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Demonstration of Continuous Net-Energy Production in Tomoiu Internal Confinement Fusion (TICF) Reactors

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Abstract
Since Arthur Eddington proposed nuclear fusion as the energy source of stars in 1920, achieving controlled fusion with net-positive energy production has remained one of the greatest challenges in modern science and engineering. Here, I'm reporting the development and experimental evaluation of the Tomoiu Internal Confinement Fusion (TICF) process, a hybrid chemical-thermonuclear system designed to generate continuous net-positive thermal energy through the continuous formation and confinement of transient hydrogen-based microplasmas.

The TICF process employs internally generated acoustic, electromagnetic, and magnetic fields to heat, compress, and stabilize high-temperature microplasmas formed within hydrogen-air-water reaction systems. Experimental testing conducted between 2019 and 2025 at multiple independent facilities, including the City College of New York and the University of Maryland, reported sustained thermal output-input ratios (Q-values) ranging from 2 to 8 across several reactors configurations.

The experiments further reported the absence of measurable neutron flux or gamma radiation, while positively charged particle signatures and transient plasmas bursts were observed during operation. These findings are interpreted as evidence consistent with aneutronic fusion reactions involving Protium and Nitrogen species.
The results indicate that TICF provides a pathway toward continuous, radiation-free, and scalable fusion-based energy generation.

Introduction
Magnetic confinement systems, particularly Tokamaks and Stellarators, laser inertial confinement systems, and magnetized target fusion represent the dominant technological approaches in contemporary nuclear fusion research. Despite decades of development, these systems continue to face major scientific and engineering challenges, including plasma instability, tritium dependence, extremely high operational power requirements, and material degradation under neutron irradiation.

Tomoiu Internal Confinement Fusion (TICF) is introduced as an alternative experimental approach to fusion energy generation. Unlike conventional deuterium-tritium fusion systems, TICF utilizes a hybrid chemical-thermonuclear process based on the continuous formation of transient hydrogen microplasmas within a confined reaction chamber.

The TICF mechanism is designed to generate localized high-temperature plasma events through hydrogen-air-water interactions. These transient microplasmas are subjected to internally generated acoustic, magnetic, and electromagnetic confinement forces that collectively stabilize plasma evolution without requiring electrical plasma heating and confinement systems.

The system reportedly operates with minimal auxiliary electrical input, primarily for instrumentation and reactor control, while thermal energy production substantially exceeds the chemical energy input of the fuel under experimental conditions. The reactor architecture enables the continuous generation of numerous transient micro-thermonuclear fusion events within a single confinement chamber.

Experimental results demonstrate sustained net thermal energy generation accompanied by the emission of positively charged particles. Measurements performed with a Digilert-50 radiation meter detected no gamma radiation, and no indications of neutron-induced activation or structural degradation were observed on reactor components after several hundred hours of operation. The lack of detectable neutron and gamma emissions, combined with the observed charged-particle production, is consistent with the hypothesized aneutronic Protium–N^{15} fusion channel operating within the TICF reactor Figure1. Approximately 6.472 transient microplasmas bursts/second have been detected using Tektronix TDS 2012 C oscilloscope, during operation, confirming the formations of transient high-temperature microplasmas, Figure 2. Additional control experiments were performed to evaluate the role of hydrogen in the observed energy generation. Substitution of water with inert gases such as argon or helium reportedly eliminated excess thermal output, while increased water-to-fuel ratios enhanced reactor temperature and energy production. These findings support the proposed role of hydrogen derived from water in the energy-generating process.

Methods

TICF Reactor Principle

The TICF process is based on the continuous formation of hydrogen-air-water micropackets that evolve into transient high-temperature microplasmas through a complex internal chemical-thermonuclear mechanism involving micro-chemical reactions, induced acoustic vibrations, energetic high frequency compression waves, micro-cavitation on liquid water, high-energy collisions, magnetic and electromagnetic interactions, and localized thermonuclear events without the need for external electrical energy input.

The reactor system employs hydrogen or hydrogen-containing fuels combined with controlled water injection to generate localized plasma events. Water serves as a source of protium participating in the thermonuclear process.

Experimental Evaluation

Multiple generations of TICF reactors were constructed and tested between 2019 and 2025. Independent evaluations were conducted at the City College of New York and the University of Maryland, in addition to testing performed at TAFE Corp. facilities, and public demonstrations. Thermal energy output was determined through enthalpy calculations derived from data generated by the tested TICF reactors. Diagnostic systems included oscilloscopic monitoring of plasmas burst activity, nuclear radiation meter, GC gas analyzer as well as mass and thermal measurements systems used to evaluate and quantify reactors performance.

Several control experiments were conducted:

- Replacement of water with inert gases.
- Replacement of hydrogen with CO.
- Variation of water-to-fuel ratios.
- Dual water-injection reactor configurations.
- Operation with alternative gas mixtures.
- At the City Collage of New York Combustion and Catalysis laboratory, the thermal energy generated by TICF C-type reactors, and the corresponding heat absorbed by a calorimeter farther demonstrated the continuous generation of net-positive energy.

These experiments were designed to distinguish potential thermochemical effects from the reported excess thermal energy production.

Results and Discussion

Independent testing of TICF reactors reportedly demonstrated sustained thermal energy output exceeding chemical fuel input under multiple operating configurations. Multiple generations of TICF reactors have been subjected to independent experimental evaluation at accredited research institutions, including the City University of New York (CUNY-CCNY) and the University of Maryland, as well as at five independent laboratories and through public demonstrations. Certified high-precision diagnostic instruments were utilized throughout these evaluations, and the calibration of all measurement systems was independently verified at each testing site by the testers.

Figures 3, 4, and 5 display findings from two CUNY-CCNY reports covering eight TICF reactors tested at CCNY's Combustion and Catalysis Lab between 2019 and 2021 under Professor Marco Castaldi PhD. Figure 7, display the enthalpy calculation of Gamma-2 reactor test with an input of 4.407 MJ/hour of hydrogen (31 g) have continuously produce 15.692 MJ/hour of heat, yielding a net gain of 11.285 MJ/hour (Q=3.56) across several tests. All TICF reactors tested produced continuous net-positive thermal output.

Oscilloscope measurements Figure 2, identified approximately 6,472 transient plasma bursts per second during reactor operation, supporting the proposed existence of continuous microplasmas formation within the reaction chamber. Further testing at the University of Maryland, led by Distinguished Professor Ashwani K. Gupta, PhD, confirmed the reactor's operational and thermal performance Figure 6, showing an output-input ratio of Q = 2.15. At a public demonstration Figure 8, at Harford Ct. on November 19, 2024, TICF Gamma-3b reactor has continuous output of 8.957 MJh corresponding to a Q-value of 6.256. An advanced TICF reactor at TAFE facility operates with efficiency in excess of 800% Figure 9. A mini-TICF power plant at the TAFE Corp. facility also demonstrated continuous electrical power generation through TICF fusion process.

Control Experiments Produced Several Notable Observations:

- Microplasmas are not generated directly from hydrogen or hydrogen-based fuels, as these reactants are completely consumed during the initial microchemical reaction events. Instead, microplasmas are generated from water that is introduced into the fuel-air mixture at the micropackets level.
- During reactors operation approximately 6.472 transient microplasmas bursts/second have been detected using Tektronix TDS 2012 C oscilloscope, confirming the continuous formations of transient high-temperature microplasmas.
- Using a Fluke 114 True RMS Digital Multimeter, voltage output ranging from 67 mV to 86 mV was measured, observed, and documented during testing conducted at the City College of New York (CCNY).
- Radiation monitoring conducted with a Digilert-50 nuclear radiation meter detected no gamma radiation above background levels during TICF reactor operation. The absence of measurable gamma activity indicates that neutron-induced activation of reactor materials was not observed, suggesting that any neutron emissions are below the detection threshold and unlikely to produce radiation hazards or structural degradation of reactor components.
- Replacement of water with inert gases eliminated excess energy production.
- Replacement of hydrogen with CO yield net-positive energy production reinforcing the role of hydrogen from water.
- Replacement of water with Deuterium and Boron depleted water yield net-positive energy production reinforcing the role of protium from water.
- Increased water injection correlated with increased reactor temperature and energy production Figure 11.
- Reactor temperature exceeded, by considerable margin, the adiabatic flame temperature calculated from corresponding heat and material balance when water was introduced into fuel-air mixture, supporting the conclusion that a nuclear process occurring, as shown in Figure 12.
- Analysis of the Gamma-2 reactor test conducted in 2019 at CUNY-CCNY (Figure 7). The calculated "specific energy" $\frac{Enet}{reacting\ mass}$ derived from the experimental test results indicate that a 0.5658 mg/h of N15-Protium have participated in the energy-production process yielding 16.952 MJ. The corresponding specific energy is: $2.996\frac{10^{13}J}{kg}.compared\ with\ HHV\ of\ H_2\ 141.8x\frac{10^6J}{Kg}$with the ratio $\frac{N15-P}{H2}=\frac{2.996\times10^{13}}{141.8\times10^6}=2.1x\ 10^5$ approximately 211,000 times than the hydrogen HHV, confirming an energy-generation mechanism operating in the nuclear scale.
- Analysis of the advanced TICF reactor test conducted in 2025 (Figure.9). The calculated specific energy derived from the reactor test indicates that a 7.95 mg/h of N15-Protium have participated in the energy-productions process, yielding 238.3 MJ. The corresponding specific energy is $3.0\times\frac{10^{13}J}{kg}$.compared with $5.03x\frac{10^7J}{Kg}$ for HHV propane combustion. The ratio of the specific energy $\frac{N15-P}{C3H8}=\frac{3.0\times10^{13}}{5.03\times10^7}\approx5.964\times10^5$ is roughly 596,400 times the energy density of propane combustion confirming an energy-generation mechanism operating in the nuclear scale.

The absence of neutron and gamma emissions, combined with reported charged particle signatures, and net-positive energy productions was interpreted as evidence consistent with aneutronic fusion processes.

Conclusion

The Tomoiu Internal Confinement Fusion (TICF) process introduces a hybrid chemical-thermonuclear approach based on the continuous generation and confinement of transient hydrogen microplasmas. Experimental evaluations conducted across multiple reactor configurations at independent facilities reportedly demonstrated sustained net-positive thermal energy production with Q-values ranging from 2 to 8. Sustained excess thermal energy production accompanied by positively charged particle emissions but without detectable neutron or gamma radiation aligns with aneutronic reaction pathways.

TICF presents a transformative pathway to controlled aneutronic fusion. By achieving continuous, self-sustained confinement of hydrogen-based microplasmas, the process has reportedly demonstrated stable continuous positive net-energy production without external electric power input. The reproductible Q-value, verified in independent laboratories, and the absence of detectable neutron or gamma emission set TICF apart from conventional fusion approaches. The results indicate that TICF represents a viable route toward clean and scalable fusion energy production.

Figure List

Figure 1: Gamma-2 TICF Reactor Tested at CUNY-CCNY Showing Protium-N15 Fusion.

- Figure 2. Oscilloscope detection of transient microplasmas bursts
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- Figure 6. University of Maryland evaluation report.
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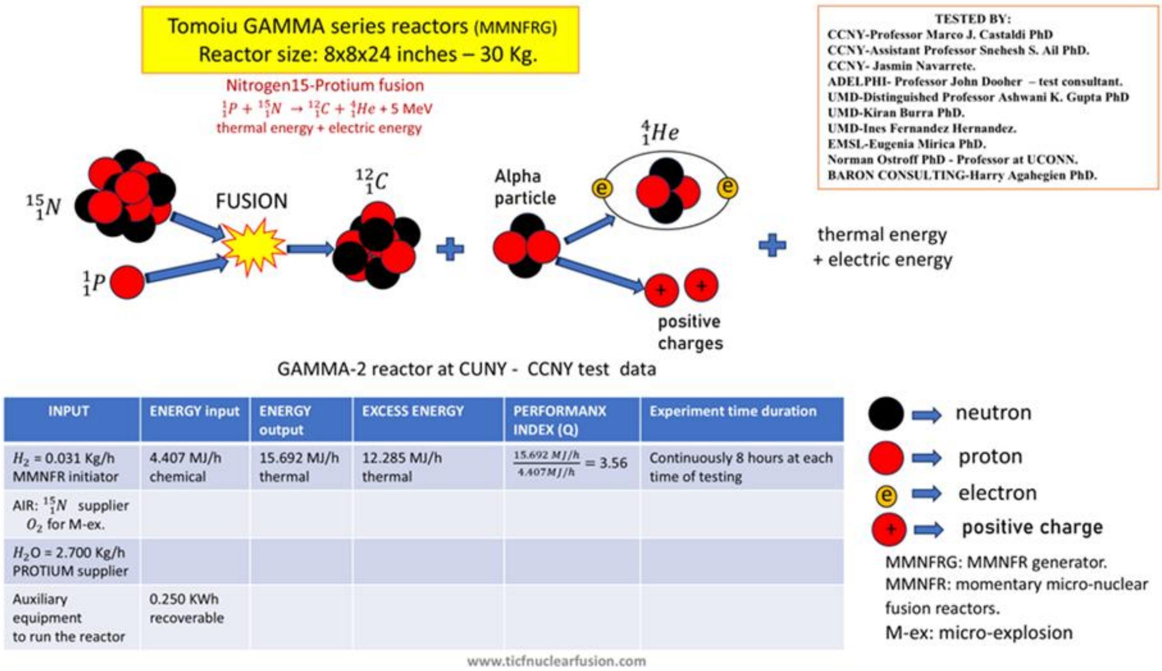
- Figure 8. Enthalpy analysis from Gamma-3b reactor at a public demonstration in Hartford Ct.
- Figure 9. Advanced TICF reactor system evaluated at TAFE Corp.
- Figure 10. Comparative performance analysis from CUNY-CCNY between Gamma-2 and JET Tokamak systems.
- Figure 11. Reactor temperature increases with the water addition.
- Figure 12. Reactor temperature calculated adiabatic flame temperature based upon respective heat and material balance.



INPUT	ENERGY input	ENERGY output	EXCESS ENERGY	PERFORMANX INDEX (Q)	Experiment time duration
H_2 = 0.031 Kg/h MMNFR initiator	4.407 MJ/h chemical	15.692 MJ/h thermal	12.285 MJ/h thermal	$\frac{15.692\ MJ/h}{4.407 MJ/h} = 3.56$	Continuously 8 hours at each time of testing
AIR: $^{15}_1N$ supplier O_2 for M-ex.					
H_2O = 2.700 Kg/h PROTIUM supplier					
Auxiliary equipment to run the reactor	0.250 KWh recoverable				

Figure 1: Gamma-2 Reactor Tested at CUNY CCNY, Showing Protium-N15 Fusion Reaction with 12.285 MW Positive-net Energy Continuous Production

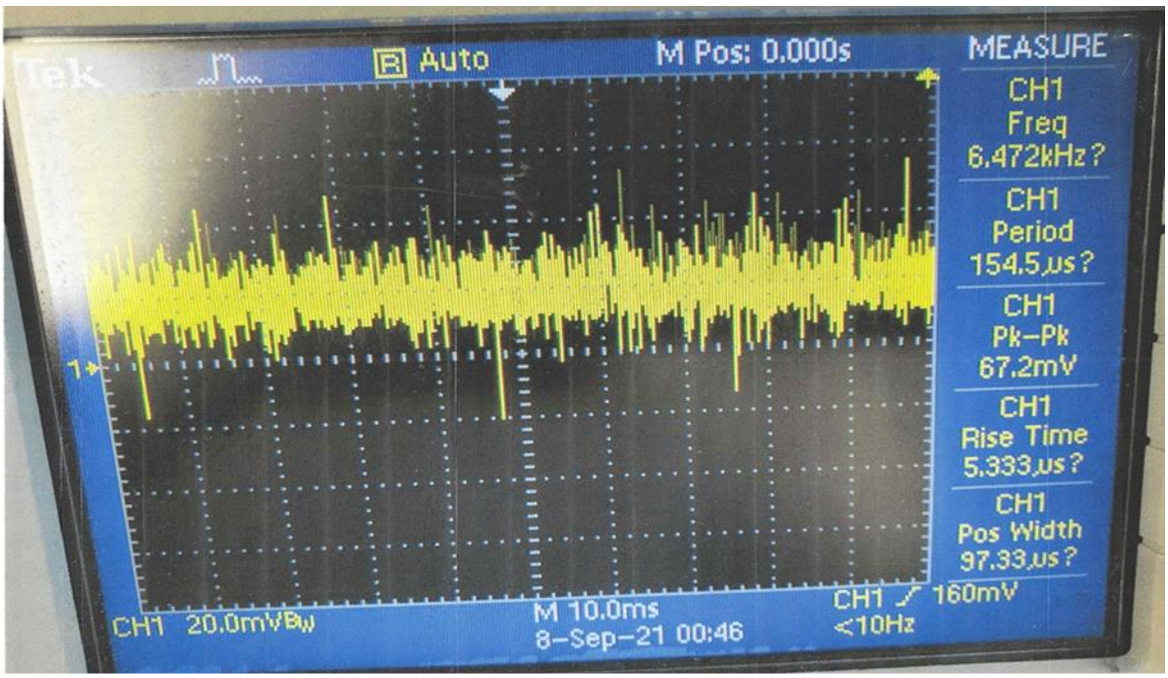


Figure 2: Continuous Formation and Burst of Microplasmas Detected by Tektronix TDS 2012 Coscilloscope

An electrode with an outer diameter of 0.250 inch and a length of 1.250 inch was instaled in the reactor chamber and electricaly insulated from the reactor wall. The reactor wall was connected to the ground. Measurments obtaned using a Tektronix TDS 2012C oscilloscope reviled electrical pulses associetaed with aproximatewly 6.472 micro-plasmas bursts per second, which result in the expulsion of mass and energies. Using a Fluke 114 True RMS Digital Multimeter, voltage output ranging from 67 mV to 86 mV was measured, observed, and documented during testing conducted at the City College of New York (CCNY).

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To: Tomoiu Advanced Energy Research

May 13, 2021

Dear Dr. Tomoiu,

This summary report, combined with the power point presentation, serves as the agreed upon deliverable for the evaluation of the Tomoiu Thermo-Acoustic Reactor. The details of the testing and evaluation are in the power point file and documentation attached in the appendix, so I will only summarize here.

We have thoroughly for 2 years tested the several reactor configurations (alpha, gamma-2, beta, calorimeter1, calorimeter2 and calorimeter3) reactors over a wide range of fuel, air and water flow rates. Furthermore, we have modeled the heat loss from the reactors and heat transfer to the calorimeters to enable a complete energy balance associated with various test conditions. To date we have tested hydrogen, carbon monoxide, ethanol, methane and propane fuels with air as the oxidizer. To that mixture we have also added various amounts of liquid water as well as deuterium free, deuterium enhanced, boron free and boron enhanced water to quantify the impact during combustion. The overall findings from these tests demonstrate that for every test that included water injection, the overall energy balance resulted in a net energy output. These results varied across the different reactor configurations but showed similar performance overall.

All flow meters, thermocouples and analytical equipment have been rigorously calibrated and were operated within recommended ranges.

We continue to conduct testing with deuterium gas and CO + AIR + C7F16, to test additional hypotheses to explain the excess energy calculated. Further testing is required to begin to understand the reaction responsible for this unprecedented performance.

We are looking forward to completing the program with deuterium gas and water injection and a follow-on program that enables us to develop and process the data that provides more insight into the possible explanation for these unique findings. We will further confirm the results obtained using the calorimeter component. A few specifics are given here in this summary report to highlight some of the findings. The detailed information can be found in the attached documents and data.

- All the reactors have been run continuously for up to 8 hours and demonstrated that repeatedly for the same input (Air – Fuel & Water mixture) an excess energy was measured and the results were well replicated.
- Multiple tests with all reactors using an input mixture of CO + AIR + WATER resulted in an excess energy output. Since CO contained no hydrogen, it is likely that hydrogen from water plays a significant role in the production of energy via the mass-energy relationship, $E = mc^2$. Tests with others fuels such as: hydrogen, propane & ethanol also resulted in excess energy output that occurred only when water was added in combination with air and fuel.

Dr. Tomoiu's analysis suggests it may be possible that the following reaction could be responsible for the measured results.

$${}^{1}_{1}P + {}^{15}_{1}N = {}^{12}_{1}C + {}^{4}_{1}He + 5\,MeV$$

Next Stage:

1. Continue testing with the calorimeter to further quantify the energy output from an updated reactor configuration.

Sincerely

Marco J. Castaldi

Professor Marco J. Castaldi PhD
Principal Investigator

140th Street and Convent Avenue Steinman Hall 307 New York, NY 10031

CUNY The City University of New York

Figure 3: Evaluation Report from CUNY-CCNY Reactors Testing Made by Professor Marco J. Castaldi PhD

The City College of New York

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To: Tomoiu Advanced Energy Research

December 7, 2021

Dear Dr. Tomoiu,

This summary report, combined with the power point presentation, serves as the agreed upon deliverable for the evaluation of the Tomoiu Thermo-Acoustic Reactor. The details of the testing and evaluation are in the power point file and documentation attached in the appendix, so I will only summarize here.

We have thoroughly for 2 years tested the several reactor configurations (alpha, beta, gamma-2, calorimeter1, calorimeter2 and calorimeter3, 4a & 4b) reactors over a wide range of fuel, air and water flow rates.

Furthermore, we have modeled the heat loss from the reactors and heat transfer to the calorimeters to enable a complete energy balance associated with various test conditions.

To date we have tested hydrogen, carbon monoxide, ethanol, methane and propane fuels with air as the oxidizer. To that mixture we have also added various amounts of liquid water as well as deuterium free, deuterium enhanced, boron free and boron enhanced water to quantify the impact during combustion.

The overall findings from these tests demonstrate that for every test that included water injection, the overall energy balance resulted in a net energy output. These results varied across the different reactor configurations but showed similar performance overall.

SUMMARY OF THE REACTORS PERFORMANCE

REACTOR	FUEL	INERT FLUID	Q
Alpha	H_2	H_2O	2.97
Alpha	CO	Ar.	0.853
Alpha	CO	He.	0.9
Beta	CO	H_2O	2.44
Gamma-2	H_2	H_2O	3.56
Gamma-2	CO	H_2O	2.287
Gamma-2	CH_4	H_2O	1.963
Gamma-2	C_2H_6O	H_2O	2.00
Calorimeter-1	CO	H_2O	1.896
Calorimeter-2	CO	H_2O	1.936
Calorimeter-3	CO	H_2O	1.745
Calorimeter-4a	CO	H_2O	1.421
Calorimeter-4b	CO	H_2O	1.421

$$Q = \frac{Thermal\ enery\ \ output}{Input\ energy\ (chemical\ energy\ contained\ in\ the\ fuel)}$$

Note that no other forms of energies been supplied to Tomoiu reactors in addition to the chemical energy contained in the amount of fuel used in the experiment.

All flow meters, thermocouples and analytical equipment have been rigorously calibrated and were operated within recommended ranges. We continue to conduct testing with deuterium gas and test additional hypotheses to explain the excess energy calculated and to understand the reaction responsible for this unprecedented performance.

CUNY The City University of New York

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Figure 4: Second Evaluation Report from CUNY-CCNY Reactors Testing Made by Professor Marco J. Castaldi PhD

A few specifics are given here in this summary report to highlight some of the findings. The detailed information can be found in the attached documents and data.

- All the reactors have been run continuously for up to 8 hours and demonstrated that repeatedly for the same input (Air – Fuel & Water mixture) an excess energy was measured and the results were well replicated.
- Multiple tests with all reactors using an input mixture of CO + AIR + WATER resulted in an excess energy output. Since CO contained no hydrogen, it is likely that hydrogen from water plays a significant role in the production of energy via the mass-energy relationship $E = mc^2$. Tests with others fuels such as: hydrogen, propane, methane & ethanol also resulted in excess energy output that occurred only when water was added in combination with air and fuel.
    - A comparison test was done using argon and helium in place of water (as an inert fluid added to air - fuel mixture). The results demonstrated there was no excess energy measured during those tests. This provides further evidence that hydrogen, from the water, likely plays a role in the energy produced via the mass-energy relationship.
-

Dr. Tomoiu's analysis suggests it may be possible that the following reaction could be responsible for the measured results.

$$ {}^{1}_{1}P + {}^{15}_{1}N = {}^{12}_{1}C + {}^{4}_{1}He + 5\,MeV $$

Finally, in our most recent test, positive charged particles were detected using a Fluke multimeter and Tektronix Oscilloscope, which is believed to be positive ions generated by decaying of Alpha particles into Helium4.

CONCLUSION:

1. The performance of Tomoiu reactors tested as measured by the ratio of heat production to the rate of fuel addition increased with the addition of water to the air – fuel mixture with considerable margin.
2. Adding water to the air – fuel mixture resulted in a reactor temperature increase.
3. The temperature observed within the reactor exceeded with considerable margin the adiabatic flame temperature computed based upon the respective heat and material balance when water was present.
4. The heat recoverable from the exhaust gases from the reactors tested greatly exceed those from what would be expected from a conventional burner.

Marco J. Castaldi

Professor Marco J. Castaldi PhD

Principal Investigator

Figure 5: Continuation of Evaluation Report Made by Professor Marco J. Castaldi PhD

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May 8, 2022

Summary results from Tomoiu Reactor Testing (Gamma-3) at the University of Maryland Combustion Laboratory during March 11-12, 2022

H2-air combustion in Tomoiu gamma-3 reactor was tested at equivalence ratio of 0.76 and 30 ml/min of water addition.
In these conditions, excess energy of 1.15 times that of H2's calorific input was observed from the reactor that provided a performance index = 2.1578
These resuts are very promising for energy generation from the reactor. The tests performed on the reactor revealed remarkable observation of excess energy of 1.15 times of H2's calorific input from the reactor, resulting in a performance index = 2.1578.

- Excess energy generation (by 1.15 times of the input H2 calorific value) could possibly be analagus to micro-packets level nuclear fusion reactors.

Further tests with H2, H2/He and other fuels and other flow rates and equivalence ratios should be performed along with radiation tests to verify this route.

Sincerely

Ashwani Gupta

Ashwani K. Gupta, PhD, DSc, PhD (Honoris Causa)
Distinguished University Professor
Hon. Fellow ASME and RAeS (UK); Fellow AIAA, SAE and AAAS
Director, Combustion Laboratory

Figure 6: Evaluation Report from UMD Made by Distinguished Professor Ashwani K. Gupta

Hydrogen test at CCNY exhaust temp. (9/20/19)

Inlet Conditions (Kg/hr.)		H2 + 1/2 O2 = H2O	Gamma-2 reactor. Recorded Temperatures		
Air		3.174	Input	22 C	295 K
Hydrogen		0.031	Reactor	1,139 C	1,412 K
water	liqiud	2.7	Exhaust	719 C	992 K
			Adiabatic flame temperature:	103 C	376 K

Input Enthalpy (MJ/hr.) at 295 K

Input Kg/hr.	Cp KJ/Kg.K	mass Kg/hr.	temp. K	Enthalpy
Air	1.005	3.174	295	0.941
Hydrogen	14.31	0.031	295	0.13
Total			TOTAL:	1.071

Combustion product at 992 K exhaust temperature.

Products	Cp KJ/Kg. K	mass Kg.	Temp. (K)	Enthalpy MJ/hr.
N2	1.167	2.395	992	2.772
Argon	0.52	0.04	992	0.02
O2 Excess	1.09	0.49	992	0.53

DIFFERENCE: (3.322 - 1,082)MJ/hr. = 2.240 MJ/hr.

Combustion Water at 992 K

	Cp KJ/Kg. K	mass Kg.	Temp. K	Enthalpy MJ/hr.
at 295 K	4.181	0.277	88	0.102
at 992 K	2.288	0.277	992	0.629
vaporization	2260	0.277		0.626
373 K	1.89	0.277	373 minus	0.195

DIFFERENCE: (1.357 - 0.195)MJ/hr. = 1.162 MJ/hr.

Liquid Water added to Air - Fuel mixture (exhaust temp.)

	Cp KJ/Kg. K	mass Kg.	Temp. K	Enthalpy MJ/hr.
at 295 K	4.181	2.7	88	0.993
at 373 K	1.89	2.7	992 minus	1.903
at 992 K	2.288	2.7	992	6.128
vaporization	2260	2.7		6.102

TOTAL: (13.223 - 1.903)MJ/hr. = 11.320 MJ/hr.

TOTAL:: (2.240 + 1.162 + 11.320)MJ/hr. = 14.722 MJ/hr.

HEAT LOSS: 0.97 MJ/hr.

GRAND TOTAL: (14.722 + 0.970)MJ/hr. = 15.692 MJ/hr.

INPUT: 0.031 Kg/hr. of H2 containe 4.407 MJ

PI: (15.692 : 4.407)MJ/hr. = 3.56

EXCESS ENERGY: 11.285 MJ/hr.

MASS CONVERTED TO ENERGY: 1.2556^(-11) Kg/hr.

CCNY - PRINCIPAL INVESTIGATOR:

Professor Marco J. Castaldi Ph.D.

Figure 7: Enthalpy Calculations at CUNY-CCNY for TICF Gamma-2 Reactor Made by Professor Marco J. Castaldi PhD

PUBLIC DEMONSTRATION of TICF TECHNOLOGYat POND CAFÉ, HARTFORD CT. 11/19/2024

$H2 + 1/2\ O2 = H2O$ GAMMA - 3b reactor

$P + {}^{15}N \rightarrow {}^{12}C + {}^{4}He + 5MeV$

ENTHALPY (ΔH) REACTOR TEMPERATURE: 1,028C (1,301K)

ΔH = (Cp) x (m) x (ΔT) Water added to air - hydrogen mixture = 1.920 Kg/hour

INPUT FROM 20C (293K)

	Cp KJ/Kg.K	mass: Kg/hr.	temperature K	MJ/h
AIR	1.005	0.95	293	0.28
HYDROGEN	14.31	0.012	293	0.05
TOTAL				0.33

ENTHALPY of COMBUSTION PRODUCTS at 1,301 K

	Cp KJ/Kg.K	mass: Kg/hr.	temperature K	MJ/h
N2	1.219	0.716	1,301	1.135
Argon	0.52	0.012	1,301	0.008
TOTAL				1.143

ENTHALPY of COMBUSTION WATER at 1,301K

	Cp KJ/Kg.K	mass: Kg/hr.	temperature K	MJ/h
at 293K	4.181	0.108	80	0.036
at 1,301K	2.49	0.108	1,301	0.35
vaporization	2,260	0.108		0.245
TOTAL				0.631

ENTHALPY of liquid added water to air - hydrogen mixture

	Cp KJ/Kg.K	mass: Kg/hr.	temperature K	MJ/h
at 293K	4.181	1.92	80	0.642
at 373K	1.89	1.92	373	1.354
at 1,301	2.49	1.92	1,301	6.22
vaporization	2,260	1.92		4.34
TOTAL			11.20211.202 MJh - 1.354 MJh =	9.848 MJh

GRANT TOTAL 1.143 + 0.631 + 9.848 - 0.33 = 10.661 MJh

CONTINOUS THERMAL ENERGY OUTPUT = 10.661 MJh

heat loss not added

INPUT Hydrogen 0.012 Kgh (1.704 MJ)

EXCESS THERMAL ENERGY via $E = mc^2$ → 8.957MJh

PERFORMANCE INDEX: 10.661MJh/1.704MJh = 6.256 (625.6%) → 526.6% NET ENERGY

Mass converted to energy: $24.16E^{-12}$ Kg

MONITORING INSTRUMENTTS:

Air: ALICAT (M-50SLPM-D) mass flow meter

Hydrogen: ALICAT (M-10SLPM-D) mass flow meter

Water: PREP 100 Chromatography Pump (by Scientific System, Inc.)

Temperatures: OMEGA PID controlers

THE LIVE DEMONSTRATION HAS CAPTIVETED EVERYONE AT Pond Café AND MILLIONS WORLDWIDE THROUGH YouTube LIVE, LIVING A LASTING IMPACT ON ALL WHO WINESED IT.

Figure 8: Enthalpy Calculus from Gamma-3b Reactor Tested at a Public Demonstration in Hartford Ct

CRUSADER TEST # 1 **October 26/2025**

INPUT from 295 K	Kg/hr	KJ/KgK	K	MJ
Air	7.59	1.005	295	2.25
C3H8	0.459	1.692	295	0.229
H2O add.	100.27			0
			TOTAL	2.479

Enthalpy of combustion products at 399 K	Kg	KJ/KgK	K	MJ/hr
N2	5.728	1.044	399	2.386
Argon	0.097	0.52	399	0.02
CO2	1.377	0.939	399	0.515
			TOTAL	2.921

Enthalpy of combustion water at 399 K	Kg	KJ/KgK	K	MJ/hr
liquid	0.751	4.186	ΔT 77	0.242
at 399 K	0.751	1.901	399	0.569
vapor	0.751	2,260		1.697
			TOTAL	1.698

Enthalpy of added water at 399 K	Kg	KJ/KgK	K	MJ/hr	
liquid	100.27	4.186	ΔT 81	33.998	
at 373K	100.27	1.89	373	70.687	minus
at 399 K	100.27	1.901	399	76.06	
vapor	100.27	2,260		226.61	
TOTAL	(336.668 - 70.686)MJ =			265.981	

HEAT LOSS Q = A x U x ΔT

Aluminium: u = 237 W/mK A = 0.962m^2 ΔT = 12 C

0.962m^2 x 237W/mK x 12 C = 2.276 KW (8.193 MJ)

Total energy input			MJ/hr
From 295 K			2.479
C3H8 (0.459 Kg/h)	HHV		23.179
Electric energy (equipment)		1,845 W	6.642
		TOTAL	32.3

C3H8 +5O2 = 3CO2 + 4H2O

INPUT	Kg/h
AIR	7.59
C3H8	0.459
H2O # 1	0.27
H2O # 2	100 from 19 C

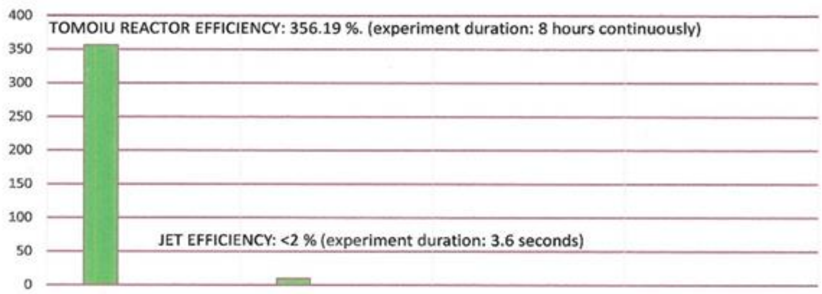
OUTPUT **Flue gas - steam**
126.4C (399.55K)

GRAND TOTAL **(2.921 + 1.698 + 265.981)MJ = 270.6MJ**
NET ENERGY **(270.6 - 32.300)MJ = 238.3 MJ**
PERFORMANCE **(270.6 : 32.3)MJ = 8.377 ;Q = 8.377 or 837.7% output**
2.276 KWh (8.193 MJ) heat loss to surrounding is not added to reactor performance calculation

Figure 9: Advanced TICF Reactor Test Independently Observed at TAFE Facility

TOMOIU THERMO-KINETIK REACTOR versus JET (Joynt European Torus)

- In 1997 the Joint European Torus (JET) located in Oxfordshire UK, achieved an fusion efficiency of 0.67 % (Q=0.67).
- A world record for a deuterium & tritium fusion reaction. This is still less output power than input power accounting for the total input to the system of 800 MW, with an briefly output of only 16 MW. with efficiency of 2 %. The total input at the peak was greater than 1,000 MW. The JET project is a nearly 40 year effort (beginning testing in 1983) leveraging 40 laboratories and 350 scientists.
- In 9/20/19 at CCNY in the Combustion and Catalysis Lab (CCL) under supervision of Professor Marco J. Castaldi Ph.D. and his team, the Tomoiu Thermo-Kinetic reactor (Gamma-2 reactor) demonstrated an output of 15.692 MJ/h with a 4.407 MJ/h input of chemical energy. This was done by reacting 31 grams/hr. of hydrogen with air and water.
- Thus the efficiency of Tomoiu Thermo-Kinetic reactor is 356.19 % (Q= 3.5619) and has been sustained repeatedly.



TOMOIU ADVANCED ENERGY RESEARCH

CCNY – PRINCIPAL INVESTIGATOR
Professor Marco Castaldi PhD

Figure 10: Comparative Performance Analysis Between Gamma-3 Reactor and JET Tokamak

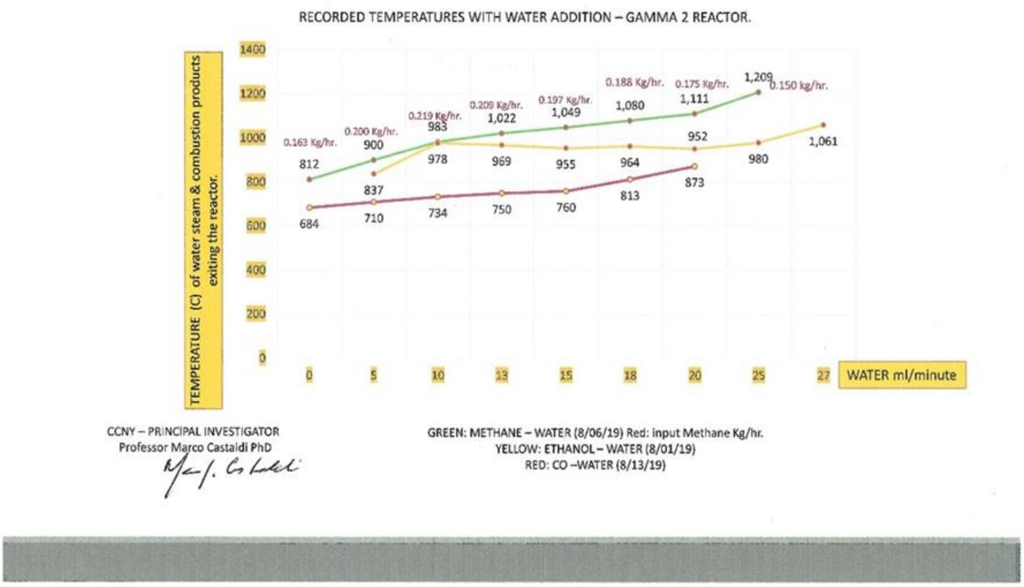


Figure 11: Reactor Temperature Increases with Water in Addition to Air-Fuel-Water Mixture

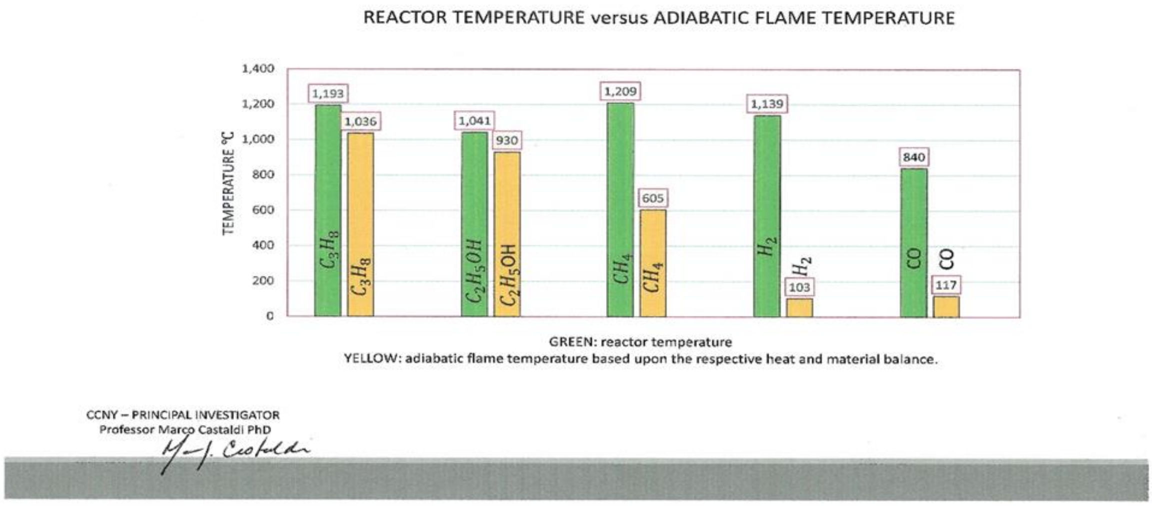


Figure 12: Reactor Temperature Versus Adiabatic Flame Temperature Based upon Respective Heat and Material Balance

References

1. Eddington, A. S. (1920). The internal constitution of the stars. *Science, 52*(1341), 233-240.
2. Mark Oliphant (1934). Early studies on thermonuclear fusion reactions.
3. Batani, D. (2024). Inertial confinement fusion: recent results and perspectives. In *EPJ Web of Conferences* (Vol. 310, p. 00013). EDP Sciences.
4. Tomoiu, C. (2026). Demonstration of Continuous Net-Energy Production in Tomoiu Internal Confinement Fusion (TICF) Reactors.
5. Independent evaluation reports from the City College of New York and the University of Maryland.
6. Tomoiu, C. (2026). Demonstration of Continuous Net-Energy Production in Tomoiu Internal Confinement Fusion (TICF) Reactors.
7. Constantin Tomoiu. Current status report: Seven operational TICF reactors at TAFE Corp.
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