



Memorandum (without appendix)

Date: June 27, 2008

To: President Lou Anna Simon
Michigan State University

From: Patrick L. Anderson, Principal & CEO
Caroline M. Sallee, Consultant

Re: Economic Impact of Proposed MSU Facility for Rare Isotope Beams (FRIB)

Executive Summary

Purpose of Analysis. Michigan State University commissioned Anderson Economic Group (AEG) to quantify the economic and fiscal impact of a Facility for Rare Isotope Beams (FRIB) on the state of Michigan. This memorandum and appendix tables provide estimates of the net employment, net earnings, and new tax revenue impact of the FRIB on the state of Michigan during the facility's construction and subsequent operation.

Conclusion. The FRIB project is a rare opportunity for the State to lock in a very large stream of future earnings and anchor a future high-tech center in our state. The total economic activity associated with the FRIB will exceed \$1 billion over the initial decade. Our analysis confirms that, even using quite conservative assumptions (described below), the new tax revenue the state would earn on construction and operation of the FRIB over a twenty year period is over \$187 million.

Unlike nearly every other project for which we have completed economic impact analyses, in this case the likely alternative to this project is nothing like it in Michigan for the next 20 years. Therefore, landing the project for Michigan will indeed cause the state to earn additional jobs, income, and state tax revenue for decades to come. Because the FRIB would support a comparative advantage of the state in high-tech and physics research, locating it here will also induce other high-wage employment in this state.

Conservative Method. We have used quite conservative assumptions in our analysis including the following assumptions: fully \$200 million of the construction spending goes out of state; 40% of the new jobs at the FRIB are shifted from existing Cyclotron operations; the existing Michigan labor market would readily supply most of the indirectly-created jobs; and the facility and its operation would be completely tax-exempt. Although it is easy to exaggerate the benefit (e.g. "take all the spending and multiply by two"), there is no need to do so.

Investing in the FRIB would be a home run for Michigan. We rarely get to even bat in this league. Our judgement is that it is clearly worth a full-scale effort by the state to bring it here.

FRIB Project and Key Assumptions

Michigan State University is competing for a grant from the Department of Energy to build a Facility for Rare Isotope Beams (FRIB) on campus. The FRIB would produce and explore rare and unstable isotopes so that scientists may better understand cosmic events and nuclear properties that could lead to medical applications and breakthroughs in materials science. The FRIB would be at least 1,000 times more powerful than the 20-year old machines currently in operation at MSU's National Superconducting Cyclotron Laboratory. MSU's most notable competition for the facility is against the University of Chicago's Argonne National Laboratory.

Key Assumptions in Analysis. Based on information provided by Michigan State University, we assume that the design of the FRIB would occur between FY 2009 and FY 2012, and that construction of the facility on MSU's campus would begin in FY 2013 and last through FY 2016. We assume that \$548 million would be spent on construction of the FRIB, and the Department of Energy would provide \$50 million annually after construction for operations for at least 20 years. We also assume that \$147.9 million of the total \$548 million spent during construction would be spent on wages for construction workers, \$196.4 million would be spent on construction materials in the state of Michigan, and \$203.7 million would be spent on construction materials purchased outside the state. These parameters are based on estimates from MSU on what materials can be purchased from businesses in Michigan and what must be purchased from businesses outside the state. We also assume that 40% of the total estimated 300 jobs at the FRIB once its operational would be filled by existing MSU employees from the Cyclotron Laboratory.

Economic Impact of the FRIB

We estimated the economic impact of the FRIB on the state of Michigan during construction and once the facility is operational.

During Construction. Michigan State University anticipates that during the course of the design phase of the FRIB, the project will create 29 full-time-equivalent jobs (FTEs) in FY 2009, and the number of jobs will increase annually to a high of 82 FTE jobs in FY 2012, as shown in Appendix Table 1 on page 5. Once construction begins, MSU anticipates construction will create between 102 FTE and 155 FTE jobs each year. We have assumed that all jobs created by the construction of the FRIB will be new construction jobs in Michigan. This assumption is unusual for us to make, but in the case of this one-of-a-kind facility it is reasonable that no other construction would be crowded out by this facility. We estimate that the FRIB's construction would create a total of 791 single-year duration jobs in Michigan.

Spending on construction materials and by construction workers would generate additional employment in the state of Michigan. We estimate that the FRIB would create an additional 4,992 single-year duration jobs during construction of the FRIB. We estimate that the construction of the FRIB will result in a net increase in employment of 5,783 single-year duration jobs in the state of Michigan, as shown in Table 1.

TABLE 1. Total Employment Impact of FRIB During Construction, FY 2009-2016

	Total Construction 1-Year Jobs
Direct Construction Employment at FRIB	791
Direct Materials and Indirect Construction Employment	<u>4,992</u>
Total New One-Year Jobs in State of Michigan	5,783

Source: Anderson Economic Group, LLC

The FRIB’s construction results in new earnings for workers in the state. We estimate that during the construction period, total new earnings would be \$446 million. This figure includes \$148 million in direct wages paid to construction workers building the FRIB and \$298 million in earnings to indirectly-generated employment. See Table 2 below.

TABLE 2. Total Earnings Impact of FRIB During Construction, FY 2009-2016

	Total Earnings (Cumulative, \$Millions)
Direct Earnings due to Employment at FRIB	\$148
Earnings from Indirectly-Created Employment	<u>\$298</u>
Total New Earnings in the State of Michigan	\$446

Source: Anderson Economic Group, LLC

During Operation. Once the FRIB is completed and operational, we estimate that 400 jobs would be created in the state of Michigan; 180 of these jobs would be at the FRIB and 220 in other industries in Michigan. We assume that 120 jobs at the FRIB would be filled by existing MSU employees. We anticipate that most of the remaining FRIB jobs would be filled by workers coming into the state from outside Michigan, while most of the new jobs created in other industries (e.g. entertainment, food service, and professional services) would be filled by existing residents. Using an average household size of 2.5, we estimate that the FRIB’s operations would result in 505 new residents.

New employment and residents due to the FRIB would generate new earnings in the state. Using information on wages for FRIB employees provided by MSU, we estimate that wages for FRIB employees, after accounting for substitution, would be \$37.5 million annually once the plant is operational. Once earnings for indirectly-generated employment is included, the annual earnings impact of the FRIB on the state of Michigan increases to \$62.8 million in FY 2017.

New State Tax Revenue due to the FRIB

The FRIB would increase tax revenue to the state of Michigan. During the eight year design and construction period, state tax revenue would increase by a total of \$36.2 million. We arrived at this figure by multiplying net new earnings in the state created each year by the FRIB’s construction by 8.01%, which is the ten-year average of the percentage of state personal income paid in taxes to the State of Michigan. Taxes paid include personal income, sales, use, business, and property taxes.

Once construction is completed we estimate the state would receive \$7.6 million annually in new tax revenue for a total of \$151.4 million during the twenty year operation of the FRIB. New state tax revenue is from the earnings of new workers in the state, assuming nominal wage growth of 3% per year, and from induced economic activity, assumed to be 10% of net direct earnings due to the FRIB. This brings the total state revenue impact due to the FRIB during both construction and operation to \$187.6 million.

Methodology

We evaluated the employment, earnings, and new state tax revenue impact of the FRIB project on the State of Michigan using the following methodology.

- We obtained employment figures by year for construction of the FRIB from Michigan State University. We assumed that the construction of the project would not crowd out any other construction activity in the state. We multiplied direct employment by a Bureau of Economic Analysis (BEA) RIMS II multiplier to obtain the indirectly-generated employment. We also estimated the employment impact of construction spending in the state of Michigan using construction spending by year of construction provided by MSU multiplied by a BEA RIMS II expenditure-employment multiplier.
- MSU provided an estimate of wages that would be paid to construction workers by year during the construction period. We multiplied the construction wages by a BEA RIMS II direct-effects employment multiplier to obtain the earnings of indirectly-generated employment.
- Employment and earnings in the state once the FRIB is operational is based on data provided by MSU. We account for substitution of 40% of the 300 FTE jobs at the FRIB to be filled by existing MSU employees, and therefore do not represent new employment in the state.
- We estimate that 100% of the net direct jobs at the FRIB will result in new residents to the state. We estimate that 90% of indirectly-generated jobs in other industries will be filled by existing Michigan residents.
- We estimate the earnings impact as wages paid to employees at the FRIB, accounting for 40% substitution, plus earnings from indirectly-generated jobs. We use a BEA RIMS II multiplier to estimate the indirectly-generated earnings.
- To calculate new state tax revenue, we start with new earnings in the state due to the FRIB during construction and annually once the FRIB is operational. We estimate likely new state tax revenue as 8.01% of earnings. This is based on total state tax revenue as a percentage of state personal income.
- We calculate induced effects as 2% of direct earnings from construction in FY 2015 and 3% of direct earnings from construction in FY 2016. We anticipate that induced economic activity will increase as the project progresses. During the FRIB's expected twenty year operation we estimate induced earnings as 10% of direct earnings. We multiply these earnings by 8.01% to calculate new tax revenue from induced economic activity.
- Based on information provided by MSU's scientists, it is anticipated that as MSU's current facility becomes obsolete and a new facility is built in a different location MSU would lose trained scientists and staff. Based on this information, we assume that the state loses on average 10 trained staff per year for ten years if a competitor wins the FRIB instead of MSU. We use the average wage of highly trained scientists (expected to be \$208,462 in FY 2017) to calculate lost earnings. We multiply lost earnings by 8.01% to calculate lost state tax revenue.