CAPITAL OUTLAY PLAN FY2021 - FY2025

Updated November 1, 2019

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Introduction

For over 75 years, Henry Ford College (HFC) has been a leader in providing innovative education focused on student success. Located in Dearborn, Michigan, the school was originally named Fordson Junior College when it opened its doors in 1938. Later, the College adopted the name Dearborn Junior College in 1946. It became Henry Ford Community College in 1952, named after the Henry Ford Trade School which closed and whose assets were transferred to the Dearborn Public Schools Board of Education. In May 2014, the College was renamed Henry Ford College.

Henry Ford College is a comprehensive college providing both two and four year degrees. Educational opportunities for students include over 100 career and university transfer programs, pre-professional studies, associate's in science, associate's in applied science, and associate's in arts degrees, associate's in general studies, bachelor's in culinary arts, as well as certificates. The College website contains a complete listing of the over 100 academic programs offered. During the 2016-2017 academic year, HFC served 18,587 students (unduplicated headcount) which is equivalent to 9,032 full-time students. The average age of HFC students is 25 and 35% attend full time.

Since its founding in 1938, HFC has been the gateway to higher education for thousands of students seeking affordable, high-quality post-secondary education. HFC is a comprehensive public college serving about 13,000 students each fall and winter semester in southeast Michigan. HFC is dedicated to preparing students for a rapidly changing world and workplace by offering more than 100 associate degree career and university transfer programs.

HFC offers high-quality, innovative programs to meet the educational and training needs of the region. Students prepare to transfer to a university or prepare to go directly to work. HFC also specializes in customized workforce development training for business and industry.

HFC offers classes on two campuses situated in Dearborn. HFC's Main Campus is located on the southwest corner of Ford Road and Evergreen, north of the University of Michigan-Dearborn campus. The East Campus is home to HFC's Michigan Technical Education Center (M-TEC) and the state-of-the-art Nursing education facility.

On July 1, 2018, Mr. Russell Kavalhuna assumed the presidency of HFC, succeeding Dr. Stan Jensen who served the College since May 2013.

I. MISSION STATEMENT

Mission

Henry Ford College transforms lives and builds better futures by providing outstanding education. As a student-centered, evidence-based college, our success is measured by the success of our students. We empower learners through the development of independent, critical and creative thinking, and we foster diversity, inclusion, understanding, and acceptance to prepare learners to succeed in a global society. We anticipate and respond to the needs of our stakeholders, exceed their expectations and serve the public good.

Vision First Choice... Best Choice...

Values

We have a PASSION for...

- teaching and learning;
- exploring diverse perspectives and ideas;
- creating a student-centered environment;
- transforming lives through continuous learning; and
- excellence in all that we do.

We demonstrate INTEGRITY through…

- accountability;
- responsible stewardship;
- ethical conduct;
- honest dialogue; and
- sustainable practices.

We promote INGENUITY by…

- being agile, flexible, and responsive;
- rewarding discovery, creativity, and innovation;
- collecting, evaluating, and acting on evidence;
- thinking critically; and
- continuously reimagining the future.

We show RESPECT for one another when we…

- collaborate and rely on teamwork;
- celebrate diversity and inclusiveness;
- maintain transparent practices;
- show compassion and empathy; and
- are engaged and committed to our shared work.

II. INSTRUCTIONAL PROGRAMMING

A. Describe existing academic programs and projected programming changes during the next five years, in so far as academic programs are affected by specific structural considerations

Programs being re-designed in the next five years include Associate degrees and certificates in **welding, tool & die, transportation, distribution, and logistics, and mechatronics**. These program improvements require high tech classrooms and laboratories that are supported by a robust technological infrastructure. Henry Ford College is submitting a capital outlay project request for FY2020 in order to continue development of major academic initiatives described below.

Henry Ford College Innovation Institute/ Technology Building Renovation and Addition

Project Purpose:

At a recent task force meeting for Dearborn, Michigan's Chamber of Commerce, Ford Motor Company shared that driverless, electric, and fully connected autonomous vehicles (CAVs) would replace the city's downtown rapid transit, busses and taxis by the year 2021. Not since the first Model T cars rolled off Henry Ford's original assembly line has America witnessed the magnitude of such a transformation in human mobility. The advent of CAVs and the "smart cities" that will evolve around them will irrevocably change the ways America lives, works, and plays. Just as in Henry Ford's day, we find ourselves today at the quintessential intersection of rapidly emerging technologies and the innovative spirit of entrepreneurship. Science and business have become inseparable partners in "Imagineering" a future world marked by revolutions in manufacturing and industry as well as in the training of the highly skilled workforce necessary to continue to make "made in America" even possible.

Henry Ford College (HFC) is uniquely positioned to prepare today's students to become tomorrow's leaders in this ever-evolving technological arena, especially since the installation of cutting-edge industry-standard equipment made possible through the Community College Skilled Trades Equipment Program (CCSTEP). However, HFC's Technology Building is now over 50 years old. Significant renovation and expansion of the facility are urgently required to support the college's innovative programming and career training, bringing technology and entrepreneurial skills together in meaningful ways that address the changing needs of business and industry in Southeast Michigan.

The building, programming, maintenance, deployment, and business surrounding the development of CAVs will require the interdisciplinary collaboration of automotive technology, advanced manufacturing and fabrication, computer-aided design and engineering (CAD/CAE), robotics, mechatronics, welding, computer programming and networking, cybersecurity and information assurance, systems engineering, logistics, and entrepreneurial studies. Henry Ford College has been a leader in providing high quality educational and training opportunities in all of these fields. But, as HFC knows from its close working relationships with the Ford Motor Company, General Motors, Fiat Chrysler and many other partners in the manufacturing industry, the jobs of the future will require workers to acquire and mater skills that blend, intersect, combine, and juxtapose knowledge and capabilities in any number of these areas. The integration and convergence of these skills require a

radical rethinking of teaching and learning within, across and between these disciplines. Such innovations in curriculum and pedagogy, in turn, require the creation of new open, flexible and interactive learning spaces that facilitate collaboration and support both project- and competency-based education.

This project will transform HFC's Technology Building, enabling the college to meet the following objectives:

- Preparing students for successful careers in emerging technologies and skilled trades, especially those related to the industry and business of advanced manufacturing and the automotive field
- Providing talented workers to address the enormous and growing gap between high-tech jobs and the lack of qualified employees to fill them
- Meeting the needs of regional business and industry partners with regard to the "skills gap" between the skills current workers possess and those sought by potential employers
- Facilitating collaboration and interaction between various career, technical education, and business programs to enhance student learning and employability
- Developing and implementing cutting-edge pedagogy by advancing interdisciplinary, project- and competency-based learning
- Creating a "Maker Space" in which students, faculty, industry partners, and entrepreneurs can envision, design, build and test new ideas through hands-on, active-learning experiences
- Housing HFC's Advanced Manufacturing Early College, creating an effective learning environment for qualified high school students who, in turn, constitute an ongoing pipeline of future skilled talent
- Ensuring that HFC's Technology Building will be able to continue to support programming needs and student success for the next 50 years.

Scope of the project:

This project includes renovation of 18,000 square feet of the HFC Technology Building to improve and reconfigure existing laboratories, including spaces not significantly updated in over 50 years. Renovation will also address deferred maintenance on building systems operating well beyond their useful life, including structure, envelope, HVAC, lighting, electrical and plumbing. This project will allow for continued renovations initiated in 2015 as part of the State of Michigan Community College Skilled Trades Equipment Grant (CCSTEP).

Proposed new construction totaling 24,000 square feet will create multidisciplinary labs, renovated automotive labs, the business and entrepreneurial collaboration space needed to support changing programs and curricula, the regional demand for workforce training, as well as business and industry partnership initiatives. New construction will also improve building and program access and internal circulation, while addressing the lack of breakout/collaborative work spaces critical for student success.
Several of the programs and physical spaces that will be positively impacted by this project include:

1. **Transportation and Automotive Technology.** Working in partnership with the Ford Motor Company Service Division, the Ford ASSET program for training Ford Dealer technicians began at HFC in 1989-90 and is now provided in schools across the country through the Ford Motor

Company. In 2016, the department expanded its Dynamometer labs through the State Matching Equipment Grant to offer Dyno Technician certification in partnership with regional R&D Automotive Engineering firms. This project will provide additional vehicular lab space to continue support of this growing industry-driven program, especially through the emergence of connected autonomous vehicles (CAVs). The programs in Automotive Technology have been the cornerstone of competency-based educational practice at HFC since the early 1960s. The College has also purchased an additional Dynometer to meet the demands of the program.

2. **HFC Fabrication Lab:** The new Welding Program and Welding Lab and will join Precision Machining/CNC and Computer Aided Design (CAD) in one contiguous SuperLab space. This layout replicates many Design and Fabricate companies throughout Southeast Michigan, which allows students in programs such as CAD-CAM (Computer Aided Design-Computer Aided Manufacturing) to work and study as they do in industry.
3. **Product Development Center ("Maker Space"):** Originally designed for communities as prototyping centers for local entrepreneurship, "Maker Spaces" (also known as "Fab Labs") are increasingly being adopted by schools as centers for project-based, hands-on STEM related education, and by entrepreneurs to explore new business products. Students learn by solving problems through design, the creation of objects and products, and the testing of these ideas by addressing real world problems. A new HFC "Maker Space" will comprise industrial grade design, fabrication, and digital tools to allow students to develop product and concept models. They will use multiple digital tools, including those written by staff and researchers at the Massachusetts Institute of Technology's *Center for Bits & Atoms*. HFC will supplement the original Fab Lab technology (including 3D printers, laser cutters, and other high-quality modeling tools) with larger-scale production equipment that will allow students to build product components in prototype, and test production constraints through programs including CNC production manufacturing.
4. **Innovation, Entrepreneurship, and Business Skills Center.** This Center will occupy space adjoining multiple HFC Technology Labs. The future Small Business Management & Entrepreneurship Certificate will prepare students who are contemplating starting their own business, or who want to improve a business they currently own. The Center will focus on business development strategies and product refinement and will provide entrepreneurs with sound foundation skills in business success including: accounting and finance, customer service, marketing, management, and Entrepreneurial Networking in the 21st Century. Students will test their ideas and evaluate their success as a process to explore their business concepts with a business systems approach. Future entrepreneurs will need appropriate experience, skills, tools, space, and a sense of potential—all of which are components and targets of the Entrepreneurship and Business Skills Center and Certificate program. An Entrepreneur Acceleration Program will be headquartered within the Business Skills Center, offering programs at local high school career and technical education centers. These learning experiences will prepare students at the high school level to become the next generation of technology entrepreneurs.
5. **HFC Advanced Manufacturing Early College:** The groups of students in the Advanced Manufacturing Dual Enrollment program with Dearborn Public Schools and other schools will require additional space, since the program is only in its second year. By year five, student on-site participation will increase to 210 students.
6. **Improved Learning Spaces in the Technology Building:** Renovations include much-needed upgrades to at least nine existing classrooms and instructional labs to improve flexibility and connectivity to new and improved hands-on lab environments.

Program Focus of Occupants:

The renovated and expanded center will support over 3,250 students annually, including those in the college's 18 programs in Industrial Technology, programs in Information Technology and Computer Information Systems, dual-enrolled high school students in the HFC Advanced Manufacturing Early College, Secondary Education students preparing to teach industrial arts, and hundreds of apprentices in Industrial Technology and CIS programs that are employees from business and industry.

This program will enable technology and occupational education students to enhance their technological program skills as well as develop product and service ideas for business and industry. New course and certificate program learning outcomes will include: competencies of a successful entrepreneur, prototyping and rapid prototyping skills, developing and understanding intellectual property laws and business practices, 21st century business leadership skills, product production analyses, pitching a business to partners, investors and funding, sales and marketing skills, and business sustainability skills.

Technology-rich labs and learning environments will support project – and competency-based curricula. In these labs, students develop the middle-level job skills or skills in advanced technology and business essential for the economy. By having access to education through collaborative spaces and open labs, and working on projects defined by industry, students will develop the tools essential for integrating new learning practices in order-to become self-directed learners who are able to achieve their personal and professional goals as well as contribute directly to economic growth and development.

1. How does the project enhance the core academic and/or research mission of the institution?

The core academic mission of Henry Ford College is to provide exceptional occupational and transfer education opportunities to our community. Duly acknowledging the rapid speed at which both the business and industry sectors in Southeast Michigan are changing and evolving, Henry Ford College took bold and innovative steps to realign its entire academic structure for the start of the 2017-2018 school year. The previous traditional, multi-layered, siloed organization had more than 120 independent programs divided into multiple academic divisions that competed with one another for resources and students. The College regrouped academic programs into inter-related clusters within four new schools, which are designed to facilitate collaboration, promote interdisciplinary cooperation, create synergies, build connections, and provide learning communities that mirror the real world. These four new schools are:

- The School of Science, Technology, Engineering and Math (STEM)
- The School of Business, Entrepreneurship and Professional Development (BEPD)
- The School of Health and Human Services (HHS)
- The School of Liberal Arts (SoLA)

Due to the growing complexity and higher skill levels industry partners expect of their employees, HFC recognized the need to build bridges between career and technical education with the fundamentals of science and mathematics to best prepare students for jobs in the emerging technologies that continue to redefine our region's economic landscape. The School of STEM was designed to bring together programs, faculty, and students in the fields of physical sciences, biological sciences, math, and pre-engineering. This creates the dynamic and fertile environment necessary for students and workers to be successful in high-tech jobs. Similarly, the School of Business, Entrepreneurship, and Professional Development provides exciting and practical opportunities to blend computer and information technology, business and economics, culinary arts and hospitality skills into industrial technology courses. It also brings engineering, cybersecurity, and automotive students together to apply their learning on an industry-standard dynamometer. It unites students in HVAC, energy technology, architecture/construction, and environmental science classes around issues such as green building and sustainability. More significantly, the School of BEPD has brought for-credit training in business together with the College's programming in the workforce and professional development, economic growth and development, corporate college, and pre-apprenticeship.
All of this was undertaken to better align the College's academic offerings with the needs and expectations of business and industry. The realignment advances, reinforces, and supports the College's new, dynamic approach to integrated learning and career preparation.

The Industrial Technology programs at HFC share a joint mission centered upon providing educational experiences to plan, build, fabricate, and maintain the designed world. We offer instruction through hands-on interactive learning, utilizing the most relevant technologies found in working environments. We aspire to develop the mastery of skills that will supply business and industry with competent professionals for a future-driven technological society.
This project will provide critical elements for enhanced student success and mastery of real-world skills through the development of strategic spaces that fit the industry-driven, hands-on, project-based approach to learning. These Strategic Spaces will help students to:

- Take short, project-intensive courses that assure skills mastery and create the foundation for further skills development and greater topical knowledge.
- Give students real-world projects and problems that immediately transfer and apply to the world of work.
- Utilize industry-defined equipment and other advanced simulation-based learning tools.

- Create the opportunity for students to leverage the skills mastered and certifications achieved toward jobs and the creation of new businesses.
- Develop student confidence and technological areas of expertise that will be recognized by business and industry.

The Integrated Manufacturing Systems Troubleshooting Lab is an excellent example of these concepts in action. Students in the Multi-Skilled Manufacturing Maintenance associate degree program work on a complex sequential manufacturing system developed by collaboration with General Motors, Toyota, Ford Motor Company, BMW, and Nissan Motors. It is known as the AMTEC Integrated Manufacturing System (AIMS), and it requires the College lab to have 480V power to run the equipment, as in a typical manufacturing plant. This system replicates the core elements of sequence-based automated manufacturing. Students are given more complex problems or "faults progressively" as projects from their first course to their final course in the program. Learning how to troubleshoot systems is universally identified by manufacturers as the primary goal for maintenance employees. With this lab tool and curricula, students can troubleshoot and repair more than 80% of the common faults that stop manufacturing systems. Employers give universal praise to this instructional innovation, and they ask us to identify more students for their businesses.

Bringing New Product Development and Technology Skill Development Under One Roof

In looking at the rapid rate of new product development and business start-ups today, it is evident that there are many abundant opportunities and synergies when technology and entrepreneurship intersect. Public educational institutions must accelerate these successful start-ups and create greater access to business development skills for broader segments of our communities.

Higher education is becoming an incubator and accelerator for transferring knowledge and technology among people and organizations. This educational service is known as Transfer of Technology (TOT). Initiatives such as Ann Arbor Spark, Automation Alley, Bizdom, Build Institute, Detroit Creative Corridor (Creative Ventures Program), Green Garage, Oakland University/OU-Inc, TechArb (Ann Arbor/U of M), Tech Brewery, and TechTown are examples of higher-education, business, and industry technology transfer. This project expands TOT capabilities to institutions of applied learning like HFC and other community colleges that may be able to replicate the model.

Schools with the ability to support TOT and business start-ups encourage the creation of new product ideas, business analysis and start-up skills, and refinement of the personal vision of student entrepreneurs. As students achieve certifications in IT, Welding, CAD, HVAC, Additive Manufacturing, Industrial Sewing, Electrical Technology, or Automotive programs, their potential to envision a future for their own business can emerge.

A few examples of the new products and businesses envisioned by students already include:

- modularized bicycle manufacturing developed in the fabrication capstone projects of the Welding program;
- Human Machine Interface (HMI) Integration Kits for manufacturing systems in the Multi-Skilled Manufacturing Maintenance program;
- Internet of Things (IoT) system of interrelated computing devices, mechanical and digital machines, objects, animals, or people that are provided with unique identifiers (UIDs) enabling the transfer data over a network without requiring human-to-human or human-to-computer interaction;
- Automotive and HVAC technicians as start-up service businesses;

- 3-D product designs for automotive applications in the Design and CAD program.

This project generates an "Applied Entrepreneur's" library of skillsets and templates based on real business tools developed by successful enterprises that *"plan, build, fabricate, and maintain the designed world."* These skills become the competencies necessary to envision, implement, and evaluate each student's products, services, and business ideas. The best ideas can then become practical business start-ups and real-world applications of student learning. These experiences challenge students and accelerate their maturity, which is necessary for successful completion of an occupational associate degree or transfer to another educational institution for completion of a bachelor's degree.

2. How does the project support investment in or adaptive re-purposing of existing facilities and infrastructure?

This project will continue the renovation and repurposing of the Technology Building as indicated in the 2015 Campus Master Plan, updating it to meet the interdisciplinary needs of college programs. Henry Ford College has significantly invested in this facility and programs as its part of matching the State of Michigan Skilled Trades Equipment Grant. The College committed $1.2 million as a direct match to the grant to address renovation of the Technology Building space to accommodate the $4.5 million of equipment for use in advanced manufacturing, mechatronic, and automotive engine testing programs. The State has recently increased the original equipment grant funds by an additional $480,000 which will increase the equipment purchase to $5 million. To date, the local direct match for the equipment project is over $1.8 million. In addition to the direct expense match for the grant, an additional $1.1 million of indirect cost expenditures were committed to the grant which results in a commitment by Henry Ford College of $2.9 million in this building and its programs.

The College also recently spent over $480,000 to renovate the welding lab. The renovation includes space/station upgrades, new exhaust and air handling capabilities, and space upgrades to conduct demonstration areas as well as areas for hands-on instruction and training. Major welding equipment was also replaced with 18 multi-purpose welding booths and the development of welding fabrication work areas. The project-based learning strategies, expected to be more materials intensive, have turned out to significantly reduce scrap generation and therefore materials consumption by 15%. This is due to the increase in student awareness of their project work and therefore material use.

Many of the labs and classrooms in the existing Technology Building, whether in the original 1965 wing or the 1996 addition, were designed for a single use, a single skill, curriculum that is now outdated, and technologies that have changed dramatically over the last 50 years.

- Classroom renovations will create learning environments that meet the needs of a 21st century curriculum, with updated, technology and better integration with adjacent lab spaces.
- To support the goals of the Henry Ford College Entrepreneur and Innovation Institute/ Technology Building Renovation and Addition, renovations to existing offices and construction of a center for entrepreneurial support and development will transform outdated offices into a collaborative hub to better connect students, faculty and employers.
- The new Automotive Lab will connect to the existing, undersized high-bay automotive service lab, and engine testing areas. This will significantly improve the usability of the existing automotive lab and provide students in the industry-driven growing programs improved access to recently updated equipment and tool resources. The connected spaces will better simulate the students' future working environments and meet the training needs of the region's automotive dealerships and automotive Research and Design firms.
- The new Fabrication Lab will connect the existing welding/materials lab, machine tool/CNC manufacturing lab and CAD and Design Studios, transforming these individual spaces into an integrated center for product development, fabrication and manufacturing. Adjacent classrooms and breakout spaces will provide space for mentorship and quick problem solving.

The 2018 Facility Condition Assessment determined the Technology Building has a current replacement value of approximately $52,653,000 and a 5-year projected deferred maintenance

backlog of over $7,667,000, the majority related to HVAC, electrical and lighting. To reduce maintenance costs, this project will address a portion of the HVAC, electrical, lighting, hardware and finishes identified as due for upgrade or replacement. While many of these systems are at the end of their expected life, the building infrastructure is capable of supporting the improvements with minimal challenge.

Energy Learning Center

Project Purpose

Major transformations are underway in the way energy is being used, distributed, and sourced in the USA and globally. A combination of factors drives these changes. There are worldwide efforts to reduce carbon emissions from energy use to limit the effects of climate change. Energy and water systems in Michigan and beyond are being upgraded to improve flexibility and reliability and reduce environmental damage. Technological advances are enabling cleaner, cheaper, and more efficient energy and water use, distribution, and supply choices. Information technology is facilitating the continuous optimization of energy performance from supply to end-use. The result is growing and significant changes to the shape of energy systems in communities, neighborhoods, and industry. They are becoming more deeply integrated along with accelerated localization of clean and renewable energy supplies, including the productive use of energy currently being wasted.

Leadership in industry, commerce, significant institutions, communities, and various levels of government increasingly understand the opportunities and risks associated with energy use. The need to develop complete energy solutions that deliver breakthrough levels of efficiency, reliability, flexibility and environmental performance at lower day-to-day costs and overall economic risk is growing. The result is an increasing demand for new skills in tomorrow's workforce at all levels, a need that Henry Ford College aims to be uniquely positioned to serve.

Against this backdrop, the leadership of Henry Ford College developed an Integrated Energy Master Plan (IEMP) that represents global best practices in both its energy education and its energy performance in terms of energy efficiency, water efficiency, energy reliability, and reduced greenhouse gas emission, while achieving acceptable investment returns. These operating results will be achieved by substantial investments in control and metering, efficiency, restructured energy supply and distribution, and enhanced energy management. This will create a world-class "Living Classroom" upon which the College will extend its academic offering.

The Energy Learning Center will be incorporated in the Tech Building. The Center will be both configured as a teaching facility and be a modern operational facility. It will be designed as a visible statement of the College's energy leadership. The Center will manage and supply competitive, clean, and reliable energy from a portfolio of efficient sources. These include high-efficiency boilers and chillers, thermal storage, combined heat and power generation, along with significant solar power generation.

The College's energy solution combines the latest, proven technologies into a world-class flexible configuration that can evolve with ongoing changes over the coming decades. It will be a complete example of energy and carbon-efficient Smart Community on a small-scale.

The Energy Learning Center and the other elements of the campus as an "Energy Living Classrooms" will enable the College to offer services and education to meet the following objectives:

- Preparing students for careers in management and skilled trades associated with the planning, design, implementation, and operation of world-class integrated energy solutions.
- Providing talented workers to address the growing gap between the need of communities, industry, and other leaders to drive breakthrough improvements in energy performance and the lack of suitably qualified employees.
- Providing talented workers to fill the gap between the needs of local and global industry partners concerning the knowledge and skills gap of current workers and the growing market for integrated energy solutions.
- Providing early engagement and outreach to elementary and high-school students in Dearborn, greater Detroit, and Windsor to raise awareness and open-up energy-related career choices.
- Creating a "Reference Destination" for US and Canadian civic and industrial leaders, policymakers, trade associations, environmental groups, and other key influencers to experience a world-class neighborhood energy solution.
- Creating a flexible technology platform that can evolve as new technical and operating approaches are developed
- Providing the basis for collaboration with selected non-US colleges to ensure a global best-practice perspective is nurtured and maintained.

Creating a pervasive energy productivity culture whereby all staff, faculty, and students have a greater understanding of the importance of proper energy management such that their future personal and business decisions will be influenced.

Scope of Project:

The Energy Learning Center (ELC) Project includes the creation of a new energy center on about 7,000 square feet at the southern arc of the Tech Building, created using both repurposed space within the existing building and some external space. This will be designed as an architecturally distinctive, high-visibility campus feature, underlining the transformational approach the College will be taking to energy education. The entire campus energy use and supply will be accessible and controllable from the ELC both for teaching and operational purposes. The ELC will physically include a flexible mix of heating supply components serving the entire campus. These include combined heat and power generation, high-efficiency boilers, and thermal storage. Space will be organized and spaced to facilitate reference visits, teaching, and general engagement. Included in the space will be a dedicated classroom. Throughout the ELC, labeling, graphics, and electronic displays for engagement and teaching will be included.

The Project also includes installing a global-best practice municipal district heating network serving the entire campus using globally recognized (EN) standards for material and installation. This network connects to the ELC and will be used for demonstrating and teaching related to best-practice municipal district energy and be one of few facilities of its kind in the USA or Canada.

Also included in the ELC is the installation of best-practice standardized district energy sub-stations connecting the district heating network to each building. Again, these will be sited such that they are appropriate for demonstration and teaching. They will again be one of the very few examples in North America of the standardized approach used in many other parts of the world.

Strategies to include new district energy networks and local energy supply are increasingly considered in energy and climate plans for North American communities and campuses, in turn creating a demand for a suitably skilled workforce.

Including aspects that are more common in other parts of the world allows the College to serve the education and training needs of a transforming US and Canadian market, including global players looking to expand their North American activities.

The ELC, including the network and sub-stations, replaces existing inefficient boilers and a 60-year old high-temperature network with customized aging building connections. This will retire significant deferred maintenance and avoid future replacement in a few years.

Not included in the project, but forming part of the overall integrated energy solution managed and taught within the ELC will be the upgrading of the cooling supply and the installation of 500kW of solar photovoltaic generation on rooftops and parking structures.

The IEMP's academic focus includes realigned workforce training, technical certification, continuing education certificates, and potentially a new bachelor's degree program. The plan is designed to position the College as the destination for elementary and high-school students in Dearborn, greater Detroit, and Windsor, Ontario, as an innovative resource for raising energy and climate awareness, new career paths, and engaging future College students.

Program Focus of Occupants

The ELC will facilitate programs aimed at complementing or upgrading the awareness and skills of a wide range of full-time and part-time students, with the underlying goal to ensure adequate human resources are available to support and accelerate the transformations in the energy market.

Technical Certification on crucial elements of the integrated energy system. These would be focused on areas less common in the current US market. These will include:

- Building energy modeling and demand estimation
- Design of DE networks
- Site preparation for installing district energy networks
- Pre-insulated DE pipe welding and inspection
- Installing and commissioning DE sub-stations
- Installation and commissioning of CHP engines
- Multi-utility metering and sub-metering

These programs would serve the need of the employee needs of both local and global industry players looking to expand the US market. The College would finalize the design of these programs in partnership with the relevant industry players.

Continuing Education to enhance the understanding of integrated energy solutions and the approaches needed to evaluate implementation alternatives. These would be eligible for the appropriate professional CEUs but would generally not earn academic credits. Topics would include:

- Integrated Energy Master Planning basic techniques
- Relationship of Energy Master Plans to other municipal/campus plans
- District energy basics

- Optimizing neighborhood energy production and distribution systems
- Neighborhood energy planning for property developers
- Energy Planning for municipal leaders and staff
- Transformational versus incremental energy planning
- Industrial site energy planning
- Community energy planning
- Campus energy planning
- Comparison of global energy practices

These would be focused on students already in roles where new approaches to energy decision making are needed. They would also be appropriate for training sales, marketing, and project managers of industry players entering or operating in this market. They could also be attractive to students in unrelated employment looking to move towards the emerging multi-billion dollar global market resulting from energy transformation and climate change mitigation.

Bachelor's degree in Energy Production in the context of integrated energy solutions: The IEMP calls for the creation of the College's first bachelor's degree focused on Energy Production balanced between local and regional supply, and between thermal and electrical demands. A vital feature of this degree would be its emphasis on teaching global best practices with an active North American context, facilitated by international institutional and faculty team.

Education and Outreach to K-12 Schools in the Dearborn and neighboring communities: These programs would be aimed at increasing the understanding of energy basics, the risks, and opportunities around the use of energy, to attract a new generation to consider some aspect of the transforming energy market as a career choice. The ELC will be the platform for site visits.

Hosting Meetings: Aimed at institutions, associations, and corporations with a sustainable energy focus. The ELC will be a significant asset to support the campus as a preferred site for regular and ad hoc meetings. The College will structure a program to host such meetings on a professional basis.

1. How does the project enhance the core academic and/or research mission of the institution?

The core academic mission of Henry Ford College is to provide exceptional occupational and transfer education opportunities to our community. Duly acknowledging the rapid speed at which both the business and industry sectors in Southeast Michigan are changing and evolving, Henry Ford College took bold and innovative steps to realign its entire academic structure for the start of the 2017-2018 school year. The previous traditional, multi-layered, siloed organization had more than 120 independent programs divided into multiple academic divisions that competed with one another for resources and students. The College regrouped academic programs into inter-related clusters within four new schools, which are designed to facilitate collaboration, promote interdisciplinary cooperation, create synergies, build connections, and provide learning communities that mirror the real world. These four new schools are:

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of science and mathematics to best prepare students for jobs in the emerging technologies that continue to redefine our region's economic landscape. The School of STEM was designed to bring together programs, faculty, and students in the fields of physical sciences, biological sciences, math, and pre-engineering. This creates the dynamic and fertile environment necessary for students and workers to be successful in high-tech jobs. Similarly, the School of Business, Entrepreneurship, and Professional Development provides exciting and practical opportunities to blend computer and information technology, business and economics, culinary arts and hospitality skills into industrial technology courses. It also brings engineering, cybersecurity, and automotive students together to apply their learning on an industry-standard dynamometer. It unites students in HVAC, energy technology, architecture/construction, and environmental science classes around issues such as green building and sustainability. More significantly, the School of BEPD has brought for-credit training in business together with the College's programming in the workforce and professional development, economic growth and development, corporate college, and pre-apprenticeship.
All of this was undertaken to better align the College's academic offerings with the needs and expectations of business and industry. The realignment advances, reinforces, and supports the College's new, dynamic approach to integrated learning and career preparation.

The Industrial Technology programs at HFC share a joint mission centered upon providing educational experiences to plan, build, fabricate, and maintain the designed world. We offer instruction through hands-on interactive learning, utilizing the most relevant technologies found in working environments. We aspire to develop the mastery of skills that will supply business and industry with competent professionals for a future-driven technological society.
This project will provide critical elements for enhanced student success and mastery of real-world skills through the development of strategic spaces that fit the industry-driven, hands-on, project-based approach to learning. These Strategic Spaces will help students to:

- Take short, project-intensive courses that assure skills mastery and create the foundation for further skills development and greater topical knowledge.
- Give students real-world projects and problems that immediately transfer and apply to the world of work.
- Utilize industry-defined equipment and other advanced simulation-based learning tools.
- Create the opportunity for students to leverage the skills mastered and certifications achieved toward jobs and the creation of new businesses.
- Develop student confidence and technological areas of expertise that will be recognized by business and industry.

The Integrated Manufacturing Systems Troubleshooting Lab is an excellent example of these concepts in action. Students in the Multi-Skilled Manufacturing Maintenance associate degree program work on a complex sequential manufacturing system developed by collaboration with General Motors, Toyota, Ford Motor Company, BMW, and Nissan Motors. It is known as the AMTEC Integrated Manufacturing System (AIMS), and it requires the College lab to have 480V power to run the equipment, as in a typical manufacturing plant. This system replicates the core elements of sequence-based automated manufacturing. Students are given more complex problems or "faults progressively" as projects from their first course to their final course in the program. Learning how to troubleshoot systems is universally identified by manufacturers as the primary goal for maintenance employees. With this lab tool and curricula, students can troubleshoot and repair more than 80% of the common faults that stop manufacturing systems. Employers give universal praise to this instructional innovation, and they ask us to identify more students for their businesses.

2. How does the project support investment in or adaptive re-purposing of existing facilities and infrastructure?

This project will continue the renovation and repurposing of the Technology Building as indicated in the 2015 Campus Master Plan, updating it to meet the interdisciplinary needs of college programs. Henry Ford College has significantly invested in this facility and programs as its part of matching the State of Michigan Skilled Trades Equipment Grant. The College committed $1.2 million as a direct match to the grant to address renovation of the Technology Building space to accommodate the $4.5 million of equipment for use in advanced manufacturing, mechatronic, and automotive engine testing programs. The State has recently increased the original equipment grant funds by an additional $480,000 which will increase the equipment purchase to $5 million. To date, the local direct match for the equipment project is over $1.8 million. In addition to the direct expense match for the grant, an additional $1.1 million of indirect cost expenditures were committed to the grant which results in a commitment by Henry Ford College of $2.9 million in this building and its programs.
The College also recently spent over $480,000 to renovate the welding lab. The renovation includes space/station upgrades, new exhaust and air handling capabilities, and space upgrades to conduct demonstration areas as well as areas for hands-on instruction and training. Major welding equipment was also replaced with 18 multi-purpose welding booths and the development of welding fabrication work areas. The project-based learning strategies, expected to be more materials intensive, have turned out to significantly reduce scrap generation and therefore materials consumption by 15%. This is due to the increase in student awareness of their project work and therefore material use.
Many of the labs and classrooms in the existing Technology Building, whether in the original 1965 wing or the 1996 addition, were designed for a single use, a single skill, curriculum that is now outdated, and technologies that have changed dramatically over the last 50 years.

- Classroom renovations will create learning environments that meet the needs of a 21st century curriculum, with updated, technology and better integration with adjacent lab spaces.
- To support the goals of the Henry Ford College Entrepreneur and Innovation Institute/ Technology Building Renovation and Addition, renovations to existing offices and construction of a center for entrepreneurial support and development will transform outdated offices into a collaborative hub to better connect students, faculty and employers.
- The new Automotive Lab will connect to the existing, undersized high-bay automotive service lab, and engine testing areas. This will significantly improve the usability of the existing automotive lab and provide students in the industry-driven growing programs improved access to recently updated equipment and tool resources. The connected spaces will better simulate the students' future working environments and meet the training needs of the region's automotive dealerships and automotive Research and Design firms.
- The new Fabrication Lab will connect the existing welding/materials lab, machine tool/CNC manufacturing lab and CAD and Design Studios, transforming these individual spaces into an integrated center for product development, fabrication and manufacturing. Adjacent classrooms and breakout spaces will provide space for mentorship and quick problem solving.

The 2018 Facility Condition Assessment determined the Technology Building has a current replacement value of approximately $52,653,000 and a 5-year projected deferred maintenance

backlog of over $7,667,000, the majority related to HVAC, electrical and lighting. To reduce maintenance costs, this project will address a portion of the HVAC, electrical, lighting, hardware and finishes identified as due for upgrade or replacement. While many of these systems are at the end of their expected life, the building infrastructure is capable of supporting the improvements with minimal challenge.

B. The unique characteristics of HFC's academic mission include:

- **Over 100 associate degree programs** and **forty-five certificate programs** in career and technical fields.
- **Seventeen areas of study** and **nineteen associate degree** programs to serve the needs of transfer students.
- HFC has launched two new **early college/dual enrollment academies** in cooperation with Ford Motor Company. The first is a collaboration with Dearborn Public Schools and Henry Ford Health Systems on HFC's campus Health Careers Early College. The second located on campus Henry Ford Early College – Advanced Manufacturing in collaboration with Dearborn Public Schools and Ford Motor Company's Next Generation Learning initiative.
- HFC has established partnerships through the **Biotechnology Program** that include internships in biotechnology laboratories that are required for students in our Biotechnology AAS Program; HFC has many partnerships with regional employers, including Enzo Life Sciences, NSF International, and Wayne State University.
- A strong connection to **over thirty local school districts**. Dual enrollment and career exploration opportunities are available to high school students to help prepare them for post-secondary education and the world of work including the Downriver Career Technical Consortium, Advanced Technology Academy, and Detroit Public Schools Community District.
- **Articulation agreements** with Oakland University, Eastern Michigan University, Ferris State University, Madonna University, Siena Heights College, University of Michigan-Ann Arbor, University of Michigan-Dearborn, University of Detroit Mercy, Midwestern University-Chicago, and Wayne State University ensure transfer students experience a seamless transition to these colleges and universities.
- A **University Center** including partnerships with Madonna University, Sienna Heights and development of four additional partners to offer four-year degrees on the HFC campus.
- **Workforce development training** including customized on-site training for many regional organizations such as UAW Ford, Fiat Chrysler Automotive, AK Steel, and Infrasource. Working with a consortium of colleges, HFC assisted with the development of the **MS-AMC performance-based objectives for trade and apprentice education**.
- HFC was award a **Department of Labor grant** to develop a new learning paradigm that integrates competency-based learning into training and educational modules to enhance employee training programs for companies and colleges. The grant has been completed in 2017.
- The College is in its fifth year in collaboration with the **Detroit Scholarship Fund (DSF)**, putting in place retention and success initiatives that encourage completion among HFC students who are DSF recipients.
- The Office of **Military and Veterans Services** offers assistance to help veterans as well as active military and their families enroll and succeed at HFC.
- **Assisted Learning Services** provides accommodations to students with

disabilities through a number of support services. A Center for Teaching Excellence and Innovation for teacher development.

- HFC's radio station, **WHFR 89.3**, provides a real-world lab experience in telecommunication for HFCC students, to serve the needs of Dearborn and the surrounding communities.
- An **English Language Institute** that offers intensive preparation in English for English Language Learners, allowing them to move directly into college-level academic programs.
- An innovative, cutting-edge **developmental education program**, with a robust Learning Lab dedicated to student success, to develop the essential reading, writing, and quantitative literacy skills of students.
- A **Center for Teaching Excellence and Innovation** for teacher development.
- **Community engagement** including plays and concerts, hosting fund-raising activities for scholarships, open lecture and film series, conference and convention facilities, and dining facilities.

C. Identify other initiatives which may impact facilities usage

Stemming from the HFC Strategic Plan, the following objectives will affect facilities usage:

1. Develop new and revise existing programs to meet the expectations of the workforce including flexible, **innovative manufacturing education environments**.
2. Expand HFC degrees to include a **Baccalaureate Degrees** as opportunities become available (e.g., Energy Production and Nursing).
3. Obtained a $4.5 million equipment grant from the State of Michigan which includes a $1.2million facility renovation investment to accommodate the equipment for program delivery.
4. Create and expand local, regional, national and international partnerships and collaborations with business, governmental, non-profit, and educational institutions to create a **global institution**.
5. Develop and deliver **technology** training based on the assessed needs of students, faculty, and staff.
6. Ensure that the College's physical facilities, equipment, and technological **infrastructure** support fulfillment of the College's mission.
7. Promote **sustainability** and environmentally sound policy in facilities resource planning.
8. Include two (2) additional Early College Programs related to Educational Teaching and Trade and Apprentice Education in 2019.

In June 2017, the College initiated a project to develop an Integrated Energy Master Plan (IEMP) which when combined with the College's Facility Master Plan will provide an integrated approach to renovate facilities that meet "World Class" energy performance standards.

The Integrated Energy Master Plan (IEMP) was completed in March 2018 and is aimed at ensuring the College has world-class energy performance in terms of energy reliability, energy efficiency, greenhouse gas emissions and energy cost. This is a transformative plan aimed at reducing the energy and emissions footprint of the College by at least 50% to bring it in line with the global best practices. The targets for the IEMP were guided by US, Canadian and European

benchmark institutions. (Details in Appendix B)

An equally important goal of the IEMP will be to create new academic offerings including new courses, apprenticeships and internships. For this reason, the IEMP is co-sponsored by the VP of Finance & Administration and the VP Academic Affairs. In support of this aspect of the IEMP, the College Campus will be consciously configured as a "Living Classroom" to serve both the academic and operational aspects of the IEMP.

D. Demonstrate economic development impact of current/future programs

The 2017 study conducted by Economic Modeling Specialists, Intl., Figure 1, provides data strongly supporting the fact that the College has a significant impact in promoting economic development, enhancing students' careers, and improving quality of life. This study is in the process of being updated for 2019.

Fact Sheet

Demonstrating the Economic Value of Henry Ford College

Henry Ford College (HFC) creates a significant positive impact on the business community and generates a return on investment to its major stakeholder groups—students, taxpayers, and society. Using a two-pronged approach that involves an economic impact analysis and an investment analysis, this study calculates the benefits received by each of these groups. Results of the analysis reflect fiscal year (FY) 2016-17.

IMPACTS CREATED BY HFC IN FY 2016-17

ADDED INCOME	JOBS
$102 million	1,974
Operations spending impact	
$18.5 million	418
Student spending impact	
$762.4 million	10,799
Alumni impact	
$883 million	13,191
Total impact	

IMPACT ON BUSINESS COMMUNITY

During the analysis year, HFC and its students added **$883 million** in income to the HFC Service Area* economy, approximately equal to **0.4%** of the region's total gross regional product (GRP). This impact is equivalent to supporting **13,191** jobs. The economic impacts of HFC break down as follows:

Operations spending impact

- HFC employed 1,427 full-time and part-time employees in FY 2016-17. Payroll amounted to $62.4 million, much of which was spent in the HFC Service Area to purchase groceries, clothing, and other household goods and services. The college spent another $49.1 million to support its day-to-day operations.
- The net impact of college payroll and expenses in the HFC Service Area during the analysis year was approximately **$102 million** in income.

Student spending impact

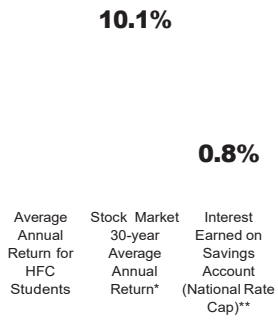
- Around 2% of students attending HFC originated from outside the region. Some of these students relocated to the HFC Service Area. In addition, a number of students would have left the region if not for HFC. These relocated and retained students spent money on groceries, transportation, rent, and so on at regional businesses.
- The expenditures of relocated and retained students during the analysis year added approximately **$18.5 million** in income to the HFC Service Area economy.

Alumni impact

- Over the years, students have studied at HFC and entered or re-entered the workforce with newly-acquired skills. Today, thousands of these former students are employed in the HFC Service Area.

*The HFC Service Area is comprised of Macomb, Monroe, Oakland, Washtenaw, and Wayne Counties.

STUDENT RATE OF RETURN



* Forbes' S&P 500, 1987-2016.

** FDIC.gov, 7-2017.

For every **$1** spent by…

STUDENTS

$4.20

Gained in lifetime earnings for STUDENTS

TAXPAYERS

$8.90

Gained in added taxes and public sector savings for TAXPAYERS

SOCIETY

$15.30

Gained in added state revenue and social savings for SOCIETY

- The impact of former students currently employed in the regional workforce amounted to **$762.4 million** in added income during the analysis year.

RETURN ON INVESTMENT TO STUDENTS, TAXPAYERS, AND SOCIETY

Student perspective

- HFC's FY 2016-17 students paid a total present value of **$34.1 million** to cover the cost of tuition, fees, supplies, and interest on student loans. They also forwent **$116.2 million** in money that they would have earned had they been working instead of learning.
- In return for the monies invested in the college, students will receive a present value of **$633.2 million** in increased earnings over their working lives. This translates to a return of **$4.20** in higher future earnings for every $1 that students invest in their education. The average annual return for students is **15.6%**.

Taxpayer perspective

- In FY 2016-17, state and local taxpayers in Michigan paid **$41 million** to support the operations of HFC. The net present value of the added tax revenue stemming from the students' higher lifetime earnings and the increased output of businesses amounts to **$349.1 million** in benefits to taxpayers. Savings to the public sector add another **$16 million** in benefits due to a reduced demand for government-funded services in Michigan.
- Dividing benefits to taxpayers by the associated costs yields a 8.9 benefit-cost ratio, i.e., every $1 in costs returns **$8.90** in benefits. The average annual return on investment for taxpayers is **26.2%**.

Social perspective

- The economic base in Michigan will grow by **$3.7 billion** over the course of the students' working lives. Society will also benefi from **$56.6 million** in present value social savings related to reduced crime, lower unemployment, and increased health and well-being across the state.
- For every dollar that society spent on HFC FY 2016-17 educations, society will receive a cumulative value of **$15.30** in benefits, for as long as the FY 2016-17 student population at HFC remains active in the state workforce.

III. STAFFING AND ENROLLMENT

A. Describe current full and part-time student enrollment levels by academic program and define how the programs is accessed by the student

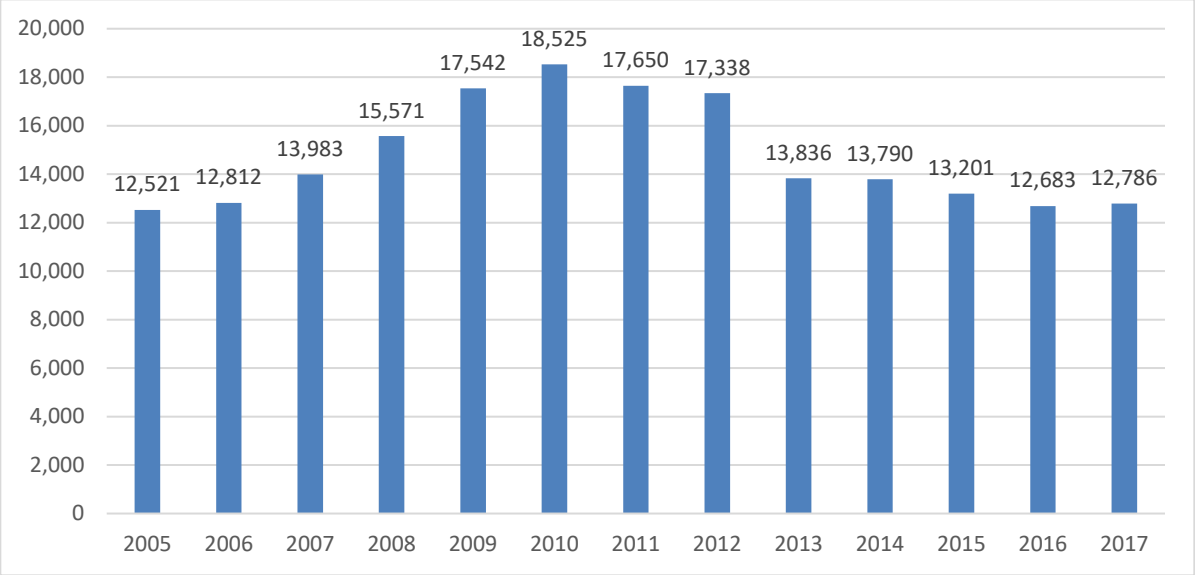
In-district enrollments (serving the City of Dearborn and parts of Dearborn Heights) comprise approximately 36% of the unduplicated headcount. Out-of- district enrollments represent approximately 64% of overall enrollment.

The majority of academic programs are accessed through on-campus instruction at the main campus. The nursing program is located at the East Campus. On-line courses have increased and account for approximately 10% of sections offered. Training programs for business and industry are provided either at the worksite or at the M-TEC facility on east campus.

B. Enrollment Patterns over the last five years & projected enrollment pattern for the next five years

Enrollment trends state-wide in community colleges showed increases from 2008 through 2010. HFC had been fortunate to participate in this upward trend and served 18,525 students in the **Fall semester** of 2010. From the start of the growth period, 2005, through fall of 2010, students increased from 12,521 to 18,525 for an increase of 24%. Since that time, enrollment has declined consistently with the inverse relationship enrollment has with the rebound of the national economy. Table 1 below illustrates Fall HFC enrollment over the period of 2005 – 2018.

TABLE 1
HFC FALL ENROLLMENT, 2005-2018
AS REPORTED TO IPEDS



HFC is breaking new ground in meeting the needs of students in terms of customer satisfaction as well as degree completion. Agreements with transfer colleges and universities, training and retraining programs, and an emphasis on distance education will be a few of the strategies used to grow and create new programs and services. Programs will be made more accessible by offering more flexible scheduling of classes, including weekend College programs, and by offering more courses and ultimately programs on-line.

Despite the expected decline in enrollment due to the strength of the economy, HFC is making significant efforts to mitigate the decrease by increasing marketing and recruitment efforts, including international and global relationships which will increase enrollment, and revising policies and procedures to enhance the student experience at HFC, including efforts to ensure posted class offerings will be provided. The College forecasts an annual .5% increase in enrollment over the next five years.

An emphasis on recruitment and retention efforts will remain strong and environmental scanning efforts will ensure that the College continues to offer programs that meet the needs of students and the community.

The College has expanded its presence in Early College programs to where over 15% of the teaching is done on campus for K-12 students.

C. Provide instructional staff/student and administrative staff/student ratios for major academic programs

In the nursing program, the faculty to student ratio is about 1:26 and the administrative staff to student ratio is about 1:176. For the health careers programs, the faculty to student ratio is about 1:28 and the administrative staff to student ratio is about 1:140. In the computer information systems program, the faculty to student ratio is about 1:25 and the administrative staff to student ratio is about 1:166.

D. Project future staffing needs based on five-year enrollment estimates and future programming

Based on enrollment projections, it is estimated that the total number of adjunct faculty will shrink as the total number of sections declines in certain areas. However, with the addition of new programs, it will be necessary to continue to attract highly qualified full-time faculty in high demand areas including culinary arts, manufacturing and health careers. Retirements in some areas allow for the vacancies to be utilized in areas where students demand has increased.

E. Identify current average class size and projected average class size based on institution's mission and planned programmatic needs

It is the policy of the College that the minimum class size is fifteen students. The average class size is twenty students. This, of course, varies according to the nature of the program or type of course. For example, it is appropriate that certain types of general education courses seat thirty students per section. However, more difficult courses or technical courses that require particular labs are appropriately run with fewer students. At times, a class of less than fifteen students is offered if a group of students need a course during a particular semester in order to graduate.

No change is projected to this policy or average class size. It is the mission of the community

college, in general, and Henry Ford College, in particular, to offer small class sizes. This aspect differentiates the community college from the four year university where a class size of 100 is not unusual. Henry Ford College students are provided more individual attention from faculty and support services.

IV. Facility Assessment

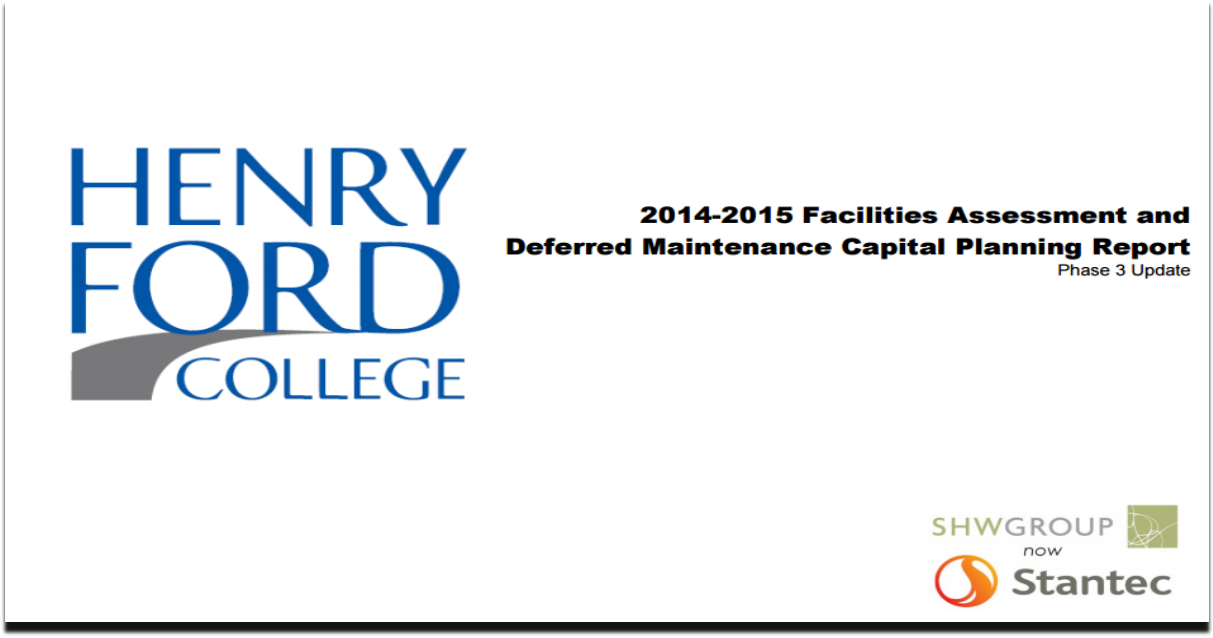
A professionally developed comprehensive facilities assessment is required.

Henry Ford College engaged Stantec, Inc. (formerly SHW) to facilitate the Master Facilities Planning process which included a facility assessment, utilization plan, and updated master plan. This initiative supports HFC's mission and strategic plan by ensuring the College provides an outstanding environment in which to deliver high-quality academic programs.

HENRY FORD COLLEGE CAMPUS MASTER PLAN 2015

COMPREHENSIVE FACILITY ASSESSMENT:
Click on the link or report icon below to review the comprehensive facility assessment in accordance with categories outlined in "net-to-gross ratio guidelines for various building types," DMB-Office of Design and Construction Major Project Design Manual, appendix 7.

2014-2015 FACILITIES ASSESSMENT & DEFERRED MAINTENANCE CAPITAL PLANNING REPORT Updated October 12, 2018



The HFC Facilities Assessment of over 750,000 square feet and 206,000,000 replacement value has yielded a Facility Condition Index (FCI) of POOR (FCI > 10%) with respect to Priority 1-3. That is, the total value of projects that will require attention within the next five years including those that require immediate attention in order to maintain facilities and related infrastructure for safe use. The buildings identified as having significant issues include the Library, Bookstore, Technology, Liberal Arts, and Physical Fitness buildings.

Major progress has been made in addressing the maintenance issues of the buildings since2018. Appendix F identifies some of the specific priority repairs required while Appendix H identifies outstanding priority projects for priority one at $5,510,002 for 2018 while Appendix H identifies priority 1-3 outstanding projects at $24,004,002 at the end of 2018.

HFC BUILDING CONDITION

KEY

FCI < 5%	Good
FCI 5% - 10%	Fair
FCI > 10%	Poor
To Be Assessed	

The Current Replacement Value (**CRV is** the cost to construct a replacement building in today's dollars), the Deferred Maintenance Backlog (**DMB**), and the Facility Condition Index (**FCI**) (DMB/CRV) is shown below for fiscal year 2017-2018:

Facility Current Replacement Value (CRV)	Annual Estimate to Maintain (2% of CRV)
$283,416,000	$5,668,000
PRIORITY 1: CURRENT YEAR	**PRIORITIES 1-3: TOTAL THROUGH YEAR FIVE**
Facility Condition Index (FCI)	**Facility Condition Index (FCI)**
1.9%	8.5%
Deferred Maintenance Backlog (DMB)	**Deferred Maintenance Backlog (DMB)**
$5,510,000	$24,004,000

CLASSROOM UTILIZATION

Detailed information regarding classroom utilization can be found on pages 52-54 of the Master Plan.

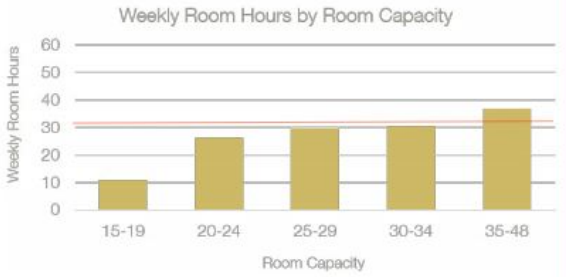
CLASSROOM UTILIZATION

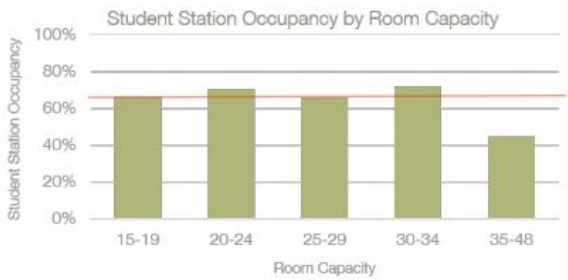
Of the 120 classrooms on campus, the majority are located in the Liberal Arts building. Built in 1963, this building is generally perceived to be in poor condition and badly in need of infrastructure, finish and layout improvements. Of the classroom spaces on campus, those located in the Liberal Arts building are on average undersized, coming in at 21 Assignable Square Feet per Student Station (ASF/SS), as compared to the target of 22-48 ASF/SS.

Building	Number of Rooms	Total Area	Average ASF/SS	Average Weekly Seat Hours	Average Weekly Room Hours	Student Station Occupancy
ATHL	2	2,015	47	27.7	32	82%
FA	8	5,350	31	19.8	22	90%
HCEC	21	18,072	26	20.5	30	67%
LA	57	35,167	21	22.8	32	73%
LRC	1	712	40	27.8	38	74%
SC	2	1,785	43	11.3	25	42%
SCI	7	7,678	26	15.7	36	48%
TECH	22	16,705	32	10.9	19	59%
Total	120	87,483	26	19.6	29	69%

Classrooms included in this study averaged 29 Weekly Room Hours across the campus, with an average Student Station Occupancy of 69%. Classrooms with smaller capacity are used less frequently during the week, but have a higher occupancy rate when they are scheduled. The larger rooms were used more frequently, but with a lower occupancy rate. These averages are not too far off from the target Weekly Room Hours of 32 and Student Station Occupancy of 65%.

Additionally, with an average 26 Assignable Square Feet per Student Station (ASF/SS), HFC is well within the target range of 22-48 ASF/SS, although at the low end of that range. This wide range allows for different types of classrooms with different furniture needs and set ups, with the smaller end of the range being appropriate for lecture halls with fixed seating, and the larger end being geared towards flexible classrooms with movable furniture.





1. **Mandated facility standards for specific programs, where applicable (i.e. federal/industry standards for laboratory, animal, or agricultural research facilities, hospitals, use of industrial machinery, etc.)**

   In the science program, laboratories must meet standards set by the Department of Transportation (chemical labeling), OSHA (workplace safety) and the EPA (chemical disposal). Chemicals are handled according to prudent practices for academic chemical laboratories, with emphasis on pertinent local, state, and federal regulations. All faculty go through yearly lab safety training.

   The Science Division has a part-time chemical lab technician who is in charge of chemical inventories and lab safety. Standardized inventory and labeling have been implemented to comply with workplace safety and chemical labeling regulations.

   The technology programs that teach the use of industrial machinery follow OSHA regulations such as those requiring personal protective equipment, machine guards, and designation of operator areas.

2. **Functionality of existing structures and space allocation to program areas served**

   Programs being revised in the next five years include Associate degrees and certificates in **transportation, distribution, logistics, and mechatronics**. These program improvements require high tech classrooms and laboratories that are supported by a robust technological infrastructure. Henry Ford College is submitting a capital outlay project request for FY2020 in order to continue development of major academic initiatives described below.

3. **Replacement value of existing facilities (insured value of structure to the extent available)**

   A report provided by R. A. Schettler, Inc., listing the Replacement Value New and the Sound or Depreciated Value of all buildings at HFC (dated 10/2018) and is included in Appendix D. Building age and size data is included in Appendix E.

4. **Utility system condition (i.e., heating, ventilation, and air conditioning (HVAC), water and sewage, electrical, etc.)**

   The current systems provide sufficient heating, cooling, ventilation, and other utilities to meet occupant needs under most operating conditions.
   However, the Facilities Assessment and Deferred Maintenance Capital Planning Report has identified **major issues in life expectancy and potential immediate system failures**.

   See Facilities Assessment & Deferred Maintenance Capital Planning Report 2018.

5. **Facility infrastructure condition (i.e., roads, bridges, parking structures, lots, etc.)**

The College has completed the redesign and reconstruction of all parking lots at the Evergreen site. This includes a new storm water improvement system that significantly benefits the Rouge River which receives storm water runoff. Additional investment in 2014, 2015, 2016, 2017 and 2018 was made in sealing and preventative maintenance of the parking lots of both the Main and East Campuses. Extensive upgrades and repairs of concrete walkways were made in 2014, 2015, 2016, 2017, 2018 and 2019 at both Main and East Campus. Roof replacements were also completed. Included in Appendix F is the listing of building repair priorities.

6. **Adequacy of existing utilities and infrastructure systems to current and five-year projected programmatic needs**

The electrical system at the Evergreen site includes many components that—after more than forty years of use—have exceeded their useful life. A plan was been developed to replace much of this infrastructure and to convert from 4800-Volt to 13.2 kva feeders as recommended by the local electricity provider. The electrical project related to the North Loop feeder should be completed by 2025. 90% of the North Feeder loop upgrade to 13.2 kva was completed with an additional section covering the Facilities Building and Powerhouse. The final phase of the North Loop upgrade includes the Tech Building Feeder and return to the Main Vault. The Liberal Arts substation was completely replaced.

7. **Does the institution have an enterprise-wide energy plan? What are its goals? Have energy audits been completed on all facilities, if not what is the plan/timetable for completing such audits?**

There is opportunity for improvement in the area of energy use/efficiency. A subcommittee comprised of facility personnel as well as faculty in the Energy Technology Program has been formed to investigate the potential for savings under performance management contracting.

Where appropriate, and as funds become available, energy audits of several buildings will be completed when possible to assist in identifying opportunities for future savings.

Also, the College has completed an Integrated Energy Master Plan (IEMP) the comprehensive energy savings plans for the campus. Institutional Energy Mater Plan (IEMP) will define building and system improvements linked to the Colleges Facilities Master Plan.

The Integrated Energy Master Plan (IEMP- Appendix B) launched in June 2017 was

completed in March 2018 and is aimed at ensuring the College has world-class energy performance in terms of energy reliability, energy efficiency, greenhouse gas emissions and energy cost. This is a transformative plan aimed at reducing the energy and emissions footprint of the College by at least 50% to bring it in line with global best practices. The targets for the IEMP were guided by the US, Canadian and European benchmark institutions.

The IEMP creates a detailed integrated technical, environmental and economic model of College's energy use from end-user through campus distribution and supply with an outlook of about 20 years. Various scenarios of end-use efficiency, smart-campus control and measurement networks, electrical and thermal distribution and on-site clean and renewable supplies are evaluated against different regulatory and cost risk. The Scenario that best meets all the transformative targets will be adopted by the College as the implementation road-map with year-on-year investments in energy infrastructure and the associated technical and economic performance.

The implementation of the IEMP includes changes in energy management practices and energy-related procurement. The aim is to build in continuous improvement around energy performance. Changes in procurement policies will also ensure new construction (including the major expansion of E building), renovation,, retrofits and energy infrastructure meet the highest possible levels of efficiency measured against comparable examples anywhere in the world.

The College's enterprise-wide energy plan depends largely on the age of the building and the details of their particular heating/cooling systems as follows:

- Construction/renovation to current energy code standards. This applies to the renovated science building (2011) as well as the new addition to the Science Center (2012) and the Welcome Center (2012).
- Retro-commissioning of relatively new buildings with modern controls as funds become available. These include the Heath Careers Education Center (1999) and the M-TEC building (1999).
- Retro-fitting of temperature controls for the Administrative Services and Conference Center (1979) as funds become available.
- Major renovation of older buildings including complete renovation of mechanical systems as is being considered for the liberal arts building (1960).
- Renovations of buildings and rooms include the use of low energy LED lighting systems and occupancy sensors.

The main campus central heating and cooling plants are given special attention with regard to energy consumption. Capital requests are being considered for replacement of a 25-year old central chiller and a 52-year old central boiler with a more efficient and flexible modern units. The chiller replacement plan includes replacing the 1960s era cooling tower with a modern, energy efficient cooling

tower, which was completed April 2017.

The Facilities Services Staff are dedicated to managing the mechanical systems with an eye to saving energy as much as possible. We retain a building controls firm who provides us with regular services to maintain our Building Management System and assist us with technical support as we improve the system.

The College is currently in the negotiation phase for a provider to implement the $23.2 million IEMP project.

8. **Identify Land owned by the institution, and include a determination of whether capacity exists for future development, additional acquisitions are needed to meet future demands, or surplus land can be conveyed for a different purpose**

Included in Appendix F is a map of the main campus of the College. The southern property line is shared with University of Michigan-Dearborn and the Gabriel Richard Campus Ministry Center. The eastern border flanks Evergreen Road and provides the major vehicular entry points to the campus roadway systems and parking facilities. Immediately east of Evergreen Road is land owned by the Ford Motor Land Development Corporation, the Fairlane Town Center, and Fairlane Meadows. The western facilities boundary is created by the Rouge River watershed, controlled under the jurisdiction of Wayne County. The northern property line is Ford Road (M-153).

Despite these space limitations, it is considered important to protect and preserve as much open space as possible, particularly space adjacent to buildings and building additions.

At this time, it is determined that additional acquisitions are not needed to meet the need of future demands.

9. **What portions of existing buildings, if any, are currently obligated to the State Building Authority and when these State Building Authority leases are set to expire**

Student and Culinary Arts Center	2028

V. IMPLEMENTATION PLAN

The Five-Year Capital Outlay Plan should identify the schedule by which the institution proposes to address major capital deficiencies, and:

1. **Prioritize major capital projects requested from the State, including a brief project description and estimated cost, in the format provided.**

   Based on the assessments described above, Henry Ford College has established the following projects which are listed in priority order:

   a. **Technology Building**: **The Center for Innovative Manufacturing Education (CIMed)**
   b. **IEMP**: **Integrated Energy Master Plan**
   c. **Library**: **Student Success Center**

   Detailed descriptions of the projects listed above are included in Appendix A and B to this document.

2. **If applicable, provide an estimate relative to the institution's current deferred maintenance backlog. Define the impact of addressing deferred maintenance and structural repairs, including programmatic impact, immediately versus over the next five years**

   The 2014-2015 (Updated in 2018) Facilities Assessment and Deferred Maintenance Capital Planning Report includes facilities issues according to their impact on health and safety, accessibility, code compliance, potential for stopping further deterioration of facilities, and impact on the learning environment.

   Due to the severity of the infrastructure failings, the College continues to budget as much as possible to address these issues on an annual basis.

   The findings of the **Technology Building** analysis include:

   - The roof is past its useful life and needs to be replaced.
   - Precast concrete panels, sill and tees show signs of spalling and cracking.
   - Lay in ceiling and carpet are past their useful life.
   - HVAC units operate all night to keep building warm in winter.
   - Dual-duct boxes and distribution equipment is original and past useful life.
   - Use of fire dampers in corridors is inconsistent and doesn't meet code.
   - Cast iron drain pipe and domestic water pipe are past useful life.
   - Electrical panels and lamps are past useful life.

Vital Statistics

Technology Building

Use Type(s): classrooms, labs, offices

Built: 1964 with an addition built in 1993

Area: 169,848 GSF

Floors: 2

Building Description:

The structural system consists of concrete beam and column structure and limited areas of steel frame construction. The façade is a combination of precast concrete panels, concrete, brick, glass and metal siding. The roof of the original building is a ballasted roof which is + 20 years old. The roof of the new addition was replaced in 1995 and is reported to be in good shape.

Observation Highlights:

- The roof is past its useful life and needs to be replaced.
- Precast concrete panels, sills and tees show signs of spalling and cracking.
- Lay-in ceilings and carpet are past their useful life.
- HVAC units operate all night to keep building warm in winter.
- Dual-duct boxes and distribution equipment is original to the building and well past their useful life.
- Use of fire dampers in corridors is inconsistent and doesn't meet current code.
- Cast iron drain piping and domestic water piping are past their useful life.
- Electrical panelboards and fluorescent lamps are past their useful life.

SHWGROUP now Stantec

CRV

$50,105,000

Priority 1	Priority 1-3
FCI	**FCI**
6.5%	16.5%
DMB	**DMB**
$3,238,000	$8,273,000
DMB EXCESS	**DMB EXCESS**
$ 733,000	$5,768,000
Over APPA 5% benchmark	Over APPA 5% benchmark

MAINTAIN DMB

$1,002,000

Annual cost to maintain current DMB

44

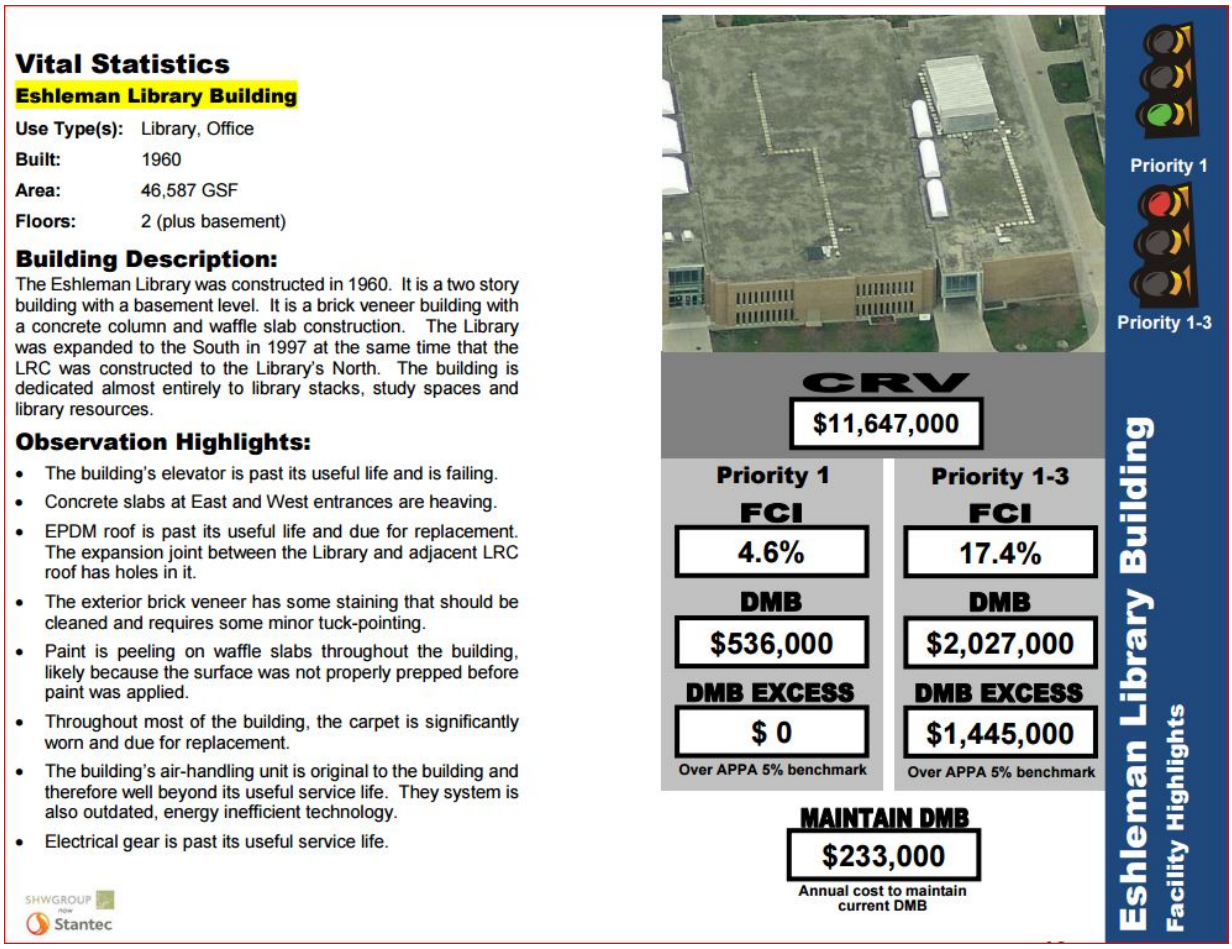
Priority 1

Priority 1-3

Technology Building
Facility Highlights

The findings of the **Eshleman Library** analysis include:

- Air handling unit is original to the building and is beyond useful life. It is outdated, energy inefficient technology and must be replaced
- Concrete slabs at East and West entrances are heaving.
- EPDM roof is past useful life and due for replacement (Note: the College continues to address immediate health and safety issues and has replaced the roof during the summer of 2017).
- Exterior brick veneer is stained and needs tuck-pointing.
- Carpet is significantly worn and needs replacement.
- Electrical gear past its useful service life has been replaced.



3. Include the status of on-going projects financed with State Building Authority resources and explain how completion coincides with the overall Five-Year Capital Outlay Plan

There are no current projects financed with State Building Authority resources. The College has been authorized by the State to initiate the design phase for the Technology Building.

4. Identify to the extent possible, a rate of return on planned expenditures. This could be expressed as operational "savings" that a planned capital expenditure would yield in future years.

Studies indicate that campus facilities and appearance are among the top reasons for students choosing a college. Therefore, modern and attractive facilities and classrooms will have significant impact on recruitment and retention. The experience and education students will receive will positively benefit local, state, national, and global employers as demonstrated by the Economic Modeling Specialist Data. The highly skilled workforce will contribute to the economic development of the areas in which the students become employed. With the

completion of the Integrated Energy Master Plan (IEMP), any modification and upgrades have been benchmarked to yield an ROI of 7%.

5. Where applicable, consider alternatives to new infrastructure, such as distance learning

The distance learning program at HFC is being reviewed vis-à-vis the long-range strategic goals of the college. The Board of Trustees is allocating resources for research, personnel and ultimately development of the *Online at HFC* College. In essence, the College is developing and implementing a brand new, sustainable, quality first, structure and model focused on student success. To achieve this, a new structure will be established, quality standards will be guaranteed prior to publication, evaluations will be regularly conducted, student learning will be easily evaluated, student services will be embedded, and sustainability measures will be set. However, the growth of distance education programs will not reduce the physical space needs of the face-to-face delivery of instruction at HFC.

6. Identify a maintenance schedule for major maintenance items in excess of $1,000,000 for fiscal year 2021 through fiscal year 2025.

There are no major maintenance items in excess of $1,000,000 planned other than the IEMP project for improving the College energy usage by 60%.

7. Identify the amount of non-routine maintenance the institution has budgeted for in its current fiscal year and relevant sources of financing

For 2019-20 the College has budgeted from operations approximately $1,100,000 for non-routine maintenance.

Upgraded Colleges WIFI network and Groupwise E-mail system funded through the Colleges Technology Fee in fiscal 2019.

Upgrade to the SME south building for provided added space for Dual Enrollment. (Rental to be changed to Dearborn Public Schools to recoup costs of renovation.) This process won't take effect until FY 2023.

Technology Building: The Center for Innovative Manufacturing Education (CIMed)

Excerpt from the HFC National Science Foundation Grant Application, October 2015:

Critical Issues Facing Education for Advanced Manufacturing Worker Development

A study of student workforce readiness conducted by the Lumina Foundation found that 96% of college academic officers felt that students were prepared for the workforce upon graduation, while only 11% of business leaders agreed (Lumina, 2015). Also highlighted by Baumann et.al (2014), there is a **gap between the skills students acquire and the skills employers need** them to have. This is particularly evident in the **U.S. manufacturing sector** where the skills gap continues to grow, not because of worker shortages, but because educational competencies are not aligned with those needed in the workplace.

Open-Lab Platform

"Traditional educational models are not designed to serve the population most needing postsecondary education. We keep trying to wedge nontraditional students into inflexible educational structures that were built for 18 to 22 year olds and have barely changed in almost a millennium." (Browser, 2014) The implementation of Common–Performance Based Objectives through the Open Lab Platform (OLP) will allow Competency Based Education to reach full potential by addressing "accessibility, affordability, transparency, and improved learning outcomes - all relevant to graduates' employability and strengthening of the workforce" (Book, 2014). The OLP will build upon best practices and lessons learned from other institutions. This is critical, because research on improving CBE's effectiveness indicates it must be supported by other innovations in design, delivery and assessment including:

- Student centered learning, in terms of flexibility and personalization (Klein-Collins, 2013).
- The ability for students to study at a variable, customized pace and receive consistent faculty support (Johnstone and Soares, 2014).
- (Create) sustainable learning resources, available at any time (Johnstone and Soares, 2014)
- Redefine(ing) the role of faculty since their role will change and insuring faculty develop CBE expertise (Mendenhall, 2012) (Cavanaugh, 2013) (Le, Wolfe, and Steinberg, 2014)
- (Create)Valid, reliable assessments (Mendenhall, 2012)
- Modularized learning (Weise, 2014)

The platform has additional economic benefits for all stakeholders that include **maximizing instructional space for teaching and learning and optimizing hands-on technological equipment** so students can access appropriate equipment. By encouraging students to embrace a more self-directed approach, they will increase their success in mastering a skill and attaining credentials.

APPENDIX B

Integrated Energy Master Plan (IEMP) and Energy Learning Center (ELC)

Henry Ford College – Bringing World Class Energy Education to Michigan

The energy outlook in Michigan, the USA and beyond, presents major opportunities for Henry Ford College. Worldwide energy use continues to grow and change. There is pressure to reduce carbon emissions from energy use to limit the effects of climate change. Closer to home, Michigan's energy and water systems are being upgraded to improve flexibility and reliability and reduce environmental damage. Technology is enabling cleaner, cheaper and more efficient energy and water use and supply choices. These factors are combining to drive a transformation the global energy market.

Senior leadership in industry, commerce, major institutions and communities increasingly understand the scale of both the opportunities and risks associated with energy use. This is increasing the need to develop complete energy solutions that deliver breakthrough levels of efficiency, reliability, flexibility, and environmental performance at lower day-to-day costs and overall economic risk. The result is a rapidly growing demand for new skills in tomorrow's workforce at all levels.

This global picture was the backdrop to decision by the leadership of Henry Ford College leadership to develop an Integrated Energy Master Plan (IEMP) to create academic opportunities to serve the changing energy market and to slash the College's own use of energy and water for the coming decades.

In 2017, the College spent $1.5M on electricity, natural gas, creating a carbon footprint of 10,800 metric tons; roughly equivalent to the emissions from 3,000 cars. Under a business-as-usual scenario combining anticipated expansion and price uncertainties, utility cost could increase to between $3.4M and $4.7M by 2039. The carbon footprint stays about the same when climate science and international agreements call for up to 70% reductions.

The College Leadership set the challenge to create an energy plan that would represent global best practices in both its energy education and its own energy performance. After a year of effort, the IEMP was completed and favourably reviewed by the College's Board of Trustees in May 2018.

The IEMP is a 20-year roadmap to 2039 for the College to raise its energy efficiency by 60%, its water efficiency by 40%, improve energy reliability, and cut absolute greenhouse gas emissions by over 60%, while achieving acceptable investment returns. It will also create a range of new energy-oriented academic and community outreach programmes.

These results are achieved by comprehensive investments in control and metering, efficiency, restructured energy supply and distribution, along with changes in the energy management processes, practices and engagement. The College will build a pervasive Energy and Climate Culture shared by all staff, students and stakeholders. This will create a world-class "Living Classroom" upon which the College will extend it academic offering.

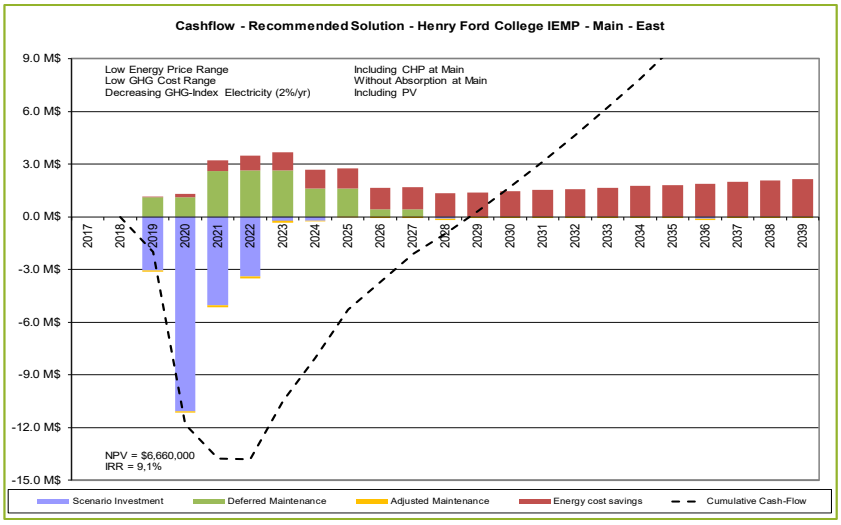
The College's entire energy and water metering, and control capability will be upgraded to create a Smart City Network, supporting efficient day-to-day operations, long-term continuous improvement, performance reporting and campus-wide engagement. All buildings will have comprehensive energy efficiency retrofits.

The 60-year old heating network will be replaced with one that meets current global municipal standards and will be extended to all buildings. This will be a relatively rare US example of a global best practice district energy network and be a valuable teaching and community asset.

A new Energy Learning Center will be incorporated as a part of the refurbishment of the Tech Building. The Center will supply competitive, clean, and reliable energy from efficient sources, including high-efficiency boilers and chillers, thermal storage, combined heat and power (CHP) generation, along with significant solar power generation. The Energy Center will be both a modern operational facility and be configured as a teaching facility. It will be designed as a visible statement of the College's energy leadership.

The IEMP technical solution combines latest, proven technologies into a world-class flexible configuration that can evolve with ongoing changes over the coming decades. It creates a small-scale example of an energy and carbon-efficient Smart Community. Some aspects of the solution are more common in other parts of the world than in the USA and Canada. This gives the College the opportunity to not only serve the education needs of a transforming US and Canadian market, but also team with global players looking to expand their North American activities. The College is already in discussion with US and European leaders to form these alliances.

The technical solution calls for total investments of approximately $23M between 2019 and 2022. About $15M represents acceleration, redirection and completion of anticipated deferred maintenance and ongoing facility programmes. The remaining $8M is the incremental investment needed to deliver breakthrough energy performance. Based on a conservative view of future energy prices the IEMP will be in positive cash flow by 2029 and deliver 7% IRR on incremental investments.



Anticipated additional academic revenues from new energy related programmes enhance the returns.

The IEMP also calls for organization changes. These include a restructured facilities team supported by Senior Sponsors. An IEMP Steering Committee will be formed including senior representatives from neighbouring industry, government and community interests. A newly formed student group “Sustainable HFC” has a key role is engaging the entire College population.

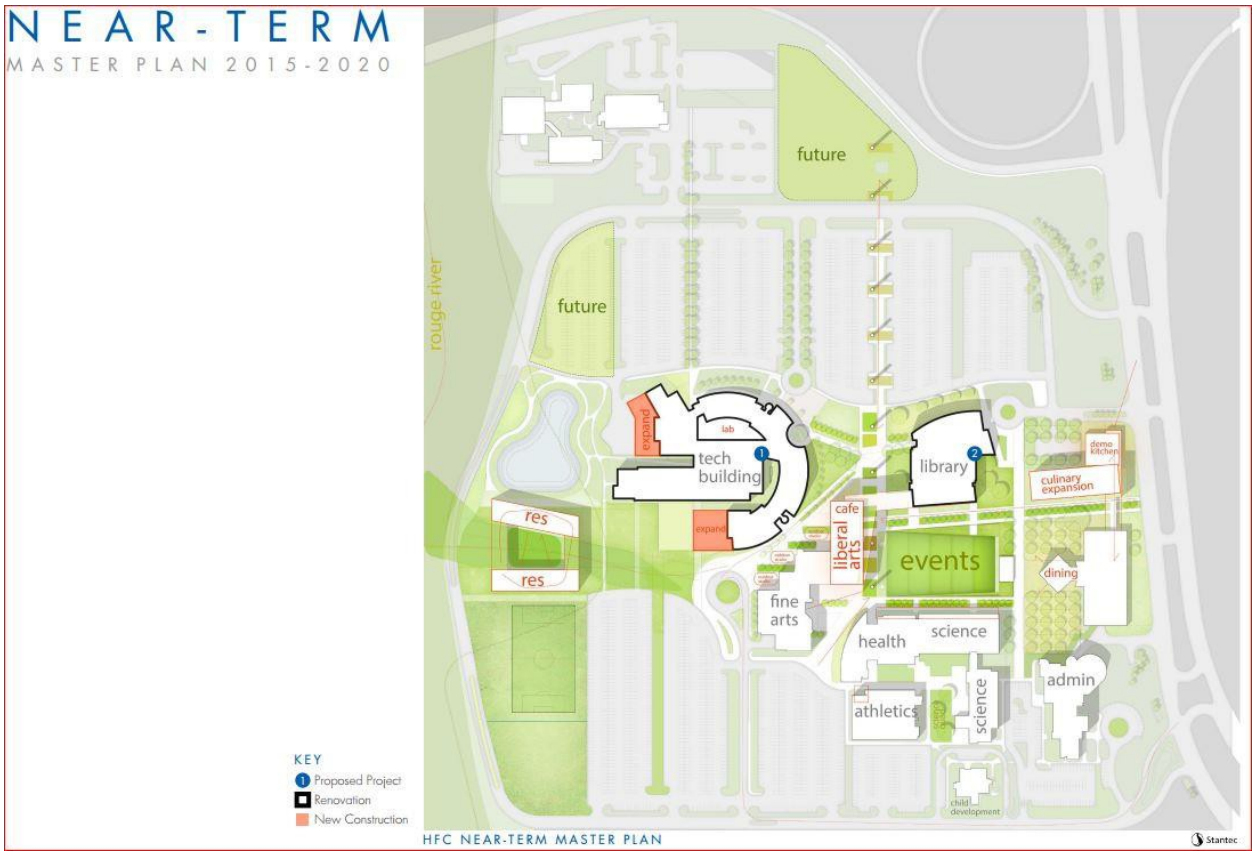
The IEMP areas of academic focus include realigned workforce training, technical certification, post-bachelor certificates and a possible new bachelor’s degree program. The College will also be positioned as destination for elementary and high-school students in Dearborn, greater Detroit and Windsor, Ontario as a resource for raising energy and climate awareness, new career paths and engaging future College students.

Implementing the Henry Ford College Integrated Energy Master Plan recommendation will transform the College’s ability to serve rapidly evolving educational needs while eliminating waste and freeing up resources for more productive use. It will set the College on the pathway to become a recognized US Center of Excellence for energy education

Library: Student Success Center

The renovation of the existing library (83,000 GSF) into the Student Success Center is being proposed to achieve the following goals:

- **Promoting student collaboration.**
- **Creating a hub for outside-the-classroom learning.**
- **Reimagining the library as the knowledge center.**
- **Prepare for Early College expansion.**
- **Upgrade classrooms and labs in academic buildings across campus.**



Outcomes

Renovation of 83,000 GSF to create

- **Learning Commons. Relocating Bookstore to Learning Commons.**
- **Reallocate floor space for quiet and collaborative study, distributing computers throughout the building.**
- **Incorporate Student Success Programs into building.**
- **Learning Success Center to house student services such as Veterans Affairs, Honors, Study Abroad, Service Learning, Civic Engagement, Assisted Learning, Outreach, and Counseling.**

R.A. SCHETTLER, INC
SUMMATION
OF

10/1/16

REAL ESTATE - BUILDING - HENRY FORD COLLEGE

SUMMARY BY BUILDINGS	REPLACEMENT VALUE NEW	SOUND OR DEPR. VALUE
LEARNING TECHNOLOGY	6,300,200.00	3,717,100.00
FINE ARTS	15,977,400.00	10,225,500.00
LIBERAL ARTS	25,266,300.00	13,896,500.00
LEARNING RESOURCE CENTER	27,780,800.00	21,113,400.00
PATTERSON TECHNICAL	44,724,600.00	26,834,800.00
PHYSICAL EDUCATION	8,893,900.00	5,247,400.00
SERVICE BUILDING	5,725,500.00	3,378,000.00
SCIENCE/SOUTH WING/ HEALTH CAREERS	43,459,300.00	33,029,100.00
STUDENT CENTER	17,414,400.00	13,409,100.00
A.S.C.C. BLDG.	15,271,700.00	9,926,600.00
CHILD ACTIVITIES CENTER	1,799,000.00	1,511,200.00
YARD IMPROVEMENTS	681,600.00	443,000.00
M-TEC BUILDING	7,352,500.00	6,176,100.00
S.M.E. WEST BUILDING	8,287,500.00	5,718,400.00
WELCOME CENTER	14,469,400.00	12,154,300.00
S.M.E. SOUTH BUILDING	6,904,400.00	5,109,300.00
NURSING BULDING	7,482,900.00	6,659,800.00
ASSET ACCOUNT GRAND TOTAL	257,791,400.00	178,549,600.00
PERCENT DEPRECIATION	X	

APPENDIX E

HENRY FORD COLLEGE
Building Age/Size

Building	Construction Date	Gross Area (Square Feet)	Volume (Cubic Feet)
Administrative Services & Conference Center	1983	59,645	980,348
ASCC – Addition	1988		
Athletic Memorial Building	1964	37,268	696,661
Athletic Memorial Building - Addition	1993	2,284	27,359
Child Development Center	1996	7,005	108,630
College Store	1975	7,752	69,768
Facilities Services Building	1994	7,932	116,576
Fine Arts	1981	65,079	987,639
Health Careers Education Center	1998	81,452	1,274,053
Learning Resources Center – Library	1966	46,587	556,615
Learning Resources Center – North Hall	1997	69,594	787,489
Learning Technology Center	1963	25,157	322,034
Learning Technology Addition	1997	615	7,971
Liberal Arts	1963	91,018	1,169,802
Liberal Arts – Chiller Addition	1995	3,823	68,812
Michigan Technical Education Center (M-TEC)	2001	28,890	300,000
Power House	1963	5,222	106,428
East Building (former SME)	1983	63,264	822,432
North Building (former SME)	1962	9,203	119,639
South Building (former SME)	1979	32,250	419,250
West Building (former SME)	1962	32,864	427,232
School of Nursing	2001	32,800	455,119
Science	1963	30,686	419,863
Student & Culinary Arts Center	1963	41,807	626,784
Technology Building – Patterson Technical Building	1965	61,567	810,222
Technology Building – Pump House	1964	462	6,468
Technology Building – Addition	1995	98,223	1,452,281
TOTAL		942,449	13,139,475

APPENDIX F

BUILDING REPAIR PRIORITIES

Building	Sq Feet	Priority Repair 1	Priority Repair 2	Priority Repair 3
Administration	59,002	HVAC system and rooftop AC units.	Replace windows and skylights	Replace fire alarm system.
Athletic Memorial Building	36,460	Replace original HVAC system	Replace electrical distribution panels.	Replace original plumbing fixtures.
Child Development Center	7,003	Replace furnaces and AC units	Replace sloped roof	Remove old lighting fixtures and wiring.
College Store	7,730	Replace furnace and AC units	Replace/upgrade entrance vestibule	Update electrical panels
Facilities Management Building	13,180	Install New Chiller Unit	Boiler Replacement	Roof Replacement
Fine Arts	61,501	Replace original HVAC system	Replace roof	Update/replace electrical panels
Health Careers Education Center	83,956	Replace roof	Upgrade HVAC system inc. heat exchanger	Replace flooring in carpeted areas
Learning Success Center				
Library	46,587	Replace carpeting	LED lighting	Replace original HVAC system
LSC - North	69,594	Replace storm drainage plumbing on N face of building	Replace entry doors	Replace original fire system panel
Learning Technology Center	25,772	Replace original HVAC system	Replace entry doors and concrete on E face of bldg.	Replace original carpeting w/new flooring.
Liberal Arts	89,580	Replace roof	Replace distribution panels and electrical transformers	Replace painted steel railings and concrete plaza.
Science	72,086	Exterior panels sealants/glazing	Replace original plumbing fixtures	Replace windows
Student Center & Culinary Arts	39,504	Replace original HVAC system	Replace original plumbing and	Address exterior building envelope.

			hot water system	
Technology				
Patterson	61,567	Roof Replacement	Electrical upgrade	Replace original corridor ceilings.
New Technology	98,223	Roof Replacement	Replace HVAC system inc. rooftop units	Restore flooring in staircases.
Pump House	462	Roof Replacement		
Welcome Center				
West	33,680	Replace roof	Add 2nd boiler	Address plumbing per Stantec report.
North	6,640	Replace roof	Replace exterior emergency exit doors	Address precast panels per Stantec report.
South	30,126	Boiler Replacement	New Digital HVAC BAS system	Roof top HVAC Replacement (2 Each)
HFC Welcome Center	60,800	Replace AC unit	Floor replacement on 1st floor	Replace doors at walkway to N bldg.
M-TEC	28,115	Concrete and walkway repair	Recaulk precast panels	Address window issues.
School of Nursing	33,155	Roof replacement	Address exterior envelope issues noted in Stantec 2018 report.	Replace flooring in common areas/corridors.

APPENDIX G

HENRY FORD COLLEGE
Main Campus Map

HENRY FORD COLLEGE

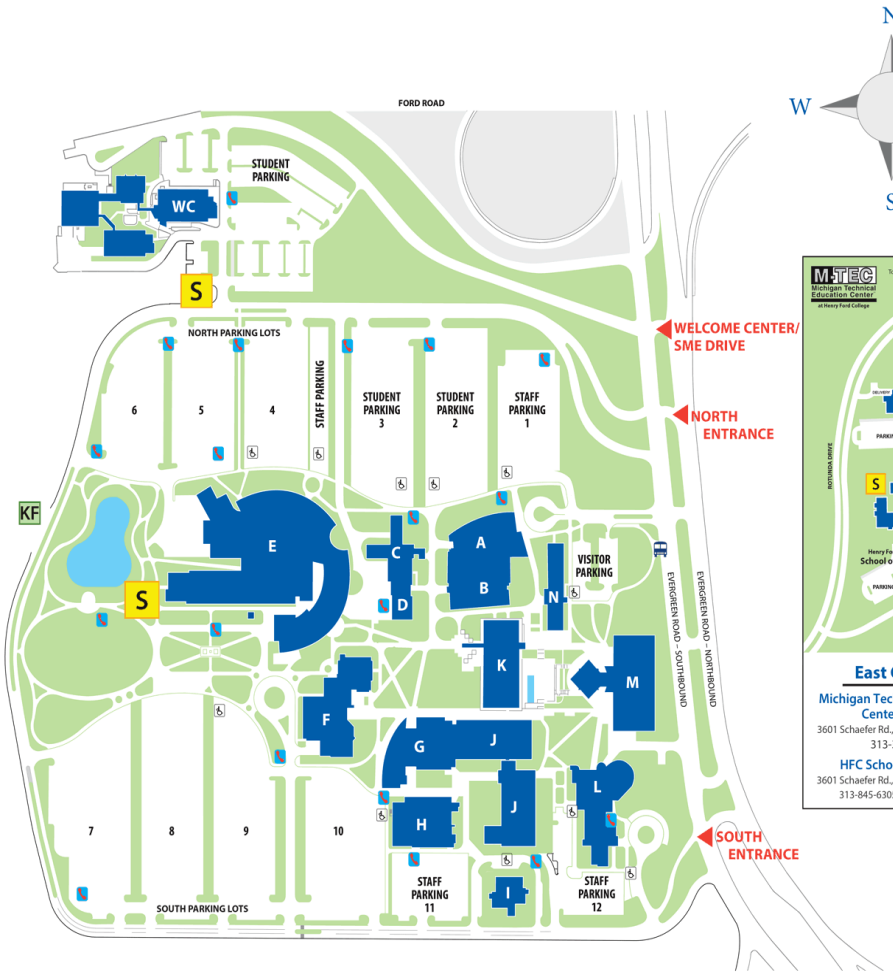
5101 Evergreen Road
Dearborn, MI 48128-1495
(800) 585-HFCC or (313) 845-9600
www.hfcc.edu

LEGEND

- Emergency Blue Light Phones
- Handicapped Parking
- M-Dot Bus Stop
- S — Smoking Zone
- KF — King Fisher Bluff Deck

A	**Learning Success Center** Assisted Learning Services Career Services Counseling Learning Lab Student Outreach Services
B	**Library** Media Center
C	**College Store**
D	**Facilities Service** Purchasing Shipping and Receiving
E	**Technology Building** Ghafari Conference Room E-123
F	**Fine Arts Center** Adray Auditorium Sisson Art Gallery
G	**Health Careers Education Center** Hackett Conference Room G-150
H	**Athletic Memorial Building** Fitness Center Gym
I	**Child Development Center**
J	**Science Building** Planetarium
K	**Liberal Arts Building** English Language Institute
KF	**King Fisher Bluff Deck**
L	**Administrative Services and Conference Center** Forfa Auditorium Berry Amphitheater Rosenau Board Room (A, B, C)
M	**Student and Culinary Arts Center** Kuhlman Dining Room Fifty-One O One Restaurant Skylight Cafe Student Activities WHFR Radio Station 89.3 FM
MT	**Michigan Technical Education Center M-TEC**
N	**Campus Safety**
SN	**School of Nursing**
WC	**Welcome Center** Community Rooms

October 2014



The latest version of the campus map can be found on the HFC website.

APPENDIX H

PowerPage Report

Friday, October 12, 2018
11:30:43 AM

Henry Ford College

Building Name	Year Built	Building Area	% of Total Area	CRV	% of Total CRV	Priority 1 (current year) Issues				Priority 1-3 (year 0-5) Issues			
						Project Totals	% of Total Project Costs	FCI	Rating	Project Totals	% of Total Project Costs	FCI	Rating
All Assessed Facilities:		**983,863**		**$283,415,695**		**$5,510,002**	**100.0%**	**1.9%**	**Good**	**$24,004,002**	**50.0%**	**8.5%**	**Fair**
East Campus		61,140		$18,647,700									
MT-M-Tec Building	2001	28,120	2.9%	$8,576,600	3.0%	$15,000	0.3%	0.2%	Good	$46,000	0.1%	0.5%	Good
NS-Nursing Building	2001	33,020	3.4%	$10,071,100	3.6%	$0	0.0%	0.0%	Good	$109,000	0.2%	1.1%	Good
Main Campus		922,723		$264,767,995									
A-Learning Resource Center	1998	53,744	5.5%	$14,242,160	5.0%	$0	0.0%	0.0%	Good	$285,000	0.6%	2.0%	Good
B-Eshleman Library	1960	46,587	4.7%	$12,345,555	4.4%	$228,000	4.1%	1.8%	Good	$1,240,000	2.6%	10.0%	Poor
C-College Store	1970	7,730	0.8%	$1,855,200	0.7%	$79,000	1.4%	4.3%	Good	$109,000	0.2%	5.9%	Fair
D-Facilities Management Building	1960	16,093	1.6%	$4,264,645	1.5%	$0	0.0%	0.0%	Good	$301,000	0.6%	7.1%	Fair
E-Technology Building	1964	169,848	17.3%	$52,652,880	18.6%	$2,953,000	53.6%	5.6%	Fair	$7,667,000	16.0%	14.6%	Poor
F-Fine Arts Building	1978	75,742	7.7%	$20,071,630	7.1%	$451,000	8.2%	2.2%	Good	$1,450,000	3.0%	7.2%	Fair
G-Health Sciences Education Center	1997	81,500	8.3%	$24,857,500	8.8%	$5,000	0.1%	0.0%	Good	$697,000	1.5%	2.8%	Good
H-Athletic Building	1964	36,460	3.7%	$9,661,900	3.4%	$235,000	4.3%	2.4%	Good	$1,367,000	2.8%	14.1%	Poor
I-Child Development Center	1996	7,100	0.7%	$1,633,000	0.6%	$16,000	0.3%	1.0%	Good	$68,000	0.1%	4.2%	Good
J-Science Building North	1960	49,000	5.0%	$15,435,000	5.4%	$0	0.0%	0.0%	Good	$612,000	1.3%	4.0%	Good
J-Science Building South	2012	18,383	1.9%	$5,790,645	2.0%	$3,000	0.1%	0.1%	Good	$3,000	0.0%	0.1%	Good
K-Liberal Arts Building	1960	104,046	10.6%	$31,734,030	11.2%	$1,479,000	26.8%	4.7%	Good	$6,856,000	14.3%	21.6%	Poor
L-Admin Services and Conference Center	1983	59,000	6.0%	$15,635,000	5.5%	$26,000	0.5%	0.2%	Good	$1,165,000	2.4%	7.5%	Fair
M-Student and Culinary Arts Center	1960	41,800	4.2%	$12,749,000	4.5%	$0	0.0%	0.0%	Good	$476,000	1.0%	3.7%	Good
N-Campus Safety	1963	19,240	2.0%	$5,868,200	2.1%	$15,000	0.3%	0.3%	Good	$978,500	2.0%	16.7%	Poor
W-Welcome Center	1982	62,000	6.3%	$16,430,000	5.8%	$0	0.0%	0.0%	Good	$118,000	0.2%	0.7%	Good
X-South Building	1978	32,250	3.3%	$8,546,250	3.0%	$5,000	0.1%	0.1%	Good	$123,000	0.3%	1.4%	Good
Y-West Building	1965	36,000	3.7%	$8,707,900	3.1%	$0	0.0%	0.0%	Good	$264,000	0.5%	3.0%	Good
Z-Community Center	1965	6,200	0.6%	$2,287,500	0.8%	$0	0.0%	0.0%	Good	$69,500	0.1%	3.0%	Good

FISCAL YEAR 2021

CAPITAL OUTLAY MAJOR PROJECT REQUEST

Institution Name: **HENRY FORD COLLEGE**

Capital Outlay Code: **xxxx**

Project Title: Energy Learning Center

Project Focus:	X Academic	Research	Administrative/Support
Type of Project:	X Renovation	X Addition	New Construction

Approximate Square Footage: 7,000

Total Estimated Cost: $ 7,400,000

Is the Five-Year Plan posted on the department's public Internet site? Yes

Is the requested project included in the Five-Year Capital Outlay Plan? Yes

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Project Purpose:

Major transformations are underway in the way energy is being used, distributed, and sourced in the USA and globally. A combination of factors drives these changes. There are worldwide efforts to reduce carbon emissions from energy use to limit the effects of climate change. Energy and water systems in Michigan and beyond are being upgraded to improve flexibility and reliability and reduce environmental damage. Technological advances are enabling cleaner, cheaper, and more efficient energy and water use, distribution, and supply choices. Information technology is facilitating the continuous optimization of energy performance from supply to end-use. The result is growing and significant changes to the shape of energy systems in communities, neighborhoods, and industry. They are becoming more deeply integrated along with accelerated localization of clean and renewable energy supplies, including the productive use of energy currently being wasted.

Leadership in industry, commerce, significant institutions, communities, and various levels of government increasingly understand the opportunities and risks associated with energy use. The need to develop complete energy solutions that deliver breakthrough levels of efficiency, reliability, flexibility and environmental performance at lower day-to-day costs and overall economic risk is growing. The result is an increasing demand for new skills in tomorrow's workforce at all levels, a need that Henry Ford College aims to be uniquely positioned to serve.

Against this backdrop, the leadership of Henry Ford College developed an Integrated Energy Master Plan (IEMP) that represents global best practices in both its energy education and its energy performance in terms of energy efficiency, water efficiency, energy reliability, and reduced greenhouse gas emission, while achieving acceptable investment returns. These operating results will be achieved by substantial investments in control and metering, efficiency, restructured energy supply and distribution, and enhanced energy management. This will create a world-class "Living Classroom" upon which the College will extend its academic offering.

The Energy Learning Center will be incorporated in the Tech Building. The Center will be both configured as a teaching facility and be a modern operational facility. It will be designed as a visible statement of the College's energy leadership. The Center will manage and supply competitive, clean, and reliable energy from a portfolio of efficient sources. These include high-efficiency boilers and chillers, thermal storage, combined heat and power generation, along with significant solar power generation.

The College's energy solution combines the latest, proven technologies into a world-class flexible configuration that can evolve with ongoing changes over the coming decades. It will be a complete example of energy and carbon-efficient Smart Community on a small-scale.

The Energy Learning Center and the other elements of the campus as an "Energy Living Classrooms" will enable the College to offer services and education to meet the following objectives:

- Preparing students for careers in management and skilled trades associated with the planning, design, implementation, and operation of world-class integrated energy solutions.
- Providing talented workers to address the growing gap between the need of communities, industry, and other leaders to drive breakthrough improvements in energy performance and the lack of suitably qualified employees.
- Providing talented workers to fill the gap between the needs of local and global industry partners concerning the knowledge and skills gap of current workers and the growing market for integrated energy solutions.
- Providing early engagement and outreach to elementary and high-school students in Dearborn, greater Detroit, and Windsor to raise awareness and open-up energy-related career choices.
- Creating a "Reference Destination" for US and Canadian civic and industrial leaders, policymakers, trade associations, environmental groups, and other key influencers to experience a world-class neighborhood energy solution.
- Creating a flexible technology platform that can evolve as new technical and operating approaches are developed
- Providing the basis for collaboration with selected non-US colleges to ensure a global best-practice perspective is nurtured and maintained.

Creating a pervasive energy productivity culture whereby all staff, faculty, and students have a greater understanding of the importance of proper energy management such that their future personal and business decisions will be influenced.

Scope of Project:

The Energy Learning Center (ELC) Project includes the creation of a new energy center on about 7,000 square feet at the southern arc of the Tech Building, created using both repurposed space within the existing building and some external space. This will be designed as an architecturally distinctive, high-visibility campus feature, underlining the transformational approach the College will be taking to energy education. The entire campus energy use and supply will be accessible and controllable from the ELC both for teaching and operational purposes. The ELC will physically include a flexible mix of heating supply components serving the entire campus. These include combined heat and power generation, high-efficiency boilers, and thermal storage. Space will be organized and spaced to facilitate reference visits, teaching, and general engagement. Included in the space will be a dedicated classroom. Throughout the ELC, labeling, graphics, and electronic displays for engagement and teaching will be included.

The Project also includes installing a global-best practice municipal district heating network serving the entire campus using globally recognized (EN) standards for material and installation. This network connects to the ELC and will be used for demonstrating and teaching related to best-practice municipal district energy and be one of few facilities of its kind in the USA or Canada.

Also included in the ELC is the installation of best-practice standardized district energy sub-stations connecting the district heating network to each building. Again, these will be sited such that they are appropriate for demonstration and teaching. They will again be one of the very few examples in North America of the standardized approach used in many other parts of the world.

Strategies to include new district energy networks and local energy supply are increasingly considered in energy and climate plans for North American communities and campuses, in turn creating a demand for a suitably skilled workforce.

Including aspects that are more common in other parts of the world allows the College to serve the education and training needs of a transforming US and Canadian market, including global players looking to expand their North American activities.

The ELC, including the network and sub-stations, replaces existing inefficient boilers and a 60-year old high-temperature network with customized aging building connections. This will retire significant deferred maintenance and avoid future replacement in a few years.

Not included in the project, but forming part of the overall integrated energy solution managed and taught within the ELC will be the upgrading of the cooling supply and the installation of 500kW of solar photovoltaic generation on rooftops and parking structures.

The IEMP's academic focus includes realigned workforce training, technical certification, continuing education certificates, and potentially a new bachelor's degree program. The plan is designed to

position the College as the destination for elementary and high-school students in Dearborn, greater Detroit, and Windsor, Ontario, as an innovative resource for raising energy and climate awareness, new career paths, and engaging future College students.

Program Focus of Occupants

The ELC will facilitate programs aimed at complementing or upgrading the awareness and skills of a wide range of full-time and part-time students, with the underlying goal to ensure adequate human resources are available to support and accelerate the transformations in the energy market.

Technical Certification on crucial elements of the integrated energy system. These would be focused on areas less common in the current US market. These will include:

- Building energy modeling and demand estimation
- Design of DE networks
- Site preparation for installing district energy networks
- Pre-insulated DE pipe welding and inspection
- Installing and commissioning DE sub-stations
- Installation and commissioning of CHP engines
- Multi-utility metering and sub-metering

These programs would serve the need of the employee needs of both local and global industry players looking to expand the US market. The College would finalize the design of these programs in partnership with the relevant industry players.

Continuing Education to enhance the understanding of integrated energy solutions and the approaches needed to evaluate implementation alternatives. These would be eligible for the appropriate professional CEUs but would generally not earn academic credits. Topics would include:

- Integrated Energy Master Planning basic techniques
- Relationship of Energy Master Plans to other municipal/campus plans
- District energy basics
- Optimizing neighborhood energy production and distribution systems
- Neighborhood energy planning for property developers
- Energy Planning for municipal leaders and staff
- Transformational versus incremental energy planning
- Industrial site energy planning
- Community energy planning
- Campus energy planning
- Comparison of global energy practices

These would be focused on students already in roles where new approaches to energy decision making are needed. They would also be appropriate for training sales, marketing, and project managers of industry players entering or operating in this market. They could also be attractive to students in unrelated employment looking to move towards the emerging multi-billion dollar global market resulting from energy transformation and climate change mitigation.

Bachelor's degree in Energy Production in the context of integrated energy solutions: The IEMP calls for the creation of the College's first bachelor's degree focused on Energy Production balanced between local and regional supply, and between thermal and electrical demands. A vital feature of this degree would be its emphasis on teaching global best practices with an active North American context, facilitated by international institutional and faculty team.

Education and Outreach to K-12 Schools in the Dearborn and neighboring communities: These programs would be aimed at increasing the understanding of energy basics, the risks, and opportunities around the use of energy, to attract a new generation to consider some aspect of the transforming energy market as a career choice. The ELC will be the platform for site visits.

Hosting Meetings: Aimed at institutions, associations, and corporations with a sustainable energy focus. The ELC will be a significant asset to support the campus as a preferred site for regular and ad hoc meetings. The College will structure a program to host such meetings on a professional basis.

Additional Information:

1. **How does the project enhance Michigan's job creation, talent enhancement and economic growth initiatives on a local, regional and/or statewide basis?**

The New Economy Task Force in the United States House of Representatives recently asked Henry Ford College to participate in addressing the looming "skills gap" that plagues the country, stating:

> Our nation is facing a large and growing gap between the skills our workers possess and those sought be potential employers. The result is six million open jobs in the United States, while 6.8 million people are looking for work. This disparity is particularly true in the science, technology, engineering, and math (STEM) fields. According to *U.S. News and World Report*, in the 2014-15 school year our nation produced 30,000 STEM graduates to fill 230,000 STEM-related jobs.

Henry Ford College is vital to job creation and economic growth of the SE Michigan region. HFC provides multiple areas of occupational education for students from Dearborn, Detroit, dozens of communities in Western and Southern Wayne County, and across SE Michigan. Our mission is to grow the highly skilled and competent new workforce talent required of current and future technicians, business owners, and entrepreneurs. By rooting skills development in "real-world" applications, HFC students are developing

both entrepreneurial skills and technological capabilities by integrating these two heretofore separate pathways of study. Locally, HFC is working with DTE and the Regional Water Authority to develop competency-based apprenticeships. Funding for this project will enable the College to continue the work of developing talent in the skilled trades. The successful DTE Grant also provides funding for the training of electrical personnel to meet the demands for electrical positions due to pending the retirement of workers in the utility industry.

HFC has a proven impact at the State level through its collaboration with Oakland Community College and the Michigan Talent Development Agency (TIA) and Michigan Economic Development Corporation (MEDC). HFC led the initiative to create and implement the MAT2 (Michigan Advanced Technician Training) program, a major statewide workforce development program in Manufacturing System's Maintenance. Funding of this current request will help expand the MAT2 approach to other occupational areas: Information Technology, Technical Product Design and CNC Manufacturing, which expands impact beyond the State to the Regional level.

At a regional and national level, the project will also enhance existing partnerships including the Ford Motor Company, General Motors, Fiat Chrysler Automobiles (FCA), AK Steel, Toyota, Nissan, dozens of 1st, 2nd and 3rd Tier Automotive Suppliers, and advanced technology vendors including FANUC Robotics in its effort to further employ robotics and automation technicians. These partnerships provide industry with new courseware, training opportunities, hands-on project-based learning tools, and the authentic assessment of skills.

Other economic sectors that will be impacted include supply chain and logistics, healthcare, and the financial sector:

- Supply Chain and Logistics: HFC has developed a new apprenticeship in Supply Chain-Logistics to support CVS Health national warehousing and distribution systems.
- Health Care: HFC has partnered with the John D. Dingell VA Medical Center and the Henry Ford Health System to create a Department of Labor approved medical assistant apprenticeship and certification program embedding new technologies for the evolving health care technician workforce.
- Financial Sector: HFC has launched new apprenticeship and certification programs in Applied Business Skills and Internet-based Commerce.

Students in the programs supported by this project will be prepared to meet the needs of industries currently contending with a profound gap of "middle-skilled" entry level available job candidates and future employees, as well as the means to "upskill" their existing workforce.

The renovated and improved facility will impact talent enhancement and economic growth by:

- Creating new student pathways into "Earn and Learn" based technology programs and pathways to employment.
- Reducing time to graduation through implementation of enhanced traditional programs and new modular project-based learning programs.
- Allowing HFC to quickly adapt curriculum in hands-on labs to meet the high-priority skill needs of employers and their employees.

- Cross-training the skilled labor force in lab spaces that can rapidly adapt to changing technology and training programs.
- Connecting technical education, design, critical thinking and the development of small business and entrepreneurial skills in a single location on campus.
- Helping students gain experience and skills on varied equipment and technology to become valuable members of the workforce, whether for regional employers or as job creators themselves.

Throughout all program initiatives, HFC will offer expanded experiential learning opportunities in a competency-based educational model to a new generation of learners. Just as job creation and talent enhancement fuel economic growth, increasing real world business skills and technological literacy will help create a more capable workforce ready to step into and shape the 21st century work environment.

2. How does the project enhance the core academic and/or research mission of the institution?

The core academic mission of Henry Ford College is to provide exceptional occupational and transfer education opportunities to our community. Duly acknowledging the rapid speed at which both the business and industry sectors in Southeast Michigan are changing and evolving, Henry Ford College took the bold and innovative steps necessary to realign its entire academic structure for the start of the 2017-2018 school year. Abandoning the traditional, multi-layered, siloed, organization of some 120 independent programs into multiple distinct academic divisions that competed with one another for resources and students, the college recently regrouped academic programs into inter-related clusters within four new "schools" designed to facilitate collaboration, promote interdisciplinary cooperation, create synergies, build connections, and provide learning communities that mirror the real world. These four new schools include:

- The School of Science, Technology, Engineering and Math (STEM)
- The School of Business, Entrepreneurship and Professional Development (BEPD)
- The School of Health and Human Services (HHS)
- and, The School of Liberal Arts (SoLA)

Given the growing complexity and higher skill levels expected by industry partners of their employees, HFC recognized the need to build bridges between career and technical education with the fundamentals of science and mathematics in order to best prepare students for jobs in the emerging technologies that continue to redefine the economic landscape of the region. As such, the School of STEM was designed to bring together programs, faculty, and students in the fields of physical sciences, biological sciences, math, pre-engineering, advanced manufacturing/fabrication, building sciences, and automotive technology. This creates a very dynamic and fertile environment for the cross-discipline training necessary for students and workers to be successful in today's high-tech jobs. It permits the embedding of math skills into industrial technology courses while bringing engineering, physics and automotive students together to apply their learning on an industry-standard dynamometer. It unites students in HVAC, energy technology, architecture/construction, and environmental science classes

around issues such as green-building and sustainability. In a similar fashion, the new School of Business, Entrepreneurship and Professional Development provides exciting and effective opportunities to blend computer and information technology skills with those necessary for developing new start-ups in e-commerce. More significantly, the School of BEPD has brought for-credit training in business together with the college's programming in workforce development, corporate training, and apprenticeship.

All of this was undertaken to better align the college's academic offerings with the needs and expectations of business and industry. This project will help to further realize, reinforce and support the college's new and dynamic approach to such integrated learning and career preparation.

The Industrial Technology programs at HFC share a joint mission centered upon providing:

> *…educational experiences to plan, build, fabricate, and maintain the designed world. It offers instruction through hands-on interactive learning, utilizing the most relevant technologies found in working environments. We aspire to develop the mastery of skills that will supply business and industry with competent professionals for a future-driven technological society.*

This project will provide critical elements for enhanced student success and mastery of real world skills through the development of strategic spaces that fit the industry-driven, hands-on, project-based approach to learning. These "Strategic Spaces" help students to:

- Take short project intensive courses that assure skills mastery and create the foundation for further skills development and greater topical knowledge
- Give students "real world" projects and problems that immediately transfer and apply to the world of work
- Utilize industry-defined equipment and other advanced simulation-based learning tools
- Create the opportunity for students to leverage the skills mastered and certifications achieved towards jobs and the creation of new businesses
- Develop student confidence and their technological areas of expertise that can be recognized by business and industry

The Integrated Manufacturing Systems Troubleshooting Lab is an excellent example of this in action. Students in the Multi-Skilled Manufacturing Maintenance associate's degree program work on a complex sequential manufacturing system that was developed through collaboration with General Motors, Toyota, Ford Motor Company, BMW and Nissan Motors. It is known as the AMTEC Integrated Manufacturing System (AIMS), and it requires the College lab to have 480V power to run the equipment as in a typical manufacturing plant. This system replicates the core elements of sequence-based automated manufacturing, and students are given progressively more complex problems or "faults" as projects from their first course to their last in the program. Learning how to troubleshoot systems is universally identified by manufacturers as their "Number 1" goal for maintenance employees, and with this lab tool and curricula students are able to troubleshoot and repair over 80% of the common faults that stop manufacturing systems. Employers give universal praise regarding this instructional innovation, and many request we identify more of these students for their businesses.

Bringing New Product Development and Technology Skill Development Under One Roof

In looking at the rapid rate of new product development and business start-ups today, it is evident that there are many rich opportunities and synergies when technology and entrepreneurship intersect. Public educational institutions must help accelerate these successful start-ups, and create greater access to the skills necessary for business development to wider and wider segments of our communities.

More and more, higher education is becoming a springboard for new product and business development. This educational service is known as Technology Transfer. Initiatives such as Wayne State University's "Tech Town" in Detroit's Midtown is an example of university-based technology transfer. This project will expand technology transfer capabilities to institutions of applied learning like HFC and other community colleges who may be able to replicate the model.

Schools with the ability to support Technology Transfer and Business Start-Ups encourage the creation of new product ideas, the development of business analysis and start-up skills, and refinement of the personal vision of the student-entrepreneurs. As students achieve certifications in our IT, Welding, CAD, HVAC, Precision Manufacturing, Electrical Technology or Dyno programs, their potential to envision a future that includes their own business can emerge.

A few examples of the new products and businesses envisioned by students already include: modularized bicycle manufacturing developed in the fabrication capstone projects of the Welding program; Human Machine Interface (HMI) Integration Kits for manufacturing systems in the Multi-Skilled Manufacturing Maintenance program; Automotive and HVAC Technicians as Start-Up service businesses; and, 3D product designs for automotive applications in the Design and CAD program.

This project will generate an "Applied Entrepreneur's" Library of Skillsets and Templates based upon real business tools developed by successful enterprises that *"plan, build, fabricate and maintain the designed world."* These skills will become the competencies necessary to envision, implement and evaluate each student's own products, services and business ideas. The best ideas can then become business start-ups, which are practical real-world applications of student learning. These experiences will challenge students in ways that help them accelerate their maturity development, which is necessary for successful completion of an Occupational Associate's Degree or Transfer to another Educational Institution for completion of a Bachelor's Degree.

3. Is the requested project focused on a single, stand-alone facility? If no, please explain.

This project will be a single, stand-alone facility comprised of renovation of and additions to the existing technology building. Reconfiguration of the facility and the added demands for space due to the program changes and the expanded need for training students in the K-12 Dual Enrollment Advanced Manufacturing and Mechatronics programs warrants additional space renovation and additions.

4. How does the project support investment in or adaptive re-purposing of existing facilities and infrastructure?

This project will continue the renovation and repurposing of the Technology Building as indicated in the 2015 Campus Master Plan, updating it to meet the interdisciplinary needs of college programs.

Henry Ford College has significantly invested in this facility and programs as its part of matching the State of Michigan Skilled Trades Equipment Grant. The College committed $1.2 million as a direct match to the grant to address renovation of the Technology Building space to accommodate the $4.5 million of equipment for use in advanced manufacturing, mechatronic, and automotive engine testing programs. The State increased the original equipment grant funds by an additional $480,000 which increased the equipment purchase to $5 million. To date, the local direct match for the equipment project is over $1.5 million. In addition to the direct expense match for the grant, an additional $1.1 million of indirect cost expenditures were committed to the grant which results in a commitment by Henry Ford College of $2.6 million in this building and its programs.

With the approval by the State of the Tech Building renovation project at $14.9 million, the design for the project has been initiated. As the IEMP and Tech Building renovations converge, the Energy Learning Center (ELC) will be built as the construction commences. The ELC will be a "working classroom" and include the College's Energy Center as well as teaching space for students in the Energy Education Program. The curriculum for the Entergy Training has been defined and has been presented in the earlier sections 1 and 2 as well as documented in the 5 year plan document.

The College also recently spent over $480,000 to renovate the welding lab. The renovation includes space/station upgrades, new exhaust and air handling capabilities, and space upgrades to conduct demonstration areas as well as areas for hands-on instruction and training. Major welding equipment was also replaced with 18 multi-purpose welding booths and the development of welding fabrication work areas. The project based learning strategies, expected to be more materials intensive, have turned out to significantly reduce scrap generation and therefore materials consumption by 15%. This is due to the increase in student awareness of their project work and therefore material use.

Many of the labs and classrooms in the existing Technology Building, whether in the original 1965 wing or the 1996 addition, were designed for a single use, a single skill, curriculum that is now outdated, and technologies that have changed dramatically over the last 50 years.

- Classroom renovations will create learning environments that meet the needs of a 21st century curriculum, with updated furniture, technology and better integration with adjacent lab spaces.
- To support the goals of the Henry Ford College Entrepreneur and Innovation Institute/ Technology Building Renovation and Addition, renovations to existing offices and construction of a center for entrepreneurial support and development will transform outdated offices into a collaborative hub to better connect students, faculty and employers.
- The new Automotive Lab will connect to the existing, undersized high-bay automotive service lab, and engine testing areas. This will significantly improve the usability of the existing automotive lab, and provide students in the industry-driven growing programs improved access

to recently updated equipment and tool resources. The connected spaces will better simulate the students' future working environments and meet the training needs of the region's automotive dealerships and automotive R & D firms.

- The new Fabrication Lab will connect the existing welding/materials lab, machine tool/CNC manufacturing lab and CAD and Design Studios, transforming these individual spaces into an integrated center for product development, fabrication and manufacturing. Adjacent classrooms and breakout spaces will provide space for mentorship and quick problem solving.

5. Does the project address or mitigate any current health/safety deficiencies relative to existing facilities? If yes, please explain.

There are no identified health or safety deficiencies in the existing Technology Building.

6. How does the institution measure utilization of its existing facilities, and how does it compare relative to established benchmarks for educational facilities? How does the project help to improve the utilization of existing space and infrastructure, or conversely how does current utilization support the need for additional space and infrastructure?

The 2015 Campus Master Plan evaluated current utilization for classrooms and instructional labs, measuring both the number of hours that rooms were in use (Weekly Room Hours - WRH) and the percent of seats occupied (Student Station Occupancy – SSO). This analysis informs both the availability and efficiency of classrooms and instructional labs.

Analysis

The analysis used schedule data provided by the College's Ellucian course scheduling software. Fridays were excluded as the difference in usage would skew the data for the balance of the week. Analysis assumed 60 schedulable hours per week (15 hours/day, Monday-Thursday) but the target WRH is lower to accommodate the typically low afternoon utilization.

Existing Classroom Utilization

For classrooms, the campus WRH average falls just below the target of 32 hours per week and the SSO slightly exceeds the target of 65%. Due to the specific nature of many programs in the Technology Building and dedication of many classrooms to a lab, both the WRH and SSO fall below the campus average and the target values:

Classroom WRH	**Classroom SSO**
Target: 32 hours/week	Target: 65% occupancy
Campus: 29 hours/week	Campus: 69% occupancy
Technology Building: 19 hours/week	Technology Building: 59% occupancy

Existing Instructional Lab Utilization

Instructional Labs have a lower WRH target due to lab setup times and a higher SSO target due to the need more tightly control headcount. The campus WRH average falls just below the target of 22 hours per week and the SSO slightly exceeds the target of 75%. Highly specific, single-purpose labs, combined

with the older curriculum in place at the time of the analysis, negatively impacted the usability of lab spaces in the Technology Building.

Instructional Lab WRH	**Instructional Lab SSO**
Target: 22 hours/week	Target: 75% occupancy
Campus: 19 hours/week	Campus: 76% occupancy
Technology Building: 17 hours/week	Technology Building: 63% occupancy

The proposed programs changes dictate the need for labs and classrooms that will be able to serve students working through different programs at different paces, often independently. The expected impact on room utilization will be to increase WRH by leveling out usage throughout the day and week. Self-paced, instructor-assisted instruction will also reduce the need to stock labs with high numbers of identical equipment, allowing for more efficient use of the space by students in different programs.

7. How does the institution intend to integrate sustainable design principles to enhance the efficiency and operations of the facility?

The College will plan for all improvements to meet or exceed USGBC LEED certification requirements. As part of addressing deferred maintenance issues, expected building system upgrades will improve the efficiency of building equipment. The proposed additions will utilize courtyards that are underutilized reducing the amount of exterior walls exposed to the elements, especially where the additions touch uninsulated walls. This will also enclose areas where students currently have to go outside to move between building wings.

The College developed a request for proposal (RFP) for a comprehensive energy savings program for the entire campus. The RFP requested services to prepare a feasibility assessment to determine investment opportunities that reduce energy consumption with an ROI of 7%. In March 2017, an energy service provider, Garforth International, was selected. With the initiation of the Integrated Energy Master Plan (IEMP), global standards will be used to exceed current US standards of efficiency. This plan will provide efficiency standards that will be part of the Colleges formal construction design process and serve as the Energy Master Plan for the Colleges Facility Master Plan. The Plan was completed in March of 2018 and is listed as a $23 million project in our 5 Year Capital Plan submission. The College is currently negotiating a contract with an Energy Project firm to implement the IEMP $23.2 million project.

8. Are match resources currently available for the Energy Learning Center project? If yes, what is the source of the match resources? If no, identify the intended source and the estimated timeline for securing said resources?

Funds have been identified for the College's match for this project from the following sources:

The College is currently in the "quiet" phase of a $20 million campaign to raise funds for the College with over $3 million targeted as the amount to be raised in the campaign for the Energy Learning Center renovations. At present, a major donor has expressed a potential commitment of over $2 million toward this goal.

The College, at the conclusion of the fiscal year 2019 (June 30, 2019), had approximately $32 in unrestricted reserves. Reserves have increased from $5.5 million to the present amount in the last five

years. A $2.5 million general fund allocation is planned for this project. From the sources noted, the College has identified potential funding of approximately $4.5 million for this project.

Therefore, of the total request of $7.4 million for this project, the College is requesting $2.9 million from the State. The college will cover the remaining $4.5 million.

9. If authorized for construction, the state typically provides a maximum of 75% of the total cost for university projects and 50% of the total cost for community college projects. Does the institution intend to commit additional resources that would reduce the state share from the amounts indicated? If so, by what amount?

In addition to $2,480,000 spent in recent years to renovate the building and the $23.2 million IEMP Project, Henry Ford College will contribute additional resources to this project, providing $4,500,000 or 60% of the total project cost of $7,400,000, reducing the state share to 40%.

10. Will the completed project increase operating costs to the institution? If yes, please provide an estimated cost (annually, and over a five-year period) and indicate whether the institution has identified available funds to support the additional cost.

The College does not project any increase in operating costs since all "current" renovations over the last three years have been made to reduce energy usage either through improved lighting, reduce electrical usage with the purchase of new equipment, and by using energy efficient materials. Also the Integrated Energy Master Plan has identified a goal of reducing all utility costs by 60% in usage by improving building envelopes and implementing global standards. ROI is estimated at 7%.

Also, the College's cost for energy and maintenance, as identified in the Activities Classification Structure (ACS) for Michigan Community College, have decreased per square foot from fiscal year 2012 to fiscal year 2018. Physical Plant costs have been reduced from $9.25 per square foot to $8.21 per square foot while energy costs have decreased for $.1060 per cubic foot to $.0905 per cubic foot during the six fiscal years. Seven years of data was available (2013 – 2018) as follows:

	Utilities	Plant
2018	.0905	8.21
2017	.0915	8.25
2016	.0869	8.26
2015	.1004	8.16
2014	.1148	6.17
2013	.0975	6.45
2012	.1060	9.25

11. What impact, if any, will the project have on tuition costs?

Because of the committed funding sources, the College expects no increase to tuition costs. The current programs using this delivery model have shown both a reduction in lab material usage, more efficient use of lab equipment, a potential reduction in lab fees, as well as more efficient use of faculty and staff, helping control future tuition increases. Students can register for multiple 1 credit courses sequential over the first twelve weeks of every semester. Further, the development of flexible and Open Lab spaces will reduce the number of identical pieces of advanced technological equipment as students work across multiple lab activities and projects simultaneously. Gone are the days of requiring 18 identical high tech pieces of equipment that begin to become outdated on the first day they are used. Two or three pieces of identical equipment are all that will be needed reducing the cost of equipment infrastructure over time.

Currently, Henry Ford College has the lowest in-district credit hour tuition rates ($101.5 per credit hour) in the state and has out-of-district rates ($177 per credit hour) that are in the lowest quartile in the state. As noted earlier, the funding sources for the renovations have been identified either through a capital campaign or from unrestricted resources. Also, as noted earlier, it is anticipated that operating costs will not increase due to implementing significant facility efficiency standards.

12. If this project is not authorized, what are the impacts to the institution and its students?

If this project is not authorized, the College will continue to be limited in its ability to support proposed curriculum changes to meet the ever changing work and job requirements in the automotive, manufacturing, and information technology fields.

The College would be limited in its ability to stay current with technology for classroom teaching, particularly in reference to its new work in Energy Management.

The College would be limited in its flexibility to change lab and room space for specific programs that a renovated/flexible teaching space can provide. The current hard wall/fixed space makes it difficult to conduct teaching where room flexibility is essential for effective teaching and learning.

If this project is not authorized, it could require additional fees/tuition from students. The College would also be required to fund renovations over a longer period of time and could require unrestricted reserve spending to address critical infrastructure and teaching needs. However, the college is committed to the ELC and will fund the project with College funds if necessary.

13. What alternatives to this project were considered? Why is the requested project preferable to those alternatives?

The college studied construction of a stand-alone building to house programs requiring larger lab/high-bay lab spaces, including a high-bay Construction Technology lab for Building Sciences areas of study. Limited developable land near the existing technology building meant a location that would have separated this program from other related programs, incongruent with the optimal lab and student access strategy of the College.

The selected approach – a renovation/addition project focused on the existing technology building – will provide appropriate lab, classroom and support spaces for all related energy technology, business, and entrepreneurial programs. Given recent significant investment in the technology building and in

modernizing academic programs, this approach is most cost effective and in alignment with the academic goals of the College especially with the initiation of the Design Phase for the Tech Building.

Additional Supporting Documentation

Research & Continuous Improvement in Manufacturing and Industrial Educational Practices Leads to Entrepreneurship Being Integrated into Project Based Learning

Over the last four years HFC has researched and adopted the best educational practices found in industry and educational institution partners nationally, resulting in new and improved educational services that create integrated, project-based modular programs. The areas of study can be found in:

- Service Occupations (HVAC, Power Engineering/Energy System's Technician, Energy Conservation / Renewable Energy Technician, and Automotive Service Technology)
- Design Occupations (Architecture, Construction Technology, Product/CAD)
- Manufacturing Technology Occupations (Precision Manufacturing/CNC, Electrical Technology, Mechanical Systems, Welding Technology, Multi-skilled Industrial Maintenance, and Process-Based Manufacturing) (Industrial Chemical, Steel, Plastics, Food and Energy) including those developed through Apprenticeship
- Energy Management and System Designs.

And despite the College's dedication of significant internal fiscal resources, staff and faculty effort, in work to improve the antiquated learning environment, the current facility does not provide the type of working spaces to support the new enhanced learning models which focus on collaborative design and fabrication as well as energy education.

Each of these programs will be enhanced by the creation of opportunities to develop innovations in products and services through entrepreneurship skills development and experience. The proposed one-of-a-kind learning environment will feature state-of-the-art manufacturing technologies and equipment, for current and future HFC occupational programs in Design, Manufacturing, Services and Pipeline Development Programs coupled with the anticipated Energy Learning Center.

Supporting Data - HFC Welding Program Demonstration Project, 2014 to Present:

In the Fall of 2014, the Welding Lab went through a radical transformation: single-function welding booths were eliminated in favor of multi-purpose welding stations; significant fabrication equipment resources were added; the entire curriculum was retooled into competency based (skills focused) sequential projects; learning outcomes and certifications were aligned with the American Welding Society's certification standards. As a result, students can now start the program *At Any Time* over the entire first twelve weeks of each of the Fall, Winter, and Spring/Summer Semesters, and they must achieve competence in each course's objectives before advancing to the next project/class.

The Welding Lab is now "Industry-level Equipped", and the rich diversity of students working on hands-on projects helps them create objects of functional use, meet project specifications and sometimes embody intelligent design. Increasingly students talk of their projects as potential products or objects that could be, "For Sale".

The Welding Program and Lab is one concrete example of the new generation of student learning labs that HFC is actualizing. With the new learning tools for technological education brought together in these new flexible and accessible lab spaces, a new 21st century learning environment, , will challenge learners to develop their skills and knowledge in new ways. They will experience first-hand the Engineering Process, where they define problems, create prototype design solutions, build and test their ideas, and evaluate their effort. And through these problem and project approaches they will achieve

levels of understanding and mastery of technologies essential in today's economy. Truly we will meet the economic and educational needs of students, regional businesses, and vibrant communities of SE Michigan.