the turbines were imported, some

major power firms, including AGL and Pacific Hydro, insisted on buying Australian made towers to support local industry.

He said he was amazed that the Koreans were able to profitably manufacture the towers in Korea and then transport them to Australia and still undercut his company. The steel structures weighed 150 tonnes each and were 80m tall and 4.5m across at their base.

"They have to get them to a port in Australia and then transport them to the site," Mr Garner said.

In Vladivostok last month, Trade Minister Craig Emerson called for lower tariffs to make environmental goods cheaper.

Dr Emerson was not available to comment on the issue last night.

The Liberal MP in the southwest Victorian seat of Wannon, Dan Tehan, said the Gillard government's promise to create more green energy jobs seemed to be derailing. "They need to act to fix this problem otherwise local jobs will continue to go offshore," Mr Tehan said.

# 6. Sea level fall defies climate warnings

BY:GRAHAM LLOYD From: The Australian September 29, 2012 12:00AM

http://www.theaustralian.com.au/news/nation/sea-level-fall-defies-climate-warnings/story-e6frg6nf-1226483797934

**THE La Nina weather pattern that caused widespread flooding across eastern Australia was also responsible for a dramatic turnaround in sea level rises.**

Global average sea levels fell by 5mm last year, presenting an inconvenient fact in a climate change narrative that warns of severe long-term threats to coastal settlements.

The 5mm decline was almost twice the rate of the 3mm-a-year average increase recorded over the past 20 years and three times the 130-year average rise rate of 1.7mm a year.

A paper published in Geophysical Research Letters and reported by the American Academy for the Advancement of Science yesterday claims to have found the answer to why sea levels fell, not rose.

And, according to the paper, the retreat is only temporary.

The research, led by NASA scientist Carmen Boening from the Jet Propulsion Laboratory at California University of Technology, has blamed the unexpected sea level fall on the weather pattern that also caused chaos on land. The switch to a strong La Nina weather pattern, which was responsible for the big wet that flooded large parts of Australia, northern South America, and Southeast Asia in 2010 was also to blame for the shrinking oceans, the paper said. Put simply, the water had moved from the oceans to the land as rainfall.

Scientists used a combination of satellite and land data to match the decline in ocean mass, which explained the sea level drop, to an equivalent increase in land-based water storage.

This was done by measuring changes in gravity on the earth.

The paper said the temporary shift of water from the ocean to land was closely related to the transition from El Nino conditions in 2009-10 to a strong 2010-11 La Nina, which affected rainfall patterns worldwide.

The greatest changes in gravity occurred in areas where the rainfall increase had been greatest because of La Nina.

In addition, the total amount of land-based water storage linked up closely with the fall in sea levels. Sea levels eventually returned to the long-term trend of a gradual rise as the water moved from land back into the sea through natural processes.

The most recent findings were in line with historical data, which showed sea levels had fallen below trend during other periods of transition to a La Nina weather pattern.

Between 1992 and this year sea levels have contracted below the upward trend in 1993-1994, 1996-97, 1999-2000 and 2007.

John Church, from CSIRO's Antarctic Climate & Ecosystems Co-

operative Research Centre, said the latest data showed the global average sea level rise had returned to the two-decade trend of 3.1mm a year at the beginning of this year. And despite Australia playing a leading role in the average sea level decline for 2010-2011, Dr Church said the regional story was one of continued sea level rises.

Data maps published by CSIRO showed sea levels had risen particularly strongly in Northern Australia between 2002 and 2012, he said.

Projected sea level increases vary greatly and take account of thermal expansion, changes in glacier mass and changes in ice sheets and ice-sheet flow.

Most recent predictions have argued that a rise in sea levels of more than two metres as predicted by some models is "physically untenable".

A rise of 80cm over the next century, at the top of the Intergovernmental Panel on Climate Change projections, is considered more plausible.

## 7. Let nature take its new course: CSIRO

*18 Sep 2012*
*The Australian*
*JARED OWENS*

http://theaustralian.newspaperdirect.com/epaper/viewer.aspx

AUSTRALIA should allow the environment to adapt to climate change naturally, rather than trying to prevent ecological change completely, according to a new CSIRO study.
A report into our national reserve system predicts the effects of global warming will begin to transform natural landscapes by 2030, with ‘‘very significant and widespread’’ impacts by 2070.

More text requires payment.

## 8. So Far Unfruitful, Fusion Project Faces a Frugal

# Congress

September 30, 2012 1:01 pm



By WILLIAM J. BROAD / The New York Times

http://www.post-gazette.com/stories/news/science/so-far-unfruitful-fusion-project-faces-a-frugal-congress-655581/

For more than 50 years, physicists have been eager to achieve controlled fusion, an elusive goal that could potentially offer a boundless and inexpensive source of energy.

To do so, American scientists have built a giant laser, now the size of a football stadium, that takes target practice on specks of fuel smaller than peppercorns. The device, operating since 1993, has so far cost taxpayers more than $5 billion, making it one of the most expensive federally financed science projects ever. But so far, it has not worked.

Unfortunately, the due date is Sunday, the last day of the fiscal year. And Congress, which would need to allocate more money to keep the project alive, is going to want some explanations.

"We didn't achieve the goal," said Donald L. Cook, an official at the National Nuclear Security Administration who oversees the laser project. Rather than predicting when it might succeed, he added in an interview, "we're going to settle into a serious investigation" of what caused the unforeseen snags.

The failure could have broad repercussions not only for the big laser, which is based at the Lawrence Livermore National Laboratory in California, but also for federally financed science projects in general.

On one hand, the laser's defenders point out, hard science is by definition risky, and no serious progress is possible without occasional failures. On the other, federal science initiatives seldom disappoint on such a gargantuan scale, and the setback comes in an era of tough fiscal choices and skepticism about science among some lawmakers. The laser team will have to produce a report for Congress about what might have gone wrong and how to fix it if given more time.

"The question is whether you continue to pour money into it or start over," said Stephen Bodner, a former director of a rival laser effort at the Naval Research Laboratory in Washington. "I think they're in real trouble and that continuing the funding at the current level makes no sense."

China is studying the program's mistakes, Dr. Bodner added, perhaps with a goal of building an improved machine.

"It's kind of an amazing device," said William Happer, a physicist at Princeton University who directed federal energy research for the first President George Bush. "Still, it's not science if you don't fail now and then. But you do have to have some wins."

Many science analysts predict that the big laser will survive, because its powerful beams can still squeeze materials to extraordinarily high pressures, temperatures and densities that are useful in safeguarding the nation's nuclear arms -- a goal that attracts bipartisan support. For instance, the laser

might help engineers see if a particular metal part that had to be substituted in a class of aging nuclear arms would still work as needed.

Even so, skeptics outside the government have long assailed the laser project, known as the National Ignition Facility, or NIF, as a colossal waste of money. Just operating it, officials concede, costs roughly $290 million a year. Some doubters have ridiculed it as the National Almost Ignition Facility, or NAIF.

Big science projects more costly than the laser include NASA's newest space telescope, whose price tag now runs to more than $8 billion, and the 17-mile circular accelerator in Europe that recently helped pin down the elusive subatomic particle known as the Higgs boson. It cost about $10 billion.

In interviews, the laser's architects and supporters at the Livermore lab defended the device as working beautifully and pointed to the challenge of planned breakthroughs as the fundamental problem.

"It's like having a cure for cancer by a certain date," said Penrose C. Albright, the laboratory's director. "I understand why people want to have milestones. But when you're dealing with science and Mother Nature, all you really can do is agree on whether you're on the right path."

The sprawling laser complex, the officials insisted, would one day achieve its advertised goal: fusing the hydrogen atoms in a speck of fuel into helium, and thus creating what physicists liken to a tiny star.

"Contrary to what some people say, this has been a spectacular success," said Edward Moses, the laser's director. Even so, he added, "science on schedule is a hard thing to do."

What has eluded Dr. Moses and thousands of other scientists over the decades is a controlled version of nuclear fusion -- the process of atomic merger that powers the sun, the stars and hydrogen bombs. The laser uses blasts of concentrated light to compress, heat and ignite tiny capsules of hydrogen fuel smaller than match heads -- hopefully, one day, setting them ablaze in thermonuclear fire.

The result, scientists hope, would include not just new science but radically new kinds of reactors to generate electric power at low cost. Hydrogen, they note, is the most abundant element in the universe.

"Bringing Star Power to Earth," read a giant banner that workers in 2009 unfurled on the newly inaugurated National Ignition Facility. Over budget and behind schedule, the construction had taken a decade.

Today, the complex has millions of parts and 192 lasers made up of 15 miles of mirrors and lenses, crystals and light amplifiers. Its innards look something like a spaceship engine room from a science fiction movie.

From the start, critics saw NIF's delays and spiraling price tag as symptoms of overreaching. In 2000, soon after the start of construction, what was then the General Accounting Office questioned the "independence" of ad hoc assessment panels and detailed a number of management and oversight failures.

By 2005, a panel of scientific experts judged the goal of ignition in 2010 during the initial laser firings as unlikely and faulted the project for what it called a lack of "standing external oversight."

In July, a report to Dr. Cook, the official in charge, called ignition by the end of this year "highly unlikely" and recommended that the project be "redirected towards a broader and more balanced research program."

Dr. Moses, the laser's director at Livermore, called many of the critics misinformed and defended the project as fundamentally sound. He said that China, France and Russia all have similar laser projects under way that use NIF as a model.
"They're betting with their pocketbooks to recreate what we're doing," he said.
Dr. Albright, the laboratory's director, insisted that the big laser would still end up being the first on the planet to make a tiny star. The question is when.
"Everybody believes we can get there," he said. "But we're exploring parts of physical space that no one has ever done before, and that's a hard problem."

# 9. 27th SOFT conference focuses on ITER and beyond

*-Sabina Griffith*

http://www.iter.org/newsline/239/1332

The Belgium town of Liège, where in 1869 Zénobe Théophile Gramme invented the dynamo, was the venue of the 27th Symposium on Fusion Technology (SOFT). More than 1028 participants convened in the town's Congress Centre last week to discuss the latest developments in fusion research.

The conference was opened in the presence of his Royal Highness Prince Philippe of Belgium who showed great interest in the "alternative energetic scenario". Belgium's Vice Minister President Jean-Claude Marcourt, one of the keynote speakers during the opening ceremony, said that with the ITER project and "its large-scale involvement new hopes have appeared".

Marcourt stressed that access to energy and economic development were closely linked. "And what are fifty years [of development] compared to the scale of the Universe", Marcourt continued. "Perhaps we are at the eve of figuring out an answer to our energy supply for the next millennium."

In his speech Hervé Pero, acting Director of Energy within the Directorate-General for Research at the European Commission, sketched the European Roadmap to Fusion Energy. A roadmap that fully relies on the success of ITER: "If ITER fails", Pero stressed during a question-and-answer session, "this will be the end to fusion! We need to make ITER a success!"

The 27th edition of the SOFT conference with its large number of participants, a grand total of 636 posters, 17 invited talks and 54 oral presentations once more highlighted the increasing interest in the development of fusion energy. For Organizer Vincent Massaut, Head of

the Belgium Fusion Research Centre SCK-CEN in Mol, it was encouraging to see so many young faces in the corridors discussing their posters. Massaut also noted a new trend at SOFT. "Although the research and development for ITER going on all around the world clearly remains the focus of discussion, I think we here witnessed the opening of a new chapter in the book on fusion research: a chapter that covers the next steps after ITER, a DEMO reactor and a fusion power plant".

"Towards a fusion power plant" was also the title of a panel discussion on Tuesday morning, moderated by BBC presenter David Shukman. The panel was made up with representatives from the fusion community — "the dreamers", as Shukman called them and representatives from the energy industry — "the realists". José A. Tagle, Head of the Technology Innovation Department at Spain's largest energy group, said that "there is no alternative to fusion energy in terms of pollution, an ever-growing population and poverty".

As to whether fusion was showing on the energy landscape, Areva Vice President Philippe Garderet replied that yes, fusion was on their radar screens, but that it was not yet showing up on the energy market. "We are still far from any serious market debate", Garderet said. "We observe with interest the transition from prototyping to industrial manufacturing."

Roberto Adinolfi, CEO of the Italian consortium Ansaldo Nucleare, added. "With ITER the market is clearly emerging, but it is still far away from [being on] an industrial scale."

The panel came to the conclusion that both for the sound development of fusion energy and for the industry to seriously buy in, the design and planning for a DEMO reactor had better start sooner than later.

10.

# Antarctic ice expands against odd

BY:GRAHAM LLOYD From: The Australian October 06, 2012 12:00AM
http://www.theaustralian.com.au/news/health-science/antarctic-ice-expands-against-odds/story-e6frg8y6-1226489479585

**ANTARCTIC sea ice has expanded to cover the largest area recorded since satellite mapping began more than three decades ago, in stark contrast to this year's record melt on the northern pole.**

The expansion continues a trend of increasing Antarctic sea ice cover of about 1 per cent a decade and is at odds with predictions of climate change models that continue to forecast a long-term decline.

Rob Massom from the Australian Antarctic Division and Antarctic Climate and Ecosystems Co-operative Research Centre in Hobart said this week: "The message is there is a lot of work to better understand what processes are occurring around Antarctica and the role of these processes in affecting sea ice." Dr Massom said the most authoritative climate change models forecast a loss of up to 30 per cent of Antarctic sea ice by the end of the century, and did not indicate the present expansion.

According to the National Snow and Ice Data Centre in Boulder, Colorado, Antarctic sea ice reached a maximum extent of 19.44 million square kilometres on September 26.

The September 2012 monthly average was also a record high at 19.39 million square kilometres, slightly higher than the previous record in 2006.

The record sea ice accumulation in Antarctica was in stark contrast to this year's record melt in the Arctic, where sea ice fell to the lowest extent in the satellite record.

The Arctic melt, to a low of 3.41 million square kilometres on September 16, occurred without the unusual weather conditions that contributed to the extreme melt of 2007, the previous record low, but the extent of this year's ice loss was affected by a severe storm.

The retreat of Arctic ice is happening faster than climate models have predicted.

Climate scientists have said the behaviour of ice cover at the two poles is not connected.

Dr Massom said despite the fact Antarctic sea ice was not melting as had been predicted by climate models, there was still cause for concern.

He is midway through a two-month voyage to the Antarctic pack ice aboard the Australian research vessel Aurora Australis.

Speaking from the ship at about 64 degrees south in the sea ice zone this week, Dr Massom said the Antarctic sea ice was shifting as well as expanding, giving a possible clue as to what was taking place.

"Although the extent of sea ice overall is increasing in the Antarctic, there are strong regional contrasts," Dr Massom said.

"In certain regions the extent and duration of sea ice is much less on the Antarctic peninsula than it used to be. Some of the changes in Antarctica are strongly negative, as they are in the Arctic."

Dr Massom said some people would seize upon this year's Antarctic sea ice record to question climate change predictions, but he said it was a "very complex system . . . In general there are signs that things are changing".

"The break up of the Larson Ice Shelf in 2002 was a very timely reminder that there is rapid change occurring in certain regions of Antarctica," Dr Massom said.

One possible explanation for the increase in sea ice was changing patterns of large-scale atmospheric circulation.

This included an increasing intensity of the westerly wind field around Antarctica, which could be leading to a greater extent of sea ice overall.

"Again, this masks the fact that in certain areas there has been quite a significant decrease where in other areas there has been an increase," he said.

"One of the reasons we are down on this ship doing experiments is we are still struggling to understand what are the processes affecting Antarctic sea ice the role of sea ice in the global climate system, how it affects the interaction between the ocean and the atmosphere.

"And we are still at a stage where the models are in slight disagreement with what we are observing. A lot of our work is aiming at picking that gap between what we are observing and what the models are telling us."

# 11. Call to take nuclear to heart, impose carbon tariffs

BY:CHIP LE GRAND From: The Australian October 10, 2012 12:00AM

http://www.theaustralian.com.au/national-affairs/climate/call-to-take-nuclear-to-heart-impose-carbon-tariffs/story-e6frg6xf-1226492394947

**AUSTRALIA had been urged to embrace nuclear power and impose a carbon tariff on goods imported from nations that have not priced carbon, instead of compensating trade-exposed industries.**

Chris Llewellyn Smith, the director of energy research at Oxford University and one of the world's leading experts on nuclear fusion, will urge scientists at a Melbourne conference today to press the case for nuclear power in the face of government reluctance and public fears.

The former chairman of the International Thermonuclear Experimental Reactor, a massive project being built in the south of France to test the viability of industrial scale nuclear fusion, says Australia must include nuclear as part of its energy mix if it is to wean itself off carbon-intensive coal.

Sir Chris conceded nuclear power was a "difficult sell" in the wake of the Japanese tsunami and Fukushima plant meltdown but argued the disaster had shown that nuclear energy, while dangerous, could be safely managed. "The fact is the nuclear accident in Japan hasn't killed anybody," Sir Chris said. "There may be one or two people who die of cancer but we are talking very small numbers if any."

Of the 15,844 confirmed dead and 3450 still missing from last year's tsunami, no deaths have been directly attributed to the radioactive material released after the ageing plant was swamped by seawater. "Nuclear has to be treated with great respect

because it is intrinsically dangerous," Sir Chris said. "But I would argue it is actually less dangerous than burning coal, which is killing people with air pollution.

"The track record of nuclear power is very good but it is hard to convince people of that because they are frightened of things they don't understand and they can't see, and the history associated with nuclear weapons." Sir Chris applauded the Gillard government's decision to price carbon.

But rather than compensating industries competing against goods produced without the burden of a carbon tax, Australia should charge a levy on those goods. "If Australia introduces a price on carbon, which it has, this will put up the cost of manufacturing in Australia," he said.

"It puts your industry at a disadvantage against any country without a carbon tax."

The All-Energy 2012 conference is being held today and tomorrow at the Melbourne Convention and Exhibition Centre.

12.

*The Race for Fusion*

# Promising New Method Developed to Harness Fusion Power

**Hannah Hickey**
*University of Washington*

October 13th 2012

http://www.thecuttingedgenews.com/index.php?article=76569&pageid=21&pagename=Energy

Researchers around the world are working on an efficient, reliable way to contain the plasma used in fusion reactors, potentially bringing down the cost of this promising but technically elusive energy source. A new finding from the University of Washington could help contain and stabilize the plasma using as little as 1

percent of the energy required by current methods.
“All of a sudden the current energy goes from being almost too much to almost negligible,” said lead author Thomas Jarboe, a UW professor of aeronautics and astronautics. He presents the findings this week at the International Atomic Energy Association’s 24th annual Fusion Energy Conference in San Diego. The new equipment looks like handles on a coffee mug – except they attach to a vessel containing a million-degree plasma that is literally too hot to handle.
Most people know about nuclear fission, the commercial type of nuclear power generated from splitting large atoms in two. Still under research is nuclear fusion, which smashes two small atoms together, releasing energy without requiring rare elements or generating radioactive waste.
Of course, there’s a catch – smashing the atoms together takes a lot of energy, and scientists are still working on a way to do it so you get out more energy than you put in. The sun is a powerful fusion reactor but we can’t recreate a full-scale sun on Earth.
An international project in France is building a multibillion-dollar fusion reactor to see whether a big enough reactor can generate fusion power.
The reactor in France will inject high-frequency electromagnetic waves and high-speed hydrogen ions to sustain the plasma by maintaining an even hotter 100-million-degree operating temperature and enclosing it with magnetic fields.
“That method works,” Jarboe said, “but it’s extremely inefficient and expensive, to the point that it really is a major problem with magnetic confinement.”
Jarboe has worked on fusion energy for more than three decades. The new copper handles can replicate the UW’s low-energy approach while maintaining a stable plasma.
For two decades Jarboe’s team has worked on helicity injection as a more efficient alternative. Spirals in the plasma produce asymmetric currents that generate the right electric and magnetic fields to heat and confine the contents. Plasma is so hot that the electrons have separated from the nuclei. It cannot touch any walls and so instead is contained by a magnetic bottle. Keeping the plasma hot enough and sustaining those magnetic fields requires a lot of energy.
“We would drive it until it was unstable,” Jarboe said of his approach. “Like you twist up a rope, the plasma twists up on itself and makes the instability and makes the current drive.”

Results showed the UW strategy required less energy than other methods, but the system was unstable, meaning that if conditions change it could wobble out of control. It's like a stick balancing on one end, which is stable at that moment, but is likely to come crashing down with any nudge. In the case of plasma, unstable equilibrium means that a twist in the plasma could cause it to escape and potentially lead to a costly reactor shutdown.

Instability was a major impediment to applying the UW method. "The big issue is whether, when you distort the bottle, it will leak," Jarboe said.

By contrast, in a stable equilibrium, any shift will tend to come back toward the original state, like a ball resting at the bottom of a bowl that will settle back where it started.

"Here we imposed the asymmetric field, so the plasma doesn't have to go unstable in order for us to drive the current. We've shown that we can sustain a stable equilibrium and we can control the plasma, which means the bottle will be able to hold more plasma," Jarboe said.

The UW apparatus uses two handle-shaped coils to alternately generate currents on either side of the central core, a method the authors call imposed dynamo current drive. Results show the plasma is stable and the method is energy-efficient, but the UW research reactor is too small to fully contain the plasma without some escaping as a gas. Next, the team hopes to attach the device to a larger reactor to see if it can maintain a sufficiently tight magnetic bottle.

13. From: Roger Greenway, ENN
Published October 13, 2012 07:06 AM

# Update: Fusion Power

http://www.enn.com/pollution/article/45081

Green house gasses, nuclear waste.....these are concerns with our most widely used power generation technologies, fossil fuel combustion and nuclear fission. Fusion power holds the promise of abundant energy, no green house gas emissions, and little to no waste products. Fusion is getting closer to commercial reality. Until now, it has been produced only in the lab, and only for the briefest of time scales. Scientists in several countries are getting much

closer to sustained fusion and this offers the real potential for commercial power production!

The crucial next steps on the roadmap to developing fusion energy will be the focus of more than 70 top fusion scientists and engineers from around the world who will gather at the University of California-Los Angeles (UCLA) this month. The Oct. 15-18 session will kick off a series of annual workshops under the auspices of the International Atomic Energy Agency (IAEA) that will address key scientific and technological challenges facing countries developing fusion as a source of clean and abundant energy for producing electricity.
Fusion powers the sun and stars. The process takes place when the atomic nuclei — or ions — in electrically charged gas called plasma fuse under extreme heat and pressure and release a burst of energy. Fusion programs seek to recreate this process on Earth under laboratory conditions.
The IAEA gathering comes against the backdrop of the construction of ITER, a huge experimental facility that the European Union, the United States and five other countries are building in the south of France to showcase fusion as a practical source of energy. Plans call for ITER to produce 500 million watts of fusion power for up to 500 seconds by the late 2020s.
Individual countries are exploring their own next steps toward fusion with different degrees of urgency, based on their perceived need for such energy. The steps themselves remain tentative and subject to government confirmation. "What's needed at present is for the planners to come together and discuss their different roadmaps," said nuclear engineering professor Mohamed Abdou, who will host the workshop as director of the Fusion Science and Technology Center at UCLA. "This will help us understand the goals and assumptions behind the plans of the major fusion programs."

# 14. A global quest to test the feasibility of fusion

http://www.utsandiego.com/news/2012/oct/10/a-global-quest-to-test-the-feasibility-of-fusion/

It is hailed by the scientific community as the largest experiment in human history, partnering 34 nations representing more than one-half of the population of the planet. All in pursuit of one of the greatest quests in the history of science – fusion energy.

Fusion is the natural power of the sun and other stars, and for decades so many of the world's greatest scientists – including Albert Einstein – have been devoted to re-creating that power on Earth to realize a clean, safe and virtually unlimited energy source.

The potential of fusion energy has captured the imagination of nations and researchers worldwide. This week, San Diego hosts one of the most prestigious gatherings of fusion researchers at the 24th International Atomic Energy Fusion Energy Conference. There, more than 1,000 researchers – fusioneers, as they're sometimes called – from 45 nations will focus on the promise and progress in the quest to supply Earth with enough energy for centuries to come.

The quest for a reliable, carbon-free energy source poses one of the great challenges to mankind. While the United States is blessed with many natural resources, future generations will need to find new energy solutions. ITER, translated as "The Way" in Latin, is a project that brings to bear the resources of 34 nations toward the single purpose of demonstrating the feasibility of fusion power to meet global energy needs.

Center stage for conference discussions will be ITER, now under construction in Cadarache, France, near Marseilles. ITER will be the world's largest fusion facility, capable of producing 10 times more fusion power than it consumes.

Partnering on ITER is the U.S. and the European Union with China, Japan, Korea, India and Russia the major partners representing ITER's 34 nations. The ITER device will, at 23,000 tons, outweigh the Eiffel Tower. It consists of more than 1 million components.

The conference, which started Monday and runs through Saturday, features more than 400 new scientific reports on fusion progress. The event is organized by the International Atomic Energy Agency in cooperation with the Office of Science of the U.S. Department of Energy and San Diego-based General Atomics, which runs the largest fusion research facility in the nation, DIII-D.

This dream of clean fusion energy started with a simple realization by Einstein, a physicist, that small amounts of matter could be changed into an enormous amount of energy, expressed in that famous scientific formula: E=mc2.

What's important for the public to understand is that fusion science is at a crossroads. ITER represents a significant step forward in the size, scope and cost of fusion research. The progress to date appears to warrant this significant investment as evidenced by the worldwide involvement in the ITER project. But while there is increased global funding of ITER, there is also financial pressure, in the form of budget cuts facing leading fusion research activities in the U.S., Europe and Japan. These financial constraints threaten to curtail development of the next generation of fusioneers who will make fusion power a reality.

In the world science community, however, there is great hope that despite the budgetary and political challenges of today, the focus remains on the promise of clean and safe energy for tomorrow.

15. 

## Bill Chameides

*Dean, Duke University's Nicholas School of the Environment*

# Fusion: Maybe Less Than 30 Years, But This Year Unlikely

http://www.huffingtonpost.com/bill-chameides/fusion-maybe-less-than-30_b_1949573.html

No ignition at the U.S. National Ignition Facility, home to the world's largest laser.

When it comes to nuclear reactions, you've got your fission and your fusion. Both garner energy from mass, according to Einstein's famous *E=mc2*, but in a different way. Fission -- the process at work in an atomic bomb or a nuclear power plant -- gets the energy by splitting a relatively heavy atom* (heavier than iron) into lighter atoms and particles. Fusion, by contrast, combines two atoms lighter than iron into a larger atom and a whole lot of energy.

Most commonly, for example on the sun and in a so-called thermonuclear bomb, hydrogen** serves as the feedstock for the fusion reaction.

And in our world, fusion is the real deal. The fusion reactions on the sun provide virtually all of the energy that drives our world -- photosynthesis, weather, pretty much life as we know it. And with the exception of just four elements -- hydrogen, helium, lithium and beryllium -- all of the elements in our world are byproducts of stars and their fusion-filled lives.

The size of three football fields, the National Ignition Facility houses 192 laser beams and directing nearly two million joules of ultraviolet laser energy in billionth-of-a-second pul target chamber center."

## Imagine a World with Virtually Boundless Clean Energy

If there were a choice between fission and fusion, it'd be a no-brainer. Fusion is the holy grail of humanity's quest for energy security.
Two downsides to fission: it requires fuels like uranium and plutonium that are in finite supply and it produces radioactive waste. Fusion produces zero waste and requires only hydrogen -- the most abundant element in the universe.
Talk about a game changer. Scientists have been thinking about how to bring this game changer into the energy game for decades. (See fusion/fission timeline.) As far back as 1946, two British scientists -- Sir George Paget Thomson and Moses Blackman -- filed the first patent for a fusion power plant.
But there have been a couple of hold-ups. To get a fusion reaction started, you need to slam the hydrogen atoms together really, really hard and that requires a lot of energy. (In a hydrogen bomb, the fusion reaction gets ignited by an atomic bomb, using fission. Not exactly the preferred method for your local fusion power plant.)
Even trickier is controlling the fusion reaction. It's one thing to make a fusion bomb, it's a lot harder to get the reaction going and keep it under control in a way that the amount of energy extracted is larger than that expended to initiate and manage the reaction.
Over the almost 70-year pursuit of the fusionary holy grail, it's been fairly common for scientists working on the problem to say that they're about 30 years away from achieving a power plant based on fusion. (See here and here.) The problem has been that while time has marched on, the 30-year horizon has remained fixed. Suffice to say it has proven to be a very tough problem.

### The Big Fusion Ten

Currently there are about 10 major projects underway around the world trying to get a net-energy producing reaction. Several basic approaches are being tried to compress and heat the fuel to get ignition: lasers, magnets, X-rays and sound waves.
In recent years, Lawrence Livermore National Laboratory's Laser Inertial Fusion Energy (LIFE) project at the National Ignition Facility

(NIF) has generally been viewed as the most promising: "Completed in March 2009, the $3.5 billion machine is the size of three football fields and has 192 laser beams. The now-operational facility is capable of directing nearly two million joules of ultraviolet laser energy in billionth-of-a-second pulses to the target chamber center."
With the facility's lasers up and running and breaking temperature records, hopes were running high for NIF over the past year or two. Bold statements and predictions peppered in its literature (pdf) also made a breakthrough look promising, such as “NIF will be the first fusion facility to demonstrate ignition and self-sustaining burn, as required for a power station,” “Demonstration of net energy gain from fusion fuel (On target, by end of 2012)," and (my favorite) “LIFE was the holy cow game changer.” NIF also indicated (pdf) that the timeline for the first commercial fusion power plant had shrunk -- instead of 30 years, it was now a mere 20 years away.
In February 2012, Mike Dunne, the director for energy laser fusion, explained the progress in some detail and included a qualified time line: "Overall our anticipation is that the prospects of getting to energy break-even look like roundabout six to 18 months away... It's impossible to predict in detail exactly what will happen and what the surprises will or won't be. But it feels around that time scale."

In March the journal *Nature* reported "Laser fusion nears crucial milestone," and quoted Lawrence Livermore National Lab director Ed Moses saying that, as far as the lab's efforts on ignition were concerned: "We have all the capability to make it happen in fiscal year 2012."

But by July 19, 2012, the fusion bubble was burst. An external review (pdf) of NIF by the National Nuclear Security Administration presented a mixed bag of praise -- "NIF has demonstrated an 'unprecedented level of quality and accomplishment'" -- and circumspection -- "considerable hurdles must be overcome to reach ignition ... [G]iven the unknowns with the present ...approach, the probability of ignition before the end of December is extremely low."

**Bad Timing**
Just so happens that LIFE's funding was to run out at the end of this fiscal year, which fell on September 30. Perhaps that's why the fusion researchers were so publicly sanguine about having results by the end of 2012. So now the scientists hand off this energy holy grail to the politicians, transforming, at least for the time being, a scientific quest into a political football, or, you might say fusing the scientific and the political. What should Congress do? Scrap the project or double down? Just another spending issue poised on the fiscal cliff our folks on the Hill will have to wrestle with.

**End Notes**

* A common fuel is the uranium isotope, U-235.

** Isotopes of hydrogen -- deuterium and tritium -- are typically used.

# 16. Fusion Researchers Gather In San Diego For Energy Conference

Monday, October 8, 2012
By City News Service
http://www.kpbs.org/news/2012/oct/08/fusion-researchers-gather-san-diego/

Nearly 1,000 fusion researchers from 45 countries are expected to discuss the latest advances in fusion energy at the Hilton San Diego Bayfront today as the 24th International Atomic Energy Agency Fusion Energy Conference gets under way.

The conference aims to "provide a forum for the discussion of key physics and technology issues as well as innovative concepts of direct relevance to fusion as a source of nuclear energy," according to the event's website.

The conference's six-day run is set to begin with the San Diego Unified School District's Soaring Eagles dance troupe performing in Native American regalia and issuing a blessing to celebrate the work of fusion researchers, according to event officials.

Those in attendance are set to include Nobel Prize-winning physicist Burton Richter, the chief executive officer of the United Kingdom's Atomic Energy Authority, and Taylor Wilson, a nuclear scientist and University of Nevada student who achieved fusion in a garage experiment in 2008, when he was 14, according to event organizers.

Frances Chen, a plasma physicist, UCLA professor emeritus and author of

"An Indispensable Truth: How Fusion Power Can Save the Planet," was scheduled as a keynote speaker along with William Brinkman, director of the Office of Science in the U.S. Department of Energy, which oversees the country's research programs in high energy physics, nuclear physics and fusion energy sciences.

# 17. So Far Unfruitful, Fusion Project Faces

# a Frugal Congress

The New York Times | International Herald Tribune
http://fire.pppl.gov/NIF_NYT_Broad_092912.pdf
By WILLIAM J. BROAD September 29, 2012

For more than 50 years, physicists have been eager to achieve controlled fusion, an elusive goal that could potentially offer a boundless and inexpensive source of energy.

To do so, American scientists have built a giant laser, now the size of a football stadium, that takes target practice on specks of fuel smaller than peppercorns. The device, operating since 1993, has so far cost taxpayers more than $5 billion, making it one of the most expensive federally financed science projects ever. But so far, it has not worked.

Unfortunately, the due date is Sunday, the last day of the fiscal year. And Congress, which would need to allocate more money to keep the project alive, is going to want some explanations.

“We didn’t achieve the goal,” said Donald L. Cook, an official at the National Nuclear Security Administration who oversees the laser project. Rather than predicting when it might succeed, he added in an interview, “we’re going to settle into a serious investigation” of what caused the unforeseen snags.