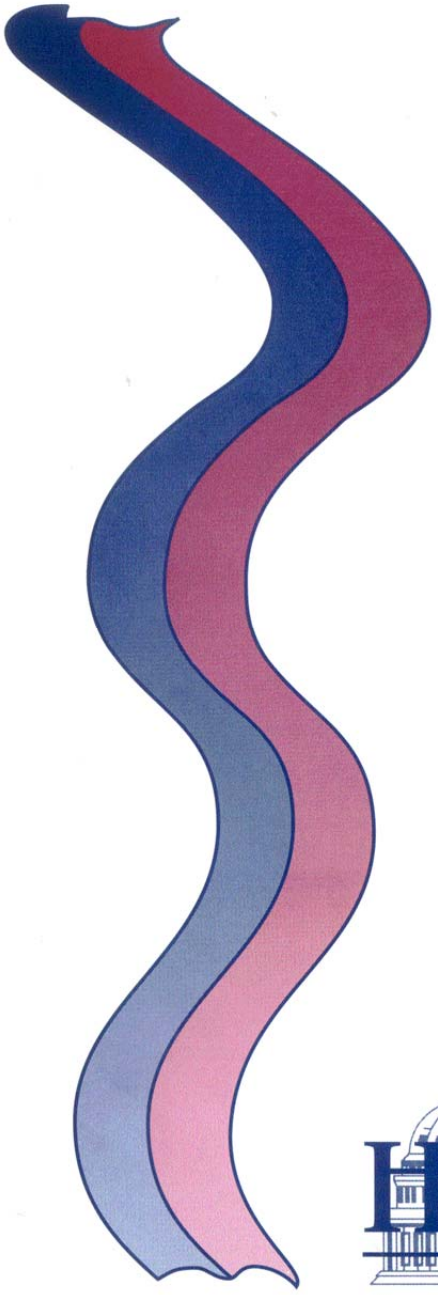

A Brief Analysis of the Effects of Multi-Value Projects in the Midwest ISO

Gary Wolfram, Ph.D.

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I. Introduction

Electricity is vital to everyday economic activity in our modern economy. A power outage not only makes life inconvenient, but it can bring the state's economy to a halt. Every retail outlet, manufacturing plant, school, auto repair shop--in short, every business relies on electricity. The cost of electricity as well as the reliability directly affects our everyday life, yet we seldom stop to think about the *transmission* of electricity. The electric grid is an important but underappreciated aspect of the economy of our state, the region, and the nation.

It is useful to think of the transmission lines as a highway system for electricity. The interstate highway connects states and regions allowing for the efficient exchange of commerce at high volumes via an unobstructed high-speed interconnected roadway. This interconnected highway provides customers goods and services and all the gains from trade that economic theory and empirical evidence have shown to be true.

The same is true of electricity. The greater the transmission infrastructure, the more efficiently energy can be transmitted throughout the state and region. This allows electricity to be produced in areas where the cost of generation is relatively low and sold where the cost of generation is higher, benefiting customers by introducing a competitive market. This is particularly useful in regions where there are no indigenous fuel sources.

Just as the highway system creates benefits that are regional and national in character, transmission projects also provide benefits that are shared throughout a region and nationally. In the same way, there are numerous and widely distributed benefits of transmission infrastructure, all of which are present in any single project. One of the benefits of such projects is a reduction in congestion, that is, the ability to more economically deliver power to load by opening access to lower cost generation resources that are inaccessible due to a lack of capacity on the transmission line. Further, the greater the investment in infrastructure, the more reliable the delivery of energy will be, which is crucial in many types of service industries as well as manufacturing. Just as the interstate highway system links the US economy together and reduces the cost of producing and consuming goods and services, the transmission system for electricity also links the economy together and results in lower costs of production.

If we all turn our air conditioners on at the same time, and the factories are running full tilt, a congested transmission system would limit the access to lower cost external resources creating a

reliance on more costly local generation resources. Similar to the situation where when we all try to drive to a Tiger game on I-94 at the same time, the traffic cannot flow smoothly. But with electricity, congestion is not just a nuisance; it leads to sharp increases in prices paid for by the customers and, eventually, could impact the system reliability.

Investment in transmission infrastructure provides benefits beyond those that can be analogized to the highway system. Some of these are due to characteristics of how energy is produced and transmitted. A robust transmission system significantly reduces inherent transmission line losses. In addition, transmission line losses are reduced exponentially as the line voltage increases. The cost of generating the electricity and getting it to your house or business will be less if there is less loss of electricity as it flows through the transmission lines; hence, improvements to the transmission system reduce the total cost of providing electricity.

Because capital costs of a generating facility are high and electricity demand is variable, it is often cheaper to import electricity from a distant source than it is to produce it locally. Of course, the ability to import or export electricity is critically dependent on the transmission system. Having access to multiple sources of electricity made possible by a regional transmission system can substantially reduce the cost of providing electricity and provide energy more reliably by allowing utilities to import power when they are unable to produce enough energy to serve demand. The transmission system also provides export capability for local generation that is in excess of what is needed to serve demand.

Therefore, a high voltage regional transmission system offers numerous benefits to businesses and residents throughout the region. As such, most industry experts agree that regional transmission is needed.[1] One such effort to provide for these types of regional systems has been undertaken in the Midwest. What has become contentious, however, is how the costs to build these projects should be allocated.

II. Economic Effects of Multi-Value Projects and How to Allocate Costs?

Michigan is part of a regional transmission organization known as the Midwest Independent Transmission Operator (MISO), which is a nonprofit organization that provides open-access transmission services and has 93,600 miles of transmission lines under its direction. Its members include thirty-five transmission owners throughout thirteen Midwestern states and Manitoba, Canada.[2]

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[1] Kwok, Peter Jordan, Electricity Transmission Investment in the United States; An Investigation of Adequacy, Sept. 2010, pg. 10, found at http://www.google.com/url?sa=t&source=web&cd=5&ved=0CC4QFjAE&url=http%3A%2F%2Fdspace.mit.edu%2Fbitstream%2Fhandle%2F1721.1%2F62058%2F707937446.pdf%3Fsequence%3D1&ei=tN7fTeqQBIbi0QGknpG5Cg&usg=AFQjCNHoZTbBDnNonzkjAh33d2UoLFp1JA.

[2] See https://www.midwestiso.org/Library/Repository/Communication%20Material/Corporate/Corporate%20Fact%20Sheet.pdf.

In December 2010, after an 18 month stakeholder process, the Federal Regulatory Energy Commission ("FERC") approved a new category of transmission projects in MISO that provide regional benefits called Multi-Value Projects or MVPs. MVPs will be planned using a holistic, forward-looking portfolio approach to infrastructure development instead of the less efficient "Band-Aid" incremental build out for the next generator or customer on the system. In recognizing the regional nature of these projects and the corresponding regional benefits, FERC approved the costs of qualifying facilities to be allocated equally to all customers based on energy usage. This is a simple and certain method of distributing the cost of this transmission infrastructure investment and makes sense from the standpoint of an economic theory of benefit-burden. The first and currently only MVP approved by MISO will be located in the Thumb region of Michigan.

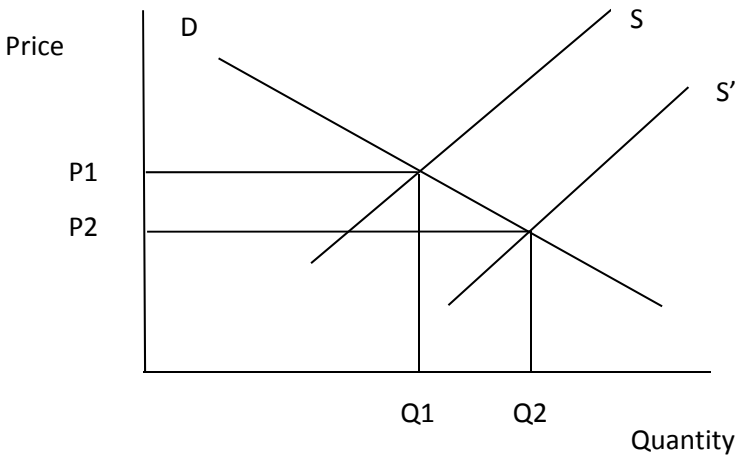
There has been some discussion of whether Michigan electric customers should pay for MVPs that are located outside of Michigan. Some have suggested that Michigan consumers get no benefit from these projects and customers in each state should pay only for the costs of projects in their state. Such an argument ignores the interconnectedness of the electric grid.

Using the highway analogy, the citizens of Louisiana might argue that they should not have to assist in paying for I-94 since they are unlikely to drive on I-94. It is fairly obvious, however, that this overlooks the fact that any market-based economy is totally interconnected. People in Louisiana purchase cars that are assembled in Michigan. The parts, fuel, computers—everything used to produce the cars travel from around the nation on the interstate highway system, and that Ford Fusion sitting on the dealer's lot in New Orleans would not be there without miles of highway that are located outside of Louisiana.

Many of the shrimp producers in Louisiana would not exist if they could only sell their shrimp within the state. The costs of computers that are used in dentist offices in Louisiana are less because computers can be imported on the national highway system, and thus the costs of dental services are lower in Louisiana because of the existence of highways that the citizens of Louisiana may never drive on themselves.

Similarly, consumers throughout the region benefit when there is an expansion or upgrade of the electric transmission system. By simply looking at power flow, it is clear how low cost generators in other states can sell their power to consumers throughout the region effectively increasing the supply of energy to customers, including those in Michigan. This increase in supply will reduce electricity prices, as is illustrated by the elementary demand and supply analysis in Figure 1.

Figure 1



Price is represented along the vertical axis and Quantity along the horizontal axis. D represents the demand for electricity and S represents the Supply of electricity, with the equilibrium price and quantity being P1 and Q1. Upgrading and expanding the transmission system will increase the supply of electricity to Michigan customers by, among other things, increasing the ability of generators of electricity in other states to import electricity into Michigan. This is represented by a shift of the supply curve to the right, S'. The new equilibrium price will be lower, P2, and the new equilibrium quantity will be higher, Q2.

The shift in the supply curve is akin to the concept of Adjusted Production Costs (APC). Adjusted production costs are the difference in the cost to generate electricity with or without some identified change in the system. In the case of MVPs, by increasing access to greater generation resources, the most economic units of generation will be dispatched first so less will have to be spent in total to generate electricity throughout the region. Lower APC results in lower overall electricity costs at all times (contrast with Locational Marginal Prices discussed below). This is also wholesale competition at work. However, the benefits to Michigan consumers do not end there. Electricity is an input into most, if not all, goods and services in a modern economy. It is challenging to think of an exception. Economic theory then tells us that when the price of an input declines, the marginal cost of production goes down. This will increase the supply of goods and services, which, as was shown in Figure 1, will result in lower prices for goods and greater quantities.

The reduction in losses as power travels from the generator to the customer that occurs with a more robust transmission system will also reduce the marginal cost of producing and delivering electricity to consumers. Once more, this will shift the supply curve to the right, reducing price and increasing quantity.

In contrast to a traditional shift in the supply curve that results from lower production costs and reduced losses, another benefit of increased transmission infrastructure and related access to greater generation resources is a reduction in the Locational Marginal Price (LMP). LMP is the spot or real time energy price at certain locations (also called "hubs") in regional markets and is set based on the marginal or next most efficient unit of generation. In MISO, Michigan has its own pricing hub.[3] The LMP is a result of marginal generation costs, plus losses, plus congestion. Michigan has some of the highest LMP prices in the Midwest region.[4] Access to lower cost marginal units by reducing congestion between those units and Michigan will lower the LMP.

Whether a particular load is served by self-generation, contracts, or purchases directly from the LMP or spot market, LMPs will have an impact on the price consumers pay because it is the market by which all other transactions are measured. Therefore, lower LMPs are good for customers. On the other hand, generators that sell energy into the market like higher LMPs because it raises the price they are paid for their power.

Reduced capacity reserve margins are another benefit of regional transmission. Capacity reserve is the amount of generating capacity that has to be available at all times to meet unexpected demand on the system to maintain reliability. With greater access to generation resources outside of the local region, the amount of generating capacity that needs to be held in reserve can be reduced which has the effect of reducing the overall cost of energy. Again, this becomes more important in those regions where there are no indigenous fuel sources and therefore a greater dependence on imported forms of generation.

The benefits of MVPs are likely to be realized in proportion to the burden placed on the system. For this reason, electricity usage is an appropriate approach to allocating these costs. Other methods, such as allocating costs based upon location of the transmission lines, would ignore benefits to those outside the geographic location of the project and assign more costs than benefits to those within the region where the additional facilities are located.

III. Costs and Benefits to Michigan Residents from Transmission Improvements

Michigan has some of the highest energy prices in the Midwest. Michigan market rates were highest or second highest in the region over 90% of the time in the last 23 months.[5]. On average, Michigan rates are 7% higher than the MISO average.[6] Michigan retails rates are also among the

[3] A map of the MISO hubs and associated LMP prices that is updated every 5 minutes is available at: https://www.midwestiso.org/MarketsOperations/RealTimeMarketData/Pages/LMPContourMap.aspx.
[4] See monthly MISO Information Forum meeting presentations, slide titled Pricing: Day-Ahead and Real-Time Average Monthly LMP for Midwest ISO and Hubs Peak/Off-Peak, available at https://www.midwestiso.org/Library/MeetingMaterials/Pages/InformationalForum.aspx.
[5] Id.
[6] Id.

highest in the region.[7] These rates are a factor that limits economic activity in Michigan, especially in the case of commercial and industrial rates and places a burden on Michigan families. One way to bring these rates down is prudent transmission investment to provide access to more economical energy.

Transmission costs are about 7% of a typical residential consumer electric bill nationwide.[8] In Michigan, the share is a little more than half of that, about 4%.[9] Generation is by far the largest share of a residential utility bill, 68% nationally and 62% in Michigan.[10] The distribution costs in Michigan account for about one third of the utility bill, with national numbers at about one-fourth.[11] Given that generation costs are the largest component of an electric bill, improving the transmission system will reduce total costs since increasing the ability to receive power from generators competing with local generators will place downward pressure on rates. Of course, this does not consider the additional benefits of reduced congestion and increased reliability that a robust transmission system also provides.

The cost to Michigan ratepayers from the MISO allocation of the costs of MVPs will, of course, depend upon what projects are ultimately built. Right now the first project is the Thumb Loop Project, which will have about 140 miles of high voltage transmission and four new substations to increase reliability and provide access to wind power in the thumb region of the state. The cost of this project will be about $510 million.[12] This project alone is estimated to reduce productions costs across the region by $1.8 to $3.79 billion over a 20 year period.[13]Should all of the proposed MVP projects currently under review at MISO be built, the estimated cost would be less than $5 billion.[14] The costs impacts to Michigan for these projects over a 40 year time frame are shown in Table 1 for Detroit Edison and Consumers Energy customers. As you can see the order of magnitude of the increases would be relatively small, only about 60 cents per month for the typical residential customer and less than 1.5% for even the largest energy users.

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[7] See Energy Information Administration, Electric Power Monthly, May 2011, Section 5.6.A. Average Retail Price of Electricity to Ultimate Customer by End Use Sector, by State.

[8] https://tonto.eia.doe.gov/energyexplained/index.cfm?page=electricity_factors_affecting_prices

[9] http://www.modernizethegrid.com/documents/CostAlloc_MI%20Gov_40411.pdf

[10] Id.

[11] Id.

[12]https://https://www.midwestiso.org/Library/Repository/Meeting%20Material/Stakeholder/BOD/System%20Planning%20Committee/2010/20100817/20100817%20BOD%20System%20Planning%20Committee%20Item%20ITC%20Out%20of%20Cycle%20Project.pdf.

[13] Midwest ISO Planning Advisory Committee (PAC) Thumb Project Out of Cycle Presentation, July 2010

[14]https://www.midwestiso.org/Library/Repository/Meeting%20Material/Stakeholder/MVP/2011%20MVP/20110526/20110526%20MVP%20Reliabilty%20Analysis%20Presentation.pdf

Table 1
Allocated cost of Starter Projects

User Category	Approximate Percent Increase in Annual Bill
Residential (500 kWh per month)	.9%
Small Commercial (1000 kwh per month)	.88%
Small Commercial (5000 kwh per month)	.99%
Large Commercial (21,600 kwh per month)	1.03%
Small Industrial (432,000 kwh per month)	1.37%
Larger Industrial (4.32 million kwh per month)	1.45%

The benefit/cost ratio for the proposed projects increases over time as the projects come on line and the benefits from reduced congestion, increased reliability, and competition among generators comes into effect. MISO studies show a 20-year benefit to cost ratio ranging from 1.12 to 2.77 to 1 with $996 million to $2.044 billion dollars in annual adjusted production cost benefits across the region.[15] That's a benefit to the typical residential customer of $14 to $19 per year.[16] And in the Eastern Planning Subregion alone (which includes most of the lower peninsula of Michigan and the Northern Indiana Public Service Company (NIPSCO) service territory in Gary, Indiana), the benefits range from $400 to $930 million dollars annually.[17] When compared to the expected annual cost to Michigan of less than $200 million, it is clear that the benefits of these projects will more than outweigh the costs to the state.

The robustness of transmission facilities in other states throughout the region is of particular importance to Michigan customers. This is because Michigan is a net importer of power. Almost 26 million megawatt hours were imported during the period 2009 to 2011, amounting to about 12% of the total energy served. Michigan imports 10% or more of its energy 80% of the time. About 25% of the time we import more than 2000 MW of power. The peak import has reached as high as 54% of total system load.[18] As stated above, development of regional MVP projects will provide Michigan greater access to more competitive generation resources for these imports providing downward pressure on APC and LMP, thus reducing total electric bills for Michigan customers.

[15] MISO 2011 Candidate MVP Portfolio Technical Studies Task Force Meeting April 25, 2011, slides 58 and 61, available at https://www.midwestiso.org/Library/Repository/Meeting%20Material/Stakeholder/MVP/2011%20MVP/20110425/20110425%20MVP%20Presentation.pdf.

[16] Id. Calculated by dividing the regional benefits by the regional MWhs (taken from MTEP 2010 Report, Appendix D1, Page 96 and subtracting FE and CIN), converting to kWhs and multiplying by 6000 (500 kWh/month for 12 months).

[17] Id. at slide 59.

[18] Data provided by ITC Holdings based on power flows across regional seams.

An inadequate transmission system creates uncertainty about the reliability of the power supply and thus is a drag on Michigan's industrial and commercial development. The proposed MVP projects are designed not only to provide access to imported electricity, but to ensure that the lights stay on in the state. Given that Michigan's state gross domestic product declined from $386.9 billion in 2007 to $361.1 billion in 2009 it is important that the state make every effort to establish an infrastructure that will attract economic development, and a robust electric power system will be particularly helpful in this regard.[19]

Also, consider the renewable energy component manufacturers that are locating in Michigan. Once a robust transmission grid is established, regardless of the RPS standards that exist in one state over another, the grid will serve as a superhighway to facilitate the movement of these resources over the system. Michigan's renewable resource manufacturers and renewable generation developers would reap the benefits of not only greater demand for the components produced in Michigan, but also the added benefit of access to sell excess capacity to the market.

III. Conclusion

Michigan's economy will benefit from improving the transmission facilities throughout the Midwest region. The benefits of improved transmission are access to lower cost energy, increased reliability and reduced congestion. This alone will attract and maintain business activity in Michigan. It is not possible to place a manufacturing facility, for instance, in a location where the grid is not large enough to support the additional electric needs of the facility or not reliable enough to ensure that the manufacturing process will not be interrupted.

Perhaps the most important benefit from an improved transmission network is the increase in competition that will result. Increasing the ability of customers to access generators from outside Michigan due to improvements in the regional transmission system will result in reduced energy costs and increased access to other markets for export of Michigan generation. Michigan needs to have access to the lowest cost power possible to help existing businesses grow and attract new businesses.

A new piece of empirical evidence on the effects of competition on rates has recently been released by Penn Future, one of Pennsylvania's leading environmental advocacy groups.[20] The report shows the significant reductions in electricity costs that have occurred since competition was introduced in the state in 1996. Commercial rates have declined by 12% in constant dollars, and industrial rates have declined by 8% from 1996 to 2010. While this study focuses on changes in legislation that introduced competition in the state's wholesale and retail markets, nonetheless, it is an affirmation that increased choice of suppliers will drive down prices.

[19] U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Accounts, GDP by State.
[20] *Consumers Win: A Decade of Electricity Competition*, Citizens for Pennsylvania's Future, Harrisburg, PA, December 2010.

The interconnectedness of the electricity grid is the reason why Michigan residents benefit from transmission projects that may be built outside of the state. Efficiency and equity are satisfied when the cost of transmission projects is allocated by usage.

In an interconnected economy, a robust electrical transmission system is vital. Arguments that Michigan should go it alone are overlooking the benefits Michigan consumers enjoy from the entire system. The costs to consumers of upgrading the system are low in relation to the benefits received and relative to overall electricity rates, making the MVP projects a solid and necessary investment for the state's economic future.

About the Author: The author is President of Hillsdale Policy Group, Ltd, and the William E. Simon Professor of Economics and Public Policy at Hillsdale College. He is the author of *Towards a Free Society: An Introduction to Political Economy* and has published numerous works on public policy issues. He has served in several policy positions, including Michigan's Deputy State Treasurer, member of the Michigan State Board of Education, President of the Board of Trustees of Lake Superior State University and Congressman Nick Smith's Washington Chief-of-Staff. Dr. Wolfram received his Ph.D. in Economics from the University of California at Berkeley and has previously taught at the University of California at Davis, Mount Holyoke College, Washington State University, and the University of Michigan at Dearborn.