Accelerating Capital
Growing the Greater Lansing Region & Investment Through Rare Isotopes
AGENDA

- Methodology
- What is FRIB?
- History of Nuclear Research at Michigan State University (MSU)
- Greater Lansing Today and Anchor Institutions
- Technology Transfer and Regional Impact
- Case Study Facilities
  - Economic Development
  - Community Well-Being
- Findings & Recommendations

Source: MSU Today
PROJECT OVERVIEW

Source: MSU Today

Source: MSU Today

Source: MSU Today
Goal:
An assessment of economic/entrepreneurial/community impacts and opportunities created by similar cases and compared to the Facility for Rare Isotope Beams (FRIB) at MSU. Also, collecting data and reporting on existing particle accelerator facilities to recommend potential strategies and best practices to incorporate.
Analyzed socioeconomic characteristics and anchor institutions of the Greater Lansing Region

Conducted a comprehensive literature review on the impact of knowledge and high-technology transfer

Evaluated case studies with similarity in either size or scope to the FRIB at MSU

Created recommendations based on our findings
The Facility for Rare Isotope Beams (FRIB)

Particle accelerator nuclear research facility

Located on the campus of Michigan State University

Discover rare isotopes

Enhance mankind’s understanding of nuclear science

A rare isotope is not naturally occurring and can have unique properties

Source: MSU Today
MSU NUCLEAR RESEARCH HISTORY

1958
MSU hires first accelerator expert

1961
NSF approves sector focused K50 cyclotron

1958
MSU hires first accelerator expert

1965
Research with K50; single turn extraction

1961
NSF approves sector focused K50 cyclotron

1978
NSF approves superconducting cyclotron magnet prototype

1975
NSF approves K500 cyclotron

1977
NSF approves K500 cyclotron

1982
Research with stable beams from K500

1985
Research with trapped rare isotope beams

1989
Research with stable beams from K1200

1990
Research with fast rare isotope beams from A1200

1996
NSF approves coupled cyclotron facility (CCF)

2001
Research with fast rare isotope beams from CCF

2002
Infrastructure for SRF linac R&D

2005
Research with trapped rare isotope beams

2006
MSU funds ReA3 reaccelerator project

2010
CD-1 approval

2013
CD-2, CD-3 approval

2020
Managing to early completion

2022
FRIB operations

2008
DOE selects MSU to establish FRIB

Source: MSU Today
Greater Lansing Today and Anchor Institutions
Greater Lansing
And Economic Data

Population: 464,036
Educational Attainment

- Graduate or Professional Degree: 8%
- Bachelor's Degree: 13%
- Some College or an Associate Degree: 19%
- High School Diploma or GED: 35%

Source: United States Census American Community Survey 2008-2012

The University of Pennsylvania Institute for Urban Research defines an anchor institution as “economic engines for cities and regions, acting as real estate developers, employers, and purchasers of goods, magnets for complementary businesses, community-builders, and developers of human capital”.

- State of Michigan
- Michigan State University
- Sparrow Health System
- General Motors

Highly skilled individuals are attracted to regions that have a “buzz” around them... places where the most exciting work is happening.¹

Think Silicon Valley

¹"Universities and Regional Economic Development", Bramwell, 2008
Characteristics of Knowledge Transfer

• Attract and retain top caliber talent
• Provide Research and Development assistance to local firms
• Exchange knowledge at regional and global levels
• Facilitation of entrepreneurial activities

Source: NSCL
University of Waterloo
Location: Waterloo, Ontario, Canada
Established: July 4, 1956
Undergraduates: 26,987
Postgraduates: 4,375

“Largest post-secondary co-operative education program in the world”
Characteristics of Technology Transfer

- Provision of support tools for start-up enterprises
- Creation of new jobs and industry
- Multiplier effect of adding new jobs
- Facilitating research-based commercialization
University of Central Florida
Location: Orlando, Florida, USA
Established: June 10, 1963
Undergraduates: 50,968 (Spring ’13)
Postgraduates: 9,213 (Spring ’13)

“A University-driven community partnership providing early stage companies with the enabling tools, training and infrastructure to create financially stable high growth / impact enterprises” (source: incubator.ucf.edu)
Case Study Facilities

TRIUMF

Fermi Laboratory

Jefferson Laboratory (J-Lab)

Source: CERN Courier

Source: Interactions

Source: JLab

National Superconducting Cyclotron Laboratory (NSCL)

Source: NSCL
- Founded in 1987
- Located in Newport News, Virginia
- Site of construction for the free-electron laser J-LAB

- Founded in 1967
- Located in Batavia, Illinois
- Joint venture with University of Chicago, Illinois Institute of Technology and the Universities Research Association (URA).

- Located in East Lansing, Michigan
- Study the nuclei of an atom
- 1965 Cyclotron became operational
- 1980 called the National Superconducting Cyclotron Laboratory (NSCL)

- Provides the centralized resources, tools, and expertise in pursuit of compelling science in comprehensive ways for universities
- 18 member university alliance

- Located in Vancouver, Canada
<table>
<thead>
<tr>
<th>Indicators/ Data Variables</th>
<th>TRIUMF</th>
<th>J-LAB</th>
<th>FERMILAB</th>
<th>NSCL</th>
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</thead>
<tbody>
<tr>
<td># Incubators in the region</td>
<td>5</td>
<td>2</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td># Spin-Offs (10 yrs.)</td>
<td>6</td>
<td>2</td>
<td>N/A</td>
<td>4</td>
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<tr>
<td># Full-Time Employees (FTE)</td>
<td>340</td>
<td>720</td>
<td>1,757</td>
<td>240</td>
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<tr>
<td># Patents (10 yrs.)</td>
<td>30</td>
<td>85</td>
<td>8</td>
<td>N/A</td>
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<tr>
<td># Conferences (Annually)</td>
<td>Average 7-11 per year</td>
<td>6</td>
<td>24</td>
<td>3-4</td>
</tr>
<tr>
<td>Visiting Researchers (Per yr.)</td>
<td>500 (10-15 per day)</td>
<td>1,250</td>
<td>2,300 (in year 2010)</td>
<td>200</td>
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<tr>
<td>Conference Attendees (Per yr.)</td>
<td>1,000 – 1,500</td>
<td>80</td>
<td>1,581</td>
<td>300</td>
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<tr>
<td>Royalties (10 yrs.)</td>
<td>$17,279,000 (FY2002-03 – FY2012-13)</td>
<td>$606,512 (8 year period)</td>
<td>N/A</td>
<td>$100,000</td>
</tr>
<tr>
<td>Operating Funding (Per yr.)</td>
<td>2013 ($86 million)</td>
<td>$100 million</td>
<td>2010 ($478.3 million)</td>
<td>$22.5 million</td>
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<tr>
<td>Variables</td>
<td>TRIUMF</td>
<td>J-LAB</td>
<td>FERMILAB</td>
<td>NSCL</td>
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<tr>
<td>Intellectual Property Assistance</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Partners/Public Private Partnership (PPP)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
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<tr>
<td>Hazard Mitigation Plan</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>University Partnership</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Venture Capital Fund</td>
<td>X</td>
<td></td>
<td>X</td>
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<tr>
<td>Action Item</td>
<td>Responsible Party</td>
<td>Timeframe</td>
<td></td>
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<tr>
<td>Develop a <strong>branding / marketing strategy</strong> for the F-RIB &amp; Greater Lansing Region</td>
<td>Educational Institution, Regional Economic Development Organization</td>
<td>Short-Term (Less than 2 years)</td>
<td></td>
<td></td>
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<td>Review existing regional incubator facilities and existing capacity, determine future demand</td>
<td>Regional Economic Development Organization</td>
<td>Medium-Term (2-5 years)</td>
<td></td>
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<tr>
<td>Prepare a <strong>Hazard Mitigation strategy</strong> for the F-RIB</td>
<td>Educational Institution</td>
<td></td>
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</table>
# Recommendations

<table>
<thead>
<tr>
<th>Action Item</th>
<th>Responsible Party</th>
<th>Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hold a series of <strong>community</strong> meetings to receive input regarding F-RIB and potential regional impact</td>
<td>Regional Economic Development Organization, Government Entity</td>
<td>Ongoing (for 5 or more years)</td>
</tr>
<tr>
<td>Establish an F-RIB specific ongoing analytics and measurement plan with regional indicators of barriers and success</td>
<td>Educational Institution, Regional Economic Development Organization</td>
<td>Ongoing (for 5 or more years)</td>
</tr>
<tr>
<td>Hold <strong>Accelerator Task Force</strong> meetings to engage all interested stakeholders at a regional level</td>
<td>Regional Economic Development Organization</td>
<td>Ongoing (for 5 or more years)</td>
</tr>
<tr>
<td>Determine the feasibility of <strong>MSU and Lansing Community College (LCC)</strong> specific degree programs related to entrepreneurship, co-operatives, and accelerator technology</td>
<td>Educational Institution, Regional Economic Development Organization</td>
<td>Ongoing (for 5 or more years)</td>
</tr>
</tbody>
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Thank You for your time!