# 

## AT THE INTERSECTION OF ENERGY AND MATTER

## THE SAFIRE PROJECT PROGRESS REPORT 09/28/2023

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With SAFIRE I and II we developed technology that allows us to replicate the processes of the sun and stars in a laboratory on Earth. The technology has repeatedly demonstrated the capability of *elemental transmutation* in a gas vacuum.

inside reactor chamber of SAFIRE II

AUREON ENERGY Ltd. was formed as the vehicle to build commercial applications of SAFIRE's *elemental transmutation* technology.

# VUZE S N

### AT THE INTERSECTION OF ENERGY AND MATTER

inside reactor chamber of SAFIRE II

Legal, finance, and business development strategies were developed. Deep marketplace research was done to determine the best first application of the SAFIRE *elemental transmutation* technology.



> ESCALATING PROB

oil and gas production, but also

AURE⊛N

	THE PROBLEM	
	Fracking technology is essential for oil and gas production. However, fracking technology comes at a potentially great cost to the environment from the disposal of produced water that	
	contains radium.	
LEM	> DISPOSAL ISSUES	
higher iter	Disposal of produced water into salt-water disposal injection wells will no longer meet the growing needs of the industry, nor is it safe for the environment.	



radioactive wast

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#### INJECTION WELLS

Because there is no good treatment for radioactive wastewater from fracking, it is pushed deep underground, often beneath drinking water aquifers.

Records show that such injection wells are frequently operated in violation of safety regulations and under conditions that greatly increase the risk of fluid leakage and the threat of water contamination.



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#### DRINKING WATER

As of January 2022, 49 states and 23,228 utilities deliver water that exceeds the optimum levels of radium set for good health and protection from cancer.

32 of these states and 197 utilities delivered drinking water that contains radium levels that exceed the *legal* limits.

Excess radium levels in drinking water have been linked to fracking operations.

RADIUM-226

RADIUM-228

"In 10 to 100 years we are going to find out that most of our groundwater is polluted."

- Mario Salazar, technical expert with the EPA's underground injection program

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The solution is NOT disposal of radioactive wastewater

The solution is ELIMINATION of radioactivity in wastewater.

Aureon's technology path optimizes for cost-effective elimination of

RADIUM-226

RADIUM-228



The team's strategic path was to build an application for an emerging market that requires the least amount of capital input, has the least competition, and utilizes the greatest leverage of our technology.

Fracking wells, Colorado

Remediation of radioactive fracking wastewater was the most obvious application.



The executive team completed a comprehensive market and business plan and has established working relationships in the field, with oil producers, engineers, scientists and laboratories who specialize in the handling of this range of radioactive material. We have contracted with a certified industry lab and industry consultants that specialize in analyzing and handling of radioactive fracking waste-water.

#### A U S E O M

#### The Problem

There is a huge shortfall in natural gas supply, and fracking is essential to natural gas production. Fracking is critical to U.S. domestic and global energy demand for natural gas because it results in a tenfold increase in natural gas production

Proposals to increase fracking volume raise serious environmental concerns. Specifically, fracking's produced water can contain concentrated amounts of radioactive material. Dealing with radioactivity in fracking wastewater is a problem without an effective solution. Nevertheless, we see in the current energy crisis a business opportunity to expand the production of natural gas safely and efficiently through developing technology to make fracking more environmentally safe.



Figure 1. Global energy communition by source - 2020 (Source: ELA)

Energy is one of the most important commodities in the world. We currently face an energy crisis of greater magnitude than anything we have seen in the modern age, including the 1970s energy

V U S E O N

Aureon's SAFIRE project has already demonstrated elemental transmutation with stable elements such as tungsten and iron. Compared to radioactive elements, stable elements greatly resist change and require high-energy, extremely dense hydrogen plasmas for transmutation to occur. The SAFIRE project has repeatedly transmuted tungsten and iron into more than 17 benign stable daughter elements.

By contrast, radium is an unstable radioactive element, like the other radioactive elements uranium, thorium, and plutonium that have been successfully transmuted into benign daughter elements by early work, as mentioned above. Transmuting the element radium into benign daughter elements is well within the capability of the existing SAFIRE processes. It is just a matter of optimizing the processes for that element.

Aureon has the unique capability to optimize the elemental transmutation process by finely tuning scalable conditions whereby atoms, ions and molecules are contained by self-generating electromagnetic fields into three-dimensional self-organizing hydrogen plasmas.<sup>112</sup> This is where atomic hydrogen nuclei change the nucleus of atoms through the transmutation process. The technology that makes these unique processes work as an optimized system for elemental transmutation is patented by



111 See Appendix A, "Brief History of Auroon Energy." <sup>117</sup> Montgomery W. Childs and W. Lowell Morgan, "Study Science and Technology 24 (2015), 055022. (PDF) Study of Science and Technology 24 (2015).

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es is the leading producer of both oil and natural gas.11 Natural gas is the most ment of our energy dependence. It is also the fastest growing fossil fuel energy orld.12 Natural gas currently provides the energy for approximately 25% of global

es industrial bulk chemical segment is the largest industrial energy consumer in the s projected to depend upon natural gas more than any other fuel source through



<sup>11</sup> Samantha Gross, "The United States Can Take 0 27, 2020, https://www.brookings.edu/policy/2020/ eil-and-gaa-production/.	Climate Change Seriously V bigideas the united states of	While Leading the World in Oil an take-climate-shange-serious
12 "Gas," International Energy Agency website, ac	cessed June 27, 2822, https	www.ics.org/fuels and techn
13 "Gas," International Energy Agency website.		
<sup>14</sup> "Chart Library – Industrial," U.S. Energy Infom https://www.nia.gov/outlooks/aeo/pdf/AE02022_ Outlook, 2022, https://www.nia.gov/outlooka/aeo/	nation Administration webs ChartLibrary_Industrial.pd /pdf/AEI02022_Nerrative.p	ite, accessed June 19, 2022, [U.S. Energy Information Add of
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examples from the business plan

#### V O Z S U A

SWD injection wells are now discouraged by regulators and investors. They have come under great sorutiny from state governments due to seismic issues like faults, outcrops, leakage, creation of conduits to other wells. Status have recently begun to create state regulatory areas the limit or ban the continued creation and use of SWD injection wells. These regulations have already resulted in an 87% decrease in seismic activity in the affected areas. More pressure is coming from ESG constraints that encourage treatment and beneficial reuse such as notable water, irrigation, and treatment to meet high puality water standards before discharge to surface water bodies

The pyramid in Figure 14 is an overview of the processing stages of the fracking water. The process begins at the bottom tier, with the bulk separation of oil, gas, water, and solida. Refinement of the oil and gas continues up the pyramid with various technologies applicable to each level.



Surron's solution is to eliminate the radioactivity from TENORM in produced water within the tertiary stage of processing-we are operating within the gold capstone of this pyramid in Figure

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and Gas Production," January ly while leading the world-in-

ologies/gas.

ministration, Annual Energy

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#### The Team

"What does it mean to innovate? Pure research, exploration, discovery, creativity and invention are all about finding something that is new. But having something new is not enough. True innovation is taking something new and building a commercial, scalable, sustainable, and profitable system of value for others around that new discovery. The profitable economics of true innovation are founded in efficient experimental design."

#### Jon McMahon, CEO, Aureon Energy

Aureon Energy is a technology company dedicated to developing commercial applications from our pure research at the intersection of energy and matter. Our global team of scientists, engineers and business leaders have both the depth and breadth of experience to bring this emerging technology to market. We are innovative and entrepreneurial in spirit, grounded in the scientific method and corporate disciplines born from total quality management and business process



Figure 19. Team skillers

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In daily planning sessions over this year the

science and engineering team has designed a new SAFIRE III micro-reactor, and created a schedule of experiments that will both refine the efficiency of the reactor and determine the necessary processes for effectively transmuting and rendering benign the radioactive elements found in fracking wastewater.





Morning Meeting

☆ Home Assembly3.iam × TUBE-02.ipt ×

For many reasons the current SAFIRE lab was not appropriate for the upcoming work. A new lab was required. Buying a building for a lab anywhere in or near Toronto would cost millions of dollars. Leasing has also become exorbitantly expensive. Should investment dollars go into buying Real Estate? Or into the next SAFIRE experiments?

Sec. Con

CONFERENCE



CEO Jon McMahon and Founder Montgomery Childs came up with a solution. Jon found two brand new prefabricated buildings that could be purchased at a considerable discount. Montgomery and Tracey Childs live on a hundred acre property. They volunteered a location to put up the buildings, the new SAFIRE labs.



The SAFIRE II lab in Toronto is being dismantled and moved to the new permanent location.



The pre-fab buildings have been purchased and are already on site.





## The new building location has been cleared.

## The ground has been graded. Building pads have been constructed.

Forms for concrete are being completed. Pouring the concrete and erecting the buildings have both been scheduled.





A temporary lab and workshop was set up, so the work can continue while the buildings are being erected.

Mastercra



The SAFIRE team at the new location

in the temporary workshop.



The SAFIRE III design and build was completed.



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A number of SAFIRE III micro-reactor prototypes were designed, built, and successfully tested.



Material tests and studies were done with different solutions, different electrolytes, different metals and how they react with each other, different voltages and currents to see what effect these factors would have.



Throughout the experiments we are measuring these factors: current, voltage, temperature inside and out, pressure, and time; and using the Design of Experiments to precisely map and understand the variables.

MASTERCRAFT

Feasibility tests were completed. Failure mode tests were completed.



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108.00

arturne

Post experimental materials tests are on going. It is not *just* the chemicals, the gases or liquids, we put *into* the reactor; the actual materials the reactor is made of are part of the proprietary transmutation effect of the process. So the reactor build itself is constantly being refined.

100

- No.

Renetal



We are employing new technology such as Historian and Grafona for data acquisition and analysis. This speeds up the process a hundredfold from what was available when we were working with the original SAFIRE reactors.



ThinkPaul





We determined the necessary factors required to run the reactor in steady-state, meaning continually, controllably, and safely. Procedures and Protocols for handling radioactive fracking water are being created and tested.

Lid brock

181

Time

SAT

Materiald

>Experiments >GT/2 >IR >Pico >VI5

Material Tests -Erosion groms/watt

Chamber Test - Pressure & Tem

- VIS Camera

~ 10 KV

INSTUMENTS

1#3

223

stort manually

start manually counted data to C#1

Can Run all day Sove & Clear data as

needed

stort monally

Running al day



An off-site secure server system has been built. All data generated from the lab is routed directly to this server. The team members access and work with the data on the server, using passwords. No data is ever kept on personal computers. The data on this server is continually backed up at a separate, equally secure, location. 1 . .



Risk ID	Linked Issue	Risk Statement	Prob	Impact	Risk Level Before Mitigation	Mitigation Strategy	Prob after mitigation	Impact after mitigation	Risk Level After Mitigation	Action Items	Comments/links
4		If information is leaked to the public, certain trade secrets or proprietary information would	3	4	12	Institute SOP to release any materials publicly	1	2	2		Part of SCG procedures
Deta	ailed securit	y protocols have been es	stablis	hed		Understand information flow protocols and what information can and cannot be shared	2	4			Part of SCG procedures
for pub	handling da lic and med	ta and for communicatio ia.	ons wit	h the		Maintain control of all posted data and information (limited 2nd party control of web sites, data sharing, etc.)	1	4			Part of SCG procedures
5		If video cons are on zoom, infromation could be leaked or accessed by zoom or 3rd parties	3	3	9	Keep conversations at the publicly releasable level; consult SCG for protocols	1	2	2	4/18 - Mike, Mick, and James to give me suggested vendors. 4/21/20 - trying Jitsi; seems stable.	
						Utilize Jitsi (as of 4/19)	1	2			
6		If team members do not have a security classification protocol they may unwittingly release data	4	2	8	Limit information given to board members and others not technically involved	2	2	4		
						Complete SCG and issue to SAFIRE team				4/19 - SCG 40% complete	
7		If bills/invoices can be traced, they may be able to easily trace and hack	3	2	6	Create shell company or off shore corporation to pay most bills	1	2	2	4/21/20 - Monty and Tracey will look into various methods of non-tracibility.	
8		If paper waste is captured it will be a leakage	2	2	4	Shred all documents	1	1	1	4/21/20 - need to purchase bi- directional shredder	
9		If we discuss plasus (or other data results) it is freely available to hackers	4	3	12	Refer to alloys with code words	2	2	4	Need to implement nomenclature for important SAFIRE items (anode, cathode, materials of interest, gases)	

It's difficult to scale something down and miniaturize it. SAFIRE III is a miniature version of SAFIRE II, which successfully proves the scalability of the original design.

In the last few weeks the team has completed the development of a robust and effective micro-reactor design on which to base the build of the commercial prototype for remediating the radioactive materials in fracking wastewater.

## SAFIRE III MICRO-REACTOR

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