OVERARCHING NARRATIVE

1. Executive Summary

The **Vermont Gallium Nitride (V-GaN) Tech Hub** will create an innovation ecosystem to accelerate the development and adoption of advanced semiconductor devices for high power/high frequency consumers in the national defense, advanced communication, and electric/hybrid vehicle industries. The total addressable market size for this technology is large, with estimated compound annual growth rates of 15-25% over the next 8 years. Building on substantial investment in GaN-based device manufacturing at GlobalFoundries' Trusted Foundry in Vermont, new and existing semiconductor design companies will work with electronic design automation providers to meet expected market growth. We will implement a comprehensive workforce development program with national semiconductor industry partners. With support from the State of Vermont and local municipalities, *we will establish US global leadership in the high power/high frequency semiconductor industry segment in the next 10 years*.

The Burlington-South Burlington Metropolitan Statistical Area (MSA) is a dynamic and thriving region in Vermont, USA, that was identified by EIG as **the top location** in an EPSCoR/rural eligible area for Tech Hub "readiness". The Burlington MSA is home to hub partners GlobalFoundries (Essex Junction), University of Vermont (Burlington), and innovation partners OnLogic and Resonant Link (South Burlington). Technology and manufacturing are, by value, 6 times the economic scale of agriculture in Vermont. Tech growth in VT will build on a strong education and quality of life infrastructure that attracts next-generation workers to the region.

2. Vision and Synopsis

V-GaN Vision: Accelerate global leadership in high-power and high-frequency semiconductor design and manufacturing in VT that will advance US national security while raising the economic and social vitality of greater Burlington.

The 2022 **CHIPS and Science Act** represents a historic opportunity to grow regional innovation, recapture the United States's global leadership in semiconductor science and manufacturing, and accelerate economic development in areas of the country that have been bypassed by the technology-based growth seen in coastal and southern cities. As part of the CHIPS Act, the US Department of Commerce announced a preliminary agreement with leading chip maker GlobalFoundries (GF) that will invest substantial public support in new and existing semiconductor manufacturing capacity, including the transition of GF's Fab 9 in Vermont to novel high power, high frequency chip manufacturing using gallium nitride (**GaN**). The Vermont Gallium Nitride (V-GaN) Tech Hub will ensure the success of this important public investment *by providing a robust **product development ecosystem** focused on the importance of this new technology for national security, health, and sustainable energy and transportation—while ensuring support for the equitable workforce and economic development needed to translate manufacturing investment into regional success.*

The V-GaN Tech Hub is a consortium of innovators in industry, government, organized labor, academia and the non-profit sector in the greater Burlington, Vermont region, aligned to achieve global leadership in the design and deployment of GaN-based semiconductors. The Hub is developing a closed-loop technology innovation cycle that links **initiatives** in chip design (**UVM**), prototyping (**GF**), and testing/characterization (**OnLogic**) in a rapid development system capable of establishing global leadership in high frequency/high power semiconductor development and manufacturing in the next 10 years. Importantly, the production of high frequency/high power semiconductor devices is one of the few areas in the semiconductor industry where global leadership is yet to be established. The V-GaN Tech Hub is partnering with

industry leaders in electronic design automation (EDA) software (**Cadence, Keysight, Mentor Graphics/Siemens**) where global leadership is still held by US firms. Our Hub will meet the goals of the CHIPS Act for global leadership in this vital national security technology area while advancing **key technology area 10: Advanced materials science, including composites 2D materials, other next-generation materials, and related manufacturing.**

Beyond the technology infrastructure, partners from education (**Norwich University, the Community College of Vermont (CCV), Dartmouth College, Vermont Manufacturing Extension Center (VMEC), Vermont tech centers, and UVM's Professional and Continuing Education**) are joining with the **International Brotherhood of Electrical Workers (IBEW**) and workforce development partner **SEMI** to create the robust workforce needed to support the transition of Fab 9 into a new manufacturing era—focusing our efforts on attracting/retaining skilled professionals, diversifying the tech workforce, and drawing talent to Vermont via high paying, high stability jobs. The **State of Vermont** and **municipal governments** in the greater Burlington area have introduced the programming/policy and financial support related to housing, workforce, childcare and investment needed to support a technology-inspired transformation of our region. Our links to the **Northeast Microelectronics Coalition (NEMC)** and industry and investment partners (**RTX, Intel, BAE**) will help ensure a robust startup ecosystem, while existing regional chip design companies (**Green Mountain Semiconductor, ASIC North, Marvell**) will benefit from the resources provided by the hub.

The V-GaN Tech Hub is committed to **Climate and Environmental Sustainability** by growing the market share of GaN products within the semiconductor market. GaN is an exceptionally good conductor with "on resistance" levels ten times lower than silicon. Lower electricity use and lower heat means that designers can reduce the size and weight of GaN based electronics, which reduces materials and requires less fuel to operate and ship them. This will hasten efforts to reshape the nation's power grid and advance electric/hybrid automobiles and aircraft—expected to be the fastest growing consumer segment for this technology over the next 10 years.

Gallium nitride materials are created within Fab 9 from available and secure supply chains. Gallium itself is a byproduct of the processes used to mine and smelt zinc and bauxite. There are no new mines needed to extract gallium to produce GaN electronics. Further, GaN is used in small quantities: GlobalFoundries estimates that when running at full production, Fab 9 will use less than 400 pounds of gallium per year.

GlobalFoundries has a commitment to sustainability and has implemented the comprehensive "Journey to Zero Carbon" program that includes enhancing manufacturing emissions controls, further improving energy efficiency, sourcing renewable/lower-carbon energy, and water reclamation/waste management.

Equity and diversity are key elements of Vermont's economic future. The Burlington MSA and entire State have programs to benefit disadvantaged and low-to-moderate income, new Vermonters (refugees, asylees, foreign-born individuals), underemployed/low skilled, ethnic and racial minorities, high school graduates not attending post-secondary education, persons with disabilities, older workers and those in rural communities. Through our partnership with the State of Vermont, the V-GaN Tech Hub Semiconductor Workforce Development Core will actively engage underserved communities via the Governor's Workforce Equity and Diversity Council, the Office of Economic Opportunity, Working Bridges/United Way, HireAbility, the IBEW, the Vermont Professionals of Color Network, and Vermont Works for Women. These programs complement existing workforce development collaborations between UVM and

VTSU, including our joint, EPSCoR-funded Center for Workforce Development and Diversity.

Timeline	2024			2025				2026-29			
Submit Proposal											
EDA Award Announcement											
Order Equipment/Hire											
Open/Operate ADCC											
Launch/Run Workforce Initiatives											
Open/Operate Prototyping Center											
Open/Operate Characterization Lab											
Exemplar and New Projects											

Our **Timeline** is for the Innovation Core and workforce development rollout to be fully operational by mid-2025. We will measure progress toward our **Specific Outcomes** via key performance indicators (KPIs) that will evolve as the hub grows. We will measure our progress in three essential ecosystem functions: technology maturation and market readiness; equitable workforce and economic development; and investment community growth (see logic model, **Figure 2**).

3. Technological Problem to be Addressed

GaN is a mechanically stable wide bandgap semiconductor. In comparison with silicon MOSFETs, GaN transistors have higher breakdown voltage, faster switching speed, and higher thermal conductivity, making them excel in high power and high frequency microwave applications. GaN devices exhibit stability at much higher temperatures than silicon devices and are naturally more radiation resistant. These properties make GaN devices perform well in demanding military, aerospace, and transportation applications.

Although numerous potential commercial applications are recognized for GaN devices, the product development pipeline is slow. One major cause is that EDA software platforms have been minimally refined for GaN deployments. This is important because these platforms dramatically speed up the device development process—using machine learning, AI and natural language processing to simulate device characteristics. With more than 50 years of data in silicon characteristics, these systems allow chip designers to explore novel silicon design solutions without the need for extensive prototyping—saving time and money. The benefit of this large body of data is evident in the advance of silicon applications over the last 3 decades.

In contrast, the short history of GaN semiconductor use provides insufficient data for reliable design and simulation functions. The organization of our Tech Hub's Innovation Core is meant to rapidly close the gap between the performance of GaN-focused EDA platforms and the capacity of the same platforms for working in silicon. By providing real time data feedback to our EDA partners (Cadence, Keysight, Siemens) in exchange for low-cost access to chip design software, our hub creates a "win-win" scenario that will rapidly solve this technology gap. Similarly, providing characterization data to GF will facilitate GaN manufacturing process improvements at Fab 9. In doing so, *the Hub will accelerate the design infrastructure, manufacture, and adoption of a game-changing semiconductor technology for high power/high frequency markets within a 10-year time horizon,* ***amplifying the public investment in GF's Vermont foundry****.*

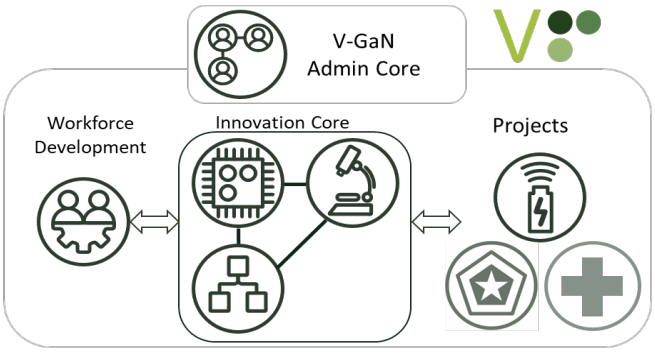


Figure 1: V-GaN Tech Hub Regional Innovation Ecosystem

Recent advancements in the use of GaN have most often resulted when a supplier works closely with a design team to use GaN as a substitute for existing power or radio frequency devices. This was the case recently when Infineon worked with Delta Electronics to improve power supply devices for personal computers, or when PowerSphyr and GaN Systems collaborated

to advance wireless charging. In each case, the potential advantages of GaN technology alone were not sufficient to create a new customer base. Rather, the combination of industry-specific design expertise coupled with high-quality manufacturing opened up new markets for GaN use.

Our plan is to expand this "design/ fabrication partnership model" by creating an ecosystem where multiple design firms from many different industry segments can work closely with GF Fab 9, while working within an ecosystem that lowers the barriers to entry for new and small companies (**Figure 1**). These firms will serve as "market makers" for the advanced manufacturing capabilities being built at Fab 9. This plan includes 7 key components:

The V-GaN **Advanced Design Computing Center (ADCC)** enables discounted access (50-90%) for hub members to leading EDA software platforms from Cadence, Keysight, and Siemens, removing a key barrier to entry for early-stage and small design firms in Vermont. Hardware and personnel to manage access to these platforms and security for the design environment will be hosted on a new, independent, "greenfield" compute cluster at UVM's Vermont Advanced Computing Center, home to 5 existing high-performance clusters.

GlobalFoundries will lead a V-GaN **Prototyping Center (PC)**. This service will provide discounted access to small batch production of new GaN devices at least three times per year—each multiproject wafer requires 2-3 months of production. Ordinarily, such small batch runs are not feasible for a large commercial fab, and the cost is prohibitive for small companies who cannot afford to purchase an entire "wafer". Hub members will be able to reserve die sizes as small as 9 mm^2, lowering the threshold to prototyping by over $180,000 per project—removing a second major barrier to product development, particularly for small or new design firms. No similar service is available at any GaN production fab in the US.

The V-GaN **Test & Characterization Laboratory (TCL)** will be a state-of-the-art facility with instruments to perform the inspection, testing, and characterization of GaN semiconductor devices that are designed by V-GaN Tech Hub members. OnLogic, a local firm that designs and manufactures industrial computers, will host the Test & Characterization Laboratory, with equipment from Hub partners Keysight and Semiprobe.

These three elements—ADCC, PC, TCL—comprise the V-GaN **Innovation Core**. As described below, the Innovation Core is key to accelerating both novel product development and improving manufacturing and design infrastructure through a trusted data environment.

The V-GaN **Administrative Core** will serve as the convener, connector, and promoter of semiconductor design and manufacturing in Vermont. It will enable and sustain this total project ecosystem and serve as a conduit for downstream consumer goods producers looking for a design firm that has the expertise they need; facilitating startups in the device design space; and ensuring equitable and fair entry points and conditions for all involved. It will coordinate with other semiconductor development hubs (e.g., NEMC) and VT ACCD, and sustain the governance and evaluation structure for the Hub. It is led by RIO Doug Merrill, and staffed for coordination and communication.

The **V-GaN Semiconductor Workforce Development Core (SWDC)** will be led by the University of Vermont's *Professional and Continuing Education (PACE)*. The core's goal is to train, recruit, and retain a sufficient and skilled workforce—operators, technicians, designers and engineers—to meet the growing needs of the semiconductor industry in Vermont. Working with national semiconductor industry partner SEMI, we will employ a curriculum that includes k-12 STEM education; targeted apprenticeships delivered by Vermont Tech Centers, the Community College of Vermont and the Vermont State University; continuing/professional

education at UVM; and baccalaureate / graduate certificates from Norwich, Dartmouth and UVM. Organized labor partner IBEW and Vermont HireAbility will ensure equitable outcomes for this program, while Working Bridges and VMEC will provide "wrap around" support for workers encountering "barriers to entry".

The final element of this proposal is the **V-GaN Commercialization Exemplar Project**, led by local startup *Resonant Link*. Expanding their proprietary, high power flat coil system for fast, efficient wireless charging, they will work with *Green Mountain Semiconductor* to develop a device for advanced unmanned aerial vehicle charging, capitalizing on GaN-based devices' small size and light weight. Developing this technology via the V-GaN Innovation Core will provide "proof of concept" while answering an immediate national security need for the US Army.

To support the acceleration of this process, a group of local (VCET Fund 2, Fresh Tracks Capital, Dudley Fund, the Fund at Hula) and national semiconductor industry investors (RTX Ventures and Intel Capital) will serve as the V-GaN Venture Advisory Committee.

4. Technological, Economic, Geographic, and National Security Nexus

The Center for Strategic and International Studies notes that DoD needs for semiconductor technology are broad and there is no "one size fits all" manufacturing solution for a national security semiconductor strategy. Numerous assessments, including recent TBRC reports, note the importance of GaN to the defense sector including critical uses in electronic warfare (radar, communications, jamming) as well as high voltage switching. The same report notes the importance of GaN-on-Si technologies for these functions—the specific manufacturing technology being rolled out in Fab 9.

On the consumer side, Yole Intelligence estimates that the GaN-based consumer power device market will reach $2 billion by late 2027 and will constitute 6% of the power electronics market by 2028, with the largest growth coming from electric/hybrid vehicles. In the wireless communication space, high frequency device demand is expected to grow from $4.6 billion at present, to $14.7 billion in 2031, with substantial market share devoted to GaN. Straits Research estimates a total addressable market for GaN at >$11 billion by 2030. The Semiconductor Research Corporation's (SRC's) *Decadal Plan for Semiconductors* identifies GaN as a critical part of the power system on chip (PowerSoC) and power system in package (PowerSiP) paradigm that will replace silicon power MOSFETS over the next several years.

Currently, the top GaN device manufacturers by market share are GaN Systems (Canada, recently purchased by Infineon), Infineon (Germany), Efficient Power Conversion Corporation (USA), and Toshiba (Japan). As such, GaN-based device manufacturing is one of the few semiconductor sectors where no clear geographical/national leader has emerged. GF's Trusted Foundry in Vermont offers the competitive advantage of larger, 200mm wafer manufacturing capacity—allowing greater volume production, lower cost, and lower fault levels. In addition, GF engineers have focused their recent upgrade on PowerSoC and PowerSiP techniques.

With significant **dual use** capabilities, GaN promises robust growth potential. GF Fab 9, America's first Trusted Foundry, is the only 200mm GaN chip fabrication facility in the world. Over the last two years, GF has invested >$300 million in the transition of Fab 9 to GaN, with recent Department of Commerce funding expected to add significantly to this total. To feed this growth in capacity and meet this anticipated growth in demand, concentrated design expertise in GaN semiconductor technology will be essential. *Our plan is to meet that demand.*

The Burlington MSA serves as a hub of economic and cultural significance for the region but remains heavily reliant on tourism despite a strong emerging tech sector and legacy of chip-making in the region. This history has been marked by a succession of rises and declines. Once the heart of IBM's memory chip enterprise, Vermont was an early victim of the offshoring of semiconductor manufacturing. After successive waves of downsizing, layoffs, and out-sourcing of various chip production functions, IBM sold their Essex VT foundry to GlobalFoundries in 2015. Work at Fab 9 continued, however, and attention turned to finding ways that the 200mm fab could use existing strengths and strong regional relationships to regain a competitive advantage. The transition to GaN-based semiconductor production grew out of those efforts.

In addition, a side effect of the gradual downsizing of IBM operations in Vermont was the founding of several Vermont semiconductor design firms such as ASIC North, Green Mountain Semiconductor and others (several of which were acquired by Marvell—a V-GaN Hub partner who maintains offices in Burlington). These companies were formed by former IBM design professionals who elected to remain in Vermont as their job functions were moved elsewhere or eliminated in favor of foreign competition. The GaN initiative at Fab 9 and the presence of these local semiconductor design firms makes this Hub possible.

Local geography provides opportunities to support a robust regional semiconductor ecosystem in the Northeast. Our proximity to Boston, Albany, and Quebec provides access to significant semiconductor assets and expertise. Importantly, the Burlington area remains home to the only large-scale contract commercial semiconductor foundry in New England. Our Hub has leveraged this uniqueness to create a network of regional partners that will help ensure our success:

- Hub partners GF, UVM, and several other V-Gan members participate in the Northeast Microelectronics Coalition (NEMC; see letter of collaboration)—a large scale semiconductor development hub funded by the DoD and located outside of Boston. Given our Hub's proximity and close working relationship with GF Fab 9, a primary goal of V-GaN is to serve as a conduit and support mechanism for NEMC projects working in GaN in the high power/high frequency sector. This complementary function can add capacity to the NEMC and broaden our Hub's connections to national security/national defense industry partners.
- Beyond this, our ecosystem continues to maintain close ties with Boston metro area aerospace and defense markets, including Raytheon and BAE, and plays a significant role in the "aerospace corridor" that runs from Connecticut to Quebec. Vermont is home to hub member Beta Technologies, an electric aircraft startup that has drawn considerable attention and venture funding to the Burlington MSA.
- Our Hub has already established cross-border ties to University of Sherbrooke and C2MI, the largest electronic systems R&D center in Canada, located ~75 miles north of Burlington.
- V-GaN Hub is well-placed to support semiconductor manufacturing growth in the Albany corridor as well (150 miles south of Burlington), where GF operates additional foundry capacity, and where plans are in place to expand manufacturing of high-performance silicon-based chips. Opportunities for shared design, R&D, and workforce development are clear.

Finally, as noted above, our region is home to nationally recognized research universities—UVM, Dartmouth, and Norwich—hub partners that serve as talent magnets for technology growth. Hub partner Resonant Link is a Dartmouth spinout that relocated to the Burlington area to take advantage of the local tech infrastructure. These institutions, and institutions across the broader region (including Massachusetts, New Hampshire, New York, and Quebec), will help drive the innovation environment created by the V-GaN Hub.

The Burlington-South Burlington Metropolitan Statistical Area (MSA) was recently identified by EIG as **the top location** in an EPSCoR/rural eligible area for Tech Hub "readiness." Local venture capital is robust and Vermont has drawn far more startup investment than its small size would suggest. Today, despite Vermont's rural status, the technology and manufacturing in the state are, by value, roughly 6 times the economic size of agriculture. Taken together, the Hub sits at a remarkable nexus of national security, economic, and geographic opportunity. Our goal is to activate this potential to lift the region and the country.

5. Private Sector and Government Participation

Our consortium is led by core public and private institutions committed to advancing semiconductor industry growth in the Burlington region. These members support a well-coordinated set of core facilities that will be developed to promote small and new business growth in a regional semiconductor economy. The **University of Vermont (UVM),** Vermont's flagship public University, will serve as the home for the *Administrative Core* of the V-GaN Tech Hub for the first five years, with the goal of moving the Hub to independent 501(c)(6) (or similar) status as membership grows. The University hired Doug Merrill (former CEO of Semiprobe Inc. and experienced industry leader) as Regional Innovation Officer in Oct. 2023.

The Tech Hub heavily leverages **GlobalFoundries (GF)** assets, technology portfolio, and skilled workforce. This includes the $65 Million federal investment in Fab 9 in the past two years that will enable the production of GaN substrates in-house and develop the fundamental GaN device building blocks for their chips. GF Fab 9 will also be the recipient of substantial funding from the CHIPS Act, announced February 19, 2024, for modernization of the 200mm Trusted Fab.

The **State of Vermont** is actively engaged in the Tech Hub through various **government** agencies including the VT Agency for Commerce and Community Development (ACCD) and the VT Department of Labor. To support the Hub, the State of Vermont has committed more than $17.5 million dollars in supplementary funding to build the design and workforce ecosystem. Support from surrounding municipalities includes commitments to a range of policy, housing, transportation and investment initiatives, and an agreement to meet/coordinate regularly to grow the Tech Hub and related economic development initiatives.

6. Sustainability

Initial financial, personnel, legal, IP, and communication support for Hub operations will be managed and supported by the University of Vermont—which will host the V-GaN Admin Core within the Office of Research. Over the course of the grant period, our goal will be to establish the V-GaN Tech Hub as an independent, member-sustaining organization. Hub members will pay an annual Hub membership fee based on the size of the company to access Hub resources. These fees will support the Admin Core. The V-GaN Innovation Core facilities will aim to be self-sustaining after 5 years by virtue of user fees. Grant funding will be used to offset the initial phase of these two cores on their way to becoming self-sustaining. We are optimistic that additional federal funding for workforce development will be made available—including ongoing national priorities around retraining for the tech economy and basic STEM infrastructure in k-12. In addition, closer relationships with industry partners created by the Hub will open additional translational funding opportunities for early-stage companies—including existing SBIR and STTR funds. Our research university partners will continue to fuel innovation to feed the startup ecosystem. Together, UVM, Dartmouth and Norwich attract more than $250 million dollars in federal research funding to the region each year.

Building on Department of Commerce and partner investments, the long-term sustainability of the Hub will depend on our ability to draw substantial private investment in the region. A primary example of what is possible can be seen in the Southend Improvement District initiative in Burlington. Beginning in 2019, the City of Burlington and private investors identified an opportunity to transform brownfield spaces via zoning changes and public/private investment. Building on the remarkable success of the Hula Lakeside co-working facility and adjacent Fund at Hula venture capital group, Burlington will transform 81 acres of space to mixed-use housing, infrastructure (including childcare), business, retail and manufacturing that is expected to attract $400 million of private investment. This "coordinated re-development" approach is part of a wider regional movement to revitalize the Burlington MSA. Our hub will take the same approach, working with municipal and state partners, local investors, and industry partners to make the Hub a *place*, as much as a *network*.

7. Engagement of Labor and Equitable Benefits

Equity and diversity are key requirements for the success of Vermont's economic future. In 2018, Chittenden County—home to the municipalities that make up the Burlington/South Burlington MSA—adopted an equity plan and began tracking progress across 17 statistical areas and more than 4 dozen assessment measures (see "scorecard"). Working closely with the municipalities in our region and the Chittenden County Regional Planning Commission, the Hub will track our impact on these key development plan metrics in addition to our external evaluation.

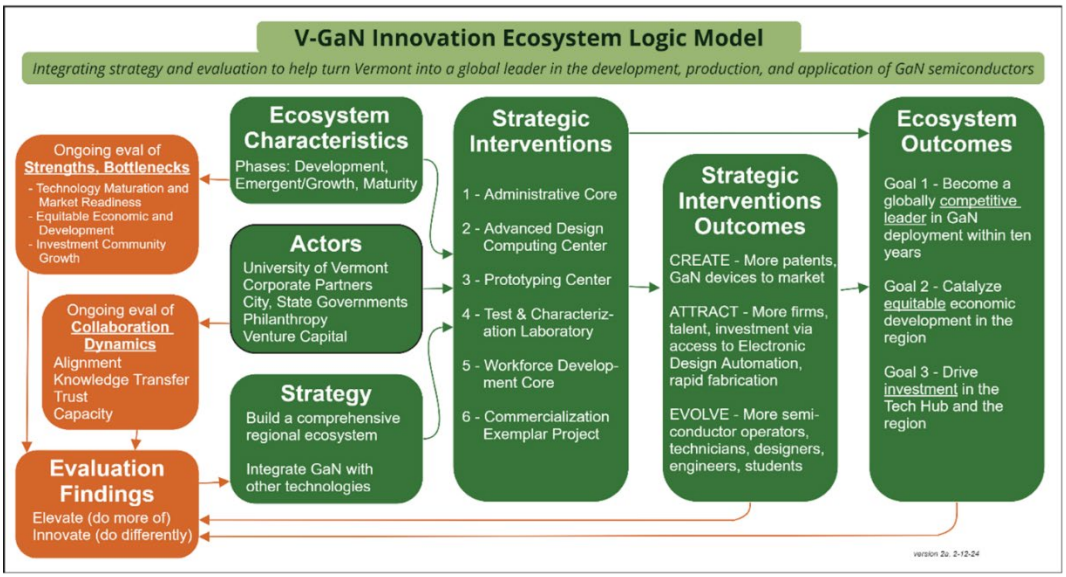
Our Hub centers on equity as a primary concern in our SWDC and includes equity-focused stakeholders at our highest governing level. To draw talent and fill the jobs created through the Hub, we will need to draw rural, renter, and New American populations. We will work closely with communities across Vermont to understand and respond to their needs and barriers that impede entry into the tech workforce. In support of this, UVM recently launched the Leahy Institute for Rural Partnerships, which will invest more than $15 million dollars in Vermont for joint university/ community programming in the next 5 years. In addition, we will rely on our partnerships with the Vermont high school Career and Technical Education Centers, the Community College of Vermont, and Vermont State University—each of which operates across the entire state—to bring the opportunities created by the growth of the semiconductor industry to rural residents/communities. Our partners at SEMI will provide access to their veteran recruitment and relocation program that helps "separating soldiers" find training and job placement in the semiconductor industry—drawing out-of-state workers to Vermont. We will leverage our connection with NEMC to participate in regional workforce programming around semiconductor jobs—broadening the pool of diverse workers to meet our overall equity goals.

Our partners at Vermont Works for Women, Vermont Professionals of Color Network, Working Bridges and HireAbility will provide support to attract and retain populations with low access to technology jobs, while our partners at IBEW, the Center on Rural Innovation, and the VMEC will provide an equity focus as we grow the Vermont tech sector. Sian Beilock, President of Hub partner Dartmouth College, has recently led the founding of the EDGE Consortium, a group of women presidents and deans of engineering dedicated to increasing the diversification of the engineering workforce, with a specific emphasis on the semiconductor industry. This important gender inequality will also be a focus of our SWDC. Reflecting this commitment, Hub partners VT Department of Labor and the IBEW will each have representation on the Advisory Committee for the V-GaN SWDC.

8. Expected Outcomes

Our external evaluation team, PEER Associates, began work with Hub leadership in Nov. 2023 to develop an ecosystem **logic model** (**Figure 2**) and evaluation plan. The model was developed after formative interviews with 32 V-GaN partners/members, analysis of the notes of our kickoff meeting, and a set of baseline analyses of Hub activity areas. The formative evaluation revealed encouraging findings related to baseline measures of collaboration and readiness. Hub partners showed high alignment on vision and goals (8.4/10); existing paths for knowledge transfer (7.8/10); trust/collaboration 7.4/10; capacity for organizational growth (8.2/10).

Figure 2: Integrated Evaluation System



Intrinsic to this effort is the ongoing analysis of Hub development bottlenecks, evaluation of collaboration dynamics, and a close integration of the evaluation process in the ongoing planning and evolution of the hub. Metrics to accompany this model are included in the Admin Core project description, and the Admin Core/RIO Merrill will be responsible for acting on evaluation findings and translating hub outcomes to Hub stakeholders.

9. Housing

Vermont is a low population (645,570 in 2021) and highly rural state (tying Maine with >60% of its population living in cities of less than 50,000 people). Nearly 1/3 of Vermonters (227,521) live in the Burlington MSA. Despite low population and low density, housing is a known challenge in Vermont, and affordable housing is the main focus of housing efforts in the Burlington area. Over the last decade, there has been considerable effort to address this challenge. The effects are encouraging; the annual number of single- and multi-family housing permits issued is up 77% since 2012. Recent state-wide work to accelerate that growth includes:

- The Housing Opportunities Made for Everyone (HOME) Act, signed by Governor Scott in 2023, allows higher density development in areas with sewer and water service.
- In 2023, the state legislature allocated $120 million over three years for affordable housing initiatives.
- Since 2022, the Vermont Community Development Program has provided grants ranging from $50,000-$1,000,000, to assist businesses with housing challenges in VT.
- In December of 2023, Vermont Housing & Conservation Board (VHCB) funded 88 units of permanently affordable apartment housing in three Vermont communities through a total

investment of $4.76 million, and an additional $1 million investment in funds to support housing developments statewide.

- Vermont's 2023 allocation of the Federal Housing Tax Credit was $3.9 million to support the establishment of low-income rental housing.

Additional initiatives are detailed in letters of support from our state and municipal partners.

10. Phase 1 Update and Member Commitments

Our mission and focus have not changed since our Phase I submission, but our consortium has increased from 8 to 22 members and financial support has grown to nearly $50 million in supplementary and in-kind value (see below). In total, 39 organizations have agreed to be part of the work of this application. A brief summary of these partner contributions and commitments are listed in **Table 1** and in detail in the Commitment Index/Letters.

Table 1 – Summary of Partners, Members, Roles and Commitments

Facility Partners			
University of Vermont	Admin Core; Host Design Facility	**Cadence**	EDA Software Provider
OnLogic Inc.	Host Test/Characterization Facility	**Keysight**	EDA Software Provider
Global Foundries	Host Prototyping Facility	**Siemens/Mentor Graphics**	EDA Software Provider
State and City Partners			
State of Vermont	SSBCI Investment; WDP-funding; tax credit, direct support & housing policy	**Greater Burlington Industrial Corporation**	Economic Development Programming
City of Burlington	Southend Innovation District; Childcare & Housing Programs; oning Changes	**City of South Burlington**	Industrial infrastructure; housing; transportation; equity prog
Center on Rural Innov	Rural Development Programing	**Vermont League of Cities**	Coordination and Advising
City of Essex Junction	Housing Initiative; transportation	**Vermont Futures Project**	Coordination and Advising
Education and Workforce Partners			
IBEW	WFD—Partner	**Working Bridges**	Workforce Support
Comm College of VT	WFD—Apprenticeships	**HireAbility Vermont**	WFD—Vocational Retraining
Norwich University	WFD—Cyber security	**University of Vermont**	WFD—Host WFD Core
Dartmouth College	WFD—Engineering	**Vermont Manufacturing Ext.**	WFD—Manufacturing training
Vermont State Univ	WFD—Apprenticeships; manufacturing	**SEMI**	WFD—Programming
Investment and Co-working Partners			
VCET	Co-Working and Startup Investment	**Intel Capital**	Investment Advisory
Fresh Tracks Capital	Venture Advisory Group	**RTX Venture**	Investment Advisory
Hula Lakeside	Co-Working and Startup Investment	**Black River Innovation**	Co-working and Startup Support
Industry Members			
Green Mountain Semi	Design	**Resonant Link**	Product development
ASIC North	Design	**Semiprobe**	Product development
Marvell	Design	**Rugged Micropower**	Product development
QP Technologies	Semiconductor Packaging		

As noted in our Admin Core proposal, we group consortium members into **Partners and Affiliates** (institutions and companies that are contributing resources to the Hub efforts over the next 5 years) and **Members** (companies that use Tech Hub resources to produce GaN-based products). Our goal over the course of the grant period is to grow this member base.

The supplemental **financial support** for the V-GaN Tech Hub is substantial. GF is providing access to prototyping that, billed at the cost of a wafer in a normal "shuttle," would be ~$200,000. V-GaN members will see a threshold cost of $9000. Similarly, EDA software platform costs are normally $200,000 to $400,000 per license per year. The V-GaN discount is 50-90%. Over the 5-year grant period, this in-kind contribution will amount to ~$29 million across the three EDA software platform providers. The State of Vermont has committed $12.5 million SSBCI investment, and $5 million for semiconductor workforce development. UVM is investing $4.4 million in cost share should this proposal be funded, and $2.1 million dollars in space, technology, administrative, legal, security and software support at the Vermont Advanced Computing Center (host of the V-GaN Advanced Design Computing Center). In total, this represents an estimated >$47.9 million in in-kind and supplementary support for the Hub.