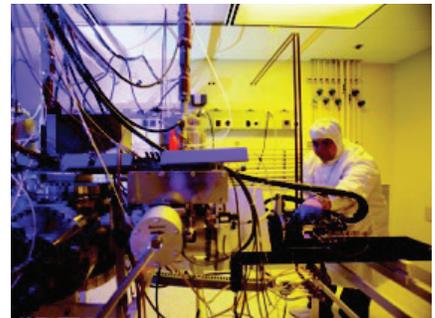


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# Application for Designation as an Investing in Manufacturing Communities Partnership Community

**April 2015**



**The Pacific Northwest Manufacturing Partnership (PNMP) identifies its Key Technology (KTS) as Advanced Materials Sciences for Advanced Manufacturing with a focus on Cross Laminated Timber (CLT)**

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## IMCP Submitting Official Authorization

March 31, 2015

Business Oregon is the state's Business Development Agency, working to retain, expand and recruit business in Oregon. Business Oregon is the lead applicant for the Investing in Manufacturing Communities Partnership (IMCP) Round II designation for both Oregon and Southwest Washington. We are statutorily authorized to submit this application, are providing staff support and are committed to the success of the Pacific Northwest Manufacturing Partnership (PNMP).

Business Oregon provides state-wide leadership on business expansion, recruitment and new business formation. It plays a critical role in global market and innovation strategy development. Business Oregon leadership teams operate over \$48 million in direct business development activities each year that fund business financing loans, state incentives, industrial lands programs, Oregon R&D innovation programs, capacity building assistance and many other programs and services statewide.

We are pleased to submit this refined application for Advanced Materials Science for Advanced Manufacturing as our Key Technology with a focus on Cross Laminated Timber as our catalytic project. Thank you for your consideration.

Sincerely,



Karen W. Goddin  
Assistant Director  
Research and Policy Division

### 3. GEOGRAPHIC SCOPE – TOP THIRD REQUIREMENT

#### KTS for the proposed Manufacturing Community

The Pacific Northwest Manufacturing Partnership (PNMP) identifies its Key Technology/Supply Chain (KTS) as Advanced Materials Sciences for Advanced Manufacturing with a focus on Cross Laminated Timber (CLT).

The key technology sectors (KTS) that comprise and benefit from the Advanced Materials Sciences focus of the PNMP region are anchored by high employment and location quotients in Advanced Materials, Agribusiness, Forest & Wood Products and our Manufacturing Supercluster. Our manufacturing innovation springs from materials science research and innovation, combined with our competitive advantage in natural resources and human capital.

Our catalytic project, focused on Cross Laminated Timber (CLT), is representative of how Advanced Material Sciences presents a global opportunity to grow our natural resource-based manufacturing industries through innovation.

#### List of states and/or territories included in the proposed Manufacturing Community

Oregon and SW Washington.

#### List of counties included in the proposed Manufacturing Community

Thirteen (13) rural and urban counties in Oregon and three (3) counties in SW Washington that comprise our primary manufacturing ecosystem.

1. Benton
2. Clackamas
3. Clark (WA)
4. Columbia
5. Hood River
6. Klickitat (WA)
7. Lane
8. Linn
9. Marion
10. Multnomah
11. Washington
12. Polk
13. Sherman
14. Skamania (WA)
15. Wasco
16. Yamhill



#### Regional boundaries of the consortium

Our region has a long history as a manufacturing and global export hub, drawing from our rich natural resource base, and culture of innovation. Native American trade defined the region's first economy, followed by the development of a thriving wood products industry, and later followed by the shipbuilding industry. Our region economy evolved through adaptation and innovation to meet emerging markets.

Today, our diverse portfolio of economic sectors is based on human capital, research and an ongoing culture of innovation. This portfolio ranges from computer chips to unmanned aerial vehicles, streetcar manufacturing, footwear design, and includes craft world-class wines and beers. Manufacturing is the backbone of our region's economy – in Oregon alone, manufacturing comprised 39% of the state's gross domestic product in 2013 and employed more than 286,200 people in 2012 in our KTS industries subset of the PNMP manufacturing field.

Our world class universities and research centers are leading the nation in advanced material sciences and technological innovation allowing us to remain competitive in the global economy. The integration of our leading manufacturing sectors – advanced materials, agriculture and food processing, forest and wood products, computers and electronics and metals – are based on our legacy and provide the foundation for our continued advances in the manufacturing economy.

The PNMP has defined advanced wood products and cross laminated timber (CLT) as the catalytic project focus for the Investing in Manufacturing Communities Partnership (ICMP) designation. As a state, Oregon led the nation in LEED certified green building projects per capita in 2010. Drawing on that strength, we are focused on leveraging our green building credentials and our wood products heritage to create innovative advanced wood products and promoting the use of CLT in multi-story construction.

### Geographic Description

The PNMP is a bi-state, sixteen-county region. United by two rivers—the Willamette and the Columbia—our partnership is built on our historical strengths in metals manufacturing along the Columbia River, and the wood products industry which originated in our extensive forestlands.

Our region includes rural, urban and suburban communities spanning the length of the Willamette Valley, from the Eugene-Springfield area in the southern Valley, north to the Portland-Vancouver area, and then east along the Columbia River Gorge to Hood River. (Please see a map of the PNMP region here: <http://www.oregon4biz.com/IMCP/>.) Our geography is rich and diverse. Class I soils bless the Willamette Valley, providing fertile ground for the agricultural industry. The same fertile soils helped propagate our forests. Four National Forests touch our borders, from the Gifford Pinchot in Washington, to the Mt. Hood National Forest along the Columbia Gorge. The Siuslaw and Willamette National Forests bind our region providing natural resources and unparalleled beauty from the Oregon Coast to the Cascade Mountains.

The wealth, diversity, and productivity of these natural resources are the building blocks for our partnership. Paired with the cultivation of research and technological innovation, our region is ripe for rebuilding and extending an innovative, sustainable and renewable manufacturing economy based on our unique historical and geographical strengths.

### Attributes of the PNMP geographic region

130 cities	286,209 jobs in our key technology industries
16 counties	6 research universities and four-year degree programs
5 colleges and universities	2 manufacturing extension partnerships (OMEP and Impact Washington)
8 community colleges	4 economic development districts
66 partner organizations	7 workforce investment boards
4 ports	2 marine transport rivers
2 interstate highways	11 research institutes and advanced engineering and transportation technology programs

## Advanced Materials Science for Advanced Manufacturing

The Pacific Northwest Manufacturing Partnership (PNMP) identifies its Key Technology (KTS) as Advanced Materials Sciences for Advanced Manufacturing with a focus on Cross Laminated Timber (CLT). Our manufacturing innovation springs from materials science research and innovation combined with our competitive advantage in natural resources and human capital. Wood products is a clear example of an industrial sector in our Pacific Northwest region that combines manufacturing competencies we never anticipated would leverage entirely new industries and enable dramatic innovation in long-standing industries. Our catalytic project, focused on CLT is representative of how advanced materials sciences present a global opportunity to grow our natural resource-based manufacturing industries through continued innovation.

Advanced Materials Sciences for Advanced Manufacturing comprises multiple industrial clusters, as shown in Table 1 below. The KTS cross multiple industries, such as metals, agribusiness, and wood products, but are connected by shared technological advances and supply chains, as well as similar workforce demands. By looking at the industries as an integrated KTS, our region is able to leverage advances in specific industrial sectors to other industrial sectors. Table 1 shows that the clusters that make up our KTS rank in the top third in the nation.

**Table 1. Advanced Materials Sciences for Advanced Manufacturing – Industrial Sectors and Employment Location Quotients, 2012**

PNMP Region	Employment LQ	Employment LQ Cutoff	Meets Employment LQ Cutoff?
Advanced Materials	1.41	1.12	Yes
Agribusiness, Food Processing & Technology	1.66	1.05	Yes
Forest & Wood Products	2.00	1.27	Yes
Information Technology & Telecommunications	1.40	1.04	Yes
Manufacturing Supercluster	1.31	1.15	Yes

Note: Cutoffs are based on methodology used by Economic Development Administration for IMCP top-third requirement, [www.eda.gov/challenges/imcp/faq.htm#top-third](http://www.eda.gov/challenges/imcp/faq.htm#top-third).

Source: US Department of Commerce, Economic Development Administration, Purdue Center for Regional Development, and Indiana Business Research Center, Innovation Data Browser, [www.statsamerica.org/innovation/anydata/index.asp](http://www.statsamerica.org/innovation/anydata/index.asp).

The PNMP region's historical strength in materials and metals forms the basis of our Advanced Materials Science for Advanced Manufacturing cluster. Raw materials, innovation in advanced material science and leading workforce and training infrastructure bind our region as a manufacturing community. With the manufacturing floor in the industries that make up our KTS becoming increasingly complex with sensor technologies, control systems, automation and robotics, we are determined to continue to focus to keep pace with the acceleration of innovation in advanced manufacturing technologies.

Oregon has traditionally played a leading role in advanced manufacturing through the innovation of advanced materials. Advanced materials are always the “next generation” materials under development. Decades ago, plywood was an advanced material. Later, oriented strand board (OSB), developed by Louisiana Pacific, was an advanced material. In the electronics industry, advanced materials created advanced electronic components that were lighter, higher capacity, and lower cost. These components created advanced products, from laptops to complex manufacturing equipment, for nearly every industry including metals, wood products, and our other large industries. Advanced materials science led to the use of exotic metals across multiple industries. Oregon has played a key role in creating the processes that allowed these metals to be used in advanced products and advanced manufacturing processes. For example, since the 1940s, metals companies such as ATI Wah Chang Corporation in Albany, Oregon have invented new alloys using rare earth metals to create advanced products for the medical, electrical energy, oil, gas, and other industries. Research at ATI Wah Chang and the Albany-based National Energy Technology Lab continue to discover materials for the next generation of electronics and batteries to power sustainable-fueled vehicles, drones, robots, and machines.

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## Catalytic Project: Cross Laminated Timber (CLT)

Within the Advanced Materials Sciences for Advanced Manufacturing cluster, the PNMP region has identified the advancement of CLT as a catalytic project, also described in the Research and Innovation section. CLT, a new generation of engineered wood product developed initially in Europe, has been gaining increased traction in both residential and commercial applications in several countries globally. Demonstration projects and research have shown the environmental advantages this product can bring to the construction sector. Additional context and depth of the promise of CLT can be found in the optional files, including a CLT handbook: US Edition, also available to download online at [www.woodworks.org](http://www.woodworks.org).

### Process

CLT is an advanced wood product made of sheets of cross-hatched wood that can be cut into correct dimensions for wall, floor and ceiling panels, thereby reducing the waste of materials and time in construction of multi-story commercial buildings. CLT competes with steel and concrete as a structurally sound building material, but is made from a renewable resource. It has significantly lower environmental impact, sequesters carbon, and yet meets the same fire safety code regulations as concrete and steel.

The CLT products embody sustainability by using a regenerative, renewable resource and reduce the waste of traditional milling. The strength characteristics of CLT are such that lower grade timber can be used - reducing pressure on older forest stands to provide valuable materials, putting foresters, loggers, millwrights and production assets back to work, as well as increasing long-term forest sustainability.

### Potential

CLT and associated advanced wood products manufacturing technologies combine our traditional competitive advantage in softwood timber supply from Pacific Northwest forests with advanced material science. This pairing holds the promise to bring a major new sustainable and renewable manufacturing industry to bear in the Pacific Northwest. It will provide substantial benefit to both rural and urban communities and strengthen the nexus between them.

The Pacific Northwest region's wood-products industry leads the country in materials science, including the development of new adhesives, resins, polymers, treatments, and technologies. Our competitive advantages over other commercial timber growing regions of the world are due to the high value of the timber we grow and the conservation values incorporated into the management of our forested landscapes. We must take every possible action to increase the ability of our manufactured wood products industries to compete in global markets for the high value wood products unique to our region. Our industry focus is to increase the number of jobs associated with every board foot of lumber we harvest from our forests.

Forward thinking regions in Canada and Europe have already created manufacturing capacity and gained traction in world markets using this technology. There is additional materials demand and supply capacity for this emerging product. However, there is no commercial production of CLT yet in the US. Taking steps now to position the PNMP region to effectively compete with European and Canadian manufacturers in these emerging markets will not only increase the value of our natural resources, but also grow the number of employed rural and urban workers in relation to the board feet of timber harvested. It is incumbent upon us to act with agility and haste as a region to best position communities and companies as dominant players within this emergent opportunity to leverage our wood products manufacturing heritage and extend our legacy as leaders in this industry.

CLT has been used in Australia to build a 10-story building and is being used in a 14-story structure in Norway. As the material becomes more known, it is being increasingly allowed in building codes, thereby increasing demand.

### Projects

In the PNMP region, several pilot projects using CLT are in various stages of development. Western Oregon University is building a new library. The Oregon Zoo is constructing a new visitor center. The City of Springfield, Oregon plans to build a hotel and parking structure as part of the Glenwood Riverfront Redevelopment along the Willamette River, and Oregon State University is planning to demonstrate this technology at its new Advanced Wood Products Center.

PNMP members also have proposed a study to the US Department of Commerce Economic Development Administration to assess the commercial feasibility of CLT in Oregon and potential benefit to rural and urban areas.

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This project demonstrates the PNMP's commitment to our rural/urban manufacturing economy in a variety of ways, including:

- Demonstrates collaborative regional innovation. As project lead, Oregon BEST is a strong founding member of the PNMP.
- Potentially providing relief and support to economically distressed and underserved communities. This feasibility study will focus on the most distressed rural areas and communities affected by the transition of the wood products economy in Oregon and Southwest Washington.
- Engages public and private partners. Manufacturers are a primary focus of this application.
- Aims to accelerate global competitiveness. The international market for engineered wood products is increasing and IBA communities could gain a significant portion of the market.
- Support environmentally-sustainable development. CLT products embody sustainability principles by using a regenerative, renewable resource that sequesters and stores carbon and reduces the waste of traditional milling in the manufacture of the product.

The PNMP regional leadership in the advanced materials sciences for advanced manufacturing field originates within our higher education research institutions that continue to innovate and support our key industries. Examples of significant state-university partnerships to enhance innovation are:

- The Center for Sustainable Materials Chemistry (CSMC), a \$20 million NSF-funded Center for Chemical Innovation that is collaboration between the University of Oregon (UO), Oregon State University (OSU), and other university partners. The CMSC is focused on research to develop new sustainable chemical processes for producing novel solutions to materials development using "green chemistry." Three companies have spun out of the center, and have attracted more than \$6 million in investment to date. These successes show how federal center grants, in conjunction with state investment, have generated significant economic impact in start-up company formation and technology licensing to major electronics manufacturers.
- In 2014, OSU and UO launched the Center of Excellence for Advanced Wood Products Manufacturing and Design through OSU's Colleges of Forestry and Engineering and the UO's School of Architecture and Allied Arts, the nation's top ranked sustainable architecture program. The governor's budget includes funds for a new state-of-the-art building, the new Oregon Forest Science Complex, at OSU that will share space with UO Architecture and Allied Arts faculty in a joint program that integrates architecture, design, engineering, and wood products. The new Center will enhance our ability to effectively innovate and compete in wood products industry. The OSU College of Engineering is known for its top-tier programs in construction, structural, and industrial engineering applications, and the UO College of Architecture and Allied Arts is internationally recognized for its sustainable building design and research programs. These are just a few examples of how our higher education system continues to support Advanced Materials Science for Advanced Manufacturing.

Our research and innovation, capital investments, and strategic economic planning are based on an assessment of our current capacity and gaps identified in the six business ecosystems in the Investing in Manufacturing Communities Playbook. Through a disciplined institutional capacity assessment, our team identified multiple manufacturing initiatives and collaborations underway. We also identified the need for an integrated framework from which to coordinate, leverage and align these efforts for greatest collective impact.

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## 4. IMPLEMENTATION STRATEGY PARTNERS

### The Pacific Northwest Manufacturing Partnership is a proven consortium.

The governing body of the Pacific Northwest Manufacturing Partnership (PNMP) consortium is led by 11 Executive Committee members representing our bi-state region. The composition of the Executive Committee provides balanced geographical and community representation in the rural and urban areas of our region through state, regional and local governments, economic development districts, non-profit organizations, universities and signature research centers, and business affiliates. The PNMP Executive Committee and other PNMP members offer diverse economic development perspectives and technical expertise in the essential elements of the manufacturing ecosystem.

In some cases, stakeholders have joined together for single representation on PNMP's Executive Committee, but many other economic development stakeholders including private businesses and industry associations participate through steering, advisory or interest groups to provide organizational and process oversight and help sustain efforts through those who are best suited to develop and carry out PNMP plans.

While relying on the collective intelligence across the community of practice from public and non-profit organizations, the Executive Committee provides the PNMP with agile decision-making capacity and broad-based economic development expertise. The first phase of our catalytic project for Cross Laminated Timber (CLT) is a testimony to the ability of our consortium to rapidly respond to an opportunity that compliments ongoing initiatives in advanced materials and manufacturing for the forestry and wood products industry. An innovative technologies proposal concept by Oregon BEST (Built Environment for a Sustainable Tomorrow) to the US Economic Development Administration (EDA) for approval under the Economic Adjustment Assistance program, was promptly endorsed through PNMP. This Economic Adjustment application, in addition to Oregon BEST funds, leveraged match and in-kind assistance from the Oregon Department of Forestry, Oregon State University, Oregon Business Development Department, City of Eugene, Clackamas County and the Corvallis Benton County Economic Development.

The PNMP has built upon the principles outlined in our 2014 Memorandum of Understanding. Since that time, we have advanced an organizational Charter that demonstrates the commitment and maturation of our organization by providing a governance structure that can be shared with other IMCP communities.

Through the effort of the City of Eugene and with lead sponsorship from Oregon State Senator Edwards, Senator Thomsen, and Majority Leader Hoyle, the 2015 Oregon Legislature passed SB 482 that recognizes PNMP under Oregon statute. The Bill, signed by Governor Kate Brown on April 1, 2015, directs the Oregon Business Development Department to consult with and support the PNMP partnership. The Department will report to the Legislative Assembly annually for as long as the PNMP advisory committee is active, beginning January 1, 2017.

Within the full range of PNMP membership, members bring a wide range of experience related to federal economic development funding. While providing a needed level of accountability and credibility, the PNMP Executive Committee also provides our Bi-State Partnership with both cash and in-kind professional and administrative support.

The following chart presents a summary of significant investment by and through key organizations within the governing body.

PNMP Leadership Organizations	2014 Cash	2015 Cash	Total Cash	"2014 In-Kind"	"2015 In-Kind"	"Total In-Kind"	TOTAL PNMP PARTNER CONTRIBUTION	"Signed MOU"	"Signed Charter"
City of Eugene	\$10,000	Pending	\$10,000	\$160,000	\$95,000	\$255,000	\$265,000	X	X
City of Springfield - Partnered with City of Eugene	\$0	\$10,000	\$10,000		\$2,500	\$2,500	\$12,500		W/Eugene
Clackamas County (In partnership with GPI)	\$1,000	\$0	\$1,000			\$0	\$1,000	W/GPI	W/GPI
Columbia River Economic Development Council (CREDC)	\$0	\$1,500	\$1,500		\$5,000	\$5,000	\$6,500		X
Corvallis Benton County Economic Development	\$1,000	\$0	\$1,000		TBD	\$0	\$1,000	X	
Greater Portland Inc (GPI) AND Greater Portland Economic Development District, Inc (GPEDD)	\$500	\$500	\$1,000		TBD	\$0	\$1,000	X	X
Lane County - Partnered with City of Eugene	\$0	\$15,000	\$15,000		\$2,500	\$2,500	\$17,500		w/Eugene
Mid Columbia Economic Development District (MCEDD)	\$500	\$0	\$500	\$1,000	\$1,000	\$2,000	\$2,500	X	X
Mid-Willamette Valley Council of Governments (MWCOG)	\$500	\$2,000	\$2,500	\$1,000	\$3,000	\$4,000	\$6,500	X	X
Oregon BEST	\$500	\$2,000	\$2,500		\$12,500	\$12,500	\$15,000	X	X
Oregon Business Development Department	\$33,940	\$25,000	\$58,940	\$6,000	\$31,000	\$37,000	\$95,940	X	X
Oregon Cascades West Council of Governments (OCWCOG)	\$0	TBD		\$0	\$2,500	\$2,500	\$2,500		X
Oregon Manufacturing Extension Partnership (OMEPEP)	\$0	\$2,500	\$2,500	\$1,700		\$1,700	\$4,200	X	X
Oregon Nanoscience & Microtechnologies Institute (ONAMI)	\$0	\$2,500	\$2,500		TBD	\$0	\$2,500	X	X
Oregon State University	\$0	\$2,500	\$2,500			\$0	\$2,500		X
Portland State University	\$0	\$0	\$0	\$3,000	TBD	\$3,000	\$3,000	X	
Southwest Washington Workforce Development Council - Partnered under Columbia-Willamette Workforce Collaborative (CWCC)	\$1,000	\$0	\$1,000		\$4,000	\$4,000	\$5,000		X
Strategic Economic Development Corporation (SEDCOR) Partnered with MWCOG)	\$500	\$0	\$500		TBD	\$0	\$500	X	
Workforce Investment Council of Clackamas County (WICCO) - Partnered under Columbia-Willamette Workforce Collaborative (CWCC)	\$500	\$0	\$500		TBD	\$0	\$500	w/CCWC	w/CCWC
Worksystems, Inc. - Partnered under Columbia-Willamette Workforce Collaborative (CWCC)	\$1,500	\$0	\$1,500	\$2,000	\$3,000	\$5,000	\$6,500	X	X
<b>TOTALS</b>	<b>\$51,440</b>	<b>\$63,500</b>	<b>\$114,940</b>	<b>\$174,700</b>	<b>\$162,000</b>	<b>\$336,700</b>	<b>\$451,640</b>		

## Pacific Northwest Manufacturing Partnership cohorts successfully manage a full range of initiatives within the manufacturing ecosystem.

Here are some examples that highlight experience within the PNMP governing body:

- Mid-Columbia Economic Development District (MCEDD)** – Mid-Columbia Economic Development District (MCEDD) has successfully administered numerous federal funds from USDA, US EDA, EPA and HUD, as well as state grants ranging from transportation to specialty crop block grants. Currently MCEDD has active awards from the Economic Development Administration through planning grant funding, economic adjustment funding for a manufacturing strategy and funding used to establish a Revolving Loan program. Through USDA, MCEDD has multiple active and vibrant Intermediary Relending programs and is managing programs funded through Rural Business Enterprise Grants.

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MCEDD received \$135,000 in “Phase I” of the IMCP challenge to develop a strategic implementation plan in support of manufacturing businesses in the five-county bi-state Mid-Columbia region of Oregon and Washington. In partnership with Washington State University, efforts are geared toward completion of a bi-state strategic implementation plan to support growth of autonomous system manufacturing businesses in the Mid-Columbia region (Wasco, Sherman and Hood River counties in Oregon and Klickitat and Skamania counties in Washington). The regional strength of manufacturers in this region in the autonomous systems industry cuts across sectors including composites, unmanned systems and value added food processing. These manufacturers have particular strengths in vision systems, image processing systems, composites, food manufacturing and control systems.

- **Mid-Willamette Valley Council of Governments (MWCOCG)** – The Mid-Willamette Valley Council of Governments is the lead applicant for the 2013 Make It In America - Make It in the Willamette Valley project, to develop industries that utilize advanced manufacturing processes to accelerate, grow, and maintain industrial activity within Marion, Polk, and Yamhill Counties in western Oregon. The project activities include supply chain market research, manufacturing sector support, outreach to targeted industries, and technical assistance. Through a combination of On-the-Job Training for unemployed workers and skill enhancements for incumbent workers, the project will focus on leadership training for businesses in the region's advanced manufacturing industry sector. The Council is partnered with DOL-EDA Applicant, Job Growers, Inc., of Salem, Oregon. The project award is \$1,714,376.
- **Oregon Manufacturing Extension Partnership (OMEP)** – OMEP is a regional leader, well-seasoned in obtaining and managing consortium grants, and participating in multi-partnered manufacturing development efforts. OMEP has had many successes delivering on federal grants aimed at improving Oregon manufacturing capacity and competitiveness. Past grants include the High Performance Enterprise Consortium (DOL) for advanced manufacturing lean enterprise training and development, the High Growth Job Training Initiative for the regional food processing industry (DOL), the NIST Northwest Supply Chain grant for which Impact Washington was a sub-recipient and the RENEW NW Energy Training Partnership Grant (DOL) for renewable energy supply chain development. OMEP currently manages the Metro In-Sourcing Training Initiative H-1B Technical Skills Training (DOL) Grant (in partnership with WSI), the NIST Business to Business Network Pilot grant (in partnership with IW, PNDC and OIT), the NIST Make it in America grant (in partnership with SEDCOR, In-Cite, and the Mid-Willamette Valley Council of Governments) and the NIST Manufacturing Technology Acceleration Center (M-TAC) for food processors for which Impact Washington and the NWFPA are sub-recipients.

OMEP was awarded 2013 Management of Hollings Manufacturing Extension Partnership/NIST funds totaling \$8,960,145 for five years, continued operation of the State of Oregon's MEP Center, which provides manufacturing extension services to primarily small and medium-sized manufacturers within Oregon. OMEP's proven experience in marketing, selling, and delivering fee-for-service products provides strong evidence of a sustainable financial model. OMEP's business model incorporates federal, state, and local investment, revenue from consulting with small and medium-sized manufacturing clients, and other sources. OMEP has secured significant cost share match for the projected NIST funding which will fund high levels of service delivery throughout Oregon, as well as delivery of specialized services. For FY 2015-16, this includes approximately 15 percent of revenue through State of Oregon support, and projected private match equaling 40 percent of revenue.

MIIA is \$375,000 (over 3 years)

M-TAC is \$500,000 (1 year)

B2B is \$250,000 (2 years)

MISTI is \$5,000,000 (the vast majority goes to WSI/OMEP provides grant management) (4 years)

NIST Base grant \$8,960,145 (5 years)

- **Oregon State University, Office for Commercialization and Corporate Development (OCCD)** – As a state university, OSU is well versed in handling and managing federal dollars that drive towards outcomes. This is demonstrated from our institutions having established scientific, ethical and financial compliance mechanisms for the intake, use and management of federal funding for a wide array of effort and application, from a wide array of federal agencies. OSU is the state of Oregon's Land Grant University, and also has the Sea Grant, Space Grant and Sun Grant designations, and deploys and supports the state's county Agricultural Extension Offices and Experimental Stations. The federal research budget for OSU was \$284M for FY2014.

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OSU has been designated as a NSF I corp site, with an associated \$300,000 award; \$100,000 per year over the next 3 years.

- **Southwest Washington Workforce Development Council (SWWDC)** – The SWWDC had a \$1.15 million budget for PY 2014 (July 2014-June 2015) that is composed of federal and state funding. Additionally, SWWDC has managed several federally funded grants in collaboration with WSI and WICCO which has required a high level of coordination and oversight. The SWWDC has successfully managed the AMJIAC IAM2 Department of Labor funded grant that includes three workforce boards and six counties.
- **Workforce Investment Council of Clackamas County (WICCO)** – WICCO makes a significant economic contribution to the regional economy. It helps move people into jobs and increases their earning potential. It benefits the business community by filling hiring needs, enhancing worker productivity through training, and stimulating consumer spending. Finally, the public as a whole benefits from reduced unemployment rates and a positive return on government investment.

A leading research firm, Economic Modeling Specialists International (EMSI), recently conducted a study analyzing the cost-benefit of the work completed across the Oregon Workforce Boards for Program Year 2012. The study found that the WICCO's expenditures alone generated over \$3.6 million in added regional income and supported 50 more jobs in the economy. Additionally, the study found that the program investments made in PY 2012 generated a total value of \$2.21 in taxable income for every \$1 spent.

2013 Expenditures = \$3.96MIL; Admin = 9%

- **Worksystems, Inc. (WSI)** – WSI is very experienced in grant administration, having successfully managed more than \$300,000,000 in WIA formula, discretionary, and local grant resources since 1998. Metro STEP is a WSI-led DOL/ETA funded project which serves as an example of a similar large-scale, multi-year, multi-partner grant. STEP (4.5 million, 4 years) is currently finishing its second year of implementation. The grant targets middle-skill manufacturing and software occupations, has a focus on the long-term unemployed, and bridges employer-identified skill gaps by connecting jobseekers to employer-vetted short-term skill interventions that lead to industry-recognized credentials. As we near the halfway point of STEP we are already at 96 percent of full project enrollment. Over 93 percent of our project enrollees have begun receiving education or occupational training, with 43 percent completing training. Of those completing training, we have a 96 percent employment placement rate. In all cases, we are ahead of the goals outlined in the project work plan.

## **Designation as a “manufacturing community” is not just a label. It will support the Pacific Northwest Manufacturing Partnership’s catalytic launch.**

PNMP partners have proven their commitment to the longevity of manufacturing industries in the region and we have positioned our resources to be deployed as further described in Section 5, Description of Local Industrial Ecosystem and Implementation Strategy.

Designation of PNMP as a manufacturing community will help us deepen our internal relationships, enhance our planning efforts and ability to leverage additional funding as opportunities emerge, and draw collectively from the IMCP resources to help us share best practices with other regions in both states.

We are inspired by the new innovation and technology emerging within our KTS and we strive to keep pace with the needs of industry as these technologies are adapted.

While not all-inclusive, following is an overview of initiatives where the IMCP designation will help us demonstrate additional effectiveness as the go-to assembly of critical resources. If designated, there are several opportunities to put the region in a better position to compete for funding that will support advanced manufacturing objectives:

- Marion County has recently organized the Distressed Cities workshop in the Santiam Canyon to focus some economic development funds and resources into the Santiam Canyon - an economically distressed area that has suffered tremendously after the establishment of a large Wilderness Area and as a result of the Spotted Owl designation. The Mid-Willamette Valley Council of Governments (MWVCOG) and Marion County are working to partner with local job training and workforce development organizations and to see what opportunities we can tap

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into to help create new job training opportunities for employees in the wood products sectors. We hope the IMCP designation will open up additional training and research opportunities in that area.

- Recent work and continued support of McMinnville Economic Development Partnerships work with local companies to create job training internships with local schools.
- Establishment of three new Enterprise Zones in the past three years – Woodburn, Newberg, and North Marion (Aurora, Donald, and Hubbard) shows that our region is working to support retention and expansion of our existing business and work with our local traded sector business to help make them competitive. This year, a new application for the cities of Sheridan and Willamina will be submitted.
- Salem has an EPA Brownfields grant for hazardous substances and is applying for another EPA grant for petroleum contamination. The funding allows the City of Salem to complete Phase I and II assessment on industrial and commercial properties and some planning work for their reuse. The work by the City will, in turn, open up these previously contaminated sites and unused or underutilized sites for additional employment land or open space. The city is committed to this project to provide employment land and a livable, workable city.
- Establishment of Urban Renewal districts and MWVCOG's assistance with these studies – Woodburn, McMinnville and Salem have URA areas, and three jurisdictions in our area are also looking into URAs.
- Since 2007 the Portland region has seen yearly cuts to our Workforce Investment Act formula funds which serve as the core funding for the public workforce system. Because of this, we have begun to rely increasingly on US Department of Labor competitive grants to augment the loss of WIA funding. Fortunately, the Portland region has had a lot of success in receiving federal grant awards. Receiving the IMCP designation will help our region to continue our successful track record, continue to provide a high level of service to the region's job seekers and businesses, and put the more rural regions of our two states in a better position to compete and receive federal funds for workforce development.
- Significant upgrades to the broadband fiber infrastructure are necessary to meet the goals of the Eugene/Springfield Prosperity Plan and to make the region and individual technology-based companies more competitive globally.
- Brownfields assessment and remediation funds will help to address the region's limited supply of shovel-ready development sites.
- Designation will put the regional universities, industries, and research centers in a better position to access funds that are fundamental to accelerating ideas into thriving commercial enterprises. Transferring research into technology, and technology into innovative businesses that are competitive in the global marketplace is critical to the sustained growth of advanced manufacturing.
- Continued airport capital improvements are needed to expand service and improve access to key national and international trade markets.
- Funding support for STEM-focused educational systems that better prepare the next generation of workers for the rapidly changing needs of advanced manufacturers will be critical.
- Capital facility and advanced equipment funding for incubators, such as the south Willamette Valley's RAIN accelerator, will be essential to their continued success. Incubation and acceleration of ideas to enterprise is a top priority for the region.
- As population and employment opportunities grow, access to affordable, workforce housing is fundamental to supporting the retention and stabilization of the regional labor pool. Therefore, various funding tools and support will be necessary to meet future growth and housing needs.

## 5. DESCRIPTION OF LOCAL INDUSTRIAL ECOSYSTEM AND IMPLEMENTATION STRATEGY

The Pacific Northwest Partnership (PNMP) is a bi-state alliance including SW Washington, and the Willamette Valley and Columbia River Corridors in Oregon. The partnership is comprised of cities, counties, community colleges, universities, research institutes and multiple economic development and workforce organizations. The strength and synergy of the PNMP is woven in our combined “manufacturing ecosystem.” The PNMP region’s historical strength in materials and metals forms the basis of our Advanced Materials Science for Advanced Manufacturing cluster. Raw materials, innovation in advanced material science and leading workforce and training infrastructure bind our region as a manufacturing community.

### (A) WORKFORCE AND TRAINING

The Pacific PNMP region has multiple workforce development efforts targeted toward the manufacturing sector, including advanced wood products manufacturing and distance learning that focuses on rural areas. A skilled workforce is a core ingredient to the continued success and expansion of our manufacturing sector. The challenge facing the PNMP is to increase our limited resources, coordinate our programs and leverage additional support to achieve widespread impact.

Our partnership includes lead workforce organizations with expertise in proven models of manufacturing skills training that produce workforce-ready employees. Our goal is to scale these efforts across the PNMP region. This approach will bring a strategic and results-oriented emphasis on skills training, apprenticeships, learning-by-doing, and practicing high-skill craft in real world settings with mentorship, coaching, guidance and support.

This focused approach will target needed training to ensure the workforce has the skills to work in the Advanced Material Science for Advanced Manufacturing cluster. As high-tech labor requirements in manufacturing increasingly resemble those of other high-tech creative industries, training strategies must adapt and keep pace. This fundamental training goal and workforce strategy is among the key motivators in pursuing the IMCP designation.

*Our catalytic project, focused on Cross Laminated Timber (CLT), is representative of how Advanced Material Sciences presents a global opportunity to grow our natural resource-based manufacturing industries through innovation.*

*One of our key outcomes is to create a workforce training path to recruit, train and retain a high-quality and educated workforce to support wood products manufacturing including cross-laminated timber production.*

### Current Capability

Our ability to inform and attract youth to the manufacturing sector is a key element in our workforce strategy. Recruiting, training, and retaining a high quality and educated workforce is a foundational principle for achieving long-term industry success and sustainability. We must simultaneously change the image and promise of manufacturing jobs while providing exposure and hands-on skills training to youth ages 16-24. Teaching the fundamental skills of computer language literacy, 21st century skills like communication and teamwork, and a passion for STEM (science, technology, engineering, and math) disciplines must begin even earlier.

In the second decade of the 21st century, computer programming, electronics, robotics and advanced materials have radically altered the manufacturing landscape. It is widely recognized that advanced manufacturing industries require individuals with high-level technical, communication and teamwork skills. At the same time, manufacturing occupations often suffer from an “image” problem. Young people, with little direct exposure or familiarity with manufacturing, often fail to recognize the industry as a viable and financially rewarding career path. A successfully implemented workforce development strategy can recast and reshape generational perceptions and interest in manufacturing sector jobs.

Our plan for enhanced and scaled collaboration is an exciting breakthrough for workforce and training in our ecosystem. It recognizes, for the first time, shared key technologies, supply chains, commonly held challenges in low wages and a diminishing pipeline of young workers pursuing manufacturing careers.

### Current Institutions and Existing Programs for Improving Capability

**Technical Institutes.** Our region is building on decades of investment in vocational/trade schools and programs that provide high school youth with an opportunity to learn needed manufacturing skills. Examples include the Pathways to Manufacturing Program in Portland, Mountain West Career Technical Institute in the mid-Willamette Valley, and the Sabin-Schellenberg Institute in Clackamas County.

**STEM Hubs.** Oregon Education Investment Board is investing millions in a network of science, technology, engineering and math (STEM) Hubs, like the Portland Metro's Partnership in Washington County. The Intel STEM Center for College and Career Readiness supports the aligned activities of partnering school districts and organizations by establishing shared measurement practices, mobilizing funding, advancing policy and building public will to support change. These STEM hubs are increasing the reach of businesses and key technologies into our school districts and communities.

**CTEs.** In SW Washington, The Clark County Career and Technical Education (CTE) consortium, an organized group of all CTE programs from three school districts, aligns their programs across districts and engages industry collaboratively to ensure their manufacturing programs meet industry demands. The CTE manufacturing programs train high school youth in six career pathways that lead to manufacturing occupations directly out of high school and align directly with Clark College manufacturing programs. In Oregon alone, 24 CTE Revitalization Grants were awarded for the 2013-2015 biennium. These CTE grants will benefit 140 schools across Oregon with programs ranging from agricultural sciences to manufacturing, marketing to engineering, building and construction trades.

**Regional Workforce Plan.** The Columbia-Willamette Workforce Collaborative has worked with area manufacturers to develop a two-year Regional Manufacturing Workforce Plan to increase the pipeline of workers into manufacturing careers, develop the skills of the manufacturing workforce, and support industry's connection to a qualified recruitment pool. Many of the plan's benchmarks have been exceeded with 1,500 youth attending career exposure events, 122 youth manufacturing internships awarded, 600 new workers trained, 633 job placements made, and 1,245 incumbent workers trained. Collectively, these efforts have established the foundation for a certified manufacturing workforce.

**Workforce Collaborative.** Recipients of round I and III US Department of Commerce Jobs and Innovation Accelerator Challenge (JIAC) grants, the Workforce Collaborative has a proven record of bi-state regional collaboration with economic development, Manufacturing Extension Partnership programs, industry associations and educators to address workforce challenges. Through these grants the Collaborative has helped many unemployed individuals re-enter the workforce through training and has supported manufacturers' internal training needs by coordinating multi-company consortium trainings.

*Opportunities for workforce development in the CLT industry are timely and promising. The PNMP has the network and resources to collaborate with community colleges, universities, public schools and workforce development agencies to establish the necessary workforce development programs needed to support CLT development and production in our region.*

### Gaps

**Lower Wages, Less Income.** The Portland-Vancouver metropolitan area per capita income has fallen below the national average and is declining relative to other regions. Since 2007, Greater Portland's per capita income fell lower than the national average and is now 21 percent behind the Seattle metro—a \$10,000 per year difference. Income inequality also is widening.

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Other cities within the supra-region are also continuing to fall behind. In the second-largest population center — Eugene-Springfield — prime-age, college-educated worker earnings rank 277 out of 283 metropolitan areas.

**Disengaged Youth and Aging Workforce.** Short-term challenges include an aging workforce in manufacturing jobs (especially machinists, computer programmers, and mid-level and executive managers) and a very high high-school dropout rate. Replacement of workers is difficult, in large part due to declining interest and misperceptions about vocational training and lack of “soft skills” necessary to obtain and retain jobs.

**Succession Planning.** A generation of manufacturing leaders and owners is now facing retirement. Succession planning and training for the next generation of manufacturing leaders is necessary to maintain existing management and executive expertise in our Advanced Manufacturing companies.

**Certifications for Employment.** Employers value certifications as an indicator of readiness for production jobs. In a recent survey, Oregon employers said certifications were valuable for workforce recruitment and retention. These technical certifications may be obtained through secondary or post-secondary training programs. While a common practice in the Midwest and East Coast, industry certifications are not yet widespread on the West Coast but the PNMP partners will serve as the link to improve this outcome.

**Shortage of Highly Skilled, Technical Employees.** In 2012, 1,939 new H1B visas were approved to fill the need for advanced degree workers in our region with 60 percent in computer/mathematical jobs. There were 703 H1B visas issued for Intel alone at an average annual salary of \$101,959. This indicates a shortage of native talent in highly-skilled computer, software and engineering occupations.

**Smaller companies ill-equipped to develop their workforce.** Manufacturing program training graduates enter the workforce with only a broad foundational knowledge base. Companies must still mold these new hires into fully productive and competent employees but many manufacturers lack the capacity to develop and manage formal internal training programs.

## Plans

The areas in which we initially plan to focus our workforce and training efforts follow.

1. **Connecting Youth: Next Generation Manufacturing Workforce** will bring more young people to manufacturing in all the industrial sectors that make up the Advanced Material Science for Advanced Manufacturing cluster and prepare them for pathways to good paying manufacturing jobs. We will also build a cadre of young leaders who think working in advanced manufacturing is an exciting opportunity by providing soft and hard skills training, on-the-job training, and internships. Specific programs targeting advanced wood products manufacturing will be developed in collaboration with community colleges and workforce development agencies across our region.
2. **Manufacturing-Ready Certification** will allow more unemployed and underemployed workers to achieve higher pay and steady employment through training and certification to meet the growing needs that the Advanced Material Science for Advanced Manufacturing cluster has for skilled workers. This is particularly urgent as baby boomers retire. Companies will have the talent they need to grow and Oregon and SW Washington communities are desirable locations for manufacturers looking to do business in the region. We will develop and adopt statewide standards for a Manufacturing Talent Pool. Our plans include identifying the industry certifications that will validate an individual's skills and knowledge as a viable candidate for the manufacturing industry. They will build upon the capacity of the Workforce Collaborative region's Certified Production Technician program. Certification in advanced wood products manufacturing skills will be included in training and certification program development.
3. **Expanding Middle and Executive Manufacturing Expertise** will prepare company leadership for the changing future of manufacturing including planned leadership transition from baby-boomers over the next decade. It also will expand continuous improvement training for small companies that have had minimal exposure to other resources; and expand access to Employee Training Assistance Fund (ETAF) for employees in H1B Visa Occupations.

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4. **Sector Pathways.** In fall 2015, Portland-based Worksystems, Inc. will launch the Sector Pathways program to create industry-specific, focused training programs intended to help youth who are disconnected from the traditional school system gain the education, skills, and credentials they need to access career-pathway employment in high-wage, high-demand occupations in the regional economy. Sector Pathways will position students to qualify for entry-level employment in manufacturing, and form the basis for subsequent specialization and progress along different career paths within a specific industry or occupation. The manufacturing skills obtained in the program will be relevant across multiple manufacturing industries, from wood product manufacturing, food processing, and metals manufacturing. Lessons learned from the Portland project will be replicable in the more rural areas of the PNMP region where wood product manufacturing for CLT will occur. The Sector Pathways program is supported by a \$300,000 grant from the TK foundation, \$25,000 in Workforce Investment Act (WIA) funds and leverages the infrastructure of the \$1,000,000 annual WIA funded SummerWorks internship program.
  5. **eLearning.** For some manufacturing occupations, the traditional training system is not producing skilled workers and graduates at a rate that matches industry demand. Additionally, small businesses frequently struggle to access training for their workers due to time constraints and resources. Worksystems, Inc. will be launching an eLearning system in July 2015 that will expand regional training capacity and offer our region's job seekers and businesses a new level of training customization, responsiveness, user flexibility, ease of access and affordability. Training content will support skill development for entry-level manufacturing jobs, skilled production and maintenance jobs, engineering and management occupations for the diverse industrial sectors that make up the Advanced Material Science for Advanced Manufacturing cluster. The online learning system will initially be available in the Portland area and the PNMP partners plan to replicate the system and make it scalable and accessible throughout the entire PNMP region. This will be particularly valuable for rural residents and manufacturers — areas poised to re-energize the wood products industry with CLT, but where workforce training is often not readily available.

## (B) MANUFACTURING SUPPLIER NETWORKS

Throughout our region, manufacturers face supply chain issues including shipping costs, affordability, inventory management, supply chain disruptions and quality control risks. The PNMP has begun to address this effort to create sustainable supplier networks and improve business-to-business communications to grow opportunities in Advanced Material Science for Advanced Manufacturing.

We plan to advance our supply-chain connection by expanding the capability and resources available to the NW Connector, Oregon Manufacturing Extension Partnership (OMEP) and IW Outreach and Training to increase buyer and supplier network connectivity across all advanced manufacturing industries. This support occurs at every level of the supply chains, focusing on smaller, rural and unconnected manufacturers. Key participants in this expansion include the region's Workforce Investment Boards, Business Oregon, and trade associations including Manufacturing 21, the Pacific Northwest Defense Coalition (PNDC), and the Northwest Food Processors Association (NWFPA). In Oregon and Southwest Washington, we are laying the groundwork to create a solid foundation for acting on supply chain gaps and opportunities.

The bi-state Jobs and Innovation Accelerator Challenge for Advanced Materials and Metals (JIAC/IAM2) metals and advanced materials project has analyzed supply chain issues in the Portland/Vancouver region for three specific industries: aerospace, electronics, advanced machines and materials. Through a Make it in America grant, the OMEP and their partners conducted an extensive supply chain research and analysis project in the mid-Willamette Valley and found that the most common difficulties in supply chain include: 1) High cost in trucking and raw materials (local cost higher than overseas cost); 2) Lack of certain resources/goods in the area (e.g., no mill produces Cross Laminated Timber (CLT)); 3) Limited local capacity — lack of frozen storage in the area, lack of commodity markets, and lack of dependable rail services and outbound trucking; 4) Low quality in products and services — long lead times on certain goods (such as plating and anodizing); and 5) Talent gap — the labor force lacks certain skill sets, particularly machining.

OMEPE also completed a research project statewide focusing on supply chain issues in rural communities. OMEPE and IW will use this information to help companies build stronger local supply partnerships, and thereby increase the speed and quality of delivery throughout our entire region. The vision and end goal is to help companies manage supply relations that consistently deliver high-quality products and services at a competitive cost, more reliably than competitors, while helping local suppliers.

The National Institute of Science and Technology (NIST) Manufacturing Extension Partnership (MEP) has invested extensively in a supply chain optimization delivery system. Specifically, the NIST MEP has developed a supplier development/supply chain optimization program that includes tools such as optimization road mapping: strategy development, objectives, and deployment. The program includes deploying risk management practices, identifying and evaluating supply chain risks and implementing a total cost of ownership methodology. With sufficient funding, OMEPE and IW intend to use the results of the research work described above to deliver the NIST supply chain optimization program. A key element of the initiative is to provide supply chain optimization services to the small/medium manufacturers that serve larger Original Equipment Manufacturers (OEMs). Consequently, a key part of the plan is to offer this capability to OEMs for support in identifying suppliers for improvement.

*Under the Oregon BEST led PNMP application for a US Department of Commerce Economic Development Administration (EDA) Distressed Communities grant for a feasibility study of CLT in the region, OMEPE and IW will work with rural and urban wood product manufacturers to assess and streamline potential CLT production capabilities for both domestic and global export outside the PNMP region.*

## Current Capability

Strengthening the supply chains that support manufacturers in key traded sector businesses is critical to growth in our Pacific Northwest economy. The regional manufacturing ecosystem has significant supply chain opportunities across a whole range of regional strengths as outlined in our key technologies and supply chain section. Key opportunities include:

- Advanced Wood Products – Engineered wood product manufacturing, wood preservation, veneer, CLT and other advanced wood product manufacturing.
- Metals and Advanced Materials – Light metals, polymers, ceramics, glass and composites.
- Electronics – Semiconductors, electrical components, cables, batteries, motors and small electrical equipment.
- Aerospace and Defense – Manned and unmanned vehicles and parts, weapons, defense and intelligence systems, satellites and launch vehicles with growing worldwide civilian applications.
- Industrial Machinery and Equipment – Both heavy industrial machines and hardware and small-scale machinery and components.
- Advanced Medical Devices and Equipment – Sensing, monitoring and scanning equipment such as MRI, PET and CAT Scan diagnostics, ultrasonic and electro-medical lasers and monitors.
- Clean Technology Components – Applications include green building, sustainable building materials, renewable energy systems, energy efficiency, and related technologies.
- Food Processing – A regional advantage of prized specialty crops (berries, fruit, etc.), as well as wheat in the mid-Columbia region. Opportunities include ingredients, packaging, sanitation, refrigeration technologies, as well as shipping and storage.

## Current Institutions and Existing Programs for Improving Capability

Greater Portland Inc, Columbia River Economic Development Council, Portland Development Commission (PDC), Manufacturing 21, PNDC, and Business Oregon work together to support both regional and statewide supply chains on two fronts: 1) To build local industry knowledge of suppliers of products, parts and components; and 2) To help large firms and government agencies identify and purchase from suppliers in our region. These efforts include:

- OMEP and IW are service providers that work directly with Pacific Northwest manufacturers to successfully compete in the global economy by optimizing operations and focusing on each company's specific obstacles to growth. During the last five years, IW worked with over 1,000 companies have resulted in more than \$65 million in client cost savings and \$407 million in client increased and retained sales. Similarly, OMEP has helped hundreds of companies in Oregon realize more than \$58 million in client cost savings and \$638 million in client increased and retained sales over this same time frame.
- PNDC is an association of Northwest defense and security industry businesses that works with the defense industry to facilitate greater access to government markets and contracting opportunities.
- The JIAC-IAM2 funding has increased understanding of the supply chain gaps in the metals, electronics and advanced materials sectors in the greater Portland region. Direct assistance was given to companies in the support of business model innovation, supply chain optimization, new product development, market understanding and strategy, and other growth supporting services.
- The NW Connectory is a buyer and supplier network that maintains detailed profiles of industrial and technology companies in the Pacific NW region, across all industries and at every level of the supply chain. In December 2014, OMEP was awarded a NIST Business-to-Business Network Pilot grant for \$250,000, to enhance the NW Connectory buyer/supplier network. OMEP worked closely with the PNDC, OregonTech and IW to respond to the federal funding opportunity. OregonTech students will work with OMEP to study the system development lifecycle (Planning, Analysis, Design and Implementation) and make system recommendations.
- The Manufacturing 21 Coalition is an advocate for the manufacturing sector in the region, and partners with local workforce development boards to train workers in timely and critically needed skills, while providing scholarships to stimulate local workforce investments.
- The Gorge Technology Alliance is a nonprofit organization made of organizations and companies involved in the technology industry in the Columbia River Gorge. More than 100 members represent over 2,000 employees in the areas of defense, aerospace, advanced manufacturing, IT, software and telecom.

## Gaps

**Supply Chain Optimization.** The region and manufacturers face supply chain gaps including shipping costs, affordability, inventory management, supply chain disruptions and quality control risks.

**Business-to-Business Networking.** Enhance limited supply chain connections by expanding business-to-business supply chain opportunities and communication.

## Plans

1. **Advance Supply Chain Connections.** Expand the capability and resources available to the NW Connectory, OMEP, and IW Outreach and Training to increase buyer and supplier network connectivity across industries and supply chains, focusing on smaller and unconnected manufacturers. Key participants in this expansion include the region's Workforce Investment Boards, Business Oregon, and trade associations including Manufacturing 21, the PNDC, and the Northwest Food Processors Association. In Oregon and Southwest Washington, PNMP is laying the groundwork to create a solid foundation for acting on supply chain gaps and opportunities. The JIAC/IAM2 metals and advanced materials project has analyzed supply chain issues in the Portland/Vancouver region for three specific industries (aerospace, electronics, advanced machines and materials). OMEP and their partners will continue their support to the companies in the mid-Willamette Valley to help resolve the challenges identified in the study.
2. **Business-to-Business Networking.** OMEP is developing a pilot business-to-business network in partnership with PNDC and IW, using and enhancing their NW Connectory database as a baseline.

## (C) RESEARCH AND INNOVATION

The PNMP region has a distinct legacy and future in innovation. It has received national attention for being an area ripe with innovation – from technologies, to policies and sustainable practices. Notably, Forbes has ranked Portland in their

top 20 innovative cities, at #10, as well as #10 among the most wired cities, important infrastructure for advanced manufacturing. Inc has ranked Portland as one of the top 20 most innovative cities nationally and 24/7 Wall St. ranked Corvallis #4 for innovative cities, one spot above Seattle, based on the number of patents, venture capital funding, and tech startups.

Described in further detail below, the region has leveraged our universities and research institutes to continue to grow our Advanced Materials Science for Advanced Manufacturing cluster. Oregon BEST, one of our Signature Research Centers and PNMP partners, will have a significant role in implementing our catalytic project, cross laminated timber (CLT).

*Related to our catalytic project in advanced wood products manufacturing, the PNMP identifies research and innovation as a major strength and opportunity for bonus points in this application.*

## Current Capabilities

State-supported colleges and universities that serve the PNMP region include Oregon State University, Portland State University, the University of Oregon, the Oregon Institute of Technology, and Washington State University Vancouver. There are also several private colleges and community colleges that contribute to the research and innovation talent in both states.

The University of Oregon (UO) and Oregon State University (OSU) are actively collaborating in developing programs that lead the nation in advanced wood products manufacturing design. The UO has the top ranked sustainable architecture program in the nation and OSU has the premier forestry and wood products programs in North America. The State and Oregon Business plan initiatives are evidence of broad support for and collaboration with the OSU-UO efforts. The UO brings an international reputation in sustainable design and research dating back at least 40 years. In addition, the UO architecture program brings experience testing and developing building systems and materials for improved building performance and lifecycle assessment.

Building on the state's academic institutions strengths, the Governor and Legislature in 2005 brought together 50 leaders from the private sector, representatives from Oregon's four leading research universities, as well as regional and local governments to form the Oregon Innovation Council (Oregon InC.). The results created three Signature Research Centers (SRCs): the Oregon Nanoscience And Microtechnologies Institute (ONAMI) which is focused on advanced materials science; the Oregon Built Environment and Sustainable Technology Center (Oregon BEST) which is focused on developing clean-tech technology that affects energy, food, water and shelter resources; and the Oregon Translational Research and Development Institute (OTRADI) which is focused on bioscience technology and drug development. These three SRCs share a common mission to support and commercialize new technology coming from private industry and university research that translate into high growth, traded sector products and services in industries which will attract foreign direct investment.

The SRCs support research and innovation in areas Advanced Material Science for Advanced Manufacturing by:

- Collaborating together – a Memorandum of Agreement is in place between each entity and the Oregon Regional Accelerator and Innovation Network (described below).
- Providing significant financial support to fledgling companies.
- Offering access to various accelerators/incubators to accelerate growth and success through mentor relationships, educational resources and investor readiness programs.
- Matching grant programs to fund initial proof of concept research.
- Providing companies access to a network of 16 laboratories and a wide inventory of equipment on our research university campuses, as well as to OTRADI's wet labs.
- Providing startup companies access to more than 500 university researchers who are 'member faculty' of the SRCs.
- Showcasing 'portfolio' companies at national events such as the National Innovation Summit.

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Through the SRCs and industry initiatives, Oregon InC helps innovators create high-paying jobs, entrepreneurs increase companies, and university researchers bring federal and private dollars to Oregon in a partnership between the state's private sector leaders and its research universities.

With six years of funding to date, Oregon InC initiatives have helped capture \$350 million in federal/private grants and have provided invaluable R&D support to more than 250 small and medium enterprises and also to our larger Advanced Manufacturing businesses such as Jeld-Wen, Intel, Hewlett-Packard, Precision Castparts, Entek International and others.

### **Current Institutions and Existing Programs for Improving Capability**

The PNMP region has invested in a number of physical assets that strengthen the links between research and the marketplace and are located throughout our region. Converting technical innovation at a research institution into a viable business can be a substantial hurdle. Bringing research to the marketplace requires a blend of skills that often do not reside within the research institutions. The following organizations support the Advanced Materials Science and Advanced Manufacturing cluster by providing a pathway for innovations developed at our research institutions to become viable businesses.

#### **University of Oregon and Oregon State University Collaboration**

OSU and UO launched the Center for Excellence and Advanced Wood Products Manufacturing and Design in 2014 through Oregon States' Colleges of Forestry and Engineering and the University of Oregon's School of Architecture and Allied Arts, the nation's top ranked sustainable architecture program. The governor's budget includes funds for a new state-of-the-art building, the new Oregon Forest Science Complex, which will be housed at OSU and will share space with UO Architecture and Allied Arts faculty in a joint program that integrates architecture, design, engineering, and wood products.

The Regional Accelerator Innovation Network (RAIN) Located in the Eugene-Springfield area, RAIN's mission is to strengthen the regional entrepreneurial ecosystem to produce more successful start-ups focused on scalable traded-sector technology companies and to develop strategies that keep successful companies in the region. It is a consortium of government, higher education, and business community leaders created to advance the formation, growth, and retention of technology based startups in the south Willamette Valley. In its role as an accelerator, RAIN provides disciplined, mentored business acceleration programs. It also connects resident talent, capital, and resources, into an intelligent network that is easy for entrepreneurs to access and navigate, no matter what stage of business development is being experienced.

Northwest Collaboratory for Sustainable Manufacturing (NWCSM) NWCSM is a cooperative venture between universities and industry in the Pacific Northwest. It was created to cultivate education, research and outreach opportunities to advance the manufacturing sector in Oregon. In particular, NWCSM partners are focused on economic development through providing a skilled workforce at all levels, research in key technology areas that ensures a vibrant and sustainable manufacturing community.

SOAR Oregon SOAR is a statewide, not-for-profit economic development organization focused on the development of the Unmanned Aircraft Systems (UAS) industry in Oregon. Its mission is to foster growth in this rapidly evolving industry, connecting diverse industry sectors such as aviation, advanced manufacturing, high tech, software development, education and more.

### **Gaps**

Our institutional PNMP partnership members have identified three primary gaps:

- Enhanced coordination among the SRCs and workforce development agencies in the PNMP region.
- Connecting the SRC start-ups and companies to post-prototyping and manufacturing opportunities resources.
- The need to grow expertise across the cluster development value chain.

## Plans

1. Catalytic Project-Advanced Wood Products Manufacturing Study: CLT Acceleration in Oregon and Southwest Washington. The PNMP and Oregon BEST have submitted a grant proposal to the Economic Development Administration for a feasibility study to identify potential economic benefits to distressed, timber-dependent communities in Oregon and Southwest Washington by the commercialization of CLT and other engineered wood products. Based on preliminary feedback, we have submitted additional information and hope to receive this award soon.

CLT is an advanced wood product with tremendous potential in the PNMP region. CLT competes with steel and concrete as a structurally sound building material, but is made from a renewable resource. It has significantly lower environmental impact than concrete and steel. The strength characteristics of CLT are such that lower grade timber can be used — reducing pressure on older forest stands and, putting foresters, loggers, millwrights and production assets back to work, as well as increasing long-term forest sustainability.

As our catalytic project, this feasibility study will examine the state's raw natural resource for this advanced material and its potential impact on the PNMP region's economy. It will be a coordinated effort between Oregon BEST, Oregon State University, Worksystems, Inc., OMEP, and Business Oregon.

The feasibility study will provide an assessment of the production capacity in the region, in terms of natural resources and manufacturing capacity. It will quantify the potential economic benefits, and identify likely barriers and solutions to overcome them.

The anticipated outcomes from the project include business and industry leaders who will have the information necessary to make decisions regarding investment of resources and capital to grow this new industry sector. Government and policy agencies will have the information necessary to utilize tools to stimulate market development. For example, building code officials will have data to support regulatory changes and a market transformation to new materials — meeting public safety needs while spurring innovation. Profiles will be available on participating business' needs — capital, machinery, workforce and market support. The region will understand the workforce training needs and can start developing appropriate programs. New areas of research and innovation will allow researchers and entrepreneurs to start developing the next generation of technologies and products using CLT.

## (D) INFRASTRUCTURE AND SITE DEVELOPMENT RESOURCES

The infrastructure capacity of the PNMP is an essential input for the continued success of the Advanced Material Science for Advanced Manufacturing cluster of industries. A strong broadband network is necessary for competitive communication ability and industrial sites must be available throughout the region. Re-purposing closed mill sites for CLT is an opportunity to efficiently use underutilized industrial sites in non-metropolitan areas. Challenges exist in funding, causing barriers to site readiness and infrastructure enhancement, as well as public development of broadband fiber infrastructure.

### Current Capacity

**Eugene Building Code Pilot.** The State Building Codes are intended to support and encourage, not inhibit, the use of innovative ideas and technological advances. Local building officials administering building inspection programs have broad authority to accept materials, systems or construction methods not specifically addressed or envisioned by the drafters of the code, but which can be shown to offer equivalent performance. CLT material technology has recently been included in the State Building Code in a manner that is most directly applicable to construction of industrial buildings. However, the logic and test data used to gain that approval could also be used as the basis for a local pilot that could explore an expanded application of CLT to construction at different scales, such as multi-family residential and commercial.

*The City of Eugene intends to conduct a pilot on CLT. Through such a pilot we plan to work closely with the state to potentially expand the scope of prescriptive CLT applications.*

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**Smart Land Use Planning.** Both Oregon and Washington State have strong land use programs that seek to develop economically sustainable communities while protecting the natural resources within each state for future generations. The State of Oregon has demonstrated innovation in land use planning since the 1970's. Our land use planning has resulted in efficient development patterns, compact urban development, and protected farm and forest lands that preserve and protect our natural resources for farming, forestry and agriculture, recreation and open space. Washington's Growth Management Act was implemented in 1990 and uses growth boundaries to guide land use.

**Brownfields.** Business Oregon manages two brownfields financing programs: the Oregon Brownfields Redevelopment Fund funded by proceeds from the sale of state revenue bonds, and the Oregon Coalition Brownfields Cleanup Fund capitalized through a revolving loan grant from the US Environmental Protection Agency. Oregon's brownfields programs provide financial assistance to support the cleanup and redevelopment of industrial sites. For example, a lumber mill and wood treatment facility had closed, leaving a vacant, contaminated site. Using a mix of state funds and alternative financing, a private wood products manufacturing company purchased the property and developed an integrated log yard. The company converts low-value woody biomass left over from timber harvesting into thermal energy products. The site now employs 20 people earning \$1.4 million annually in wages.

In addition to these state managed programs, the EPA has awarded three Brownfields Assessment Grants to cities within the PNMP. In 2012, to the Brownfields Assessment Coalition of Eugene, Springfield and Lane County was awarded a \$680,000 Community-wide Assessment Grant. In 2013, the Cities of Beaverton and Vancouver each were awarded \$400,000 Community-wide Assessment Grants, and Vancouver was additionally awarded a \$200,000 Area-wide Planning Grant. These community-wide assessments are underway.

An example of a potential brownfields redevelopment site is in the City of Sweet Home in Linn County. A 450-acre Willamette Industries Mill / Morse Brothers-Knife River property, was rezoned over a decade ago to support mixed-use recreational/commercial/planned development. The property is owned by Linn County, which acquired it through tax foreclosure in 2010. Approximately 230 acres of the property – that portion once occupied by Morse Brothers-Knife River – has completed environmental cleanup and received a letter of No Further Action from DEQ. The remaining acreage is undergoing further assessment with cleanup planned to follow.

**Site Development and Readiness Programs.** In 2003, Oregon established the Site Certification Program. The Oregon Certified Industrial Site Program maintains an inventory of industrially-zoned properties that are declared "project ready."

In 2015, Southwest Washington plans to update their regional land inventory to align with Business Oregon's 2012 Regional Industrial Lands study. The study determines the supply and readiness of large lot industrial sites and inform the work of local jurisdictions in infrastructure investment. By aligning the two studies, the region will have a comparable and comprehensive inventory of large industrial sites categorized by development readiness.

**Broadband.** Broadband is the new "land use infrastructure" that we need to plan for and grow to further connect our manufacturers to global markets. We seek to be a leader in the world of broadband planning, infrastructure investment, and access. These plans take aim at both issues of adoption of broadband in low-use households as well as issues of availability, cost and access for companies.

**Transportation Infrastructure.** Our region's transportation corridors include the Columbia and Willamette rivers, north/south and east/west rail corridors focused on exports through the ports of Portland, Vancouver, Camas-Washougal and Coos Bay and the Interstate Highway system, with I-5 and I-84 unifying the region.

## Current Institutions and Existing Programs for Improving Capability

**Certified Shovel-Ready Industrial Land.** The acquisition or preparation of industrial land priorities have been identified in multiple regions within the PNMP. In the south Willamette Valley, the focus is on increasing the number of certified industrial sites, including the unincorporated area of Goshen in Lane County that has more than 300 acres of existing, underutilized industrially designated land.

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**West Coast Infrastructure Exchange (WCX).** To help finance and update needed infrastructure improvements particularly in rural communities and small cities, Oregon recently adopted a comprehensive strategy to expand the tools available for financing infrastructure needs. These include organizing the West Coast Infrastructure Exchange (WCX), creating a state infrastructure commission, and approving the WCX as a vehicle to energize public-private financing.

The WCX is designed as an interstate vehicle to increase the feasibility, reduce the costs, align public and private needs, connect to private capital, apply new financing tools, and exploit financing opportunities for most types of infrastructure. Oregon's newly adopted Public Infrastructure Act (HB 4111), passed in the 2014 legislative session, requires the state Treasurer to screen projects, piloting an approach similar to that used by Partnerships BC in British Columbia.

**Broadband.** In 2009, the Oregon Broadband Advisory Council and a Broadband Advisory Council Fund were created by the Legislature to help ensure the implementation of statewide broadband strategies. The Council members represent Oregon's cities, counties, telecommunications service providers, Tribes, educators, and economic development organizations, among others.

## Gaps

Federal agency partnerships and attracting private capital are critical in addressing regional infrastructure gaps and implementing the PNMP regional plans and needs.

**Limited Broadband Services.** The availability of Broadband services is a particular concern in smaller urban areas and rural communities where company ambitions and tech leadership are hampered by poor fiber infrastructure delivery – especially over the last mile. Providing globally competitive broadband speed at competitive costs requires the construction of additional fiber infrastructure directly to businesses for service providers to compare fairly.

**Doing more with declining public funds.** Federal agency resources are scarce and need strategic focus to maximize limited investments. Just in the Portland region, a gap of approximately \$20 billion in infrastructure funding is expected by 2035. According to the American Society of Civil Engineers Report Card, Oregon's need for drinking and wastewater infrastructure alone is \$6.6 billion.

**Adequate supply and inventory of 'shovel-ready' industrial land.** Oregon has a statewide program to identify these sites, and maintains a database tool. Our partners in Washington do not currently have this capacity, but are interested in developing a shared program to identify and ensure availability of these sites.

**Contaminated industrial sites.** In non-metro areas, large-scale industrial properties, mills, lumber yards, and wood treatment facilities are brownfield sites. These sites make it difficult for struggling communities to redevelop infrastructure and revitalize their local economy.

## Plans

1. **West Coast Infrastructure Exchange (WCX).** Stretch public dollars available for infrastructure through public-private partnerships facilitated by capital facilities reform under HB 4111 and the growth of WCX and related vehicles. The voice of manufacturers and business leaders in advocating for public investment in infrastructure is also critical. Network the strategies of Metro and the Economic Development Districts to develop coordinated needs analyses and funding strategies for infrastructure. The WCX will provide a platform for identifying, bundling, and leveraging a region-wide pipeline of integrated investment priorities. We will request federal agreement to assist the region develop the WCX. We plan to extend the program to Clark County and Southwest Washington.
2. **Expand Industrial Land Readiness and Site Certification to more sites in more communities.** Funds will be used in a revolving program to help pay for the assessments and documentation needed to make an industrial site ready and competitive for business expansion and location. An inventory of certified industrial sites is a goal

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for all subregions. Site certification is an excellent tool for identifying issues related to industrial land readiness (i.e., wetlands, transportation capacity, local capacity, environmental contamination). The region's existing brownfields programs can be used to increase the inventory of shovel-ready industrial sites.

3. **Expand broadband services.** The City of Portland and suburbs are currently in discussions with Google to become a Google Fiber region. Business Oregon has developed an Oregon Broadband Plan to build capacity in other parts of the region, with a focus on rural and small urban areas. Both initiatives need to be implemented.

## (E) Trade and International Investment

Concentrating on our catalytic project, cross-laminated timber (CLT), we aim to increase exports of value-added advanced materials as well as growth in the machinery and technology needed for the production of this new building material.

In the PNMP region, there are several planned CLT structures. By increasing our CLT production capacity, we can shift from needing to import the wood products to producing it locally, and thus exporting it from the PNMP region and growing US exports. Our challenge is boosting the PNMP region's small and medium size companies export sales and expanding foreign direct investments (FDI) opportunities. We seek to create cohesive trade and investment plans that address key barriers to exporting and attracting foreign direct investment.

### Current Capability

The PNMP region is a major exporter, generating \$28.8 billion in exports in 2013, an increase of 74 percent from 2005. Computer and electronic products is the leading export industry with \$6.7 billion in exports, accounting for 60 percent of exports in the region. Other advanced manufacturing sectors leading in exports are machinery (\$2.4 billion), transportation equipment (\$1.5 billion), and chemicals (\$1.1 billion). The supply chain for the manufacturing of wood products is demonstrated by the strong levels of wood products exported to foreign countries. Wood products exports have increased from \$466.9M in 2008 to \$525.7M in 2012. Similarly, paper exports grew from \$419.5M in 2008 to \$450.1M in 2012.

In large part because of a concentration in computer and electronic products, the Portland metro is the region's export powerhouse, ranking as 11th highest among major metropolitan areas as a percentage of GDP according to the Brookings Institution. Nearly one-fifth of the Portland area's regional economy is generated by exports.

### Current Institutions and Existing Programs for Improving Capacity

Business Oregon invests in programs to assist small and medium sized companies to start exporting or increase export sales. The State's Trade Team comprises four Oregon-based global trade specialist and representative offices in Japan, South Korea, China and the European Union. It administers two grant programs — the State Trade and Export Program (STEP) and the Oregon Trade Promotion Program (OTPP) — which are awarded to small businesses to offset the costs of qualified international marketing activities such as trade shows, partner matching programs and trade missions. A key export partner is the U.S. Department of Commerce's Export Assistance Center (USEAC) in Portland which partners with the State and other local economic development partners to expand export opportunities for Oregon and southwest Washington companies.

Business Oregon helps plan and execute trade missions led by the Governor and other private and public partners to Asia, Europe and, increasingly, to emerging markets, such as Brazil. The State of Oregon, through targeted and coordinated efforts with the PDC and the cities of Hillsboro, Eugene, and Salem, has successfully recruited major Japanese and German electronics firms (Toshiba Semiconductor, Komatsu, Sony, SEH, On Semiconductor) since the early 1990s and more recently, clean technology companies from Japan and Germany. Another major foreign investor is Daimler Trucks North America, one of the largest private sector employers in the Portland region and the largest FDI employer in the state.

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In 2011, the Greater Portland region was selected by the Brookings Institution to participate in its Metropolitan Export Initiative. The Greater Portland Export Initiative has brought together local, regional, state and federal trade and economic development partners to assist companies so as to expand the region's export capabilities and export sales.

In 2014, the Greater Portland region was selected to participate in the Brookings' FDI pilot project. The goal of the project is for Greater Portland to secure and strengthen its long-term position as a competitive, sustainable, and globally integrated economic region through an intentional focus on regional economic growth, cluster development, exports and foreign direct investment.

Economic development organizations collaborate to support business expansion and recruitment of global investment within our region. Team Oregon Technology & Advanced Manufacturing groups have contracted with a third party, ROI Staffing, a recruitment generation company, to generate qualified leads from targeted companies attending the world's largest advanced manufacturing trade show in Hannover, Germany. Other promotion efforts include marketing Oregon to recruitment prospects within our Key Technology Industries priority areas.

The PDC has played a significant role in exporting Portland's expertise in sustainable development using the We Build Green Cities. This Export Initiative promotes companies' expertise in green building, infrastructure, recycling, energy efficiency and renewable energy and CleanTech industries to prospective foreign customers.

*Developing a strong CLT industry in the PNMP region will enhance the PNMP's ability to promote its reputation and expertise as an export center of sustainable development tools around the world.*

## Gaps

There are several gaps we will address with our partners.

**Foreign Direct Investment.** The region has benefitted in the past from major Japanese and European investments in the PNMP region, but only ranks 50th in foreign-owned establishment employment per capita among major metropolitan areas according to the Brookings Institution. There has not been a comprehensive foreign in-bound investment strategy until the recent launch of Greater Portland Global.

**Export assistance funding.** While the Greater Portland Export Initiative made progress, there is an ongoing struggle for sufficient funding to implement tactics to further boost exports.

**Small and medium firms need assistance.** Our region has a high portion of small and medium-sized firms that are often unaware of opportunities for trade or investment or grant programs that can help them attend trade shows.

## Plans

1. Greater Portland Global. Greater Portland has launched a Global Trade and Investment Plan to boost exports and FDI. When implemented, partnership members will be able to capitalize on this strategy, market analysis, data, and efforts to bring new business opportunities to the region and the state.
2. Facilitating Export Growth. For the 2015-2017 biennium, the state will expend \$500,000 to support export promotion grants and assistance programs for Oregon companies:
  - Market Opportunity Assessment and Market Intelligence: Advise exporters on overseas market opportunities and feasibility of global exports sales by offering targeted market and industry research in select foreign markets, due diligence checks on foreign businesses, insights into global competitors, and business protocol practices in foreign cultures.
  - Matchmaking and Access to Global Markets: Assist Oregon companies looking for foreign agent/distributors, foreign customers, or joint venture partners and introducing them to Oregon's international networks of foreign government officials, foreign companies, and foreign trade associations.

- Trade Shows and Trade Missions: Recruit Oregon companies interested in new markets or expand sales in existing markets through trade show participation. Plan and execute Governor led trade missions.
- Oregon Trade Promotion Program: Offers limited financial assistance for selected trade shows that cover targeted business/industry cluster areas. Funds allow small-sized Oregon companies to showcase their products or services in foreign markets. The program covers as much as 50 percent of a company's eligible expenses up to a maximum of \$2,500 per event.

## (F) OPERATIONAL IMPROVEMENT AND CAPITAL ACCESS

The PNMP has discovered that demand for MEP services is greater than the supply and that our region has gaps for seed stage capital, venture capital, and private equity. One solution to this challenge that the PNMP supports is partnering universities with industry to invest in applied research initiatives, programs that provide highly trained employees, expertise to test new products and manufacturing technologies, and strategic workforce education programs within the Advanced Material Science for Advanced Manufacturing cluster.

### Current Capability

According to a 2011 study conducted by the American Institute of Economic Research, Oregon's manufacturers derive more benefit per dollar invested than manufacturers in any other state. The study's results indicate that Oregon remains the most efficient manufacturing state in the country.

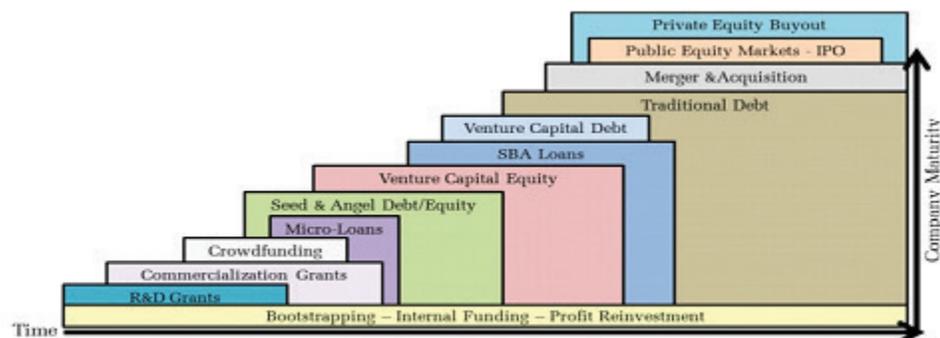
Many Oregon and Washington manufacturers have adopted advanced process innovation, such as lean manufacturing, but much deeper penetration is necessary among smaller companies. Investment in technology that could help automate or simplify manual processes is one important strategy.

In 2014, the State of Oregon, Oregon Community Foundation and the Meyer Memorial Trust commissioned a report, Oregon Capital Scan: A Line is Drawn, in an effort to build on the 2012 "capital scan" study to determine capital access gaps and assets in Oregon. The research shows that the gaps in seed stage capital has narrowed slightly with the growth in the number of Seed and Angel groups around the state. However, venture capital and private equity remains scarce, particularly for in-state resident capital.

### Current Institutions and Existing Programs for Improving Capability

Our key institutions that support Operational Improvements are OMEP and IW. Please note that they are described above in the Manufacturing Supply Networks section.

The State of Oregon's growth capital access ecosystem is composed of a number of providers with varying investment profiles, tools and tactics, shown in the figure below.



**The Oregon Growth Board (OGB)** was established to invest and manage funds for the purpose of spurring innovation, investing in Oregon start-ups and closing the capital gaps. An important focus is placed on leveraging state resources to improve the availability of capital for high-growth companies. The OGB investments support entrepreneurial capital that is key to the state's innovation strategy in Advanced Material. The Oregon Legislature appropriated \$40 million in OGB funds during the 2013-2015 session.

The OGB invested an estimated \$38 million in new funds that are targeted to assist early and growth stage companies in high-tech, clean tech, advanced manufacturing, and forest products industries. The Board also manages a \$2 million fund that serves rural businesses, underserved populations, including minority- and women-owned businesses. The OGB can use these funds to make investments, loans, or grants that further the development of the Advanced Material Science for Advanced Manufacturing cluster.

**Oregon Seed and Angel Funds.** The Pacific Northwest accounted for 7.7 percent of the deals and 6.1 percent of the dollars invested by Angels nationally in 2013, according to the Angel Resource Institute, a small decrease compared to 2012.

The Oregon Seed and Angel investment landscape has evolved, with an expansion in both the sources of investment and the scale of investment available. In addition to the longstanding Oregon Angel Fund and the former Portland Angel Network, new entrants and forums have arisen for the aspiring entrepreneur including additional fixed Angel group conferences as well as independent year-round Angel investing organizations. Some of the regular investment organizations include the Portland Seed Fund, Portland Incubator Experiment (PIE), Bend Venture Conference, Willamette Angel Conference, Roseburg Angel Investor Network, Southern Oregon Angel Investment Network, Cascade Angels, TiE Angels, and others.

**Angel, Seed & Convertible Note Transactions Oregon Summary**

2012			
# of Deals Funded	Total Funding	Average Deal	Median Deal
49	\$26,990,000	\$587,000	\$340,000
2013			
# of Deals Funded	Total Funding	Average Deal	Median Deal
45	\$25,180,000	\$646,000	\$400,000

Source: CB Insights

**Oregon Nanoscience and Microtechnologies Institute (ONAMI).** Since late 2006, ONAMI has made available a program of commercialization “gap” grants intended to help technologies created within the state and its universities to transition between the lab and commercial launch. Though a defined program and with the assistance of its Commercialization Advisory Council, ONAMI has granted over \$6.5 million since 2006.

**Oregon Built Environment and Sustainable Technologies Center (Oregon BEST).** Oregon BEST nurtures clean technology innovation by transforming new ideas, research, and products into green collar jobs, greater sustainability, and economic prosperity for Oregon. Oregon BEST provides commercialization funding to compelling collaborations between a small Oregon business and at least one Oregon partner university. The funding is designed to bridge the gap between traditional research and development funding and private investment. Oregon BEST has awarded over \$1.5 million dollars in commercialization funding grants during 2012 and 2013 to companies working in biomass, energy storage, energy efficiency, green building, and a variety of advanced materials.

The \$200,000 project titled, “Advanced Wood Products Manufacturing Study – Cross Laminated Timber Acceleration in Oregon and Southwest Washington,” will study a variety of aspects essential for the region to play a significant role in the adoption of CLT in the building industry. It will provide insights on the raw material resource, the manufacturing capacity, the capital expense to start up a manufacturing line, the workforce training needs, and the market opportunity, as well as the market barriers. The PNMP provided assistance with grant writing and securing matching funds from Oregon BEST, Business Oregon, OSU, Woodworks, City of Eugene, Clackamas County, City of Corvallis, Benton County, and the Oregon Department of Forestry.

*When a U.S. Economic Development Administration, Economic Adjustment Assistance solicitation was released this past September, we were able to quickly create consensus, define the team and respond by proposing to advance the development of Cross Laminated Timber or CLT in Oregon. We believe CLT has the potential to revitalize our wood products industry.*

## Gaps

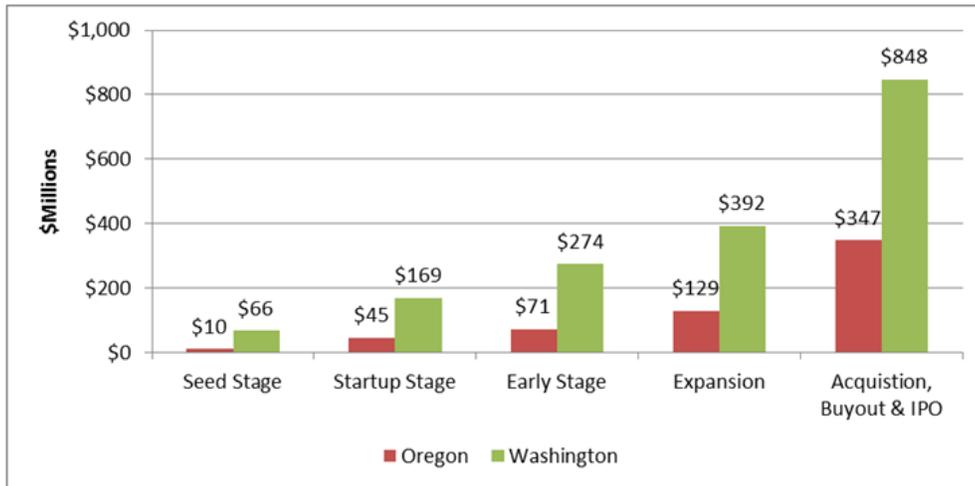
**Operational Improvements.** OMEP recently was one of 10 MEP centers around the country to undergo a federal funding re-compete. OMEP was selected to continue to be Oregon’s MEP center for the next five years and received a more than doubling of federal funding starting in FY 2015-16. NIST funding increased from a base of \$778,620 to \$1,792,029 annually. OMEP was selected to re-compete in the first round because the state was significantly underfunded compared to other MEP centers per manufacturer and OMEP was recognized as having strong state support. IW is currently participating in a similar re-compete process. If successful, IW will receive \$2,534,872 in NIST funding per year.

While these new federal dollars will help immensely in the future, current resources do not allow OMEP and IW to provide enough operational excellence manufacturing support for companies to optimize and grow their capacity utilization. Achievement of International Organization for Standardization (ISO) quality standards also requires more support than companies can afford or OMEP and IW can provide. OMEP and IW have been historically under-funded relative to the market demand for innovation services as follows:

- **Process Innovation:** Companies require support in operational excellence to optimize their production and grow their capacity. Achievement of ISO quality standards also requires more support than companies can afford or OMEP/IW can provide.
- **Product Innovation:** Low investment in R&D can cause companies to fall behind in the development and implementation of their product roadmap. More investment is required to ensure companies of support in new market understanding and new product development.
- **Business Model Innovation:** Often the limiting factor in company growth is a failure to understand the implications of a company’s business model. A deeper understanding of a company’s specific value proposition, delivery system, sales channel, key customers and partnerships is necessary to unlock company growth potential.

**Access to Capital.** We define a gap as a lack of capital available to finance a business or concept that has reasonable probability of success, assuming an efficient capital market. Our region’s capital ecosystem is currently characterized by a myriad of small, underfunded efforts that are loosely connected. Oregon’s capital ecosystem is less developed than neighboring Washington despite adjusting for population size. The graph below illustrates per capita private investment in Oregon compared to Washington. The difference in per capita investment is likely due in large part to fewer per capita investment opportunities in Oregon relative to Washington.

## Per Capita Private Investment in Oregon and Washington (2001 to June 2011)



Source: Cambridge Associates.

Note: Investment data excludes debt, bridge financing, and restart/turnaround capital.

Overall, our region is limited by its general access to capital. We have identified two specific areas where the problem is particularly acute for firms in the Advanced Material Science for Advanced Manufacturing cluster:

- **Seed Stage Capital Gaps:** Seed stage capital is sparse across sectors, with the exception of software, for companies needing between \$100,000 and \$500,000. Seed stage companies are seeking to take their concepts and technologies and develop them into prototypes or products. These businesses do not generally qualify for formal venture financing. The gap is bound by the Oregon Angel Fund with larger investments in more mature start-ups and Oregon's angel investors and existing seed funds at the lower end with smaller earlier stage investments.
- **Working Capital Gaps for Growth of Small Manufacturers:** The growth of Oregon's small manufacturers is limited by a lack of working capital (\$150,000+ lines of credit). When businesses grow, they require more working capital to finance the additional inventory needed for larger orders. Without working capital, businesses are forced to use their own capital to finance inventory. This can be a challenging obstacle to growth, since most of these businesses cannot generate enough cash in order to finance the growth.

### Plans

1. **Increase funding to MEPs.** OMEP and IW leverage significant private funding in their delivery of service, but they lack funding to expand their services.
2. **Expand post-innovation, early stage funding and next stage capital for commercialization.** The PNMP region has gaps for seed stage capital, venture capital, and private equity.

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## 6. PERFORMANCE MEASUREMENT / IMPACT EVALUATION

The executive committee coordinating body of the Pacific Northwest Manufacturing Partnership (PNMP), spearheaded by Business Oregon, the State economic development agency, is prepared to act as the body responsible for conducting an impact evaluation of the PNMP partnership efforts. In addition, Senate Bill 482, which is awaiting the Governor's signature and will likely be law by the time this application is reviewed, authorizes the PNMP as a legal entity required to provide annual reports to the legislature. We will use the metrics in that reporting system to align IMCP federal and state legislative obligations for performance measurement, accountability and adjustment.

Performance measures and impact evaluation are crucial to determining whether the approaches the PNMP plans to take will be efficient and effective in the short and long term. They are specific, measurable, attainable, relevant and time-bound. As with any programs or projects, our metrics reflect alignment of the targeted priorities, expected performance and confirm decisions made are the best to achieve the overall goals.

The impacts of public policies and investments will tell us if there are intended or unintended consequences of our actions. The PNMP is a synergistically connected suite of public agencies, jurisdictions, businesses, nonprofits and more, all of whom are charged with reporting data and making evaluative judgments about the policy, programs, and projects they implement to a variety of agencies, most notably the Federal government. Our partners—as governments, institutions and agencies—currently collect data and evaluate their individual programs and projects. Our state and regional partners also collect data on a larger scale, in compliance with federal and state reporting requirements. Each partner will share in data collection, evaluation of programs, projects, economic indicators and other statistics necessary to monitor progress toward our stated goals for each initiative. Our current system of reporting will be better consolidated through our lead partners to show an accurate reflection of where we have been, and where we are going as a region.

In this section, we first identify the metrics that assess the PNMP's success in implementing all the plans across all six industrial ecosystems. Then we describe the cost/benefit impacts specific to planned projects within each of the six ecosystems.

### Metrics-Applicable to Entire Industrial Ecosystem

We have identified four metrics that cut across all six elements of the PNMP industrial ecosystem: wages, number of jobs, unemployment rate, and number of firms. The PNMP believes that regular tracking of these fundamental metrics will provide the best measure of our success.

#### Wages

The 2012 mean annual wage for our region was \$46,561, lagging behind the national mean annual of \$49,289. A broad goal of expanding the Advanced Materials Science for Advanced Manufacturing cluster is to increase average incomes across the region. The Advanced Materials Science for Advanced Manufacturing cluster offers high paying jobs, an average of \$79,000 annual wage.

#### Number of jobs in the Advanced Materials Science for Advanced Manufacturing cluster

PNMP partners believe it will be important to track the number of jobs in the Advanced Materials Science for Advanced Manufacturing cluster, so we understand which sub-sectors are growing and thriving the best. The table shows our baseline data, for 2012.

## Advanced Materials Sciences for Advanced Manufacturing –Industrial Sectors and Employment, 2012

PNMP Region	Employment
Advanced Materials	63,688
Agribusiness, Food Processing & Technology	53,071
Forest & Wood Products	25,982
Information Technology & Telecommunications	75,008
Manufacturing Supercluster	68,460

Source: U.S. Department of Commerce, Economic Development Administration, Purdue Center for Regional Development, and Indiana Business Research Center, Innovation Data Browser, [www.statsamerica.org/innovation/anydata/index.asp](http://www.statsamerica.org/innovation/anydata/index.asp).

### Unemployment rate

Unemployment statistics show that the PNMP’s labor force is underemployed. The US Bureau of Labor Statistics reports that unemployment rate in 2014 for the PNMP region was 7.6 percent.

### Number of firms in the Advanced Materials Science for Advanced Manufacturing cluster

The number of firms in our Key Technology (KTS) cluster is one way to measure its vibrancy. As our efforts to bring capital to new businesses coming out of our research and innovation succeed, new firms will be created. It is important to note that this metric does not absolutely measure success. A large number of many small firms may not generate substantial new jobs and income. Therefore, we believe this metric should be interpreted in the context of the number of jobs and their wages. This metric, however, will help to measure the level of innovation, as new firms form to respond to new technical advances and potential business opportunities.

### Cost/Benefit Impacts-Applicable to Specific Programs

We have also identified metrics that specifically measure the success of individual programs described in the ecosystem sections of our application. Please see the table below for the descriptive information for identified metric. In addition, the PNMP has conducted extensive research evaluating the cost effectiveness of existing programs and the potential impacts of planned programs. Below, we describe the cost/benefit impacts we have evaluated.

#### A. Workforce and training

##### 1. Connecting Youth: Next Generation Manufacturing Workforce

Cost/Benefit Analysis: SummerWorks, a WorkSystems, Inc. program in the Portland metro area, connects low-income youth with summer jobs. Benefits include the wages earned by the youth during the program and an increased likelihood that participating at-risk youth will graduate from high school, positively affecting their earnings over their working lives. A high school graduate earns \$11,008 more than someone with no high school diploma, (based on 2012 average earnings data). Expanding the program to include more youth will expand the benefits.

**Cost:** Existing annual program costs (2013): \$875,000.

**Benefit in summer earnings by participating youth:** \$670,000. Net Present Value of increased earnings: \$5,392,000.

##### 2. Manufacturing-Ready Certification

Cost/Benefit Analysis: Workforce Collaborative partner LWIBs implemented a pilot program to establish a certification program for manufacturing skills in the fall 2014. In its inaugural year, the program trained and certified the industry-

identified skill competencies of 40 unemployed individuals. Program benefits included reduced recruitment and training costs for employers, increased wages for participants, and increased personal income tax revenue.

To estimate the benefits, we applied a job-placement rate from a similar program to the expected wage impacts. According to the US Census Bureau, certification increased median monthly earnings by \$1,057, an annual difference of \$12,684 (ACT: 2013). Expanding the program to include more participants will expand the benefits.

**Cost:** Annual program cost (2012): \$75,000.

**Benefit:** Expected wages (2012): \$330,000. Expected increase in annual tax revenue \$19,000.

### 3. Expand Middle and Executive Manufacturing Expertise

Cost/Benefit Analysis: OMEP is implementing a new program, Tools for Conscious Leadership, which focuses on training leadership at small and medium-sized firms, serving firms in Oregon and Southwest Washington. The program began in early 2013, providing training to managers.

**Cost:** The \$250,000 grant funded four classes since the beginning of 2013, training 92 individuals.

**Benefit:** To date, documented benefits include employee retention and promotions, but the data is confidential. The program is expected to yield increases in labor income seven times greater than the cost of the program, as well as avoided operating costs at least equal to the cost of the program. Increased funding will allow the program to expand into more rural and more expensive-to-serve parts of the region.

## B. Manufacturing supplier network

### 1. Advance Supply Chain Connections

Cost/Benefit Analysis: Advancing supply chain connections will create new jobs as new and existing firms are able to serve upstream and downstream needs of other manufacturers. As an example of how an advancing supply chain impacts the regional economy, we assessed the impacts of the electric vehicle (EV) industrial cluster. These results exemplify investments in advancing supply chains, and can be replicated throughout the KTS.

**Cost:** In 2011, the Oregon Innovation Council funded Drive Oregon with \$1.2 million to accelerate industry growth.

**Benefit:** The small industry is growing rapidly, with growth in manufacturers of EVs, as well as growth in their suppliers. A 2013 report conducted by the Northwest Economic Research Center (NERC) found a high concentration of the EV industry in Oregon's manufacturing sector. NERC had to conduct primary research to identify the industries that make up the cluster, as the technology has yet to be incorporated in the North American Industrial Classification System. NERC estimated that the EV industry directly creates over 400 jobs and \$18.4 million in personal income. The industry grew about 20% between 2010 and 2012, and growth will continue as its supply chain becomes more integrated.

## C. Research and innovation

### 1. Catalytic Project-Advanced Wood Products Manufacturing Study: CLT Acceleration in Oregon and Southwest Washington.

Cost/Benefit Analysis: Currently, there is no production of structural CLT in the United States. We will conduct a feasibility study to identify and assess the manufacturing capacity and market development study of select Pacific Northwest communities leading to the development and adoption of CLT.

**Cost:** The feasibility study will cost \$200,000.

**Benefit:** Primary outcomes include: 1) assessing natural resource capacity; 2) identifying capable producers and local manufacturing capacity; 3) quantifying economic benefits; and 4) assessing and working to overcome barriers to market. Associated jobs that stem from the establishment of CLT facilities in the PNMP will yield increased jobs in the forest and wood products sector, where the average wage is \$49,700.

## D. Infrastructure and site development

### 1. Expand Industrial Land Readiness and Site Certification to more sites in more communities.

Cost/Benefit Analysis: The state of Oregon invested \$19 million on cleaning up 92 brownfield sites, to leverage additional funds to abate the properties for redevelopment.

**Cost:** State of Oregon investment: \$19,000,000.

**Benefit:** A 2014 analysis found that the economic activity on the redeveloped sites created jobs and tax revenue:

- The jobs on the redeveloped sites generate \$470 million annually in wages.
- The jobs on the redeveloped sites generate \$19 million annually in income tax revenue.
- The redeveloped sites generate \$10.5 million annually in property tax revenue.

### 2. Expand broadband services by providing dark fiber to key businesses.

Cost/Benefit Analysis: High quality telecommunications are an accelerator of economic development, providing infrastructure that increases worker productivity. There is unambiguous support for the fact that ubiquitous, low-cost broadband has a strong correlation to competitiveness and quality of life. Benefits include reduced costs to served businesses, increased productivity, and expanded service capability. The improved service will incent existing businesses to remain in the area and has the ability to attract new firms. Revenue from served businesses will cover the cost of installation, for lower fees than current service levels.

**Cost:** Installing fiber optic cable for a single building: \$38,000.

**Benefits:** Net present values of reduced service fees (10 years) for 50 buildings: \$1,580,000. Benefits include reduced costs to served businesses, increased productivity, and expanded service capability. The improved service will incent existing businesses to remain in the area and has the ability to attract new firms. Revenue from served businesses will cover the cost of installation, for lower fees than current service levels.

## E. Trade and international investment

### 1. Focus Initiative: Greater Portland Global

Cost/Benefit Analysis: Business Oregon, with grants from the state of Oregon and the U.S. Small Business Administration that fund export promotion, has supported 265 companies since 2013 to expand their exports.

**Cost:** Grants funded by State of Oregon and U.S. Small Business Administration since 2013: \$851,000.

**Benefit:** Value of immediate and projected exported sales: \$182,000,000

## F. Operational improvement and capital access

### 1. Increase funding to MEPS

Cost/Benefit Analysis: This summary shows OMEP's annual direct benefits within its current funding as independently reported by clients. These figures do not include comparable benefits stemming from Impact Washington's work in Southwest Washington. Expanding funding for operational improvement assistance will yield expanded benefits. OMEP and Impact Washington leverage significant private funding in their delivery of service. OMEP=\$1.0 million and growing. Business Oregon has made a specific investment in OMEP over the years =1.25 million in 2014 and 2015.

**Costs:** For OMEP – total program costs (2013 dollars) - \$3.1 million OMEP all sources (\$778,000 NIST Base [funding, \$625,000 State, and the balance Other Federal Grants and Client Service Fees. As stated earlier, NIST funding will increase to \$1.8 million starting in FY 2015-16.

**Benefit:** Annual benefit from 2012-2013 program activity (2013 dollars): Labor income: \$17,713,000. Output value from increase sales and reduced costs: \$38,836,000. Avoided costs associated with improved workforce practices and avoided investments: \$2,392,000. Associated state income tax and license revenue: \$1,916,000. Associated local government property tax and license revenue: \$1,036,000.

## 2. Focus Initiative: Post-innovation; early stage funding and next stage capital for commercialization

Cost/Benefits: A collaboration among Oregon universities, Pacific Northwest National Laboratory and industry, ONAMI was created to dramatically grow research revenue and accelerate commercialization of resulting technology in Oregon. One of ONAMI's major programs is a professionally managed commercialization gap fund. Since 2005, 32 new businesses have been created, with 132 FTE at startup, including 62 new patents.

**Cost:** State of Oregon investment (2005-2013): \$53,000,000.

**Benefits:** Federal awards and contracts: \$315,000,000. Private awards and contracts: \$130,000,000. Investment in startup companies total \$445,000,000.

*Our region is leading the nation in advanced wood products development. Our catalytic project, focused on Cross Laminated Timber (CLT), is representative of how Advanced Material Sciences presents a global opportunity to grow our natural resource-based manufacturing industries through innovation. The alignment of investments in research, innovation, technology development, and business incubation along with market demand for advanced wood products make the PNMP application ideally suited to be a successful designated Manufacturing Community.*

**Table 3. Performance Measurement and Impact Evaluation Table (Also Attempted through MAX Web-based Upload System)**

Name of Metric	Name of Project	Timescale of Metric	Frequency of Updates	Data Sources	Additional Information on the Metrics
Average wage in KTS clusters in PNMP region	Applies to entire Industrial Ecosystem	Short, mid, and long-term	Annually	EDA's cluster mapping tool ( <a href="http://www.statsamerica.org/innovation/anydata/">http://www.statsamerica.org/innovation/anydata/</a> )	See text
Average wage across all industries in PNMP region	Applies to entire Industrial Ecosystem	Short, mid, and long-term	Annually	EDA's cluster mapping tool ( <a href="http://www.statsamerica.org/innovation/anydata/">http://www.statsamerica.org/innovation/anydata/</a> )	See text
Number of jobs in KTS clusters in PNMP region	Applies to entire Industrial Ecosystem	Short, mid, and long-term	Annually	EDA's cluster mapping tool ( <a href="http://www.statsamerica.org/innovation/anydata/">http://www.statsamerica.org/innovation/anydata/</a> )	See text
Unemployment Rate in PNMP region	Applies to entire Industrial Ecosystem	Short, mid, and long-term	Annually	US Bureau of Labor Statistics	See text
Number of establishments in KTS clusters in PNMP region	Applies to entire Industrial Ecosystem	Short, mid, and long-term	Annually	EDA's cluster mapping tool ( <a href="http://www.statsamerica.org/innovation/anydata/">http://www.statsamerica.org/innovation/anydata/</a> )	See text
Percent of workers who enter employment or education within 6 months of program completion	Connecting Youth: Next Generation Manufacturing Workforce	Short-term	Annually	Implementing agencies	Workforce and training

Name of Metric	Name of Project	Timescale of Metric	Frequency of Updates	Data Sources	Additional Information on the Metrics
Number of workers who enter employment within 6 months of program completion	Connecting Youth: Next Generation Manufacturing Workforce	Short-term	Annually	Implementing agencies	Workforce and training
Number of workers who enter manufacturing employment within 6 months of program completion	Connecting Youth: Next Generation Manufacturing Workforce	Short-term	Annually	Implementing agencies	Workforce and training
Number of workers who receive manufacturing industry certifications	Manufacturing-Ready Certification	Short-term	Annually	Implementing agencies	Workforce and training
Number of employers that sign on to “preferred” certifications and recognized standards	Manufacturing-Ready Certification	Short-term	Annually	Implementing agencies	Workforce and training
Number of educational institutions offering industry certifications	Manufacturing-Ready Certification	Short-term	Annually	Implementing agencies	Workforce and training
Number of mid-management and executive workers that participate in leadership training programs	Expand Middle and Executive Manufacturing Expertise	Short-term	Annually	OMEPE, Worksystems Inc., and other workforce programs	Workforce and training
Retention rates of participants in leadership training programs	Expand Middle and Executive Manufacturing Expertise	Short and mid-term	Annually	OMEPE and Worksystems Inc., and other workforce programs	Workforce and training
Provide for 4 additional OEM engagements that affect at least 15 suppliers	Advance Supply Chain Connections	Short-term	Annually	NW Connectory, OMEPE, and IW	Manufacturing supplier network
Complete feasibility study	Advanced Wood Products Manufacturing Study: CLT Acceleration in Oregon and Southwest Washington	Short-term	One time	Oregon BEST	Research and Innovation
Summary of findings and assessment of statewide industrial readiness by region and key industries	West Coast Infrastructure Exchange (WCX)	Short-term	One time	Business Oregon	Infrastructure and site development

Name of Metric	Name of Project	Timescale of Metric	Frequency of Updates	Data Sources	Additional Information on the Metrics
Number of sites designated as Certified Industrial sites	Expand Industrial Land Readiness and Site Certification to more sites in more communities	Short, mid, and long-term	Annually	Business Oregon	Infrastructure and site development
Number of sites that are designated as "Decision Ready"	Expand Industrial Land Readiness and Site Certification to more sites in more communities	Short, mid, and long-term	Annually	Business Oregon	Infrastructure and site development
Number and acres of brownfields remediated through the Oregon Brownfields programs	Expand Industrial Land Readiness and Site Certification to more sites in more communities	Short, mid, and long-term	Annually	Business Oregon	Infrastructure and site development
Number of communities served by high capacity broadband	Expand broadband services by providing dark fiber to key businesses	Short, mid, and long-term	Annually	Business Oregon	Infrastructure and site development
Changes in exports and foreign direct investment	Greater Portland Global	Mid-term	Annually, through 2020	Brookings Institution and Business Oregon	Trade and international investment