

'LENR, Existential Risks and Rewards.'
Alan Smith. www.lookingforheat.com

“Science should not be an elitist activity, it is something that should be driven by society for the benefit of society and we should aim to have everyone agree with that.”

Nobel Laureate, Edvard Moser

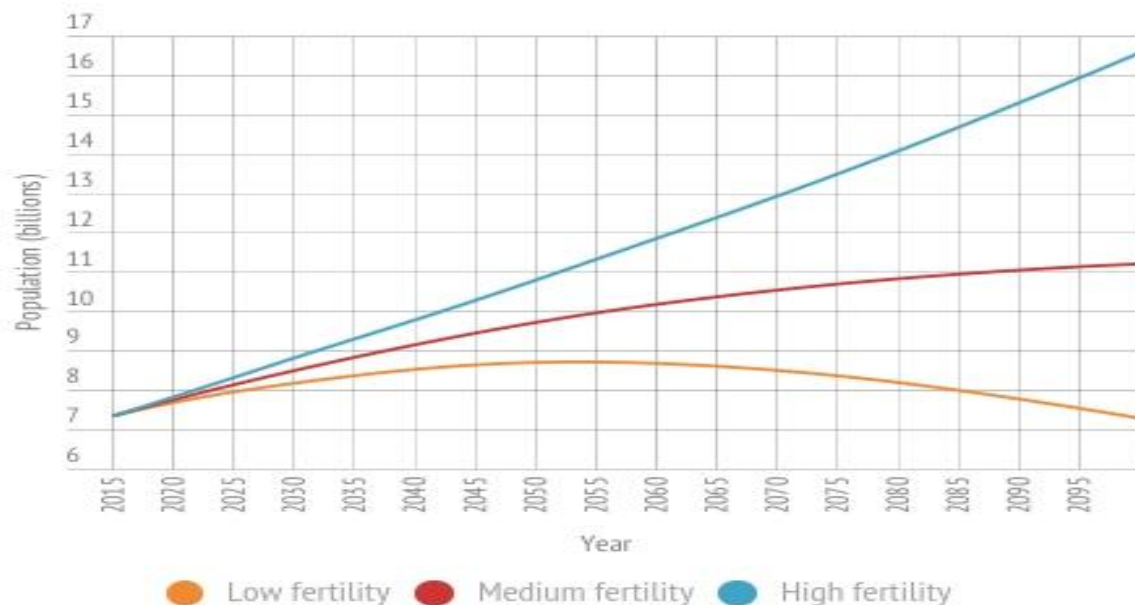


LENR researchers, perpetually underfunded and mostly ignored are the maverick steers protecting the flanks of the herd. This outsider status is viewed as a problem of course, but it also offers opportunities to repurpose 'useful' LENR as a key component of risk-aversion strategies for our planet. When our work is seen not just as oddball physicists doing odder experiments, but presented as a path to safe zero-emission energy in an unstable world, it will re-awaken interest and open up new sources of support from risk-aware citizens, businesses, and governments.

WHAT ARE THE RISKS WE FACE?

The graph below shows a global population of between 12 or, in the worst case, 15.8 billion by 2100, in environmental terms this is the equivalent of collision with an asteroid. Since we currently inhabit the only life-support system known to exist anywhere, it needs saving from global collapse caused by sheer numbers. According to some estimates humanity's ecological footprint is already 1.5 times larger than the ability of the planet to supply natural resources and services. If the global population grows as projected, humanity would need approximately three planets by 2080.

Population projections, 2015-2100

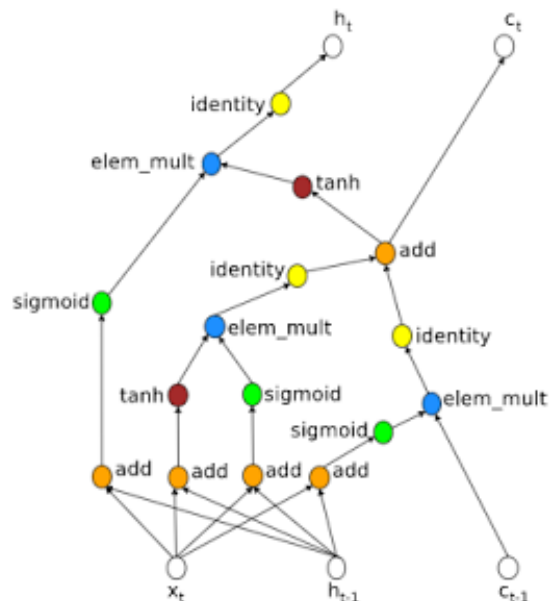


Source: UN Population Division, World Population Prospects: The 2015 Revision, online, 29 July 2015

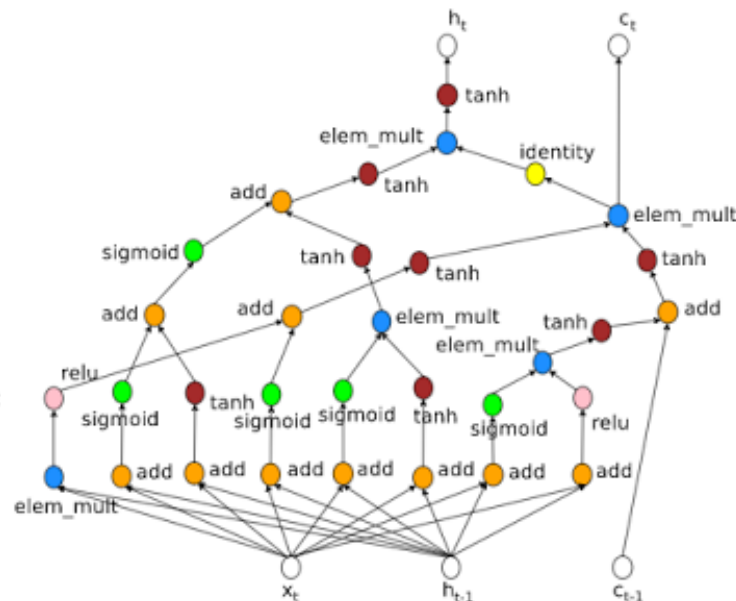


ARTIFICIAL INTELLIGENCE

Google's AI's are designing new AI's themselves – and the designs are surprising human coders because they are 'different'. Who knows what the AI's are up to? Never forget, it was 'Greeks bearing gifts' who brought down the walls of ancient Troy. Artificial Intelligence offers us a shiny new horizon full of infinite possibilities, but one of its striven-for offshoots, the driverless vehicle has potential to destroy millions of jobs – 5 million driving jobs in the USA alone. It is estimated that by 2030, 95% of U.S. passenger miles travelled will be served by on-demand autonomous electric vehicles owned by fleets, not individuals



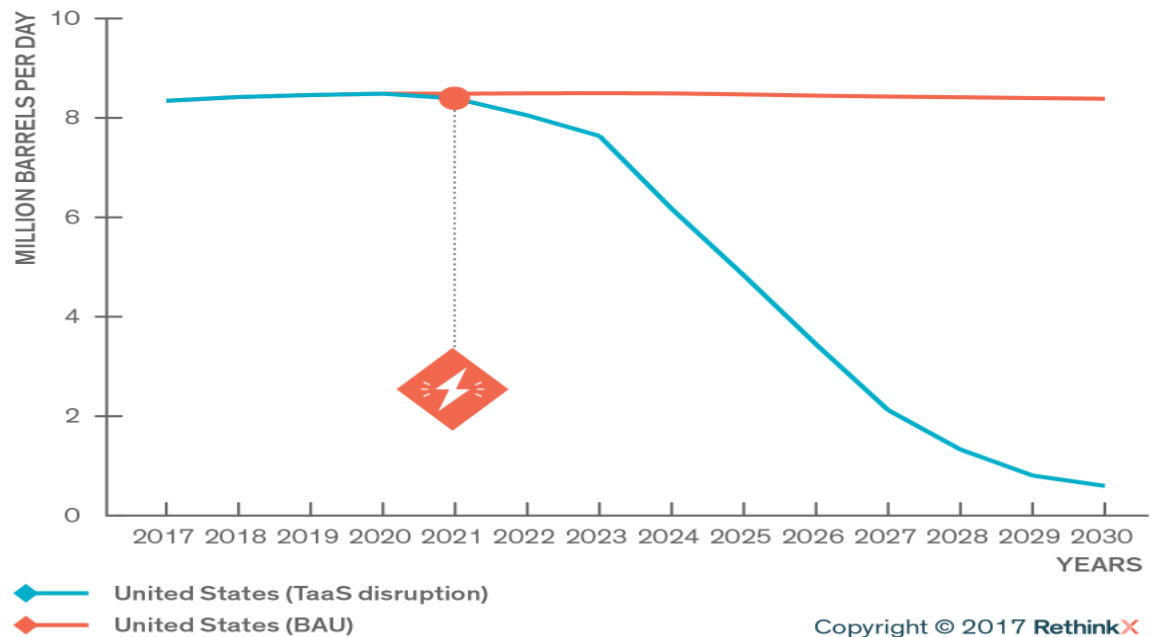
Human Designed Circuit



AI Designed Circuit

Autonomous electric vehicles will have a huge impact the transportation and oil industries, decimating their value chains, causing oil demand and price to plummet, and destroying investor value but also creating trillions of dollars in new business opportunities and GDP growth. For that reason alone, it will happen.

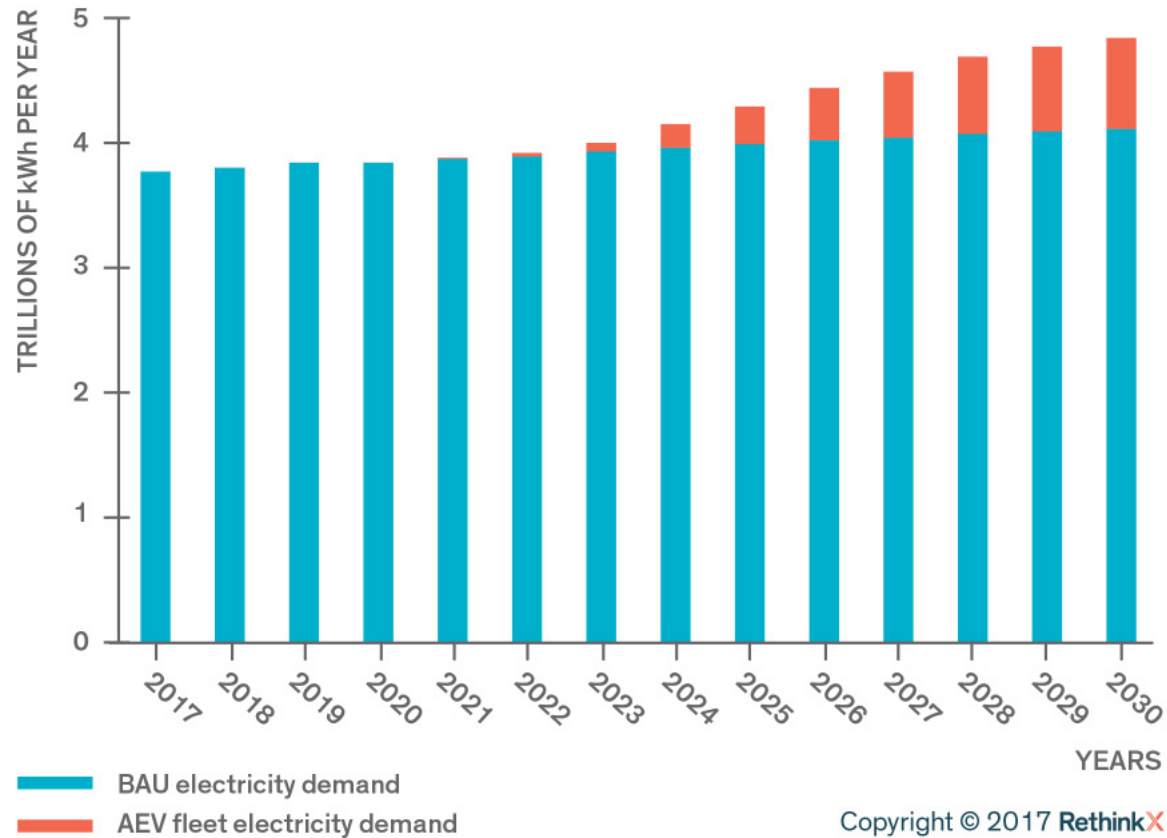
» *U.S. light-duty vehicle oil-demand forecast*



AI AND YOUR JOB

Don't for a moment think that 'real' AI will merely displace driving jobs and put an end to the professional 'Go' tournament circuit. AI is coming for jobs near yours – and mine. Jobs in the law, jobs in finance, and most factory and warehouse jobs will be gone by the time my grandchildren are old enough to vote. Let us not forget, it was 'Greeks bearing gifts' who brought down the walls of ancient Troy

IN RED- ADDITIONAL ELECTRICAL ENERGY REQUIRED IN USA TO POWER A NATIONAL FLEET OF AUTONOMOUS VEHICLES



CAN WE USE LENR TO ENGINEER OUR WAY 'OUT FROM UNDER'?

Every attempt we have made so far to engineer our world into a better place has offered unwanted side-effects, in the same way that every new drug contains the seeds of a new affliction. This is not a new observation, Rachael Carson's seminal book 'Silent Spring' on the dangers of pesticide use in the 60's, and Phillip Slater's 'Earthwalk' in the 70's both pointed out the folly of believing that we can simply engineer our way out of problems.

My argument is that contrary to our experiences with almost everything else, LENR offers a potential remedy for and a potent defence against known and unknown existential risks resulting from climate change, habitat loss, ecosystem collapse and overpopulation.

Though I am not sure that keeping the lights on will really stop people having babies.

DEFINING THE IDEAL SYSTEM

1. It should be first and foremost safe. Safe because it does not emit dangerous radiation, or create problematic waste.
2. It should be robust and reliable.
3. It should be both scalable and a distributed system rather than a centralised one. That ensures energy portability, accessibility, and system resilience.
4. Ideally it should not be dependent on scarce and expensive materials like palladium/deuterium which would create new scarcities and sources of conflict, but based on more common elements.
5. In operation it must be zero-carbon/zero emissions.
6. It should conform to the 'precautionary principle'.

REFLEXIVE OBJECTIONS TO LENR.

There will be many objections to this point of view. Every LENR field researcher has met them before. The immediate ones – which we might call ‘reflexive’ objections, are well known.

1. ‘It doesn’t work’.

For those (very few) who have not yet practised answers to this, I suggest you look at Jed Rothwell’s polished ripostes. Plenty of good ammunition there!

2. ‘Proper scientists don’t believe in it’.

Well, they are seldom asked, but again Jed Rothwell came up with: ‘I know of only one public opinion poll of scientists, from Japan. It shows them split about evenly.’

3. ‘Peer-reviewed journals won’t even publish LENR papers.’

To which the short answer is: ‘With notable exceptions (Come on ‘Nature!’) they do’.

REFLECTIVE OBJECTIONS TO LENR

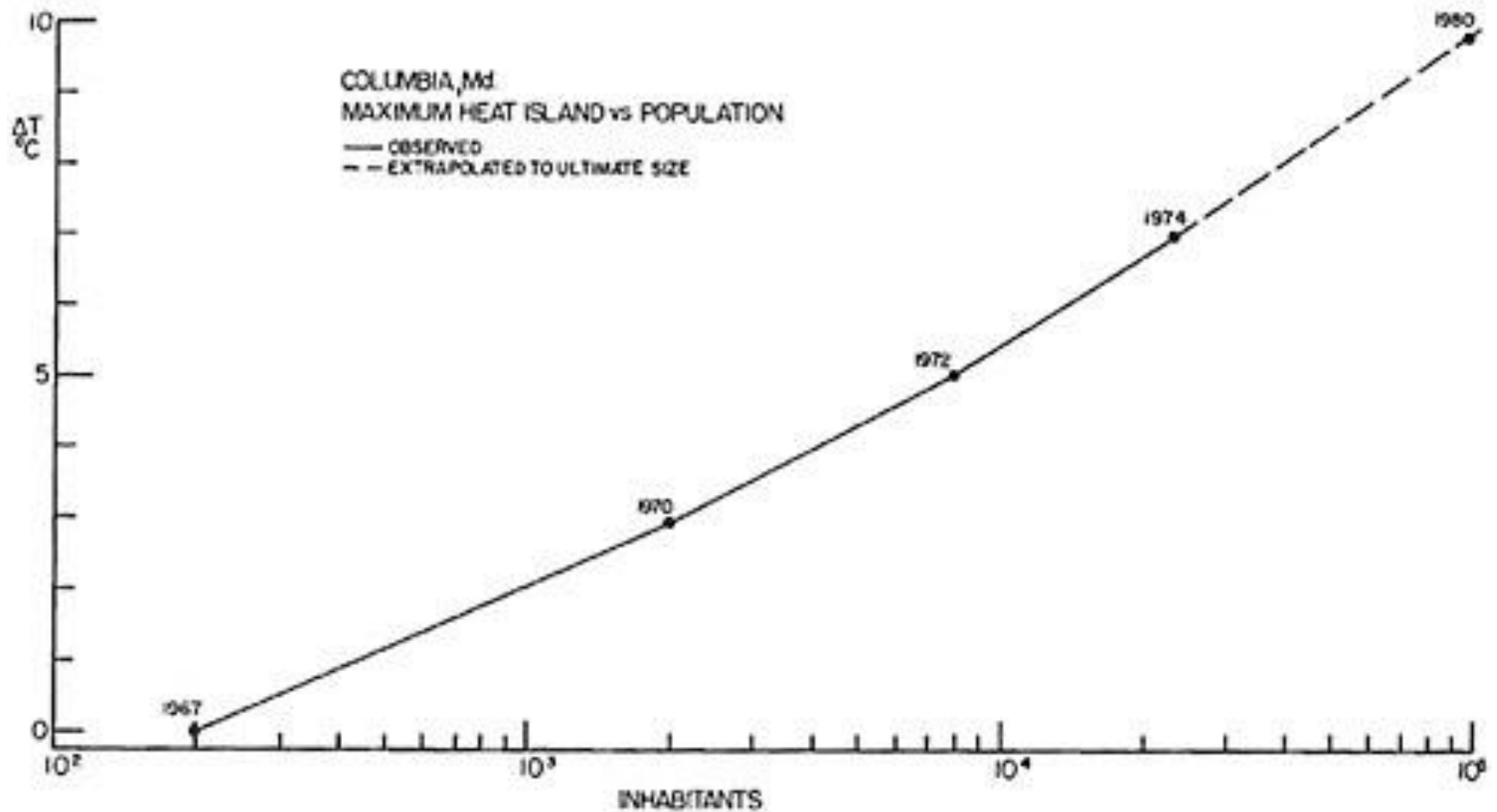
A sure sign your audience has given the subject some proper thought

4. 'Working LENR would be too disruptive economically, it would destroy employment and the balance of trade.'

The truth is that major disruption is inevitable, the economy will be unrecognisable within 10 -15 years. Business model innovation is every bit as disruptive as technology innovation. Think AI, Airbnb, think Uber. Try not to think of McDonalds. It is a case of 'seat-belts on' - a crash is coming.

5. 'If everybody on the globe had access to energy, it would fry the planet, even without greenhouse gases.'

Not true. Never forget, our entire history of interaction with the planet is one massive geo-engineering project, especially with regard to agriculture and desertification. What's needed is reverse geo-engineering to undo the damage. In 1974 anthropogenic heat production was about 8×10^3 GW or 0.01 percent of the solar heat gain. By 2000 this figure was still less than 0.05% and it has remained at around this figure since then. If 'strong' LNER increased this figure by 20X, the total man-made contribution would be 1%, offset by a reduction in CO2 and other emissions.



Big effects are caused by the concentration of population into cities and megacities, and their associated 'heat islands' than would be by LENR. Such hot spots cause mesoclimatic changes, The chart is 'old data' but a very clear illustration of the 'heat island' effect as measured on calm evenings in one growing US township.

The world is certainly going to need more air-conditioning.

THE BIG ONE - WARS, TERRORISM, AND LENR

6. 'Abundant energy from LENR would be used by bad actors as a tool of warfare and oppression.'

Armies have always fought wars, warlords and governments have always tended to oppress. Fighting for control of food and energy sources and access to strategic materials has always been a feature of life on our planet. Battles in the 1939-45 war and many conflicts since have shown that oil is now both a cause of war and a weapon.

Distributed LENR energy would actually remove some of the root causes of such conflicts. At the same time it would make communities and societies more resilient in the face of conflict.

The end of monopolistic controls over energy and more equal distribution of the fruits of abundant energy across the globe will mean less conflict, not more.

DISTRIBUTED LOW-COST LENR ENERGY - IMPACT ON PLANETARY RISKS FOR THIS CENTURY: Individual risk scores on a scale of 1-10, where 10 is highest.

EVENT+LENR	PROBABILITY	DOWNSTREAM EFFECT ON HUMAN SOCIETY	BENEFIT (b)	HARM (h)	b-h
USEFUL AI	9	Economic disruption	7	5	+2
G. WARMING	10	Mass migration, conflict	10	2	+8
EPIDEMIC*	8	Regional social collapse	10	0	+10
PANDEMIC **	4	Global social collapse	10	0	+10
SOLAR FLARE***	5	Grid loss, web collapse.	8	0	+8
CONFLICT ****	10	Migration, famine, death.	6	4	+2
GLOBAL WAR	4	Nuclear winter, famine.	10	0	+10
SUPERVOLCANO	2	Decade of winter.	10	0	+10
OVERPOPULATION	9	Resource war, famine.	10	2	+8
ASTEROID STRIKE	?	Un-foreseeable	10	0	+10
TOTALS			91	13	+78

* National/continental scale. ** Global scale *** Carrington event. **** Regional warfare.

The benefits of a resilient zero-carbon LENR system, capable of producing electricity either directly or indirectly outweigh the potentially harmful ones by a factor of 7.

The big problem is that right now we don't actually such a system. We have the sizzle, but we don't have a proper steak, in fact we are not all sure we even know what that steak would look like.

THE BENEFITS CLEARLY OUTWEIGHT RISKS – SO SELL THEM

The benefits of a resilient zero-carbon LENR system, capable of producing electricity either directly or indirectly outweigh the potentially harmful ones by 700%.

The big problem is that right now we don't actually such a system. We have the sizzle, but we don't have a proper steak, in fact we are not all sure we even know what that steak would look like.

LENR might be a 3-legged horse, but they are three very appealing legs. And more durable than Betty Grable's. 1. Energy security in an uncertain world: 2. Zero carbon emissions in a warming world: 3. Abundant energy for an overpopulated world. I am sure that everybody working in the LENR field dreams about the transformative nature of a reliable and useful system.

Inspire funders with the thought that long-term, we have what is possibly the only answer.

SELL THE SIZZLE, NOT THE STEAK – BE MORE OPEN

Consequently we should be selling LENR projects using precisely the arguments that are used to sell other things, take note of how the nuclear industry, hot fusion and more recently fracking have been sold to funders and to the public.

“Scienceis something that should be driven by society for the benefit of society.

DATA SHARING: Means it is time to be less secretive – as has been said ‘we are all keeping the same secrets from each other’. The ‘open science, open data’ model that MFMP (Martin Fleischmann Memorial Project) is a model that is working pretty well.

For similar reasons ‘Looking For Heat’ was established to supply hardware and raw materials to small-scale researchers. We make videos too- and some achieve over 15,000 views.

As part of our own programme www.lookingforheat.com has sold or donated over 20 reactor systems to researchers world-wide, and encourages them to share results, though that’s difficult to achieve. People –especially inventors - do love their secrets.

SELLING THE SIZZLE -FINDING NEW SOURCES OF FUNDS

SOCIAL MEDIA : The key message is – this is 2017. Worry less about publication in peer-reviewed journals, worry more about how (or even if) you are trending on Twitter. Positive publicity is the key to raising LENR's profile, and to raising money for research.

CROWDFUNDING: A new option for funding research projects, the number of successful science-related crowdfunding campaigns is growing, because the public is willingness to support and participate in scientific projects. Putting together a crowdfunding campaign is not easy however, since basically the idea is to appeal for small sums of money from large numbers of people.

FIND A PATRON:- from among the world's 2000+Billionaires. This is a group of individuals who tend to be very interested in the existential risk problems I have described. Contacts in the academic world - who specialise in the philosophy and practicalities of existential risk - tell me that most of their private sector funding comes from such 'ultra-high net worth' (UHNW) individuals.

It is possible that there are two key factors that stimulate this particular donor group. First and most importantly they often feel a genuine urge to their cash mountains to 'make a difference', there is also the old maxim 'the more you have, the more you fear losing it'.

IT IS TIME TO REACH OUT FROM THE LABORATORY AND BUILD NEW AUDIENCES AND NEW SOURCES OF SUPPORT FOR RESEARCH INTO WHAT SHOULD BECOME THE MOST IMPORTANT TOOL FOR PLANETARY SURVIVAL AND THE MOST BENIGN ENERGY SOURCE THERE WILL EVER BE.

THE TOOLS TO AROUSE PUBLIC INTEREST AND GOODWILL EXIST, AND NEW FUNDING SOURCES CAN BE FOUND BY DOING THAT. IT IS TIME, NOT TO RE-THINK WHAT WE DO, BUT DEFINITELY TIME TO CHANGE HOW WE DO It.

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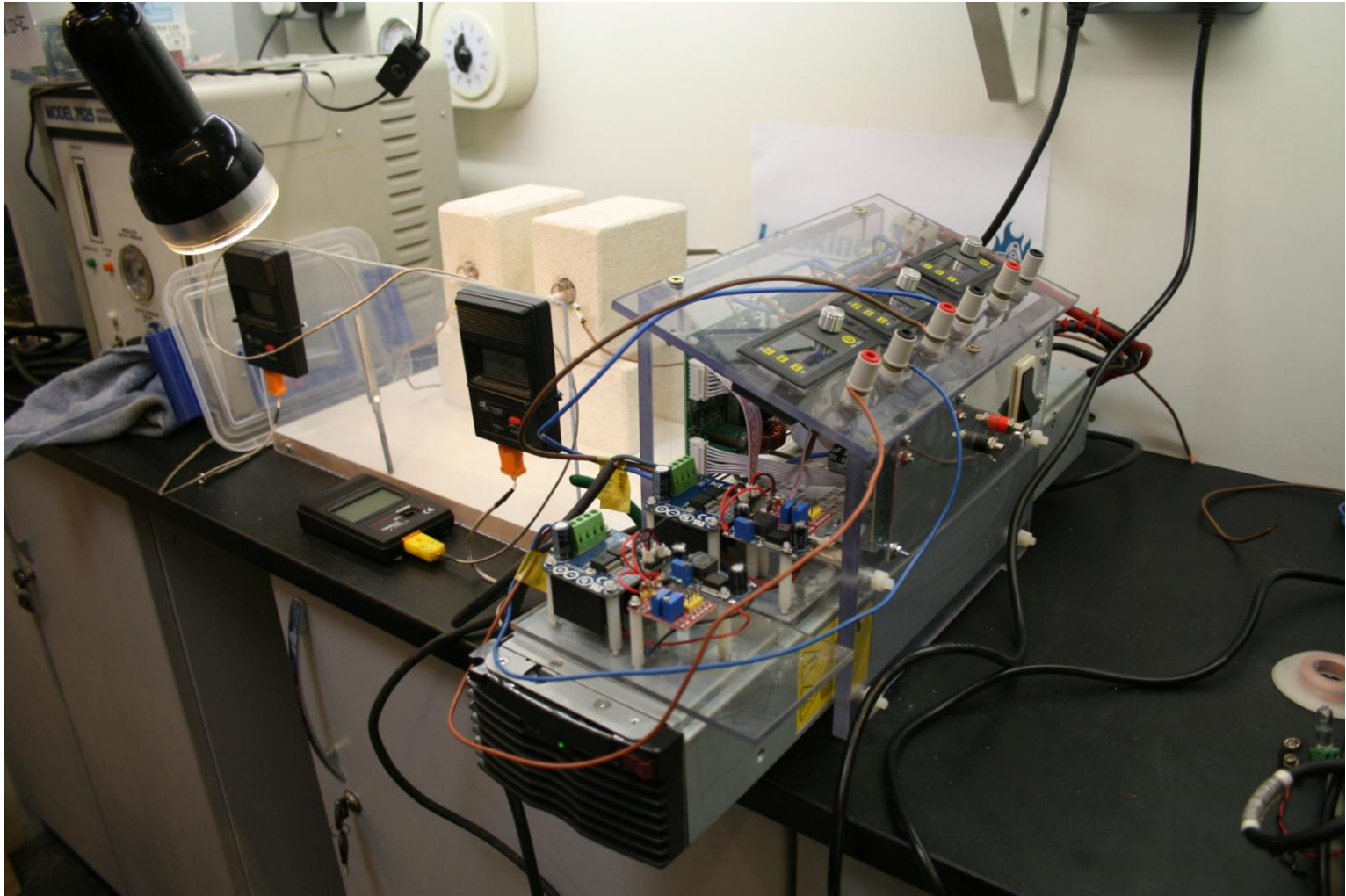
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Open-access/ open science websites :Open data (Example: Climate.com), Open content (Wikipedia, Safecast) Open knowledge (Udacity, Coursera, Kahn) Open-source software (Android, Linux) Open-source development/collaboration (GitHub) Open-crowd product development (Quirky)



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