

ITER Forum website Update 6/16

B.J.Green (22/7/16)

1. Sweden abolishes nuclear tax

10 June 2016

<http://www.world-nuclear-news.org/NP-Sweden-abolishes-nuclear-tax-1006169.html>

The Swedish parliament has today agreed to abolish a tax on nuclear power as it recognizes nuclear's role in helping it to eventually achieve a goal of 100% renewable generation.

The framework agreement announced by the Social Democrats, the Moderate Party, the Green Party, the Centre Party and the Christian Democrats, will see the tax phased out over two years. It also allows for the construction of up to ten new nuclear reactors at existing sites, to replace plants as they retire. Setting 2040 as the date at which Sweden should have a 100% renewable electricity system, the document stresses that 2040 is a 'goal' and not a cut-off date for nuclear generation.

A variable production tax on nuclear power introduced in 1984 was replaced by a tax on installed capacity in 2000. Since its introduction this tax has gradually increased and today corresponds to about 7 öre (0.8 US cents) per kilowatt-hour. In February this year, utility Vattenfall said that the capacity tax had brought its nuclear operating costs to around 32 öre (3.8 US cents) per kWh. However, its revenue from nuclear power generation is only about 22 öre (2.6 US cents) per kWh.

Swedish utilities had sought redress against the tax through the courts, but the European Court of Justice ruled last October that Sweden could continue to tax nuclear power, deciding the tax is a national, rather than European Commission, matter.

Vattenfall CEO Magnus Hall welcomed the agreement, which he said gave the utility the predictability it needed. "The abolishment of the nuclear capacity tax is an important precondition for us to be able to consider the investments needed to secure the long-term operation of our nuclear reactors from the 1980s," he said.

Vattenfall's reactors at Forsmark and Ringhals have undergone a comprehensive modernisation programme to allow them to operate until the mid-2040s. However, to continue operating beyond 2020 they must meet stricter safety requirements through the installation of independent core cooling. Investing in those upgrades was economically impossible with the tax in place.

"Even with the abolishment of the capacity tax, profitability will be a challenge," Hall concluded. "Low electricity prices put all energy producers under pressure and we will continue to focus on reducing

production costs. Naturally, investment decisions must be taken on commercial grounds, taking all cost factors and expected long-term market developments that the agreement implies into account," Hall said.

The director general of the World Nuclear Association, Agneta Rising, said: "Today's announcement is a positive development. It is vital that there is now consistent policy to give operators the confidence to make the investments needed in their plant to allow for their long term continued operation. Other countries should follow Sweden's example and ensure that their energy policies provide a level playing field that treats all forms of generation equally on their merits."

*Researched and written
by World Nuclear News*

2. **The Nuclear Royal Commission's spotlight on the need for reform**

May 20, 2016

[https://www.australianmining.com.
au/features/the-nuclear-royal-
commissions-spotlight-on-the-
need-for-reform/](https://www.australianmining.com.au/features/the-nuclear-royal-commissions-spotlight-on-the-need-for-reform/)

It is an idea that some will find startling and others will find long overdue – the removal of the existing federal prohibition of nuclear power.

But that's exactly what the South Australian Royal Commission into nuclear fuel cycle opportunities has recommended. Specifically, that the SA 'Government pursue removal at the federal level of existing prohibitions on nuclear power generation to allow it to contribute to a low-carbon electricity system, if required'.

Yet, this message is not new.

We have seen this message ring clearly in international circles where the importance of nuclear power in the energy mix has been consistently articulated.

The latest World Energy Outlook by the International Energy Agency (IEA) sees nuclear energy increasing its share of the global electricity generation mix slightly from 11 per cent in 2013 to 12 per cent by 2040 in its base case scenario. However in its 450 scenario, which 'depicts a pathway to the 2°C climate goal that can be achieved by fostering technologies that are close to becoming available at commercial scale', global nuclear power generation rises to 18 per cent of the mix.

In the IEA's 450 scenario, nuclear energy is second only to hydro in electricity production. When compared to other critical low emissions sources, nuclear will reflect a lower share of the total installed capacity, but will generate more electricity due to the intermittency of wind and solar.

Nuclear electricity will be 18 per cent of global electricity production coming from just 8 per cent of global installed electricity capacity. Solar PV with 14 per cent of installed capacity will generate 7 per cent of the electricity, while wind will generate 15 per cent of the power from 18 per cent of the capacity.

This projection reflects the critical role nuclear energy plays in generating low emissions base load electricity in a carbon constrained world.

Similarly, the Intergovernmental Panel on Climate Change (IPCC) has seen its attitude shift towards an increasing importance of the role of nuclear power. [Nuclear is grouped with renewable energy](#) as key in a low-carbon energy system, along with carbon dioxide capture and storage (CCS).

The [IPCC warns](#) 'No single mitigation option in the energy supply sector will be sufficient to hold the increase in global average

temperature change below 2 °C above pre-industrial levels....Achieving deep cuts will require more intensive use of low GHG technologies such as renewable energy, nuclear energy, and CCS'.

In this context, the Nuclear Royal Commission in South Australia has done a great service in shining a light in Australia on the importance of nuclear energy globally, and the possible roles Australia can play in the fuel cycle.

Its call to remove the legislative ban on nuclear energy serves to normalise this important industry, regardless of whether nuclear energy is pursued in Australia any time soon.

Its call for the SA government to 'pursue the simplification of state and federal mining approval requirements for radioactive ores, to deliver a single assessment and approvals process' supports the greater role Australian uranium can play in safely and responsibly producing more uranium for nuclear power generation around the world.

And its thorough evaluation of the potential for offering spent fuel storage and disposal services in Australia has provided an invaluable body of information for the public to deliberate on.

In addition to clearly detailing the safety and security of such an enterprise, and the economic benefit to Australia, the Commission explained what it would mean.

'As Australia is a net exporter of energy, it has a significant role to play in assisting other countries to lower their carbon emissions. This includes countries with less opportunity for large scale renewable energy deployment than Australia, for whom nuclear power makes a substantial contribution to their production of low carbon energy. For new nuclear entrants or countries with little prospect of siting their own used fuel disposal facilities, an international solution would remove a significant impediment to the new or ongoing use of

nuclear power as a low carbon technology. As a result, Australia would derive a reputational and financial benefit by hosting a facility for the disposal of international used fuel’.

It is time to reform Australia’s uranium and nuclear regulatory framework to reflect the global importance of these industries and the contributions Australia can safely, responsibly and economically make in the years ahead.

3. **World Nuclear Performance Report 2016**

<http://www.world-nuclear.org/our-association/publications/online-reports/world-nuclear-performance-report-2016.aspx>

At the start of 2015 there were 436 operable reactors around the world and by year-end there were 439. This increase in reactor numbers came despite the retirement of seven units during the year. A larger number of nuclear power units are under construction than at any other time in the last 25 years, and with another ten new reactors coming online – also a 25-year record for the industry – 2015 demonstrated improving new build performance all round. The existing global fleet generated roughly 10% of the world’s electricity, making up around one-third of the world’s low-carbon electricity supply.

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4. The US should remain in the ITER project for now

David Kramer

Physics Today

July 2016, page 36

http://scitation.aip.org/content/aip/magazine/physicstoday/article/69/7/10.1063/PT.3.3233?utm_source=Physics%20Today&utm_medium=email&utm_campaign=7275171_July%202016%20Table%20of%20Contents&dm_i=1Y69,4BXK3,E1OV2B,FVCQI,1

To read this article it must be purchased.

5.

A fieldtrip to ITER, a work-in-progress that will test fusion’s feasibility

In France, 35 countries invest time, cash, and effort in commercial energy's future.

by Dave Loschiavo - Jul 3, 2016 10:00pm CST

<http://arstechnica.com/science/2016/07/a-fieldtrip-to-iter-a-work-in-progress-that-will-test-fusions-feasibility/>

ST. PAUL-lez DURANCE, France—Rolling hills and oak woodlands dominate rural Southern France. However, about 35km north of Aix-en-Provence, nature has given way to a team of 1,000 construction workers who are laboring around the clock to build the largest physics experiment that’s never been discussed by

Sheldon, Leonard, Raj, and Howard.

Known as ITER, this experimental **Tokamak fusion reactor** is intended to be the last necessary step to prove the scientific and technological feasibility of fusion as a commercial energy source. It is a collaborative effort of China, the European Union (through Euratom), India, Japan, Korea, Russia, Switzerland (also through Euratom), and the United States. In total, it will include 35 countries.

The scale of this project, in so many dimensions, is nothing short of awe inspiring and humbling. Physically, the main buildings used to assemble and house the Tokamak reactor stand 60m (~200ft) tall and sit in a leveled area of 40 hectares (~100 acres). The entire site, adding the open space and office buildings, measures 180 hectares. Logistically, as a construction project, the ITER team is tracking over 200,000 actions necessary to bring the effort to fruition.

The project's chronology is equally vast. It began with discussions between General Secretary Gorbachev and President Ronald Reagan in 1985, and ITER is scheduled to run through 2046—it'll represent more than 60 years of effort.

Still, none of these metrics will measure up to ITER's weight on the scale of human achievement. The project's potential impact for humanity is immeasurable. In short, fusion could provide a much safer and cleaner method of generating energy than current methods using fission and fossil fuels.

Containing a plasma

The Tokamak fusion reactor, which the ITER team refers to as “the machine,” will use deuterium and tritium (two hydrogen isotopes) as fuel. Under extreme heat, the hydrogen isotopes fuse into helium, releasing high energy neutrons. When ITER's Tokamak reactor is operational, it will contain 10 times the volume of plasma in today's reactors. The knowledge gained from the operation of the plant, materials and control experiments, and study of plasma will pave the way for the commercial production of fusion power. Within the Tokamak, superconducting electromagnets will create fields that contain and control the plasma. The coils are composed of niobium-titanium (Nb-Ti) and niobium-tin (Nb₃Sn) and cooled by super critical helium at four Kelvin. The toroidal field created by the coils gives the particles in the plasma a spiraling path through the machine, aiding in confinement. The coils also create a poloidal field that prevents the plasma ring from expanding and holds it in the desired shape. The central solenoid in the middle of the

machine drives the plasma current.

The magnets create fields in the range of 12 to 13 Tesla (T)—by comparison, the magnets of the Large Hadron Collider (LHC) produce about 8T. ITER's magnets also have the capability to store over 50 Gigajoules (GJ) of energy, while the magnets in the LHC are limited to about 12GJ. In certain sections of the magnets, one meter of coil can have over 50 metric tons (112,000 lbs) of force pushing it. At the central solenoid, the inward pushing forces can reach 40,000 to 50,000 metric tons. Because the forces generated by the magnets are greater than the mass of the structure housing the machine, theoretically they could lift the entire building.

Sustainable fusion

In addition to functioning as a platform for experimenting with plasma, the machine will provide the capability to test ways of using fusion to produce additional tritium fuel. It will host different configurations of tritium breeding blankets, a critical technology for the large-scale production of fusion power.

The neutrons released in fusion reactions can produce tritium when they interact with lithium (high energy neutrons react with the lithium atoms, producing tritium and helium). Tritium has a short half-life; it's also rare and expensive. That combination makes it a limiting material for fusion. By placing a "blanket" of lithium around the reactor, fusion itself can help us overcome this limit. During its functional life, ITER will use tritium already in the global supply, but it will produce critical data needed on tritium breeding blankets.

Ultimately, the Tokamak reactor is projected to produce 500MW of fusion energy while consuming 50MW to heat the hydrogen.

Because the primary purposes of the reactor are to learn more about the properties of plasma, the means of controlling plasma, and the production of tritium by lithium breeder blankets, the excess energy will not be harnessed to produce electricity.

Construction

The project recently crossed a major milestone with the delivery of the first components of the machine. These pieces, once assembled on-site, will make up the cryostat—the world's largest stainless steel high-vacuum vessel with a volume of 16,000 m³.

The cryostat is essentially a large thermos within which the rest of machine will reside. Ultimately, it will stand nearly 30m (~100ft) high with a similar width. The cryostat will maintain its internal temperature at -269° C, allowing the magnets to function as superconductors.

The size of some of the components used during construction at the site has provided its own set of logistical challenges. For example, a set of two cranes provides a combined lifting capacity of 1,500 tons. They were delivered partially assembled, but even then, one section measured 47m in length. To get the cranes from the Marseille Fos Port to ITER, they were put on a barge and transported over the Étang de Berre inland sea, transferred to a special vehicle in Berr-L'etag, and then driven at 5km/h over 104km of specially reinforced road. The cranes were moved only at night in order to minimize the disruption to local traffic.

As with many projects of this physical scope and duration, progress hasn't come without difficulties and missteps along the way. Across the years, overly optimistic projections for budgets and schedules were made. Consequently, cost overruns and schedule delays have taken their toll on the project's credibility. Most recently, ITER announced 4 billion Euro (\$4.4 billion) in overruns and said the first tests with plasma would likely be delayed an additional five years to 2025.

Since one of the goals of the project has been to spread the scientific and technological learning across the participating nations, decisions haven't always been made with the goal of keeping costs down. While it may be less expensive to have a single source build a set of components, that doesn't necessarily provide an equitable sharing of technological growth—in many cases, components were made in more than one country.

Additionally, this arrangement has failed to foster a fully cohesive team environment at times.

The new head of ITER, who took over in 2015, is Director-General Bernard Bigot. Bigot recognized these concerns before taking on his role, so he made his acceptance of the position incumbent upon having the authority to manage ITER as a more closely-knit project instead of 35 different efforts spread across the member nations.

But a large project does not turn on a dime. And this project has been in existence for 31 years, involves production efforts on three continents, and includes politicians and technicians from 35 countries. It turns *slowly*. Still, impacts from changes in the management approach are being seen. Domestic agencies from the member nations have already acknowledged the need for increased levels of cooperation and a broader acceptance of working together as a team for the benefit of the entire project.

The total construction cost is projected to top out at approximately 15 to 20 billion Euro (~\$20 billion). Because member nations are

producing and contributing components (rather than simply funding ITER), an exact cost will likely never be known. Still, delays and increased costs get noticed, create challenges, and force member countries to make decisions about what to, and what not to, fund. The morning I arrived at the Marseille Provence Airport, Director-General Bernard Bigot and Communication Head Laban Coblentz were there to catch a flight for a short-notice trip to testify in front of the Subcommittee on Energy and the Committee on Science, Space and Technology at the United States House of Representatives.

The optimist in me thinks the decision makers will see the potential value in a cleaner fuel source for a planet that is so desperately in need of one, and as such they'll find a way to keep this project running. The potential it has to affect the future course of humanity is immeasurable, after all. No cost or challenge should be insurmountable.

Dave Loschiavo is a cybersecurity consultant who's lucky to live in the beauty of the northern Sierra Nevada. For Ars, he previously wrote about the experience of [fiber connectivity coming to his remote area](#).

6. **Momentum JV wins CMA contract to build ITER's €174m nuclear fusion reactor**

29 June 2016

<http://www.power-technology.com/news/newsmomentum-jv-wins-cma-contract-build-iters-174m-nuclear-fusion-reactor-4935745>

ITER Organisation has signed a construction management-as-agent (CMA) contract with Amec Foster Wheeler-led joint venture (JV) Momentum to build a €174m nuclear fusion reactor at Cadarache in France.

The JV comprises French-based Assystem and South Korean KEPCO Engineering and Construction Company and is owned one-third by each of the partners.

Amec Foster Wheeler's clean energy business president Clive White said: "The Momentum partners will bring complementary skills to bear and embed a can-do project culture focused on safety, quality and maintaining schedule and costs.

"Amec Foster Wheeler has played an important part in the ITER project for more than 20 years and this important contract underlines our key role in developing future nuclear technologies while continuing to support existing fission power industry."

The contract has been signed for ten years, with provision for a three-year extension. As a CMA contractor, Momentum will be responsible for managing and coordinating the assembly and deployment of over one million components for the ITER reactor.

The centre holds the world's largest tokamak, an experimental machine used to harness fusion energy.

ITER's director-general Bernard Bigot said: The role of the construction management-as-agent is absolutely central to the success of the ITER Project.

"And since fusion holds so much potential as an environmentally clean, virtually limitless, and safe source of energy, the stakes of success for the seven ITER Members are very high.

"With the expertise represented by the Momentum joint venture, we feel confident that the assembly and installation of the ITER facility will meet its objectives to deliver on time and on budget with the highest standards of quality."

Under the terms of the deal, services will include construction preparation; project, contract, and configuration management; works supervision; site coordination; and activities resulting in mechanical completion. However, the deal does not include design or fabrication of components, construction of the buildings or building services.

7. KEPCO E&C to take part in international reactor project

<http://www.koreaherald.com/view.php?ud=20160629000412>

THE INVESTOR] KEPCO E&C is to take part in the International Thermonuclear Experimental Reactor project as part of the MOMENTUM joint venture, the company announced on June 29.

According to **KEPCO E&C**, the value of the contract is 230 billion won (US\$197 million).

The JV, led by UK's Amec Foster Wheeler, has been signed on as a construction management-as-agent, KEPCO E&C said.

The JV also includes the French engineering firm Assystem.

As CMA contractor, MOMENTUM will manage and coordinate the assembly and installation of more than 1 million components for the ITER reactor.

The ITER project will see the construction of an experimental tokamak nuclear fusion reactor next to the Cadarache facility in southern France.

By Choi He-suk (cheesuk@heraldcorp.com)

8. **Contract to manage Iter assembly and installation**

28 June 2016

<http://www.world-nuclear-news.org/NN-Contract-to-manage-Iter-assembly-and-installation-2806164.html>

Following a year-long international tender process, the Momentum joint venture - comprising Amec Foster Wheeler of the UK, Assystem of France and Kepco Engineering & Construction of South Korea - has been selected as construction management-as-agent contractor for the Iter fusion project.

Under a ten-year, €174 million (\$193 million) contract signed yesterday, the Momentum joint venture will manage and coordinate the assembly and installation of more than one million components for the Iter tokamak and associated plant systems. There is an option for a three-year extension to the contract.

The contract was signed by Bernard Bigot, director general of the ITER Organization; Tom Jones, vice-president for business development at Amec Foster Wheeler Nuclear; Hubert Croly-Labourdette, vice-president for strategic operations at Assystem; and Jik-Lae Jo, executive senior vice-president at Kepco E&C. The scope of services the Momentum joint venture will provide under the contract includes contract management, configuration management, project management, construction preparation, site coordination, works supervision and activities leading up to mechanical completion. The contract does not cover design or fabrication of components, construction of the buildings or building services.

The ITER Organization said it will place a series of work contracts for the assembly of the tokamak machine and the mechanical and electrical installation of the plant systems. In addition, domestic agencies will also have their own contracts for some plant

installation works. "The Momentum joint venture will work closely with the ITER Organization to coordinate all work carried out under the different contracts," the ITER Organization said.

Bigot said, "The role of the construction management-as-agent is absolutely central to the success of the Iter project. And since fusion holds so much potential as an environmentally clean and virtually limitless safe source of energy, the stakes of success for the seven ITER members are very high."

He added, "With the expertise represented by the Momentum joint venture, we feel confident that the assembly and installation of the Iter facility will meet its objectives: delivery on time and on budget with the highest standards of quality."

Construction work on Iter began in Cadarache, southern France, in 2010. Once completed, a commissioning phase will follow that will ensure all systems operate together and prepare the machine for the achievement of first plasma. This had originally been planned for November 2020 but earlier this month the council of the ITER Organization endorsed an updated integrated schedule for the project, with first plasma now envisaged in December 2025. Iter's operational phase is expected to last for 20 years.

*Researched and written
by World Nuclear News*

9. **India delivering components for largest fusion energy project**

June 28, 2016

<http://www.siasat.com/news/india-delivering-components-largest-fusion-energy-project-979182/>

Gandhinagar :India has started delivering components for a multi-national project to build world's largest fusion device for carbon-free energy in France.

"So far we have delivered less than 10 per cent of total components," said Dheeraj Bora, director of Gandhinagar-based Institute for Plasma Research (IPR), which is handling the Indian part of the ITER (International Thermonuclear Experimental Reactor) project. India has so far earmarked Rs 2,500 crore for the project, and IPR has sought more funds, Bora said at a press conference here.

The project will pave the way for a new form of clean energy

through processes that undergo inside the Sun and the stars. It is expected to be ready by December 2025, he said.

India is supposed to contribute 9 per cent of components, or 15 packages. Other countries involved in the project are European Union, China, Japan, South Korea, Russia and the US.

Private companies such as Larsen & Tubro Hazira, L&T Construction Chennai, INOX India Limited Vadodara, Linde India Limited Kolkata and ATL Bangalore are building components including Cryosat, cooling water systems, vessel in-wall shielding blocks, radio frequency heating sources, cryo distribution and cryolines, power supplies, diagnostic neutral beam system and diagnostic systems.

“First set of vessel shield has been sent to South Korea, cooling water system has been shipped, beam dump has been delivered, and parts of Cryosat have also been delivered. Components of Cryosat’s base section of around 500 tons were the first of the ITER machine core components to be delivered at ITER site (in France) in December 2015,” Bora said.

Director of communication of the ITER, Laban Coblentz, said that India is making “on schedule delivery of components,” and is a “fantastic partner.”

“Fusion is going to change the nature of how we produce electricity..This scientific collaboration is a large-scale experiment to show feasibility of fusion energy. December 2025 is the new schedule for the completion of the project. Cryosat is the biggest contribution that India is making. India is a fantastic partner and is pretty on-schedule on delivery,” he said.

PTI

10. London, UK,

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June

2016

MOMENTUM joint venture wins €174m ITER

contract

Newsfacts:

MOMENTUM JV, comprising Amec Foster Wheeler, Assystem and KEPCO E&C, named construction management-as-agent contractor on unique international project

Project managing the assembly of more than one million components in world's largest fusion reactor

Key role in international effort to make fusion a viable source of almost limitless, carbon-free energy

<http://media.amecfw.com/momentum-joint-venture-wins-174m-iter-contract/>

Representatives of the ITER Organisation announce today that they have signed a construction management-as-agent (CMA) contract with the MOMENTUM joint venture, led by Amec Foster Wheeler in partnership with Assystem and KEPCO Engineering and Construction Company.

MOMENTUM will play a vital role in ITER's project to build the world's largest nuclear fusion reactor at Cadarache in France. The 10-year contract is expected to be worth €174m and there is an option for a three-year extension.

The role of the Construction Management-as-Agent is absolutely central to the success of the ITER Project. And since fusion holds so much potential as an environmentally clean and virtually limitless, safe source of energy, the stakes of success for the seven ITER Members are very high. With the expertise represented by the MOMENTUM joint venture, we feel confident that the assembly and installation of the ITER facility will meet its objectives: of delivery on time and on budget with the highest standards of quality.

Bernard Bigot, Director-General of the ITER Organisation

The MOMENTUM team is proud and delighted to be chosen for such a pivotal role on one of the world's most important energy projects. The MOMENTUM partners will bring complementary skills to bear and embed a can-do project culture focused on safety, quality and maintaining schedule and costs. Amec Foster Wheeler has played an important part in the ITER project for over 20 years and this important contract underlines our key role in developing future nuclear technologies while continuing to support

the existing fission power industry.

Clive White, President of Amec Foster Wheeler's Clean Energy business

MOMENTUM's three partners will allocate their best people to address the challenges related to such a unique project. This new CMA contract embodies Assystem's continuous involvement in the ITER project since work began at Cadarache in 2005. It highlights our expertise in complex, international project management.

Stéphane Aubarbier, Chief Executive Officer of Assystem

KEPCO E&C has a long-term commitment to ITER, having delivered technical and project management services since 2008. Our appointment alongside our partners in Momentum will help to strengthen technical cooperation for the successful completion of the ITER project, which is of such vital importance to the development of the world's future energy.

Koo-Woun Park, President and Chief Executive Officer of KEPCO E&C

As CMA contractor, MOMENTUM will manage and coordinate the assembly and installation of more than one million components for the ITER reactor. At its centre is the world's largest tokamak, an experimental machine designed to harness the energy of fusion, the nuclear reaction that powers the sun.

The scope of services includes contract management, configuration management, project management, construction preparation, site coordination, works supervision, and activities leading up to mechanical completion. The contract does not cover design or fabrication of components, construction of the buildings or building services.

11. NIF quest hobbled from the start

Extra Dimensions: Any progress in the pursuit of laser-initiated fusion is overshadowed by the project's failure to meet an absurdly ambitious deadline.

Andrew Grant

01 July 2016

http://scitation.aip.org/content/aip/magazine/physicstoday/news/10.1063/PT.5.2043?utm_source=Physics%20Today&utm_medium=email&utm_campaign=7284067_The%20week%20in%20Physics%2027%20June-1%20July&dm_i=1Y69,4C4F7,E10V2B,FW6GN,1

On 17 June *Physics Today's* David Kramer wrote a revealing story about the latest setback for the National Ignition Facility (NIF). A new report from the National Nuclear Security Administration (NNSA) confirms that nearly four years after the

nuclear fusion lab's self-imposed deadline, NIF is still nowhere close to achieving ignition—a reaction that generates more energy than that of the laser used to initiate the reaction.

When David first told me the news, I immediately thought about my visit to the Lawrence Livermore National Laboratory facility in February 2013, four months after the missed deadline. I came away from the tour impressed by the laser technology but more baffled than ever about the NIF leadership's 2009 ignition guarantee. It doesn't take a historian to understand that efforts for controlled fusion **don't tend to go as smoothly as planned**. Lo and behold, once NIF was turned on in 2010, scientists quickly realized that their simulations of how hydrogen capsules would implode when struck by a laser-driven burst of x rays were alarmingly off. Among other problems, the **capsules weren't imploding evenly**, which short-circuited the fusion reaction. NIF researchers responded by doing what scientists are supposed to do—take measurements to explore what's going on and adjust predictions accordingly—but meeting the deadline became a pipe dream. I got the sense during my visit that these scientists felt that no matter how much insight they gained into the factors preventing ignition, they would be labeled as failures for missing a deadline they didn't set.

The facility's scientists have made laudable achievements since the September 2012 deadline came and went. The laser pulse was adjusted to deliver an ultraquick burst, leading to a swifter and more compact implosion. A late 2013 trial **produced about 14 kJ of energy**, 3 kJ more than the laser energy absorbed by the capsule. (Of course, the 14 kJ didn't nearly make up for the roughly 1800 kJ of laser energy that never got absorbed.) About half the yield resulted from alpha heating, the crucial mechanism for achieving a sustained, self-perpetuating reaction.

Despite the incremental progress, the chances of achieving ignition at NIF or any other laser facility are dwindling. "Barring an unforeseen technical breakthrough and given today's configuration of the NIF laser, achieving ignition on the NIF in the near term (one to two years) is unlikely and is uncertain over the next five years," the new report says. "Currently there is no known configuration, specific target design, or approach that will guarantee ignition on the NIF." The language is more pessimistic than that of NNSA's 2012 report, which stated that it was "too early to assess whether or not ignition can be achieved at the NIF."

The facility's importance for nuclear weapons research will at least allow for limited opportunities to continue inching toward ignition. NIF engineers are tinkering with the fuel capsules and the cylindrical hohlraums that house them. Custom diagnostic instruments now extract as much information as possible from each laser shot; that data, in turn, help improve the simulations.

There's plenty of blame to go around for NIF coming up short, but it's a shame that the facility's scientists were pretty much doomed to fail from the first shot.

12.

Solar and wind power simply don't work - not here, not anywhere

By Keith DeLacy - posted Thursday, 23 June 2016

<http://www.onlineopinion.com.au/view.asp?article=18325>

One policy which seems to have escaped scrutiny during this election campaign is Labor's commitment to increase the Renewable Energy Target to

50 per cent by 2030. I am surprised because it is a proposal that has enormous ramifications for economic growth and living standards, and disproportionate impacts on traditional Labor constituencies.

The problem we have in Australia is when we talk renewable energy we are talking wind and solar only - low value, expensive, unreliable, high capital cost, land hungry, intermittent energy.

According to the Department of Industry and Science wind currently generates 4.1 per cent and solar 2 per cent of Australia's electricity. But even this is highly misleading because it is such low value power. You could close it down tomorrow (which it regularly does by itself) and it would make no difference to supply.

If we talk about total energy, as opposed to just electricity, wind and solar represent 1 per cent of Australia's energy consumption. This despite billions of dollars of investment, subsidies, creative tariffs, mandates, and so on. Solar and wind simply don't work, not here, not anywhere.

The energy supply is not dense enough. The capital cost of consolidating it makes it cost prohibitive. But they are not only much more expensive because of this terminal disadvantage, they are low value intermittent power sources — every kilowatt has to be backed up by conventional power, dreaded fossil fuels. So we have two capital spends for the same output — one for the renewable and one for the conventional back-up. Are you surprised it is so much more expensive, and inefficient, and always will be? So wind and solar, from a large scale electricity point of view, are duds. Now I know that will send the urgers into paroxysms of outrage. But have you ever seen an industry that so believed its own propaganda. Note, when they eulogise the future of renewables they point to targets, or to costly investments, never to the real contribution to supply.

Let's look overseas where many countries have been destroying their budgets and their economies on this illusion for longer and more comprehensively than we in Australia. The Germans are ruing the day they decided to save the world by converting to solar and wind. Germany has spent \$US100bn on solar technology and it represents less than 1 per cent of their electricity supply. Energy policy has been a disaster. Subsidies are colossal, the energy market is now chaotic, industry is decamping to other jurisdictions, and more than a million homes have had their power cut off.

It is reported electricity prices in Germany, Spain and the UK increased by 78 per cent, 111 per cent and 133 per cent between 2005 and 2014 as they forced additional renewable capacity into their electricity markets. Sunny Spain used to be the poster boy for renewables in Europe — photovoltaic cells and wind turbines stretching on forever. Now they are broke, winding back subsidies, even the feed-in tariffs which were guaranteed for 20 years. But wait, what about the green energy jobs that everybody gushes about? Spain has an unemployment rate of 21 per cent with a youth rate of 45.5 per cent.

Britain is little better. Subsidies are being wound back, and a Department of Energy report points out that in 2013, the number of households in fuel poverty in England was estimated at 2.35 million representing around 10.4 per cent of all households.

It is no better in the US either. States with renewable energy mandates are backtracking faster than Sally Pearson can clear hurdles. Ohio has halved its

mandate level (it was 25 per cent by 2025) because of high costs. West Virginia has repealed its mandate because of high costs, and New Mexico has frozen its mandates. Kansas was repealing its mandate which reportedly would save ratepayers \$171m, representing \$4367 for each household, and so the dismal story goes on. The US Department of Energy has found electricity prices have risen in states with mandates twice as fast as those with no mandate. As of 2013 California was the only state to adopt a feed-in tariff for solar power. It was immediately dubbed a failure by the renewable energy community because it offered only 31 cents per kWh, only five times the rate for conventional base load power.

Ah, but Asian countries are jumping on the bandwagon. Maybe. China built one new coal-fired power plant every week in 2014, and India's coal-powered investment in that same year equalled the total electricity capacity of NSW and Queensland. To summarise — with all of the trillions spent worldwide on wind and solar, wind currently represents 1.2 per cent of global consumption of energy, and solar 0.2 per cent.

The good news, it is possible to reduce fossil fuel use in electricity generation — through hydro-electricity and nuclear fuel. Plenty of countries have done it — Canada 60 per cent hydro and 15 per cent nuclear; Sweden 45 per cent hydro and 48 per cent nuclear; Switzerland 54 per cent hydro and 41 per cent nuclear; France 11 per cent hydro and 79 per cent nuclear.

But Australia has zero tolerance of these two workable alternatives to fossil fuels. At least we are consistently inconsistent.

So where does that leave us? On the basis of evidence everywhere we could easily double the price of electricity and get nowhere near the 50 per cent target. What would that mean?

First, it means rapidly disappearing blue collar jobs in high energy industries like manufacturing, car and ship building, smelting and refining, steel making and food processing. There may be still some construction jobs, but they will largely be assembly only, as all of the components will come from those countries more interested in growing the economy and eliminating poverty than stoking the warm inner glow. Make no bones about it, a clean green economy has no place for high-vis shirts.

Second, rapidly rising electricity prices and the subsequent increase in the cost of living, disproportionately affects those at the bottom of the income scale.

Policies like this are OK for the Greens. They can keep their virtue intact because they never have to deliver. As Gough Whitlam once said, only the impotent are pure.

Mainstream parties don't have that luxury. They need to look at the true costs, and benefits, of all policy proposals.

13. Iran Hopes to Join Project to Produce

Nuclear Fusion Power

By EDITH M. LEDERER, ASSOCIATED PRESS NEW YORK

— Jul 8, 2016, 6:20 PM ET

[Iran](#) is hoping to join an international project in southern France that hopes to build the first machine to generate significant amounts of energy using nuclear fusion, which is considered a clean, safe and virtually limitless form of nuclear power. Laban Coblentz, spokesman for the ITER project, said a high-level Iranian delegation led by nuclear chief Ali Akbar Salehi and Vice President for Science and Technology Sorena Sattari visited St. Paul Lez Durance on June 30-July 1, where the fusion device is being built. Coblentz said fusion-generated nuclear power has no significant weapons applications.

Salehi was quoted by the Mehr news agency as telling reporters on Wednesday that during the visit "we discussed possibilities of Iran's joining to ITER, and the other members welcomed a prospective Iran membership."

Nuclear fusion, which joins atoms together, is the process that powers the sun and stars, and "harnessing fusion's power is the goal of ITER," according to its website. The project "has been designed as the key experimental step between today's fusion research machines and tomorrow's fusion power plants."

Coblentz said in a telephone interview and email exchanges with The Associated Press this week that the six world powers who signed last summer's nuclear deal with Iran to rein in its nuclear program — the U.S., [Russia](#), China, Britain, France and Germany — encouraged Tehran's participation in the ITER project.

The six powers believe that Iran wanted to use its nuclear reactors — which are based on fission where atoms are split — to produce uranium for nuclear weapons, which Tehran denies.

An annex to the nuclear agreement on Civil Nuclear

Cooperation says the six powers and Iran can "explore cooperation" on an Iranian contribution to the ITER project. Coblenz said the Iranians are "very eager to get moving" and join the 35 countries collaborating on building the world's largest experimental fusion machine called a tokamak.

Iran has not made a formal application and new members must be approved unanimously by the ITER council which also includes India, [South Korea](#) and Japan who were not part of the Iran nuclear deal, he said.

"But the ITER Charter makes it clear that ITER is a project open to any country that is prepared to have meaningful participation," both technological and financial, Coblenz said.

He said "it was clear from statements that Iran made that they view themselves as having a gap to make up technologically, but their first move is to understand what is the nature of that gap" and if they need to take any further steps before seeking membership.

Iran's nuclear agency announced in July 2010 that it had begun studies to build an experimental nuclear fusion reactor.

Coblenz said Iran now has three small tokamak machines and is building a fourth.

It also has about a hundred plasma physicists and about 150 scientists with doctorates in fields related to nuclear fusion "so they clearly have a serious academic program," he said.

The heart of a tokamak — invented by Russian researchers in the late 1960s — is a doughnut-shaped vacuum chamber where under extreme heat and pressure, gaseous hydrogen fuel becomes a plasma. That plasma is where hydrogen atoms can be fused to produce energy, and the particles can be controlled by massive magnetic coils placed around the chamber.

The ITER project's goal is to produce the world's largest tokamak which can produce 500 megawatts of fusion power — far more than a European tokamak that holds the current

record of 16 megawatts of fusion power. Coblenz said the best technically achievable schedule for making the ITER tokamak fully functional is 2025. How long it would then take to build a commercial fusion power plant will depend on "the level of political will and the sense of urgency," he said.

14. Hyundai Heavy clinches additional ITER component deal

<http://www.koreaherald.com/view.php?ud=20160719000940>

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Updated : 2016-07-20 09:31

[**THE INVESTOR**] **Hyundai Heavy Industries** has won an additional contract to supply two vacuum vessel sectors, the key component of the multibillion-dollar project International Thermonuclear Experimental Reactor, the company said on July 19.

Under the US\$101.6 million deal, HHI will build two of the nine vacuum vessel sectors (No.7 and 8) that make up the main body of the ITER, the world's largest nuclear fusion machine being built in Cadarache, southern France. Each vacuum vessel sectors measures 400 tons in weight and 12 meters in height.

The company is scheduled to complete the equipment by the end of 2020 and deliver to the ITER construction site.

In 2010, HHI received the first order to build two vacuum vessel sectors (No.1 and 6) by 2019. With the latest addition, the price of the contract Hyundai won amounts to a whopping US\$380 million.

The ITER project, funded and run by seven entities -- including the European Union, India, Japan, China, Russia, South Korea and the US -- was launched in 2007 with an aim to build an experimental nuclear reactor that generates cleaner, safer and more efficient energy sources through

atomic fusion.

14. **Close encounters of the MAST kind | 19/07/2016**

http://www.ccfе.ac.uk/news_detail.aspx?id=390

It may look like a UFO, but it's actually the latest big component to go into the new **MAST Upgrade tokamak**, now being assembled at CCFE. The component is known as the 'upper divertor coil cassette' and is part of the coils that will produce the magnetic field to confine the hot plasma inside MAST Upgrade during experiments.

The cassette is integral to the workings of the Super-X divertor – a novel concept for exhausting waste plasma that will be one of the main innovations of the new device. In the video below you can see the cassette being lowered and attached to MAST Upgrade's outer cylinder, which was **recently moved into place**.

There is still much work needed to complete the assembly of MAST Upgrade – but with each component re-installed it looks more and more like a real tokamak.

Ioannis Katramados, MAST Upgrade's Load Assembly leader, is delighted with such visible progress:

“This has been a long time coming but good preparation, hard work and learning from earlier difficulties has paid off. As more modules come together, the machine takes shape, lifting everyone's spirits and giving us all a push to get the job completed. My thanks to the team for a brilliant performance – again!”

15. **Wendelstein stellarator begins upgrades after fusion success**

11th July 2016 12:00 pm

<http://www.theengineer.co.uk/wendelstein-stellarator-begins-upgrades-after-fusion-success/>

The Wendelstein 7-X stellarator has successfully completed its first stages of research, heating plasmas to temperatures of 100 million degrees Celsius and achieving pulse lengths of six seconds.

Known as W7-X, the nuclear fusion device is the largest

stellarator ever constructed, using 50 computer-designed electromagnets to guide superheated plasma around its 16m-long toroidal chamber. The project has taken two decades to reach this point, and is potentially a key step towards nuclear fusion power plants that will provide clean and virtually limitless energy.

Following **an intricate build process** that lasted nine years and involved over a million hours of labour, W7-X was **fired up for the first time** in December last year at the Max Planck Institute for Plasma Physics (IPP) in Greifswald, Germany. Initially heating helium to around 1 million degrees Celsius, the device reached a significant milestone in February of this year when it **made its first hydrogen plasma**.

In total, approximately 2,200 plasma pulses have been fired since operations began, building from initial lengths of half a second up to six seconds. At mean plasma densities the physicists were able to generate temperatures of 100 million degrees Celsius for the plasma electrons, and 10 million degrees for the ions. These temperatures were recorded using 4 megawatt microwave pulses lasting one second. “We are more than satisfied with the results of the first experimental campaign”, said project lead Prof Thomas Klinger. “(They) greatly exceeded what our rather cautious predictions had led us to believe.”

Since completing the first phase of research in March, W7-X’s plasma chamber has now been reopened so that upgrades can be made, and longer pulses can be fired. Workers will install 6,200 graphite tiles of various shapes that will protect the vessel walls. The ten strips of tiles will also act as divertors to control the plasma’s density and remove impurities. According to the scientists at IPP, these elements must be installed to a precision of 1-2 millimetres – a challenging task given the stellarator’s asymmetric sweeping curves.

“After exact measurement of the inside wall we therefore

compare the wall dimensions with the tile measurements by a numerical method and modify, where necessary, the tiles with a computer-controlled milling cutter”, explained Mathias Müller from IPP’s Technical Services.

The intricate nature of the upgrades means they won’t be completed until mid-2017. W7-X should then be ready for plasma pulses of eight megawatts lasting ten seconds. If everything goes to plan, the graphite tiles will eventually be replaced with carbon-fibre-reinforced components that are also water-cooled. Over the course of the next four years, the stellarator will build towards heating powers of 10 megawatts, and continuous plasma firings of around 30 minutes. If achieved, this would mark a major leap forward in the development of commercially viable fusion energy. “It’s exciting to see the Wendelstein 7-X stellarator complete its initial experimental campaign,” said **Dr David Kingham, CEO of UK fusion company Tokamak Energy**. “The more we can showcase fusion technology, the more its viability as an energy source will be appreciated.”

16.

POLITICS

ECONOMY

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**EDUCATION
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ENERGY/ SUMMER 2016

Fusion: The next big thing

A Q&A with a remarkably optimistic Dennis Whyte from MIT



EDWARD M MURPHY Jul 11, 2016

<http://commonwealthmagazine.org/energy/fusion-the-next-big-thing/>

GREATER BOSTON IS on a roll, propelled by innovation. The US Chamber of Commerce recently named the region number one in the nation for “fostering entrepreneurial growth and innovation.” Our universities, medical institutions, research labs, and venture capitalists have combined to develop enterprises on the spearhead of biotech and high technology, producing whole industries that barely existed two decades ago. There is a lot of runway ahead in these new fields but it is worth asking, in an economy largely dependent on continuous innovation, what is The Next Big Thing? The answer to that question may lie in an undistinguished, recycled industrial building not far from Kendall Square.

There, working in MIT’s Plasma Science and Fusion

Center, a group of physicists, engineers, and graduate students routinely turn on their favorite device, called a tokamak, and achieve temperatures approaching 100 million degrees Celsius, which is many times the temperature at the center of the sun. The physicists' improving ability to achieve and contain such temperatures is generating optimism that science is getting much closer to an elusive goal: generating significant amounts of electric power through the use of fusion.

Fusion occurs when two or more atoms collide at very high speed to form a new "fused" nucleus, resulting in the release of significant excess energy. By contrast, fission is the "splitting" of atoms into smaller parts, a process that also releases energy. All existing commercial nuclear plants use fission to create power, but they come with well-documented disadvantages associated with their complex fuels, operational risks, radioactive waste, and security threats.

Electricity generated by fusion would effectively eliminate those disadvantages. The fuel is an abundant and inexpensive form of hydrogen; there is no risk of a meltdown; the byproducts present minimal radiation problems; and there is no material a terrorist could steal for a dirty bomb. Best of all, fusion offers the possibility of replacing a large portion of the world's fossil fuel consumption with a carbon-free supply of power.

The dream of fusion power has propelled physicists to pursue it for more than half a century. While the basic science was understood, the design, engineering, and materials necessary for a controlled fusion reaction took decades of trial and error to grasp. But the consequences of success are so revolutionary that governments and research institutions around the world have kept at it.

In recent years, the progress in fusion research has generated an increasing level of buzz among those who follow the field. Perhaps the most telling sign of this is the emergence of private companies in a field traditionally dominated by publicly funded research labs. Venture capitalists and prominent billionaires such as Paul Allen and Jeff Bezos have invested in firms dedicated to creating practical fusion energy.

The accelerating knowledge base is also raising questions about whether an expensive international research project in France, which is based on 1990s technology, should continue. The United States is currently providing 9.1 percent of the \$20 billion-plus in funding for the International Thermonuclear Experimental Reactor in southern France that is behind schedule and over budget. Even if the reactor gets built, it's a research project that will not supply power to the grid. Some analysts think the US funding would be better spent on projects taking advantage of contemporary technology.

In an effort to gauge where things stand in the

development of fusion energy, I sought out MIT Professor Dennis Whyte, one of the world's foremost experts on the topic. Whyte is head of MIT's Department of Nuclear Science and Engineering and is also Director of the Plasma Science and Fusion Center. We spoke in his office in Cambridge.

EDWARD M. MURPHY: Some people think of fusion as a form of French-Asian cuisine. Is that a useful metaphor for what you do?

DENNIS WHYTE: Up to a point, it is. Fusion is a blending together of different elements to create something new. Our kind of fusion is very spicy. At a hundred million degrees, it might burn your tongue.

MURPHY: There is a perception in some quarters that the reality of fusion power is getting closer. Is that perception accurate?

WHYTE: Yes. In the last few years there has been an increasing realization of the dramatic progress of fusion science. There is a lot of hard work ahead of us.

conditions necessary to make fusion power are in hand. We see clear opportunities on both the technical and science side to accelerate fusion's development. There are also some invigorating changes in the support of fusion in that the private sector is starting to invest. For a long time, this work relied solely on government support.

MURPHY: What has happened in recent years to

create this momentum?

WHYTE: I'd point to three things. First, we have established the scientific credibility of fusion research and this has led to the realization that maybe we have it better in hand than we thought before. Second, the really big one, is the advent of new superconducting technology. Improved superconductors have a lot of implications, but the main one for us is the ability to create magnetic fields of unprecedented strength. Third, improved computational resources, essentially supercomputing, have allowed us to understand the fusion environment better because we can analyze and model the complex energy systems that we are trying to create.

MURPHY: Let's back up a bit. What is the significance of a strong magnetic field in a fusion reaction?

WHYTE: In fusion, we are duplicating the process that powers the sun by heating up heavy forms of hydrogen to the point where the atoms fuse together and release enormous amounts of energy. We routinely achieve 100 million degrees to create this reaction in what we call a plasma. In order to create net energy from fusion, we have to hold this plasma inside a very strong magnetic field. The more force you can exert with the magnetic field, the more stable it becomes and also the smaller the device becomes.

MURPHY: Have stronger magnetic fields and improved superconductors allowed you to think in

new ways about how to develop a practical fusion device?

WHYTE: We've done more than think about it. We have actually scoped out a conceptual design of how these new technologies combine together to develop what appears to be a much more attractive product for making fusion energy.

MURPHY: What are the characteristics of your new design?

WHYTE: We call it ARC, an acronym for Affordable, Robust, and Compact. The basic idea was to ask the question: What would be the minimum-size fusion device that would produce significant amounts of net electrical power? The capacity to make the magnetic field much stronger significantly reduced the size of the device compared to what previous studies had shown. We did the engineering calculations and found a surprising result: a rather compact device can make 250 million watts of net electricity.

MURPHY: Can you put 250 million watts in context?

WHYTE: That's sufficient to power Cambridge. And the fuel is basically free, derived from water. I did the calculation and the yearly cost of fuel per resident of Cambridge is around 20 cents.

MURPHY: You said the ARC device is designed to be compact. How big is it compared to conventional power plants?

WHYTE: The plasma, where the fusion occurs, has an outside diameter of about 26 feet. The entire

device, which will include the “blanket” that surrounds the plasma to capture the fusion energy and make electricity plus the magnetic coils, has an outside diameter of about 40 feet. To be more parochial, the device easily fits under the dome at MIT.

MURPHY: So a small fusion plant could power Cambridge inexpensively?

WHYTE: There’s more. Fusion is complicated but, when you make it work economically, it’s the home run for energy. You don’t have any carbon emissions. It’s intrinsically safe and it produces continuous power. It’s not intermittent, which is the challenge with renewables.

MURPHY: It hasn’t actually happened yet. How could fusion power become a real energy source?

WHYTE: I have no doubt that we can make fusion energy. The harder path in front of us is making it commercially and economically competitive. Fusion is just more complex than other energy sources. There are going to be hits and misses. It seems to me to be a ripe opportunity for a new kind of partnership between the public and private sector to move things forward.

MURPHY: Do we need to have a Manhattan Project or an Apollo Project to make this happen?

WHYTE: I’m not convinced of that actually. More resources are essential but what we need is a scaled and evolving pathway towards fusion energy. The Human Genome Project is a good example of the kind of process needed—public and

private with a wide variety of approaches. At the beginning of the Human Genome Project 25 years ago, I don't think anyone could have conceived that you would have small private companies doing sequencing of your DNA when you mail it in. We can accelerate the development of fusion by trying out many smaller different kinds of configurations to find out which ones work best. We need to throw some cold water on the long, slow R&D projects. We're recognizing that it's time for the technology development and innovation cycles that come from the private sector. We need rapid innovation cycles that fail or succeed quickly. There will be spinoff benefits that we can't imagine yet. By the way, Massachusetts has a chance to be at the forefront of this because we have the right combination of ideas and capabilities to lead the way.

MURPHY: What is a realistic timeframe for getting fusion power into the energy grid?

WHYTE: That's the classic question. I'll start with the joke: Fusion is the perfect energy source that's 30 years away and will always be 30 years away. I hate that joke. I want to eliminate that joke from the English language. The conditions necessary to make fusion energy have been known since the 1950s and those have not changed because they are based on the fundamental laws of nature. It's very complex but I think the technology that exists now, while it's no guarantee of success, will let us accelerate the development cycle so that it's much

faster. I see a pathway that would make fusion energy in under 15 years.

MURPHY: Actually on the grid?

WHYTE: On the grid, what I'd call a fusion pilot plant. A demonstration that you could make electricity. I think it's really important that we hold ourselves to an aggressive timeline and meet it using these new technologies.

MURPHY: There are amazing implications if that can happen.

WHYTE: Yes, 85 percent of our energy now comes from burning fossil fuels and there is very serious science saying that you cannot keep doing that. Renewables have some attractive features but the idea of trying to replace 85 percent with renewables presents risks which are probably not acceptable. It's not even clear if it's technically possible at this point. Fusion is the ultimate choice. The problem is it can't take forever because, by the numbers that are coming out, we need to start deploying it in the next 20 years. That's why I really believe it's worth a crack to see if we can get there in 15. If we create the perfect system 50 or 100 years from now, it could be just too late. That's the urgency of this.

Edward M. Murphy worked in state government from 1979-1995, serving as commissioner of the Department of Youth Services, commissioner of the Department of Mental Health, and executive director of the Health and Educational Facilities Authority. He recently retired as CEO and

chairman of one of the country's largest providers of services to people with disabilities.

17. ČEZ requests EIA for new Dukovany units

21 July 2016

<http://www.world-nuclear-news.org/NN-CEZ-requests-EIA-for-new-Dukovany-units-2107166.html>

Czech utility ČEZ has requested the Ministry of Environment carry out an environmental impact assessment (EIA) for the potential construction of two new reactors at the Dukovany nuclear power plant.

The company said today it has submitted the required documents to the ministry to launch the EIA process.

The purpose of the assessment, ČEZ said, is to "identify, describe and comprehensively assess foreseeable impacts of the planned projects on the environment and public health in the relevant context". It added, "Based on our experience, the EIA may be expected to take several years to be completed."

All four existing reactors at Dukovany are expected to remain in operation until at least 2035, ČEZ said, and then to be gradually retired. It said, in accordance with the National Action Plan for the Development of Nuclear Energy approved by the government last June, one or two new units could be built at Dukovany to replace the existing ones.

The plan foresees nuclear energy to be a major source of power that will allow the Czech Republic to be self-sufficient in terms of power generation and ensure reliability of power supplies to end users.

The plan says, "It is desirable from the perspective of the state to immediately initiate the preparation for siting and construction of one nuclear reactor at the Temelin site and one reactor at the Dukovany site as well as to protect potential risks by obtaining the required licences for the possible construction of two reactors at both sites." It added, "In particular, to maintain the continuation of production at the Dukovany site, the construction of a unit at the Dukovany site and its commissioning by 2037 are crucial in order to ensure the continuity of the operation of a nuclear facility and human resources at the site until 2037 when the shutdown of the existing nuclear power plant is expected."

ČEZ said, "By preparing in a timely manner for two potential new units in Dukovany, we will be able to ensure uninterrupted power

generation from key nuclear sources in a location where the long-term environmental impact of the safe and reliable operation of the existing four units of the Dukovany nuclear power plant can be verified."

Pavel Cyrani, director of ČEZ's sales division and a member of the company's board of directors, said: "From the economic and environmental viewpoint, we still consider nuclear energy as one of the best energy sources for the Czech Republic, and the EIA is one of the steps in collecting source documentation for subsequent decisions on the construction itself. This way we have fulfilled some tasks defined in the National Action Plan for the Development of Nuclear Energy approved by the Czech government."

He added, "The European energy sector has been going through a period of changes and uncertainty, and we need to be prepared for all possible directions of the future development."

In July 2008, CEZ requested that the Ministry of the Environment conduct an EIA of two additional reactors at Temelin. It submitted the documents needed by the ministry to conduct that assessment in June 2010. In January 2013, the ministry concluded the construction of two more units at Temelin would not have a significant environmental impact.

The tender process for two new Temelin units was launched in August 2009 and attracted bids from three candidates - Areva; Westinghouse; and a consortium between Škoda JS, AtomStroyExport and OKB Gidropress. However, ČEZ informed Areva in October 2012 that its bid had been disqualified. In April 2014, ČEZ - which is 70% state owned - announced that it had cancelled the tender process.

*Researched and written
by World Nuclear News*

18. **Fourth Ningde unit enters commercial operation**

21 July 2016

Unit 4 of the Ningde nuclear power plant in China's Fujian province has entered commercial operation, plant constructor China Nuclear Industry 23 Construction Company Limited announced today.

<http://www.world-nuclear-news.org/NN-Fourth-Ningde-unit-enters-commercial-operation-2107165.html>

The company said the CPR-1000 pressurized water reactor entered commercial operation at 12.05am today, having completed a 168-hour continuous demonstration run.

Fuel loading operations began at unit 4 on 31 December 2015 and the process of loading all 157 fuel assemblies into the reactor's core was completed 3 January. The unit achieved first criticality on 16

March and was connected to the grid on 29 March. Ningde 4 is one of four 1020 MWe CPR-1000 units built as Phase I of the plant. Construction of units 1 and 2 started in 2008 and those units entered commercial operation in June 2013 and May 2014, respectively. Construction of units 3 and 4 started in 2010, with Ningde 3 entering commercial operation in June 2015.

The Ningde plant is built across three small islands near Fuqing City in the northeast of Fujian province. The plant is co-owned by CGN (46%), China Datang Corp (44%) and Fujian Energy Group (10%). Ningde is the first nuclear project of Datang, one of the five large generating companies formed from splitting up the State Power Corporation in 2002.

The construction of two Hualong One reactors is planned for Phase II of the plant.

CGN now has 13 nuclear power reactors in commercial operation with a combined generating capacity of 13.8 GWe. It has a further ten units under construction, with a capacity of 12.3 GWe.

CGN now has 17 reactors in operation with a combined generating capacity of 18.17 GWe and a further eight units currently under construction.

*Researched and written
by World Nuclear News*

19. **Third Barakah reactor vessel in place**

21 July 2016

The reactor vessel has been installed for unit 3 of the Barakah nuclear power plant under construction in the United Arab Emirates. All four units at the site should be in operation by 2020.

<http://www.world-nuclear-news.org/NN-Third-Barakah-reactor-vessel-in-place-2107164.html>

A ceremony was held yesterday to mark the installation of the component. Among the attendees was Saeed Eid Al Ghafi, chairman of the Executive Office, and Awaidha Murshed Ali Al Marar, chairman of the department of municipal affairs and transport and a member of the Executive Council. The event was also attended by, among others, Emirates Nuclear Energy Corporation (Enec) senior management and the Korean Ambassador to the UAE.

The vessel - measuring 14.8 meters in height and 5.5 meters in diameter and weighing 533 tonnes - was produced in South Korea by Doosan Heavy Industries and Construction. Its installation follows that of unit 1 in May 2014 and that of unit 2 in June 2015. Enec CEO Mohamed Al Hammadi said, "The safe and successful installation of Enec's third reactor vessel is the culmination of many years of hard work and dedication." He added, "Enec is committed

to delivering a world-class nuclear energy program and as we move from construction through to operation we continue to improve, particularly in the overall project management. The phased approach to completing each unit with a substantial amount of time between each one means each unit's development adopts the efficiencies learned from the previous one."

In a \$20 billion deal announced in December 2009, Enec selected a consortium led by Korea Electric Power Corporation to build four APR-1400 reactors at Barakah, about 50 km from the town of Ruwais. Overall construction of the four units is now more than 65% complete, Enec said. Unit 1 is scheduled to start up in 2017, with the other units following at yearly intervals. The four reactors are expected to provide about 25% of the UAE's electricity and save up to 12 million tonnes of greenhouse gas emissions annually.

*Researched and written
by World Nuclear News*

20. Panic Hits South Australia: Wind Power Debacle Sends Power Prices Through the Roof

July 18, 2016 by [stopthesethings](#)

<https://stopthesethings.com/2016/07/18/panic-hits-south-australia-wind-power-debacle-sends-power-prices-through-the-roof/comment-page-1/>

South Australia's witless Labor government is in a state of full blown panic.

Since the closure of Alinta's Northern and Playford power stations at Port Augusta, peaking power operators (using highly inefficient **Open Cycle Gas Turbines** or even **diesel generators**) have been gouging SA's crippled power market, every time wind power output collapses. The spot price quickly rockets from around \$70 per MWh to \$2,000 per MWh and, towards the end of each 60 minute trading period, often hits market cap – previously \$13,800, and from 1 July \$14,000, per MWh (see **our post here**). Only a few months ago, Labor Premier, Jay Weatherill was in Paris spruiking up SA's wind powered credentials; and cooing about his plans for a 50% Renewable Energy Target.

That was then, this is now. His distraught Energy Minister, Tom Koutsantonis is at wits end, as he attempts to placate furious business leaders faced with rocketing power prices and routine load-shedding and blackouts.

While the wind cult are working at fever pitch to throw a lid on the calamity that is South Australia (blaming everything but the obvious target for the disaster), mainstream media are finally cottoning on to the greatest energy disaster in Australia's history.

Late to the party is The Australian's Michael Owen.

Once upon a time, The Australian was at the forefront of uncovering the greatest economic and environmental fraud of all time. However, after American wind and Open Cycle Gas turbine maker, GE threw \$millions at The Australian back in late 2014 for an advertorial campaign headed "Powering Australia", its editorial line shifted; apart from pieces written by external commentators – like Keith De Lacy, articles critical of wind power became a rarity.

With the disaster in SA now impossible to cover up, The Australian, among others, has started unloading, as follows.

Rush to wind forcing power prices up, say SA Liberals

The Australian

Michael Owen

15 July 2016

Wind power is driving base-load electricity providers out of the market, SA Liberals say.

The traditional manufacturing state of South Australia, with the worst jobless rate in the country, is paying the highest -prices in the national electricity market.

South Australia's lack of access to low-cost coal, an exposure to higher wholesale gas prices and an absence of competition in conventional power generation was to blame, analysts said.

The state's Liberal opposition has pointed the finger at the Labor's government's "overzealous rush into wind power" that it said was driving base-load electricity providers out of the market, pointing to the closure this year of the coal-fired Port Augusta power stations.

Soaring electricity prices in South Australia have seen up to 10 major manufacturers, including BHP Billiton, Arrium and Nyrstar, approach Treasurer Tom Koutsantonis to warn of production shutdowns unless the government intervened.

As a result, an extra 239 megawatts of power will come on line from today after private energy supplier Engie agreed to fire up a previously mothballed generator at Pelican Point, near Port Adelaide.

Spot power prices for South Australia have risen to more than seven times that of the Victorian price and almost eight that in NSW during the past week.

Mr Koutsantonis said yesterday the energy crisis had arisen because of a shortage of electricity being supplied to the state through an interconnector with Victoria, compounded by a planned outage at the Heywood Interconnector for upgrade work, higher gas prices and wild storms.

"A confluence of remarkable events has led to incredible volatility in the spot market over recent days, which has resulted in higher electricity prices and put pressure on South Australian businesses, some of whom have raised their concerns with me," he said.

“Engie has brought additional generation at Pelican Point online after I approached them with the request. No amount has been paid to Engie to increase generation.”

Mr Koutsantonis said the situation was “another example of the failure of the so-called national energy market”.

The state had allocated \$500,000 in last week’s budget for a feasibility study into greater inter-connection of energy supply between South Australia and the eastern states, and asked the federal government to assist, he said.

This came as South Australia’s unemployment rate surged to 7 per cent last month, well above the 5.8 per cent national rate.

Business SA and the opposition said a lack of power security, stability and price competitiveness would only lengthen job queues.

“If there are manufacturers that are considering South Australia and looking at another state where it is more cost-competitive, then they’re going to go there,” Business SA’s Anthony Penney said yesterday.

“Businesses in this state, particularly our manufacturers, our energy intensive industries, have been telling us for a while that energy prices are getting out of control.

“Right now, renewables in South Australia make up over 40 per cent of the energy, without the technology to effectively store the power being generated.”

Australian Energy Regulator data shows power prices in South Australia during the next two years will be 34 per cent higher than the national average and 69 per cent higher than Victoria.

The Australian

Tom Koutsantonis might be gilding the lily with his comment that: “Engie has brought additional generation at Pelican Point online after I approached them with the request. No amount has been paid to Engie to increase generation.”

Back in February, Koutsantonis was cited by the Australian Financial Review in a story in which Labor was putting forward a contract worth \$50 million, in order to secure a guaranteed supply of power from the Pelican Point power station: [SA’s Wind Farm Fiasco: \\$Millions in Subsidies Thrown at GDF Suez to Reopen Mothballed Gas-Fired Power Plant](#) (In the piece above the owner is referred to as ‘Engie’; the AFR article had the owner as GDF Suez – both of which are French and are probably related). Tom shouldn’t be ashamed of throwing money at conventional generators to guarantee available capacity: “capacity payments” are part and parcel of trying to rely upon sunshine and breezes; guaranteed payments to conventional generators in order to ensure a meaningful supply of electricity are used by the [Germans](#) and the [British](#), among others, adding \$billions in unnecessary costs to power consumers, all for the sake of childish ideology.

Now, that ideology is about to catch up with the rest of the Australian

States; with a vengeance.

Warning of energy crisis to hit the nation

The Australian

Michael Owen

16 July 2016

An energy crisis in South Australia created by an over-reliance on untrustworthy and expensive wind and solar will force the state Labor government to seek greater access to cheaper coal-fired electricity from the eastern states.

This comes amid rising concern that federal renewable energy targets will force other states down the path taken by South Australia, which has the highest and most variable energy prices in the national electricity grid.

South Australian Treasurer Tom Koutsantonis, who is also the Energy Minister, yesterday put the eastern states on notice, vowing to “smash the national electricity market into a thousand pieces and start again”.

He warned other states that the energy crisis was “coming to get them”.

“This is coming to Victoria, this is coming to NSW ... every jurisdiction is facing what we’re facing now,” the Treasurer said.

South Australian Labor’s admission that it needed urgent reform of the national energy market rules, so that in addition to upgrading connection with Victoria it also could tap into NSW baseload power, reveals the vulnerability of its reliance on renewables. The last coal-fired power stations in South Australia closed in May.

Wind and solar make up more than 40 per cent of the state’s energy mix under a green policy agenda driven by Labor, in power in South Australia since 2002.

Several major companies, including BHP Billiton and Arrium, this week warned Mr Koutsantonis of possible shutdowns because of high energy prices, forcing him to plead for a temporary power spike from a private owner of a mothballed gas-fired power plant. Private energy supplier ENGIE fired up its Pelican Point plant near Port Adelaide for a short time yesterday, bringing an extra 239 megawatts of power into the grid. Mr Koutsantonis said the federal government had encouraged South Australia, which has the best conditions for wind farms, to chase the energy source as part of Australia’s renewable energy target of about 24 per cent by 2020.

“Wind is paid by the commonwealth to produce power ... if you are going to pay wind farms to produce electricity regardless of demand, you better make sure that is distributed equally across the country because you can’t have a national policy implicating just one state,” he said.

He called on Malcolm Turnbull to immediately appoint an energy minister and schedule an urgent meeting of federal and state ministers to undertake energy market reform.

“If you want a true national electricity market, you really need to have all of the states interconnected.

“What we have is a series of state-based markets with very poor interconnection between them,” Mr Koutsantonis said.

The market was supposed to integrate the east coast states with South Australia and Tasmania to allow the free flow of electricity across borders via a series of interconnectors, he said. It excludes West Australia and the Northern Territory.

An upgraded interconnector with Victoria is scheduled for completion next month, and South Australia also wants a larger interconnector with NSW, at a cost of between \$300 million and \$700m.

“Victoria has multiple markets it can draw from; we have one, NSW has two and Queensland has one. That’s not a national electricity market,” he said.

The Australian

Tom Koutsantonis’s vow to “smash the national electricity market into a thousand pieces and start again” sounds a lot like angry words from a desperate man. However, Tom has a point.

While it is true that the cause of South Australia’s energy disaster is founded on Federal government legislation – the **Large-Scale Renewable Energy Target** – it was SA’s Labor government under then Premier Mike Rann which blundered headlong into wind power.

Rann and his family profited handsomely from SA’s wind rush. Lured by hollow promises of a wind turbine blade manufacturing plant that would potentially employ hundreds, back in 2002, Rann and his co-conspirators jumped into bed with a band of criminals (we mean that literally), shysters and chancers associated with Babcock & Brown (aka Infigen): **How a Band of Criminals, Shysters & Chancers Conjured Up the Wind Industry in Australia**

Now, the consequences are hitting home. And there is no way that Koutsantonis & Co can extricate themselves from the unfolding disaster. Tom Koutsantonis talks about interconnectors as being some kind of saving grace for his beleaguered State. However, Tom has more than just a little to learn about electricity generation and distribution.

Tom’s confused pitch seems to be that interconnectors actually “generate” power. They, of course, do no such thing. They are part of a transmission system; and don’t “generate” anything at all.

Funnily enough, it’s generators that “generate” power: transmission lines “transmit” power; and interconnectors work like plugs and sockets that connect high-voltage lines travelling over vast distances in one part of a grid to another, conveying large volumes of power produced by generators located hundreds, and sometimes thousands of kilometres away from the “load” aka “customers”.

When people like Tom Koutsantonis talk about throwing serious money at the construction of an interconnector with a capacity of 500MW, say, they seem to be out to convince themselves and others that they are locking in an additional 500MW of power, which will be available to South

Australians 24 x 365. Nothing could be further from the truth. Interconnectors are nothing more than pipes, directing power from a generation source to a load. With the major generators based in Victoria's Latrobe Valley or New South Wales Hunter Valley, much of what they generate is consumed in Victoria or in NSW long before it reaches South Australia. It is only excess Victorian or NSW generation that might benefit SA; and then only to the extent that the thermal load limit of the interconnector permits that capacity to be transported to South Australia. While an interconnector might be rated at 500MW, it usually delivers only a fraction of that figure; and then, due to thermal constraints and/or shifts in demand (an increase in load on one side of the interconnector against a fall on the other), only for limited periods.

Overloading the interconnector beyond its thermal limit results in an automatic shutdown; and whatever is being transmitted at that point in time is lost altogether.

South Australians got a taste of precisely that result back in November last year when 110,000 homes and businesses were plunged into darkness. The cause of that calamity was an almost complete collapse in wind power output, resulting in an abnormal load being drawn across the interconnector and its self-protecting shutdown: [**Wind Industry's Armageddon: Wind Farm Output Collapse Leaves 110,000 South Australian Homes & Businesses Powerless**](#)

Thanks to its ludicrous attempt to rely on wind power, South Australians can expect to spend a whole lot more time in the dark from here on.