

New Mexico Energy Technology Incubator (NM-ETI)

Concept For New Mexico

Presented by Simon Woodruff Woodruff Scientific Inc 2778 Agua Fria Street, Unit 6, Santa Fe, NM 87507 <u>simon@woodruffscientific.com</u> | (505) 316 3130

Timeline





Working towards March 15th 2023 Stakeholder meeting in Santa Fe Purpose is to get the lab built with all the right folk involved

Context

- Funding for private fusion organizations in the US: ~3Bn in the last 14 months.
- Since Q>1 (Dec 5th 2022), more \$ coming DOE, ARPA-E, Private Investment.



Private Sector Investment in Nuclear Fusion May Top \$1 Billion in 2022

Source: BloombergNEF, U.S. Global Investors

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Problem





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Solution: make a shop window to the NM labs











Hot-house energy technologies





* Fusion industry is hiring!

Technologies to hothouse for fusion customers

- Advanced Manufacturing
- Data Science, Visualization and Information Management
- Materials
- Tritium Fuel Cycle
- Breeder Blankets
- Radiation Shielding
- Superconducting and copper magnets
- Lasers and Optical Technology
- Plasma heating systems
- Pulsed and DC power Supplies
- Advanced Sensors, Instrumentation, & Control Systems
- Networking & Collaboration



Stakeholder companies and organizations will benefit from key enablers



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Key Enablers



Woodruff Scientific Business Model

Woodruff Scientific was founded in 2005 with SBIR grants, aiming to accelerate the commercialization of fusion energy technologies

Companies:

Compact Fusion Systems (2021) DONE
SciVista (2018-2022) DONE
Woodruff Power Engineering (2022 - present) Ongoing
UHV3D (2017 - present) Ongoing
XTUS ENERGY (2021 - present) Ongoing
nTtau Digital (2022 - present) Ongoing in the UK
Fusion Advisory Services (2022 - present) Ongoing

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Woodruff Scientific Commercialization Assistance



- NMETI can perform an important role for expediting commercialization of technologies at the national laboratories;
- Some technologies are at low TRLs, and so need some more development or 'industry hardening' before being offered as a product to customers;
- Hiring from the fusion academic community, giving opportunities to recent graduates;
- Training of SFCC students provides workforce development;
- NMETI does surveys of technologies and works with labs to get tech out and bring expertise into the loop;
- Working with other national labs where expertise is critically important.

NM CERG Overview

- Funded for \$1.25M (\$1M federal, \$250K cost-match) in Summer 2021 through the DOE EPIC RFP
- Three-year award, partnering with NMEDD, LANL and Sandia to scale and grow a clean-technology development cluster in New Mexico
- NM CERG is founded on a pipeline for success model: energy innovators access a structured, tailored/customized, development pathway for their clean-tech startup, from both business as well as technical success and growth



GOALS

- Better serve the needs of the clean energy landscape in New Mexico by offering a collaborative nexus for access to training, resource, and assistance
- Increase technology development and economic potential, establish a strong foundation for technology transfer and acquisition opportunities, and support technology development via prototyping and rapid manufacturing
- View clean energy from a wider nexus; including transitional technologies, enabling technologies, and service-based models

ARROWHEAD CENTER®





New Mexico A.I. LABS

Why We Exist & Whom We Serve

New Mexico.Al (NMAI), a non profit 501(c)(3) organization, works with New Mexico communities and businesses to make Artificial Intelligence work for them.

How We Serve

NMAI offers workshops and consulting support that help NM communities and businesses leverage A.I. to solve their most pressing problems.

What's Unique About Us

Our process entails a thorough initial discovery meeting with interested parties. Following that discovery meeting, our team gets smart on their problem space and business domain. We then come back with recommendations that outline the best way to apply A.I. to solve their problems. This can take the form of a day/multi-day workshop or consulting engagement with an embedded NMAI team member.

Where Are We Now

People Interested In Our Services

We have already garnered interest in the New Mexico community to use our services. The interest is wide and varied: addiction recovery, wild horse management, tv/film and fusion energy businesses, just to name a few.





Investment

Key statements here from investment groups

What makes a company investable?

What stage would investment group want to step in?

What level of investment would be be considered?



Advanced Manufacturing

Manufacturing in NM is gaining momentum, although still a long way to go.

Opportunity to align with DOE mission area in advanced materials and manufacturing technologies:

https://www.energy.gov/eere/amo/ advanced-materials-manufacturing -technologies





Top 10 New Mexico Manufacturing Sectors, in Millions of Dollars, 2019

Training and retention in NM

- Collectively we have participated in the PILAS internship program at SFCC
- Worked with SFCC in advisory role (Thomas Click's computing group);
- Worked with ME staff, have staff involved in continuous education;
- Worked with UNM internship program;
- Hired first NM staff from NMTech;
- Held numerous NMBSA grants with Sandia and LANL;
- Worked closely with Air Force Research Labs.



Companies that we are spinning up



From Disruptech, we have considered:

- Mechanical X-ray device for pipe inspection
- Vacuum dirigibles
- Novel capacitor builds

We have also been interacting with LANL and SNL for:

- > Pulsed power (NMSBA)
- > Design review support
- > Computational modeling



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Woodruff Power Engineering

- Pulsed power and magnets for energy R&D
- Founded in 2005, 8 employees.
- Selling pulsed power and magnets into fusion organizations.





UHV3D Inc

Mission: Automate the design of metal AM components for Extreme Environments

Purpose: Accelerate the development of **clean energy**

MVP development with LANL currently for fusion component design.

Progress in 2022

Open source workflow ~15% implemented with

team of summer students DONE Information Management 10% 100% Advanced constitutive FreeCAD models for metals (LANL 20% collaboration) 20% Gmsh, Moose Тору 15% 5% Certified Digital Twin of Component 20



Companies that would join us





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Company: Molten Salt Solutions is a startup company in Santa Fe, New Mexico developing products and technology for the metal processing industries and nuclear power industries.

Contact: Molten Salt Solutions, 3900 Paseo del Sol, Santa Fe New Mexico 87501, elling@moltensaltsolutions.com

Technology: Liquid-liquid chemical extractions using high speed countercurrent chromatography (HSCCC) offers much lower processing costs and hardware costs than alternative technology for isotope enrichment. Molten Salt Solutions is developing extraction systems for lithium isotopes using HSCCC. The company will dramatically lower the cost of producing bulk lithium-7 for nuclear power applications.

Los Alamos National Laboratory (LANL) has developed unique HSCCC equipment that allows high-volume countercurrent flow of the two liquid phases. Molten Salt Solutions has licensed the LANL technology and is working with scientists at the Laboratory to develop its proprietary lithium enrichment process.



Frazer Nash



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OXFORD SIGMA

Ο X F O R D S I G M Λ

Oxford Sigma tackles energy security and climate change by accelerating the development of fusion and advanced nuclear energy.

SME Based on Harwell Campus, Oxfordshire, UK

We develop novel material designs, technology for fusion, and advanced fission energy systems. Projects and research collaborations that the company is undertaking:

- Project Wolfram
 - Patent pending technology in tungsten materials for fusion energy
- Project Ally
 - Patent pending technology in liquid metal fusion breeder blanket designs
- NeutronicBEAST
 - Oxford Sigma has developed a Multiphysics dynamic optimiser software to provide an easy-to-use and powerful tool for simulating nuclear fission kinetics, fusion reactors and radioactive inventories.
- Design of Radiation-Tough High Entropy Alloys with Singapore University of Technology and Design
- Liquid Metal corrosion barrier development with Oxford University

www.oxfordsigma.com

info@oxfordsigma.com



nTtau Digital LTD

Mission: Accelerate fusion scientific discovery and engineering design by building integrated digital design tools for fusion pilot plants.

Purpose: accelerate the deployment of innovative energy technologies in time to make a difference to Net Zero 2050.





Going to scale



Production Ramp Up - Experience







- 4 years experience with Production Line at ZF Autocruise
 - ZF is an Automotive Tier 1 supplier producing millions of components for many Automotive OEMs.
- Technical Lead for the first all solid state automotive laser (lidar) sensor.
- Developed product with Design for Manufacturing, for production in quantities of 1+ Million parts, and failure rates (FIT) in ppm.
- Developed Production line equipment for producing product.

Production Ramp Up







Requires production rate 3x year-on-year between 2025 and 2026.



Requires production rate 2x year-on-year between 2027 and 2030.

Additional factory space - 1350 sq ft



Additional factory space - 1350 sq ft



Additional factory space - 1350 sq ft



Estimated capacity: 3 power supplies modules / day. 65 per month. 720 per year. Increased capacity is possible with more factory space if needed.

Location, location, location



Site for the NMETI: Concept for SFCC-ic





The Innovation Center will continue to broaden the community connections to campus, expanding from Bioscience, Health, Biofuels, **Controlled Environment** Agriculture, Algae Cultivation, Machining and Culinary Arts to IT, Film, Arts, Hospitality, and Fitness.

20,000sqft energy lab and manufacturing facility





Putting the new lab in an Opportunity Zone would provide investment incentives





Opportunity Zones Map:

And who knows... perhaps AI can help design it?!





A NM lab for AI reproduced here by kind permission of Sabri Sansoy!