Network Link Analysis: Dr. Glen Wurden & the LANL P-24 Group

Executive Summary

This analysis assesses the role of Dr. Glen Wurden and the Los Alamos National Laboratory (LANL) P-24 Magnetized Plasma Team as a human capital and technology transfer vector to the private Field-Reversed Configuration (FRC) ecosystem, focusing on MSNW LLC, Helion Energy, and TAE Technologies. The investigation concludes that while the P-24 group does not function as a direct human capital pipeline, it serves as a critical and active technology transfer vector through a structured, capability-focused, and government-mediated model. The primary mechanism for this transfer is the Department of Energy's (DOE) Innovation Network for Fusion Energy (INFUSE) program, which facilitates formal partnerships. Through this program, private companies contract LANL to leverage its unique and advanced diagnostic hardware and high-performance simulation capabilities to de-risk specific, mission-critical technical challenges. This relationship is best characterized as a "capability-as-a-service" model rather than a traditional talent pipeline. This structure is well-suited to an advanced technology ecosystem where private entities are protecting highly proprietary intellectual property while still requiring access to the unparalleled resources of the national laboratory system.

1. Analysis of LANL-Private Sector Interactions

This section investigates direct, person-to-person links between the LANL P-24 group and the target private companies through co-authored research and the career paths of junior personnel. The analysis reveals a notable absence of recent direct collaboration, pointing to a shift in the nature of the relationship from foundational academic partnership to a more formal, firewalled engagement as the private sector matured.

1.1 Collaboration Trace (Publications & Reports, 2014-Present)

A comprehensive search of publications and technical reports from 2014 to the present yields no evidence of direct co-authorship between Dr. Glen Wurden or the listed staff of the P-24 Magnetized Plasma Team—including Dr. Scott C. Hsu, Dr. Thomas E. Weber, and Dr. Samuel Langendorf—and personnel explicitly affiliated with MSNW LLC, Helion Energy, or TAE Technologies. This absence of open, direct scientific collaboration in the contemporary period is a significant finding that indicates a change in the primary mode of interaction between the national lab and the private FRC sector.

This current state is best understood by examining the historical context and technical lineage that connects these entities. The P-24 group's expertise is deeply rooted in the same intellectual ecosystem as the target companies. A critical link is the 2015 paper on plasma-gun-assisted FRC formation, co-authored by T.E. Weber of LANL and R.J. Smith of the University of Washington. The University of Washington is the academic home of Dr. John Slough, the founder of MSNW and a co-founder of Helion Energy, placing this work squarely within the intellectual orbit of the private FRC pioneers. The paper details advanced FRC formation

techniques directly relevant to Magneto-Inertial Fusion (MIF), a core technological interest of these companies.
Even more directly, Dr. Weber's earlier dissertation work (c. 2010) on the Electrodeless Lorentz Force (ELF) thruster was the explicit result of a Small Business Technology Transfer (STTR) grant awarded to **MSNW LLC**. This confirms a direct, formal research collaboration between a key member of what would become Wurden's P-24 team and a foundational company in the private FRC space.
The clear historical evidence of academic and grant-based collaboration stands in stark contrast to the complete lack of such open partnerships in the post-2014 period. This timeframe coincides with the period of major private investment and technological maturation for companies like Helion and TAE. This divergence suggests a deliberate strategic shift. As these companies developed highly proprietary intellectual property backed by billions in private capital, the mode of interaction with national labs transitioned away from open-source academic partnerships. The new model, detailed in Section 2, is a firewalled, capability-for-hire approach mediated by government programs like INFUSE. This structure protects the companies' core IP while still allowing them to access LANL's unique capabilities. The absence of recent publications is therefore not a sign of a weak link, but rather an indicator of a maturing, more commercially sensitive relationship.

1.2 Human Capital Pipeline Analysis

A direct trace of the junior researchers and postdoctoral fellows identified as members of the P-24 team in Dr. Wurden's 2020 INFUSE workshop presentation reveals no subsequent employment at MSNW, Helion, or TAE Technologies, refuting the hypothesis that the group serves as a direct talent pipeline to these specific companies.

- **Dr. Tom Byvank:** Identified as a P-24 postdoc in 2020, Dr. Byvank's career has remained at Los Alamos. As of 2021 and beyond, he is documented as a scientist in LANL's X Theoretical Design Division (XTD), focusing on experimental and computational plasma physics.
- **Dr. Kevin Yates:** Also a P-24 postdoc in 2020, Dr. Yates's record shows continuous employment as a postdoctoral researcher within the P-24 group at LANL from 2019 to the present.
- **Dr. John Boguski:** Listed as a P-24 postdoc in 2020, Dr. Boguski's affiliation remains with Los Alamos National Laboratory. In 2023, he was serving as Vice Chair of the American Physical Society (APS) Division of Plasma Physics Public Information Committee, still representing LANL.
- **Chris Roper:** Identified as a summer student with the P-24 group in 2020, Mr. Roper subsequently pursued his Ph.D. in Aerospace Engineering at the Georgia Institute of Technology. His career path has remained firmly in the academic and national lab sphere, including a residency at LANL in 2024.

The career paths of these four individuals show a clear pattern of talent retention within the national laboratory and its associated academic ecosystem. Rather than exporting personnel to the private sector, LANL appears to be cultivating and retaining this specialized expertise in-house. This suggests that the value of the P-24 group to the private FRC ecosystem is not in the personnel it graduates, but in the unique concentration of expertise it *maintains*. Private companies access this stable, persistent national resource not by hiring individuals away, but by contracting the team for specific tasks through formal government programs.

Name	Role at LANL (c. 2020)	Post-LANL Affiliation(s)	Subsequent Employment at MSNW/Helion/TAE
Dr. Tom Byvank	Postdoc	Los Alamos National Laboratory (XTD)	No
Dr. Kevin Yates	Postdoc	Los Alamos National Laboratory (P-24)	No
Dr. John Boguski	Postdoc	Los Alamos National Laboratory	No
Chris Roper	Summer Student	Georgia Tech (Ph.D.), LANL (Residency)	No

2. Analysis of Government Programmatic Links

The formal, government-brokered collaborations between LANL and private industry constitute the primary vector for technology and capability transfer. These programmatic links, primarily through the DOE's INFUSE program, provide the strongest evidence of a direct, ongoing, and strategically important relationship between the P-24 group and the private FRC ecosystem.

2.1 Funding Vector Analysis (DOE INFUSE & ARPA-E)

The DOE's Innovation Network for Fusion Energy (INFUSE) program is the dominant and most explicit vector connecting LANL to the private FRC ecosystem. Multiple awards directly fund LANL to provide technical support and hardware to private companies, including those central to this analysis.

- **TAE Technologies:** A FY 2021 INFUSE award titled "X-ray Diagnostic for C-2W FRC Plasma" establishes a direct partnership where LANL is funded to provide TAE with two 7-detector high-frequency x-ray diagnostic systems. These systems are for installation on TAE's C-2W "Norman" experimental device to study MHD mode activities.
- **HelicitySpace:** A FY 2019 INFUSE award for "Simulation of plectoneme formation" and a FY 2021 award for "Simulation of the Helicity Drive Magneto-Inertial Fusion Concept" establish LANL as a key modeling and simulation partner for this emerging MIF company.
- **Hyperjet Fusion Corp.:** A FY 2019 INFUSE award for "3D MHD simulations support for PJMIF" confirms another simulation-based collaboration between LANL and a private MIF company, demonstrating a broad pattern of engagement.

While not a direct funding link to the target companies, the ARPA-E ALPHA program (Accelerating Low-cost Plasma Heating and Assembly) further establishes LANL's central role in the broader MIF ecosystem. LANL was a key awardee in this program, partnering with HyperV Technologies to develop plasma liners for fusion. The official retrospective of the ALPHA program explicitly contextualizes Helion Energy's work as building upon foundational research from MSNW, situating all these players within the same advanced technological domain that ARPA-E sought to accelerate.

Award Year	Private Partner	Project Title	LANL's Role
FY 2021	TAE Technologies, Inc.	X-ray Diagnostic for C-2W FRC Plasma	Design, provide, and assist with installation of two 7-detector high-frequency x-ray diagnostic systems.

Award Year	Private Partner	Project Title	LANL's Role
FY 2021	HelicitySpace	Simulation of the Helicity Drive Magneto-Inertial Fusion Concept	Provide high-performance computing resources and expertise for advanced plasma simulations.
FY 2019	HelicitySpace	Simulation of plectoneme formation	Provide high-performance computing resources and expertise for advanced plasma simulations.
FY 2019	Hyperjet Fusion Corp.	3D MHD simulations support for PJMIF	Provide high-performance computing resources and expertise for 3D MHD simulations.

2.2 Technical Role Definition

Based on the programmatic awards and the P-24 group's stated capabilities, LANL's specific role in the private fusion ecosystem is defined by two core competencies: providing advanced, bespoke plasma diagnostics and offering high-performance computing for modeling and simulation.

1. **Provider of Advanced, Bespoke Plasma Diagnostics:** The collaboration with TAE Technologies is the exemplar of this role. According to the award abstract, TAE requires a specialized diagnostic to "quantify MHD mode activities in the FRC core with sufficient time and spatial resolution" to understand and extend the stability boundaries of their device. Dr. Wurden's P-24 team possesses the exact capability to design, build, and help field the required "7-detector high-frequency x-ray diagnostic systems". This is a direct transfer of a high-value technological capability that would be difficult for a private company to develop from scratch. This service aligns perfectly with the capabilities advertised in Dr. Wurden's 2020 presentation, which include soft x-ray diagnostics, Ross-filtered SXR detectors, and a 4-strip gated x-ray imager.
2. **Provider of High-Performance Computing (HPC) Modeling and Simulation:** The collaborations with HelicitySpace and Hyperjet Fusion define this second critical role. These companies leverage LANL's world-class supercomputing infrastructure and proprietary simulation codes (e.g., 3D MHD codes) to model complex, non-linear plasma physics phenomena. This access allows startups to perform virtual prototyping and explore physics regimes that would be prohibitively expensive or impossible to access experimentally, thereby de-risking their concepts and accelerating their design cycles.

This "capability-as-a-service" model positions LANL as a strategic "de-risking" agent for the private fusion industry. Private fusion companies face immense technical risk, which can be a significant barrier to attracting private investment. Key risks include understanding and controlling plasma instabilities (TAE's problem) and predicting the behavior of novel fusion concepts (HelicitySpace's problem). LANL possesses unique, pre-existing, taxpayer-funded assets—advanced diagnostic hardware, HPC codes, and the world-class expertise to run

them—that can directly address these risks. The INFUSE program acts as a formal broker, allowing private capital to be paired with these public assets. By providing high-confidence data from advanced diagnostics and simulations, LANL helps validate the physics underlying a company's approach, making it a more attractive and defensible investment for venture capital and other private funders.

3. Final Assessment

This section synthesizes the findings to provide a definitive, confidence-scored judgment on the role of Dr. Glen Wurden and the LANL P-24 group as a transfer vector to the private FRC ecosystem.

- **Role as a Human Capital Pipeline:**
  - **Assessment:** The LANL P-24 group does **not** function as a significant direct human capital pipeline to MSNW, Helion, or TAE. The evidence for this pathway is negative. Junior personnel and postdocs associated with the group have been retained at LANL or have pursued further academic and national lab careers.
  - **Confidence Score: LOW.** The available evidence strongly contradicts the hypothesis of a direct personnel pipeline.
- **Role as a Technology Transfer Vector:**
  - **Assessment:** The LANL P-24 group functions as a **critical and active technology transfer vector**. This transfer occurs through a highly structured, formal, and capability-specific programmatic channel, primarily the DOE INFUSE program. The model is one of providing "capability-as-a-service" rather than a passive diffusion of knowledge or personnel. LANL provides access to unique, high-value assets—specifically advanced plasma diagnostics and high-fidelity simulation capabilities—that allow private companies to solve critical R&D problems, validate their physics, and de-risk their technological pathways for private investors. This firewalled, contractual relationship is the defining characteristic of the technology transfer mechanism.
  - **Confidence Score: HIGH.** The evidence from multiple, official INFUSE program awards provides direct, unambiguous proof of this role.

The observed interaction model—formal, firewalled, capability-for-hire—is perfectly congruent with an ecosystem where private entities are protecting billions of dollars in proprietary IP and potentially pursuing dual-use technologies. This structure allows companies to leverage the immense resources of the national lab system to solve specific, targeted problems without exposing their core designs, operational parameters, or business strategies. In this context, Dr. Wurden and the P-24 team are not simply academic collaborators; they are the operators of a national-level suite of advanced tools that the emerging private fusion industry can contract to accelerate its path to commercialization and solidify the U.S. position in a globally competitive field.

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