

# Rossi's E-Cat Victory on Cold Fusion's Emergence Day -- E-Day

*The date October 28, 2011 will be recorded in history as the day when Andrea Rossi's cold fusion E-Cat technology emerged victoriously into the commercial marketplace, after an important test by a yet-undisclosed customer. Test parameters discussed. Move over oil, coal, and uranium... Ni-H cold fusion technology is coming to town!*

By [Hank Mills](#)

*Pure Energy Systems News*

The past year has been a mixture of both excitement and vexing anticipation for those following the saga of Andrea Rossi's [E-Cat](#) (Energy Catalyzer) technology. At the beginning of this year, it was announced that a one megawatt E-Cat plant would be built, tested, and sold to a customer.

On [October 28th of 2011](#), the completed one megawatt plant was successfully tested, and the first ever sale of a commercial cold fusion power system was made. This means that cold fusion is no longer a theory that can be irrationally dismissed by skeptical naysayers, but a real world technology that in short order will spark a new industrial and technological revolution.

For those who are not familiar with Andrea Rossi's E-Cat technology, his cold fusion reactors utilize tiny amounts of nickel, hydrogen, and a proprietary catalyst to produce copious amounts of energy -- in the form of heat. A reactor with an internal volume smaller than a D-Cell battery, can produce a maximum of ten kilowatts (kilowatts, not watts) of output. Such a reactor can continually operate for over six months without any additional nickel or catalyst being added to the system. Hydrogen will be consumed by the system and must be replenished, but at a very slow rate (potentially far less than a gram a day).

To activate or "turn on" a reactor, a combination of heat (from electrical resistors) and hydrogen pressure must be utilized. Once the reactor core has been filled with pressurized hydrogen, the resistors are turned on. The power to these resistors is gradually increased, until the temperature inside of the reactor is high enough that nuclear reactions start to take place.

At this point, a decision can be made to allow the reactor to operate with a constant input from the resistors, or to turn off the resistors and allow the system to "self sustain." If the operator desires the system to self sustain, the resistors are turned off, and a radio frequency generator is



Andrea Rossi consults with Giuseppe Levi during the test of the 1 MW E-Cat on Oct. 28, 2011  
*Photo by Sterling Allan*

activated. This radio frequency generator (that consumes around 50-100 watts) somehow stabilizes the rate of nuclear reactions that are taking place.

There are additional important features of the E-Cat technology that should be noted.

- The fuels (nickel and hydrogen) and the proprietary catalyst used by the E-Cat are cheap. The fuel cost for an E-Cat is almost zero for all practical purposes.
- The fuels and catalyst used in the reactor core of an E-Cat are very abundant in the Earth's crust, and are commonly available. Due the fact that only tiny quantities are consumed, there is no chance of the Earth running out of these elements.
- The technology utilizes no radioactive materials, unlike conventional fission based reactors -- that use uranium or plutonium.
- No nuclear waste is produced by an E-Cat system. This is a vitally important feature of the technology, due the fact huge quantities of hazardous waste is produced by conventional fission based nuclear power plants.
- Minimal radiation is emitted from the reactor core. The little radiation that is generated can be easily shielded with a couple centimeters of lead. Zero radiation is emitted to the environment outside of the system.

The E-Cat represents a technological breakthrough that could provide cheap, abundant, and environmentally friendly power to our entire world. Once fully proliferated around the world, it could bring about an end to the use of fossil fuels, and conventional nuclear fuels. The first step towards such a cold fusion era was for the first one megawatt plant to be tested and sold. This test and sale was successfully made on October 28, 2011.

## **The Setup**

Over the past year a few different models of E-Cat reactor (the metal tube that contains the Ni-H nuclear reactions), and modules (the containers that house the reactors) have been demonstrated. All of these E-Cat models have been successfully tested, and proven to work. However, there have been changes in the design of both the reactors, and the modules. This had led to some confusion about which model of reactor and module would be utilized in the test of the one megawatt plant.

The modules utilized in the test of the one megawatt plant were large metal boxes of a rectangular shape. Inside of each module, is a "wafer" with a multitude of metal fins. Inside of this wafer there are three reactor cores, with a volume of 50 cubic centimeters each. The fins of the wafer help to more effectively transfer the heat produced by the reactor, to the water that fills the module.

At the test of the one megawatt plant, 107 modules (each with three internal reactor cores), were placed inside, and on top of a metal shipping container. These modules were connected both in parallel and series. Water is supplied to the modules via two pumps. These pumps draw

water from two large, open vats of water. The amount of water pumped into the reactors is measured via flow rate meters, and the temperature of the water is measured with a calibrated thermocouple.

The temperature of the steam at the output of the plant is measured via a calibrated thermocouple, placed very close to where the steam exits the shipping container. In addition, a small container is present to capture and store any steam that has condensed back into liquid water. The quantity of such liquid water collected during the test was minimal (five liters), but was subtracted from the quantity of water considered to have been vaporized.

The hot steam produced by the plant was sent through one or more heat dissipaters, and was condensed back into liquid water. This water was then recycled, by being pumped back into the vats or containers, from which the input water is pumped.

It is obvious that electrical power was needed to operate the plant, and all of the various systems that were present - the E-Cat modules themselves, the pumps, the fans, the computer control systems, data recorders, etc. The largest portion of the electrical power consumed was produced by a large, on-site electrical generator, and a much smaller portion came from the local power grid. An electrical generator had to be used to produce this power, because the wiring setup of the factory only allowed for a maximum draw of ten kilowatts.

One very important feature of this test is that there was a backup system for everything, just in case of a failure. There was a second electrical generator that would automatically turn on if the first one failed, four water pumps were present in case one of the two required pumps malfunctioned, two control panels were present in case of a computer problem, and the heat dissipaters were designed with four times the capacity required for the test. Rossi put all of these backup systems in place to reduce the chance that something might go wrong during the test. This is a sign of a serious and dedicated inventor, who is determined to have a successful test of his product.

## **The Results**

The results of this test were clear and obvious. A vast amount of excess energy -- apparently from a cold fusion reaction -- was produced.

At approximately 10:30, AM the test began. At this time, the resistors used to heat the reactor cores in each module, were switched on. Also, the pumps, fans, sensors, controls, and computer equipment were all turned on, and active.

The input power to the resistors (which consumed the lions share of power during this time period), was 10 kilowatts, to begin with. The input power was slowly increased, until the output temperature was 99 C. At that moment, the input energy was increased to maximum, until the water began to vaporize. To begin self sustain mode, the resistors were turned off

completely, and one or more radio frequency generators (used to stabilize and/or enhance the reactions) were turned on. Despite the fact the radio frequency generators did consume electricity, the amount of power they consumed was miniscule -- around 50-100 watts.

According to Rossi's statement [here](#), before self sustain mode started, 400 kilowatt-hours of power was consumed, and 300 kilowatt-hours were produced. This conflicts with a statement he made via email, stating that only 300 kilowatt hours were consumed. To be conservative, for this report, the figure of 400 kilowatt hours will be used.

(To avoid such discrepancies, it would have been helpful if the input power data set -- showing the electrical input verses time -- had been released. Instead, we have to rely on the figures Rossi provides, from the report signed off by the costumer's consulting engineer who ran the test. I firmly expect the input figures Rossi and the consultant have provided to be correct. However, an excel file with all of the measurements taken would be very helpful, and allow for a more precise analysis.)

During self sustain mode, the actual input power contributing to heat production can be considered as nearly zero. Electrical power was used to keep the pumps, control systems, sensors, and fans running. However, the fans only helped dissipate the heat (steam) coming from the output, and the mechanical action of the pumps would have contributed almost nothing to the production of heat. The actual amount of power used to support all these systems during self sustain mode was 66 (sixty six) kilowatt hours.

Self sustain mode continued for approximately 5.5 (five and one half) hours, beginning at around 12:30 pm. During this time period, 2,635.033 (two thousand six hundred and thirty five) kilowatt hours of output - in the form of heat - was produced. In other words, an average constant production of 479 kilowatts for five and a half hours. This is a huge amount of power, and the fact that it was produced with virtually zero input power validates the E-Cat technology beyond any reasonable doubt, whatsoever.

The energy output figures were calculated by determining the energy required to vaporize or phase change (transform from water to steam) the volume of water that was being pumped through the one megawatt plant. The equation used to calculate this was included in the official report that was released at the end of the test...

[Total Energy Produced: (steam kg x 627.5) + (100 - input water T) x kg of water heated x 1.14 = 2,635 kwh]

What is also very significant, is that the temperature of the output did not decrease over the course of the five and a half hours, when there was virtually no input power. At times, it even increased slightly! There is no possible way, according to the basic laws of physics, that a system could continually output such a quantity of heat with no input. Unless of course, there is a truly novel, nuclear process taking place inside of the reactor cores, producing massive quantities of heat.

There is actually no sign that the reaction was fading or decreasing in intensity after five and a half hours of self sustaining operation. If the decision had been made (which probably was not made due to a lack of time), it could very well have operated for many additional hours in self sustain mode.

## Analysis

Let's look at a few figures and calculations, in regards to the test of the one megawatt plant.

The first figure has already been partially addressed. It is the production of approximately 2,635 kilowatt hours of output (or an average constant production of 479 kilowatts) during the five and a half hours of self sustaining operation. During this time period, the plant consumed only 66 kilowatt hours of electrical power, but most of this consumption is irrelevant to the output the plant produced. The only consumption that significantly impacted the output of the system was the power used by the radio frequency generators that somehow stimulate and regulate the nuclear reactions that take place in the reactor cores.

Interestingly, in an email Rossi has specifically indicated that the radio frequency generator(s) only consumed 50-100 watts, or a total of 550 watt hours for the entire period of self sustain. This is a trivial amount of input power.

By dividing 479,000 watts by 100 results in a COP of 4,790 for the plant during the period of self sustained operation. In simple terms, for every 1 (one) watt of electrical input power, 4,790 (four thousand seven hundred and ninety) watts of thermal output power was produced. This is a stunning number, and there are a couple of factors that could actually increase this figure. For example... [Editor's Note: The small amount of hydrogen consumed also needs to be factored in here.]

- The reactors inside and on top of the steel container have a large surface area. The hoses, pipes, and valves that connect all the modules also have a large surface area. Despite the fact that all of the surface area are covered with a thermally insulative material, we know from previous tests that the these modules become hot to the touch during operation. Quite a bit of heat energy is obviously lost due to the less than perfect thermal insulation, due to the massive surface area. How much heat energy could be lost? I'm not sure, but experts who have done calculations have determined it could be a lot.

- To keep the calculations conservative and not biased in favor of the E-Cat, the small quantity of liquid water that was collected from a valve where the steam exits the container was discarded from the calculation used to determine energy production. The decision was made to consider what was collected as water that had never been vaporized. Five liters of liquid water was collected, which may have actually been steam, that condensed back into water while traveling through the series of pipes and tubes inside of the plant.

The truth is that the plant could have been producing more than a constant 479,000 watts during self-sustain mode. It could have been closer to one megawatt than the official conservative figures show.

Finally, we need to look at the input and output figures when including the time period before the plant went into a self sustained mode of operation. We have been told that during the time period before self sustain started (which is about two hours), the plant consumed either 400 or 300 kilowatt hours of power (the difference is due to two different statements from Rossi). To be conservative, let's go with 400 kilowatt hours for the electrical power consumption rate. The plant also produced 300 kilowatt hours of power during this time period.

If we add the power consumed before self sustain mode began (400 kilowatt hours) to the power consumed after the self sustain mode began (550 watt hours), the result is 400.550 kilowatt hours of total power consumption. This is excluding the 66 kilowatt hours of electrical power that was consumed after self sustain mode began to run fans, pumps, and control equipment.

The resulting COP calculated by dividing 2,935 kilowatt hours of total output (which includes the 300 kilowatt hours before self sustain and the 2,635 kilowatt hours produced afterwards) by 400.550 kilowatt hours. The resulting COP is 7.327, which means even considering the input power used before self sustain began, the overall COP of the system is well over 6 (six), which is what Rossi guarantees.

Of course the above figure does not eliminate the power that was used to run the fans, pumps, and other equipment BEFORE self sustain began. So if that power is eliminated, even this figure is actually low, and the real COP would be higher.

The skeptics may claim that the input power to the pumps, fans, computers, sensors, and control equipment should be calculated into the COP, but I do not think that would be appropriate. In my opinion, the only forms of input power that should be included in the calculation are what was used to operate the electrical resistors inside the modules, and the radio frequency generator(s). Even if the pumps could increase the amount of heat produced by some tiny amount, I think the contribution would be very low -- probably near zero.

So my best estimate of the performance of this system, with the information I have available, is a solid COP of 7 or higher during the entire test, and a COP of 4,790 during self sustain mode.

It looks like a victory for the E-Cat.

### **The Fascinating One Half Megawatt Decision**

The test of the one megawatt E-Cat plant was originally supposed to start earlier in the day than

it did. The reason for this delay was that in an early morning test of the system the temperatures increased in a way that indicated instability in the system. Rossi claimed that the system was "difficult to modulate." Basically, what this means is that the energy output was too high to be controlled in a satisfactory manner.

To resolve the issue, the hydrogen pressure in all the reactors was reduced. As has already been revealed by Rossi, increasing or decreasing the hydrogen pressure is a way of throttling the output in these systems. By reducing the hydrogen pressure, the temperatures would not rise quite as high, and the system as a whole would be more stable. The consequence of reducing the hydrogen pressure would be that the plant would not be able to achieve a constant one megawatt of output in a self-sustained mode.

To achieve one megawatt of output in a stable manner, it would have required a constant "drive" or input of electrical energy into the resistors. Somehow, the heat from the resistors not only triggers the nuclear reactions during start up, but can also allow for the system to be more easily controlled. Rossi admitted during the question and answer period after the system would be easier to control with a "drive", and could have reached one megawatt. However, the ability of the plant to operate in self-sustained mode was very important for the customer, so it was decided to simply reduce the hydrogen pressure, and allow the system to produce less total output in a self-sustained mode of operation.

Due to reducing the hydrogen pressure to ensure stability and control, each module produced far less output than it could have if the pressure had been higher. Instead of the planned 10 kilowatts of output per module, there was only around 4 kilowatts of output. This is fascinating to me, because it means that what was witnessed during this test was only a \*fraction\* of the full potential output of the plant. In fact, these modules are not actually limited to 10 kilowatts, but have previously been stated to produce a full rated output of 27 kilowatts. They have been reduced in power output only to help insure stability and control of the plant.

Of course the simple fact is that the 479 kilowatts of constant output during self-sustained mode (with no input power) is a huge amount of energy, in and of itself. A full megawatt of more would have been spectacular, but what was produced was a tremendous success!

## **Who Conducted the Test**

We do not know a lot about the company who purchased the plant, or the "controller" or "consultant" that ran the test on their behalf. The name of the consultant who ran the test (making all the decisions about how it would be conducted) is Colonel Engineer Domenico Fioravanti. Rossi has stated he is, "an engineer of NATO (a Colonel) who has 30 years of experience in thermopower plants and thermodynamical systems." Those individuals who witnessed the test and talked with him (for example Mats Lewan of NyTeknik), claimed he seemed absolutely professional, and definitely acted like a credible, professional engineer.

Colonel Engineer Domenico Fioravanti controlled all aspects of the test on behalf of the customer purchasing the plant. He made all the decisions about where thermocouples should be placed, how the flow of water should be measured (he purchased and utilized his own flow meters), and all other aspects of the test. By having total control of the test and being an experienced engineer, he was in a great position to determine the credibility of the results.

What we do know about the company is that they are NOT the "big name" American company that was so widely talked about several weeks ago. Rossi's relationship with that potential company faded (at least enough for the sale to not go through), and this new company/organization (or perhaps military entity) stepped up to the plate. Rossi has stated in an email that, "THE CUSTOMER HAS BOUGHT THE E-CAT AS A MOBILE HEATER FOR REMOTE CAMPS." This seems to indicate to me that the organization may be related to the military. Also, Rossi's remark that it is the kind of company that does \*everything\* in secret, seems to add credence to that possibility.

The most important result of the test is that the outcome satisfied Colonel Engineer Domenico Fioravanti, who then decided to go ahead, and sign off on the purchase of the plant. This means the sale of the world's first large scale cold fusion plant (perhaps the first sale of any sized cold fusion system) has been made. For this reason, the test of October 28, 2011 will be remembered as a historic event, as the day cold fusion entered the commercial marketplace.

## **Dry Steam and Tiny Quantities of Hydrogen**

Ever since the beginning of this saga, many individuals (some honest and some with an agenda) have been bringing up the issue of steam dryness. If the output energy of a system is being determined by the quantity of water being phase changed -- from liquid water into steam -- the "dryness" of the steam is important. The steam needs to be "dry" in that it is not mixed with particles of liquid water. If it is not dry, the amount of energy produced in a test can be dramatically reduced.

In this test, the consultant of the customer Colonel Engineer Domenico Fioravanti was certain that the steam being produced was very dry, and therefore the energy output calculations were accurate. This is what Mats Lewan reported about the issue, from his time talking with Fioravanti.

The following can be found in the comments of the NyTeknik article at....

[http://www.nyteknik.se/nyheter/energi\\_miljo/energi/article3303682.ece](http://www.nyteknik.se/nyheter/energi_miljo/energi/article3303682.ece)

1. Only two thermocouples were used - one in the water tank from which the pumps got the water, one at the steam outlet outside the container.
2. I talked a lot with the examiner Fioravanti. He seemed very experienced and he didn't believe a single

thing in the discussion on the steam quality. He said that there are three stages in steam systems.

1. Water being heated.
2. Water boiling and steam being produced. Steam temperature is only defined by pressure here. At atmospheric pressure it's 100 degrees centigrade.
3. Steam transported away from the water and heated further. This is basically dry steam.

The only case when you have low steam quality or droplets or liquid water in this steam is in long or poorly isolated tubes for steam transport. Steam then condenses and there will be a flow of water together with the steam.

This is not the case with the Ecat he said, and he saw no doubt whatsoever on the steam quality at atmospheric pressure and 105 degrees.

Mats Lewan

I think it is safe to say the steam was very dry. Fioravanti makes it pretty clear that steam dryness was not an issue in this test.

### **The Even Greater Success That Could Have Been**

There is no doubt about it in my mind, this test was a big success. It was a success for a number of reasons including the facts that the customer's consultant was satisfied with the result, the sale was made, and it is obvious a huge quantity of excess energy was produced. The fact the sale has been made is especially important, because it means that Rossi will have the funds to pay the University of Bologna and the University of Uppsala the money for them to begin their research programs on this technology. Also, he will have the funds to continue researching the technology, and to build additional one megawatt systems to sell to additional customers.

Despite the fact the test went well and the objectives were met (except the fact the plant operated at less than one megawatt which is not really a significant issue), the test could have been performed in a way that would have been a bit more acceptable to mainstream scientists. I am not at all saying the test was not suitable for Rossi's purposes, or adequate to determine excess energy. The results of the test were clear and conclusive in my opinion. However, one particular hope of mine is for more so called "mainstream" scientists to accept that the E-Cat technology is real. In order to convince more of them, the test could have been performed in an even more detailed and precise manner. For example....

- A "control" run could have been made in which no hydrogen was placed in the reactor cores. The output of the control run could have been compared to a similar run with hydrogen, which would have produced excess power. The difference between the two would have been undeniable even to a hardnosed cynic -- as long as of course he was not on the pay roll of one of Rossi's competitors.

- A database or excel file of all the electrical input measurements, collected during the test, could have been provided with the report that was presented. This would help make any analysis of the test more precise. Right now, it is obvious that the gain of energy was huge. However, without such precise information (to produce graphs and charts with), the excess energy production cannot be studied as "in-depth" as it could be with such data. If the customer has such data, I hope it will be released.
- Measurements of the radiation produced inside of the reactor could have been made, showing that nuclear processes were taking place. Obviously, there is a huge gain of energy during the test, but measurements of emissions from inside the reactors would have provided additional evidence of "cold fusion" reactions. To keep the exact nature of the emissions confidential (it has been stated they could potentially give away the identity of the catalyst), the radiation sensors could have been setup in such a way to provide only very limited information. Perhaps only the quantity of radiation could have been measured, and not the exact spectrum.

These sorts of additions to the test would have made it even more successful than it already turned out to be. It would have given even more evidence of validity of this technology, to add to what we already have. With enough evidence collected and shoved in their faces, mainstream scientists will eventually be forced to admit this technology works. Also, when the stack of evidence becomes large enough, the mainstream media will no longer be able to stay silent.

I'm eager for every bit of evidence we can get, because we don't know which piece of additional evidence might be the "straw that breaks the camel's back", so to speak.

Of course from Rossi's point of view, such an advanced test is not needed to meet the goals he has set. His tests are good enough to show an obvious, and huge gain of energy. This is satisfactory in his opinion. He is extremely busy trying to get funding, further develop the technology, fight the war to get his patents granted, and build one megawatt plants. If he is able to prove his technology works and make the sales he needs to continue forward, that is enough for him. This is a reasonable approach, and might just be what he needs to do right now. Too much publicity might even make MORE work for him, and distract him from moving forward. However, at the same time, providing even more evidence could help earn the technology well deserved recognition, as the world's first commercial source of energy from cold fusion.

## **A New Cold Fusion Era**

The E-Cat Era has begun, due to the successful test and sale of the one megawatt plant. Already, Rossi has declared he has found a customer for the second one megawatt plant that will be ready in three months. This customer is said to be located in the USA, and will not be as secretive as the first customer.

Rossi will be traveling back to the USA in the near future to setup manufacturing of additional

units. He expects to be able to produce between 30 and 100, one megawatt plants the first year. At first the price will be \$2,000 per kilowatt of capacity, but with mass production and economy of scale kicking in, the price will eventually go down to as low as \$100 per kilowatt installed.

I would suggest that any company that is interested in purchasing a plant contact Rossi as soon as possible. It seems the line at the checkout register is forming. What will be interesting is to see how long the mainstream media and mainstream scientific community will be able to ignore the growing number of satisfied customers.

They need to accept the truth -- cold fusion is here, and its name is the E-Cat!