

# Cold Fusion

or

# LENR

Low Energy Nuclear Reactions

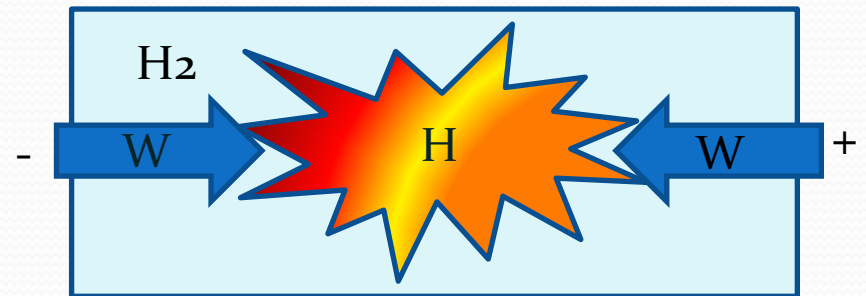
November 2016

A presentation of Marc Ellenbroek, the Netherlands

# Contents

- History of LENR and Cold Fusion
- Situation today
- Expected developments
- Applications of LENR
- Consequences of LENR

# History: @ GE 1909 Irving Langmuir



There is more energy produced than used...

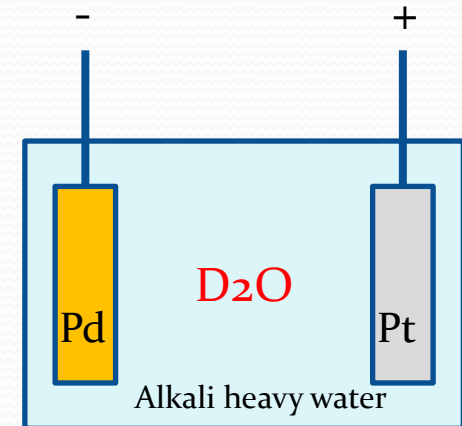
- Niels Bohr: 'Don't publish that you have found excess heat'

# History: 1983

## Stanly Pons & Martin Fleischmann



Inventors of LENR and Cold Fusion



They measured the following details

- Electric values
- Calorimetry heat balance
- $\gamma$  radiation and neutron flux
- Development of Tritium and Helium

- **Conclusion: Nuclear reactions must be taking place.**

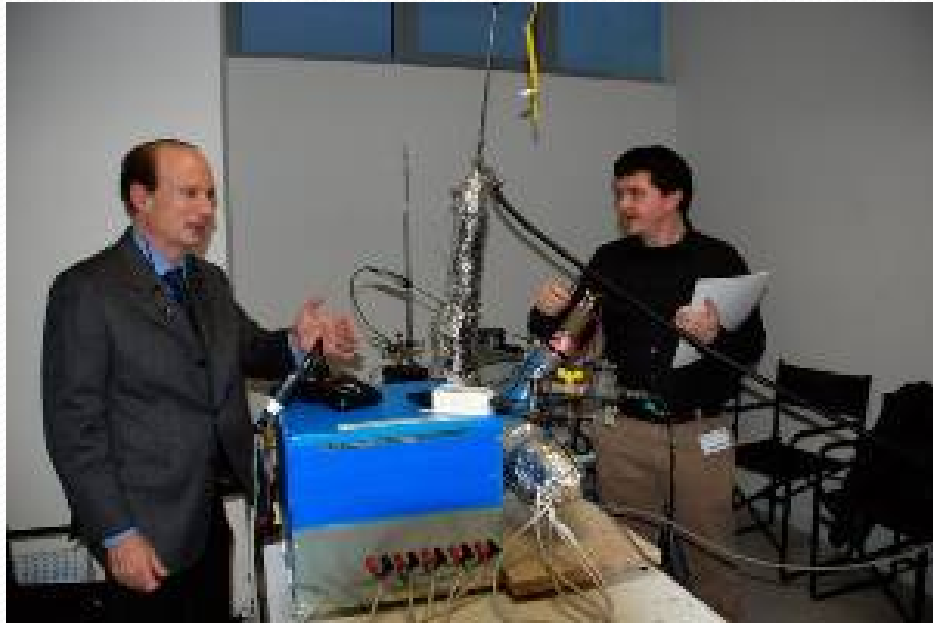
# History: Pons en Fleischmann 1989

- They published their results under pressure in 1989. All major media covered it.
- Many labs tried to reproduce their findings ... but 'no' results.
- After only 3 month a conference was held, they were accused of fraud and CF was degraded as a 'Pseudo Science'
- During 20 years the media hardly published anything about Cold Fusion, however....
- Small groups of scientists continued testing in e.g. Italy, the US, Japan and Russia.



# History: Rossi 2011

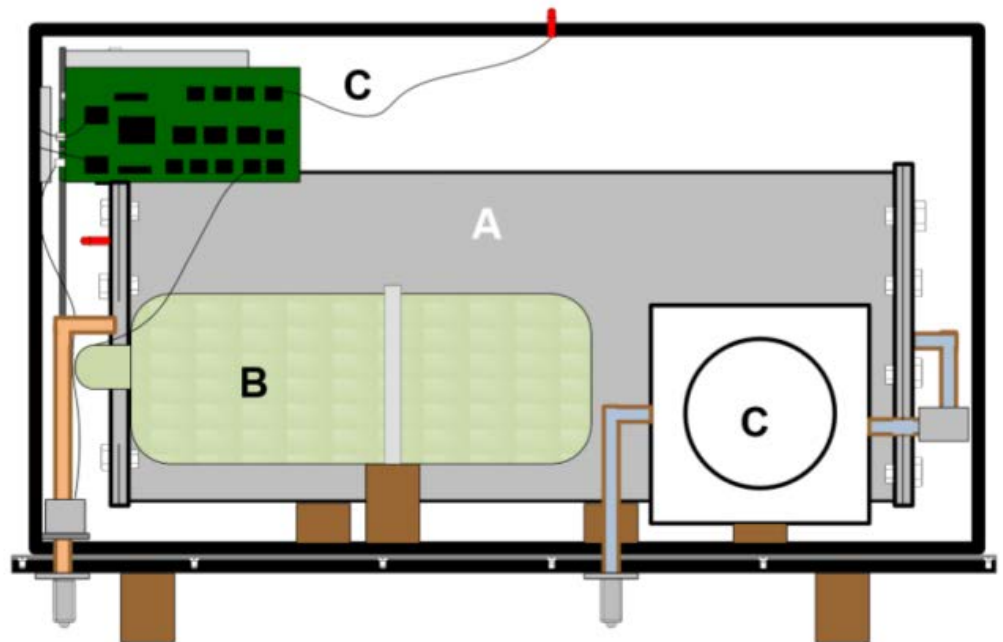
- E-Cat produces 10 kW during half a year
- Operation based on an invention of professor Piantelli: the Ni-H reactor.
- Rossi worked with emeritus professor Forcardi.
- COP = 6.
- At that moment is it not tested independently.
- Rossi sold an 1MW plant to a 'military customer' in October 2011.



# History: Rossi is not the only one:

## **Defkalion** (Greek company)

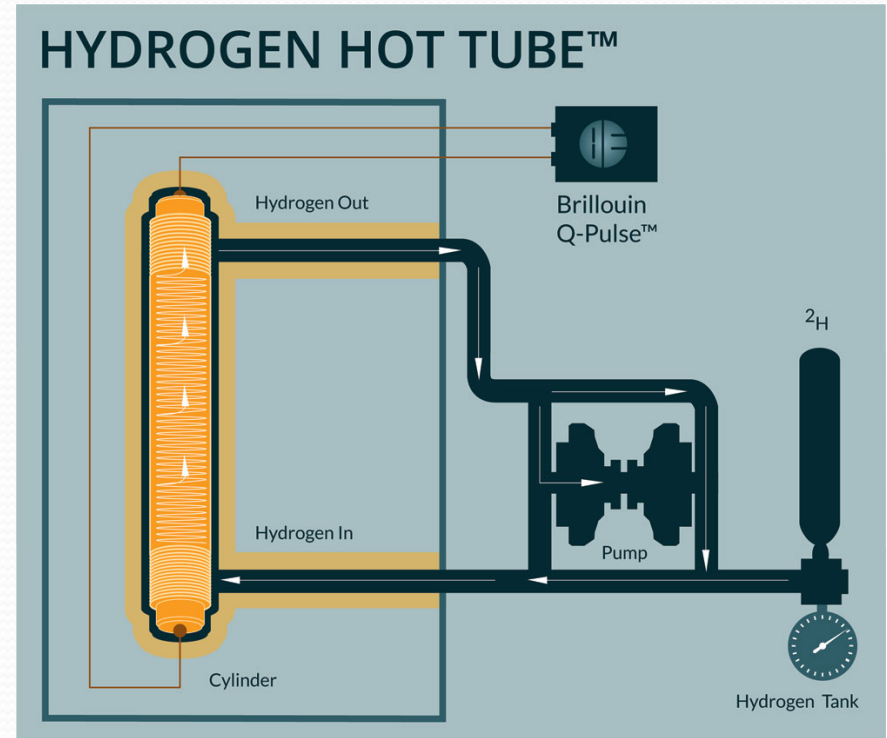
- Has Rossi's knowhow 'taken over' and said they are making a unit called 'Hyperion' that can produce 5-45 kW of heat. (2012).
- They moved to Canada but nothing was heard from them since 2015. Probably stopped due to finance issues.



# Historie: Rossi is not the only one:

## Brillouin (USA):

- They say they can start and stop their HotTube reactor at any wanted moment. It produces heat and (small quantities) of helium.
- The principle they have developed is called 'Controlled Electron Capture Reaction'

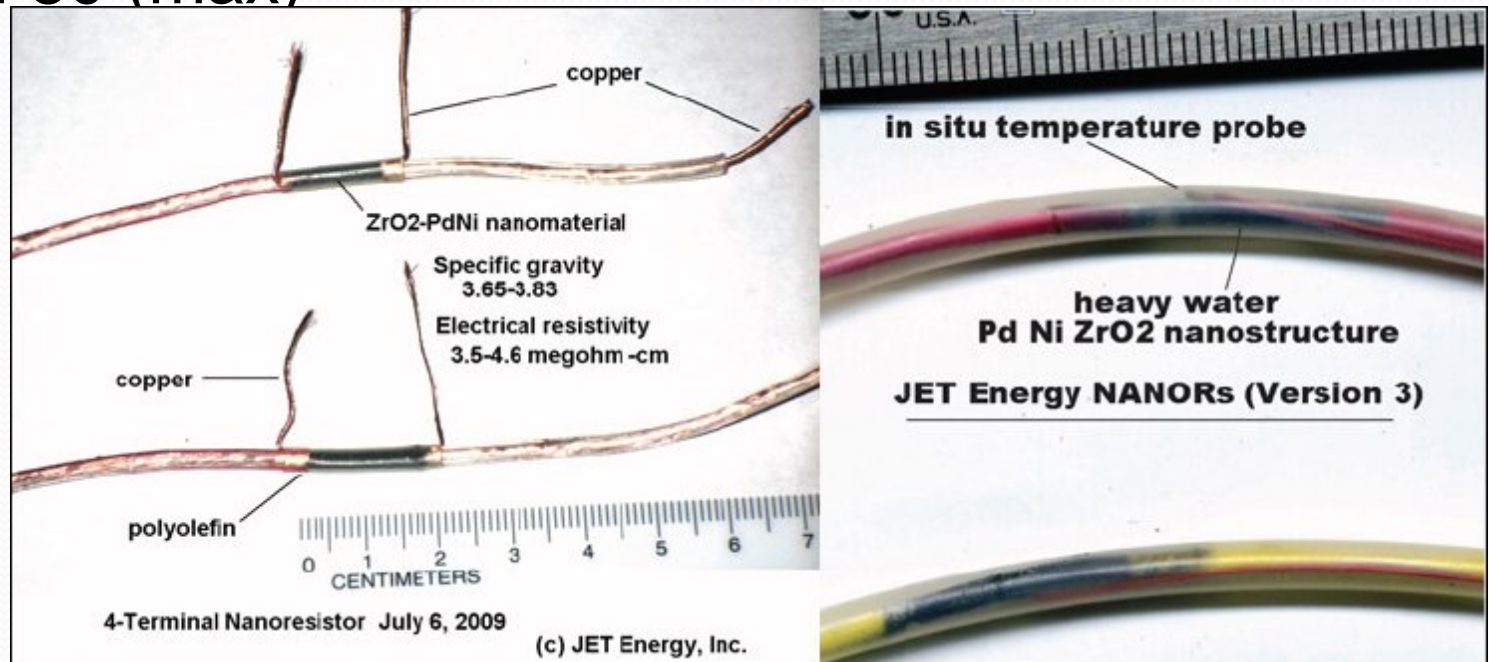




# Historie: Rossi is not the only one:

## NANORTECH

- Professors Peter Hagelstein and Mitchel Swartz (both MIT) developed the Nanor
- COP: 80 (max)



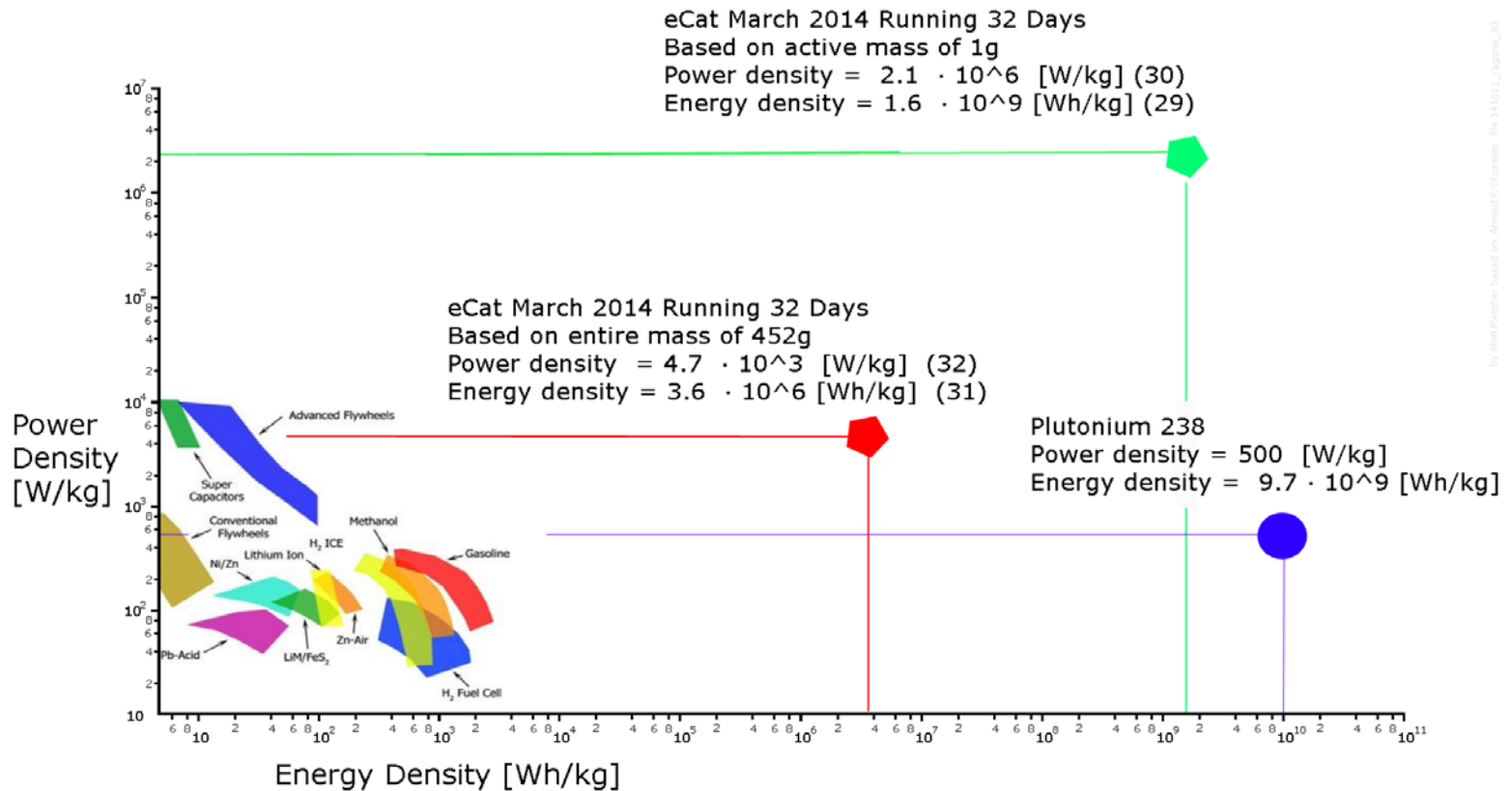
# Historie Rossi: Hot Cat tests

**2014**

- Al<sub>2</sub>O<sub>3</sub> closed tube
- 2cm diameter 20 cm lang
- Contained 1gr fuel: Ni powder, LiAlH<sub>4</sub> powder lithium and some other substances
- The test was done by Swedish and Italian scientists in an facility in Lugano and took 32 days



# History Rossi: 2014 Hot Cat test



Observation of abundant heat production from a reactor device and of isotopic changes in the fuel  
 Levi et al. <http://www.sifferkoll.se/sifferkoll/wp-content/uploads/2014/10/LuganoReportSubmit.pdf>

Fig 13 expanded to show the Ragone plot of Pu-238 and the eCat test, March 2014

by Alan Fletcher lenr.qumbu.com, based on Ahmed F. Ghoniem, Needs, resources and climate change: clean and efficient conversion technologies, Progress in Energy and Combustion Science 37 (2011), 15-51, fig.38. Version 141011\_ragone\_31

# History Rossi: 2014 Hot Cat test

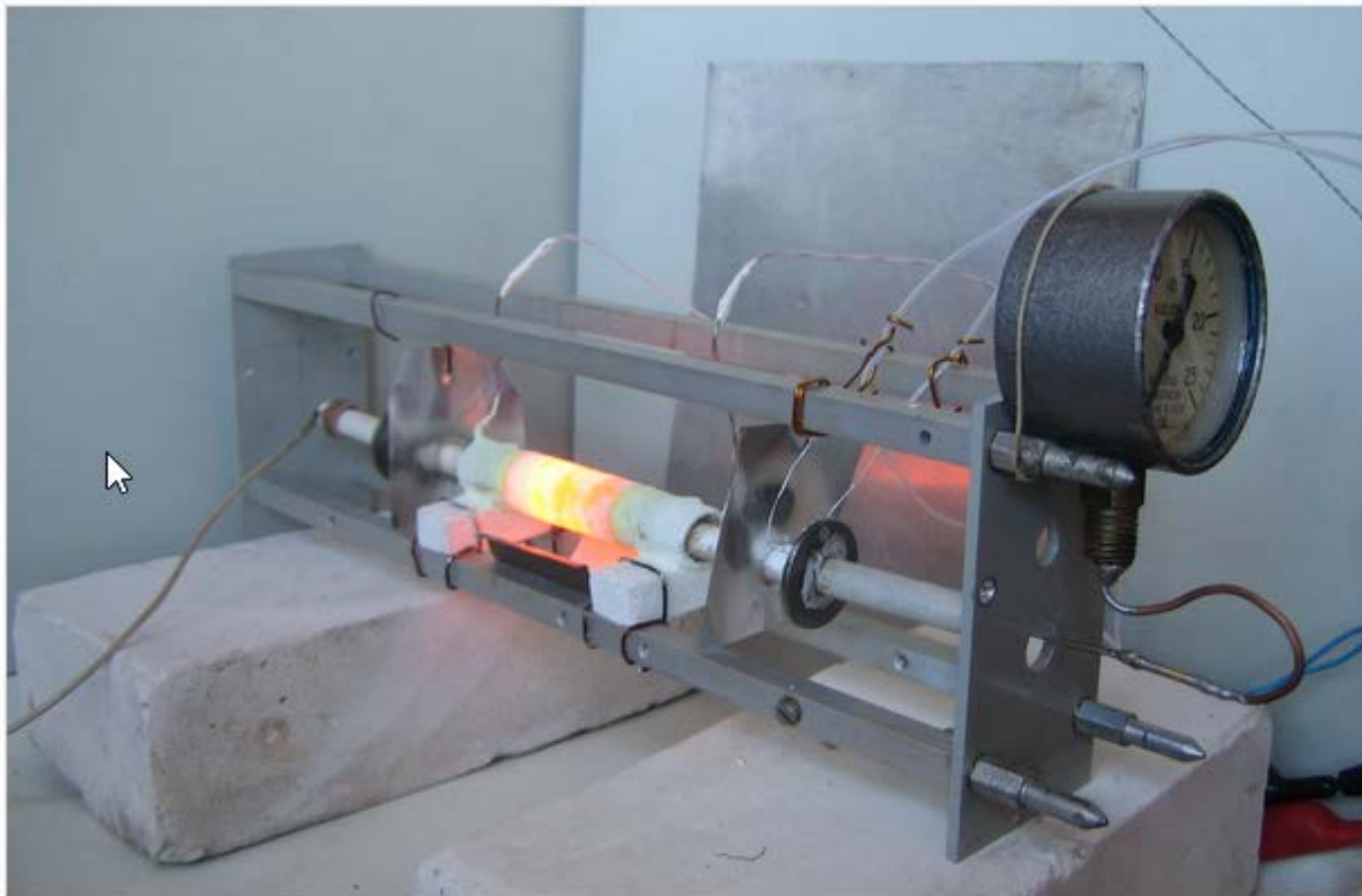
mg sample	Sample id	Li 6	Li 7	Ni 58	Ni 60	Ni 61	Ni 62
	Standard 2	6,0	94,0	66,0	27,6	1,3	4,0
	Standard 3	6,0	94,0	66,1	27,5	1,3	4,1
	Standard 4	6,0	94,0	66,0	27,5	1,2	4,1
2,13	sample 1 ash	57,5	42,5	0,3	0,3	0,0	99,3
2,13	Sample 2 fuel	5,9	94,1	65,9	27,6	1,3	4,2
	Nat. abundance	7,6	92,4	68,1	26,2	1,1	3,6

## Analys of the fuel: % Shift in isotopes

- Except  $^{62}\text{Ni}$  all Ni isotopes seem to have disappeared
- The  $^6\text{Li}$  level seems to increase and  $^7\text{Li}$  to decrease in comparison to each other.
- **This is only possible due to nuclear reactions!**

# In 2015 Replication attempts

Alexander Parkhomov

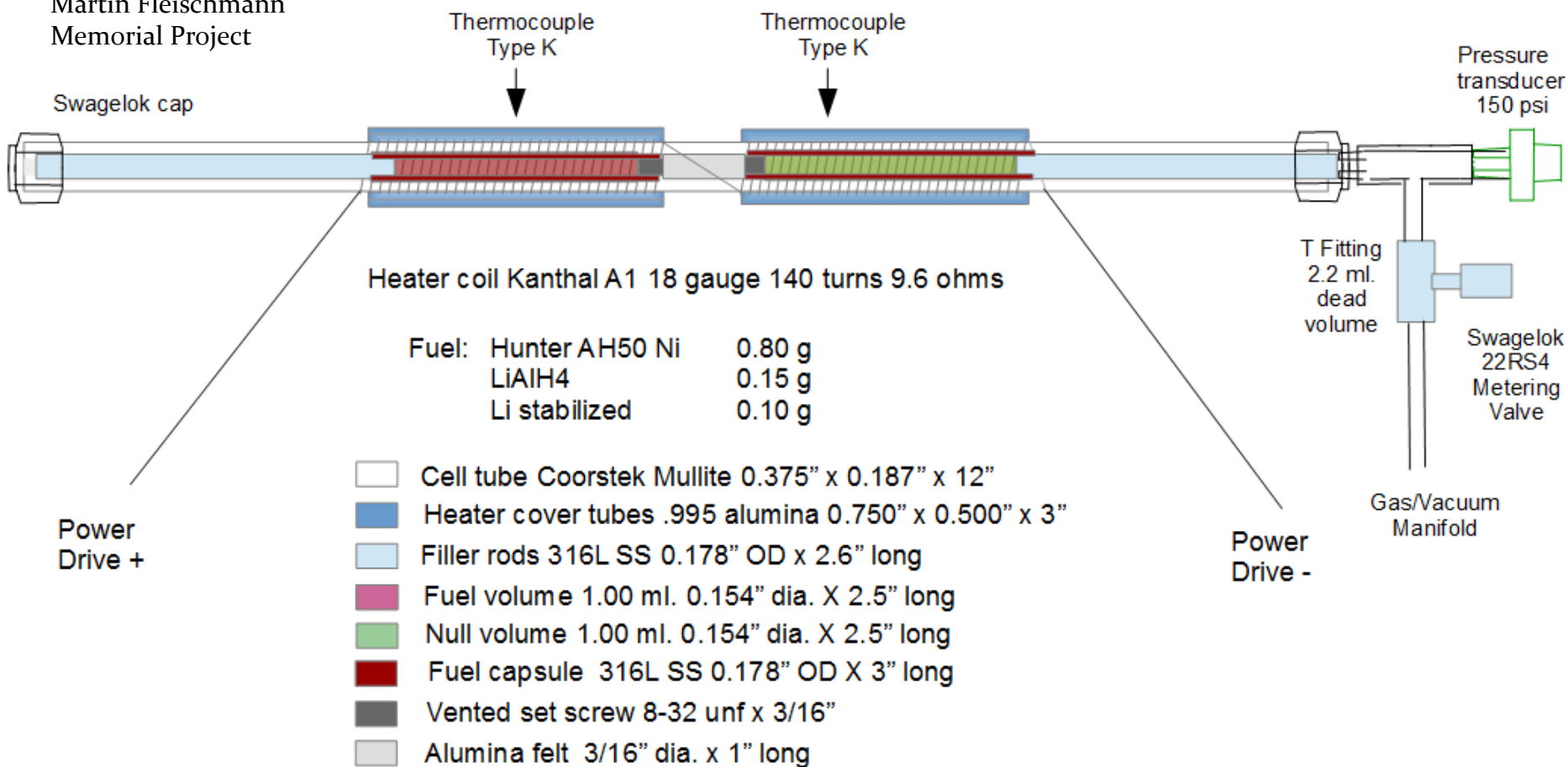


*Source: lenr.seplm.ru*

# In 2015 Replication attempts

**MFMP**  
Martin Fleischmann  
Memorial Project

## MFMP GlowStick GS5.2 Reactor



# 1 MW steamgenerator Rossi/IH



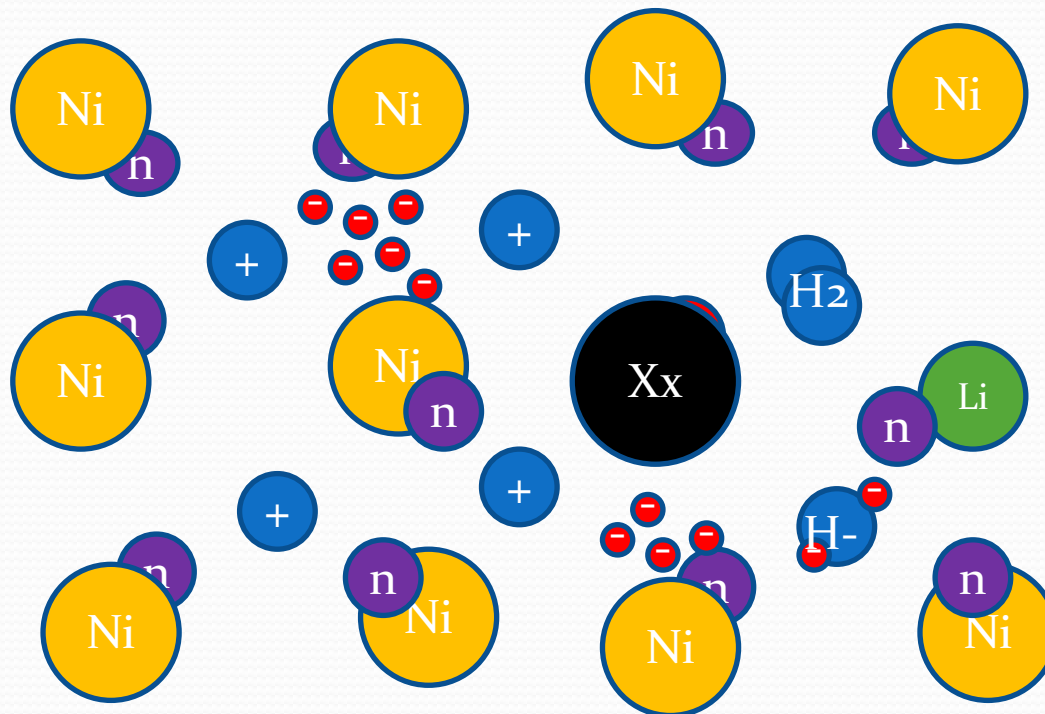
Assembling 1 MW unit 2014



Rossi checking the 1 MW unit 2015

# Theories

- Rossi/Cook: Quantum State Li:  $7\text{Li} + 1\text{H} \rightarrow 8\text{Be} \rightarrow 2(4\text{He})$
- Widom-Larson:  $p + e \rightarrow n$ ; Ultra slow neutron:  $n + 1\text{H} \rightarrow 2\text{D}$
- Storms: Nuclear Active Environment (NAE)
- Gullström: 'Neutron tunneling'
- Dubinko: 'Discrete breathers' &  $\text{H} \leftrightarrow \text{H}_2$  oscillations
- Piantelli: Fusion with H- Anion





# Features of LENR (when Rossi is right)

- Energy density between 500.000 – 1.000.000 times higher than gasoline
- Power density around 5000 times higher than gasoline
- It can be made such that it emits no radiation
- No pollution. A LENR reaction produces e.g. helium out of lithium or nickel transmutes to copper.
- It produces high quality heat (up to 1600 °C) and also electricity and light.
- The fuel is extremely cheap and abundant
- If you know how to do it every technician can make his own reactor and it will be extremely simple and cheap.

# Applications of LENR

- Abundant and cheap production of energy for:
  - Space heating
  - Production of sweet water
  - Local generation of electricity, maybe in combination with heat for domestic and industrial usage.
  - Very compact ‘atom batteries’: “life-long battery included”
- Transmutation of matter e.g.:
  - Reduction of radio active waste (patent Mitsubishi)
  - Production of rare material like gold and other precious materials

# Expected Future

- It is hoped that 'Rossi say's' will become reality in 2017 and we will see a breakthrough of LENR. These are some of the consequences:
  - A 'Paradigm change' in the world. This may happen relatively fast. Energy projects will be stopped. (Power stations, wind mills, ITER, hydroelectric plants, etc.)
  - Many new companies will come, but also many will be closed (like in the energy sector).
  - Research (LENR and physics) programs will be established which will lead to LENR improvements and new applications.
  - There will be a new world order. (Possession of an energy source will have no value anymore and no reason to fight a war).
  - Danger: The high energy density of LENR may destabilize the world. (Military usage).
  - Danger: The economics of many countries will be disrupted.
- **LENR should be introduced slowly to avoid chaos in the world**

# The most up-to-date LENR links:

- **[E-catworld.com](http://E-catworld.com)**
- **[egooutpeters.blogspot.nl](http://egooutpeters.blogspot.nl)**
- **[lenr-forum.com](http://lenr-forum.com)**
- **[Lenrproof.com](http://Lenrproof.com)**