



Interior view of the first-generation 1 MW ECAT power plant. Note that the racks are built of smaller ECAT units in parallel.

Image source: [www.ecat.com](http://www.ecat.com)

## **ECAT – A novel and environmentally friendly LENR-based energy technology**

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[www.novam-research.com/resources/ECAT.pdf](http://www.novam-research.com/resources/ECAT.pdf)

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## What is the ECAT ?

The ECAT technology is based on Low Energy Nuclear Reactions (LENR). ECAT reactors generate a large amount of heat energy when small amounts of hydrogen, special nickel powder and an undisclosed material are combined. About 50 g nickel are able to generate a permanent power of 10 kW for 6 months. About 1 percent of the annual world nickel production would be sufficient to provide the energy needs of mankind. This high efficiency results from nuclear reactions whose involved nuclear forces (strong interactions) yield much more energy compared to chemical reactions like combustion processes which are based on electromagnetic forces (electromagnetic interactions). However, in contrast to conventional nuclear technologies, the ECAT reactors are environmentally friendly because they do not involve radioactive materials, do not produce radioactive waste, and their weak gamma rays can easily be shielded. Furthermore, they do not produce any exhaust gases. The main inventor and developer of the ECAT technology is the Italian engineer Dr. Andrea Rossi.

The first-generation ECAT generates heat energy in form of hot water with a temperature up to 120 °C. It is appropriate for industrial heating and cooling applications. Every 6 months it is necessary to replace the relatively small amounts of nickel and hydrogen. The nickel is largely recyclable.

The first-generation ECAT was already produced, tested and certified in form of some 1 MW power plants. The COP of the first-generation ECAT power plant is 6, i.e. the generated heat energy is 6 times higher than the electric energy which is required to operate the power plant (COP = Coefficient of Performance). The price of a 1 MW ECAT power plant was 1,5 Mio. USD and it pays itself off after about 4 years. The customers and locations of the running 1 MW power plants were not yet announced. Probably they are located in United States, some at a military facility and a single power plant at a large company.

The second-generation ECAT, also called high temperature ECAT or Hot ECAT, generates heat energy in form of hot water with a temperature above 120 °C or high temperature steam. It is appropriate for industrial heating applications or an efficient conversion into electricity. Its COP is 6 or higher.

It was also announced to develop and produce small 10 kW home units which can be added to already existing heating systems.

In an entry from 20 August 2015 in [ecat.com](http://ecat.com) it is said that the mass production of 1 MW ECAT power plants is planned to start late 2016 / early 2017.

## **Summary from the worldwide first ECAT Congress which took place on 8 and 9 September 2012 in Zurich / Switzerland**

- The congress was focussed on technical and engineering issues and the market introduction. There were about 300 participants from all over the world, especially from Germany, Switzerland and Italy. Also Andrea Rossi was there and he presented a comprehensive talk. Congress languages were German, English, and Italian.
- The first-generation 1 MW ECAT power plants
  - consist of 106 x 10 kW ECAT units
  - generate heat energy in form of hot water with a temperature up to 120 °C and are appropriate for industrial heating and cooling applications
  - have a COP (Coefficient of Performance) of about 6, i.e. the generated heat energy is about 6 times higher than the electric energy which is required to operate the ECAT power plant
  - are certified for an industrial usage
  - have a safety certification from the established certification company SGS
  - run failure-free since February 2012
- Second-generation ECAT, also called high temperature ECAT or Hot ECAT: A prototype of an ECAT unit which generates heat energy in form of hot water with a temperature above 120 °C or high temperature steam was investigated by an independent group of scientists and engineers. The high temperature steam allows an efficient conversion of the heat into electrical energy. Furthermore, the hydrogen at the high temperature ECAT is not provided by a gas bottle but by tablets that consist of a hydrogen storage material which releases hydrogen at elevated temperatures. Andrea Rossi presented many technical details from an interim report about an ongoing investigation of the high temperature ECAT.
- 10 kW ECAT home units: It takes some time before it is allowed to sell these systems because their certification requires more experiences and statistical data from the industrial 1 MW power plants.
- About LENR (Low Energy Nuclear Reactions) and ECAT:
  - the details of the LENR processes are still not yet known
  - the formerly assumed main reaction, i.e. the transmutation from nickel into copper, seems to be only a side effect which does not yield significant amounts of energy
  - transmutations from nickel into other nickel isotopes and iron were also reported / detected
  - a participant did remark that the measured gamma radiation indicates that a transmutation from hydrogen into helium takes place. This comment was appreciated by Andrea Rossi but he did not confirm the actual presence of this process

## **Third party report published in arXiv.org indicates anomalous heat production**

A recent report about an investigation of ECAT reactors by an external team of scientists indicates that the generated energy is much higher than what may be gained from any conventional energy technology that is based on chemical processes like combustion.

Abstract of the report: <http://arxiv.org/abs/1305.3913v1>

Complete report: <http://arxiv.org/pdf/1305.3913v1>

## **About the market introduction of ECAT power plants**

The currently existing 1 MW power plants were produced in Italy and / or United States by Andrea Rossi, his co-workers and subcontractors.

In 2012 some people from Germany and Switzerland did establish two new companies, namely ECAT Germany and ECAT Switzerland. That was done in agreement with Andrea Rossi in order to promote the market introduction of the ECAT technology in Germany and Switzerland. However, the planned market introduction by ECAT Germany and ECAT Switzerland in 2013 did not proceed because Andrea Rossi did not provide an opportunity for potential customers to visit a pilot plant and imposed very strict requirements on potential customers.

In 2013 Andrea Rossi and the United States company Industrial Heat LLC did join, see e.g. the following press release from 24 January 2014:

<http://www.prnewswire.com/news-releases/industrial-heat-has-acquired-andrea-rossis-e-cat-technology-241853361.html>

Therefore the companies ECAT Germany and ECAT Switzerland gave back their ECAT distribution license. They got back 110 % of the paid license fees and have terminated the distribution of the ECAT technology. It should be mentioned that many people from and around ECAT Germany and ECAT Switzerland did invest a lot of unpaid work for the company formation, dissemination of information, and distribution. This is not mentioned in order to judge Andrea Rossi's decisions but it is mentioned to acknowledge their efforts for a novel and environmentally friendly energy technology and a better world. It should also be mentioned that the first worldwide ECAT congress in September 2012 in Switzerland (see page 3) was organized mainly by the people from ECAT Switzerland.

Andrea Rossi and Industrial Heat LLC perform further research and development to make this technology widely available. In an entry from 20 August 2015 in [ecat.com](http://ecat.com) it is said that the mass production of 1 MW ECAT power plants is planned to start late 2016 / early 2017.

## Some references and links

- [www.ecat.com](http://www.ecat.com)
- [www.e-catworld.com](http://www.e-catworld.com)
- A blog with postings from Andrea Rossi: <http://rossilivecat.com>
- German-language articles in the journal "NET-Journal" (ISSN 1420-9292):
  - Issue January / February 2014, pages 8 - 10
  - Issue September / October 2015, pages 7 - 9

## Additional references, information and links about LENR

- Initiative and company LENR-Cities: <http://lenr-cities.com>
- 11th International Workshop on Anomalies in Hydrogen Loaded Metals on 15 and 16 October 2015 at the company Airbus in Toulouse / France:  
<http://www.iscmns.org/work11>
- NASA aircraft presentation from February 2014:  
<https://connect.arc.nasa.gov/p1zygz2h3i/?launcher=false&fcsContent=true&pbMode=normal>  
<http://www.e-catworld.com/2014/03/01/nasa-lenr-aircraft-presentation-published/>
- On 22 March 2012 there was a colloquium at CERN about LENR and the presentations of several speakers can be downloaded from the following site:  
<https://indico.cern.ch/event/177379/>

Some scientific papers about LENR or cold fusion:

- Generalized Theory of Bose-Einstein Condensation Nuclear Fusion for Hydrogen-Metal System, Y. E. Kim, Department of Physics, Purdue University (USA), published in June 2011 in the Journal of Nuclear Physics:  
<http://www.journal-of-nuclear-physics.com/?p=501> and  
[www.journal-of-nuclear-physics.com/files/Generalized%20Theory%20of%20Bose-Einstein%20Condensation.pdf](http://www.journal-of-nuclear-physics.com/files/Generalized%20Theory%20of%20Bose-Einstein%20Condensation.pdf)
- An Unitary Unified Quantum field Theory, L. G. Sapogin, Global Journal of Science Frontier Research / Volume 11 Issue 4 Version 1.0 July 2011:  
[http://globaljournals.org/GJSFR\\_Volume11/5-An-Unitary-Unified-Quantum-Field-Theory.pdf](http://globaljournals.org/GJSFR_Volume11/5-An-Unitary-Unified-Quantum-Field-Theory.pdf)
- Approximation Equations with Oscillating Charge in Unitary Quantum Theory and its Applications to the Analysis of Some Quantum Problems, L. G. Sapogin and Yu. A. Ryabov, International Journal of Applied Science and Technology / Volume 1 (2011) 1 – 27:  
[www.ijastnet.com/journals/Vol\\_1\\_No\\_5\\_September\\_2011/1.pdf](http://www.ijastnet.com/journals/Vol_1_No_5_September_2011/1.pdf)
- About unitary quantum field theory and catalytic process theory, L. G. Sapogin and Yu. A. Ryabov, Elixir Applied Mathematics 34 (2011) 2412 – 2425
- Widom-Larsen Theory: [www.newenergytimes.com/v2/sr/WL/WLTheory.shtml#basicconcepts](http://www.newenergytimes.com/v2/sr/WL/WLTheory.shtml#basicconcepts)
- A Nuclear Experiments Blog: [www.journal-of-nuclear-physics.com](http://www.journal-of-nuclear-physics.com)