Towards reducing CO2 emissions related to electricity generation,

Let's talk about wind, transmission expansion, and actual, local solutions….

Tall, white, sleek wind turbines against the backdrop of an open sky are the ubiquitous symbol of renewable energy in the US. An increasingly environmentally conscious American public wants to see carbon emissions reduced significantly and is looking to growth in wind production as a solution. Within this imagery, it is assumed that transmission expansion is the best way to reduce CO2 emissions over time. But is this really the case? Regional utility planning for expansion transmission lines estimates that even with wind resources increased five-fold, CO2 emissions would continue to rise.[i]

An alternate view sees Wisconsin wind farms as a component of our renewable energy mix and one that we can support without having to expand our transmission footprint. This view recognizes that we live at a time when only energy efficiency, load management[ii], and local power (or distributed energy resources, DERs[iii]) can guarantee reductions in CO2 emissions and also preclude the need for transmission expansion.

This comprehensive view differentiates between ***local*** and ***remote*** renewable energy approaches. *Local* refers to energy produced very close to where it will be consumed, insuring that grid power, which averaged 74% fossil fuel generation in 2016, is used much less and that reductions in CO2 emissions are maximized. *Remote* refers to energy that has to be transported over long distances. Rapidly occurring technological changes are presenting a wide array of local renewable and energy efficient options. These local options make inefficient transmission expansion unnecessary, and in doing so, prevent the fixed electric rate and fee hikes and economic and environmental disruptions that accompany transmission expansion. Indeed, penetration of energy efficiency, load management, and DERs in the energy market is growing in 27 states, where such end user improvements are chosen over utility capital investments and transmission expansion.[iv]

A few points to consider when thinking about wind, transmission expansion, and cost-effective local alternatives for energy generation and reductions in CO2 emissions are the following:

1) ***Transmission expansion in Wisconsin and the Midwest has not resulted in significant increases in the percent contribution of wind to the power flow:***

   Since 2005, the Midwest has seen about 15 new, open-access, expansion transmission lines, 7 of which have been built in Wisconsin. Interestingly, since 2005, the percentage of wind in the Midwest grid has only increased about 3-4%. As of 2016, wind's portion of the Midwest's total electricity output was approximately 8%. [v]

2) **2) Transmission expansion does not directly affect the amount of remote wind power that Wisconsin utilities buy and transmission expansion is a very inefficient way to increase "green power" in our outlets.**

   As electricity use has leveled off and financial incentives continue to encourage Wisconsin utilities to sell power from their own power plants, the amount of power imported into WI through interstate transmission lines is contributing a smaller percentage of the power we consume. Of the 54 million megawatt hours (MWh's) of power sold to ATC-Wisconsin utility customers in 2013, only approximately 5.1 million were imported from out of state, or about 10% [vi] The amount of out of state wind power that actually reaches WI's electric outlets is a small percentage of this 10% because imported power is a *mixture* of all fuel generation types. In 2016, the Midwest electricity market averaged 74% fossil fuel generation and 8% wind generation.[vii] Because of the combination of low use of imported power [viii]and the low percentage of green energy in that power, enlarging the transmission system is a very inefficient way to "green up" our outlets. In contrast, when a household adds grid-tied solar or deploys energy efficiency to cut household use of grid power in half, the negative CO2 impacts of that grid power are also cut in half .

3) ***Transmission expansion provides grid access to fossil fuel as well as wind generation and may result in an increase in carbon emission levels:***

Because access to interstate transmission lines is not determined by fuel generation type, if built, CHC would still carry the high percentage of fossil fuel generation, including power from new coal power and natural gas plants being developed. Indeed, this is why American Transmission Company and transmission builders cannot guarantee that any new expansion line will deliver more renewable energy. Interestingly, carbon emission impacts under six futures from 2020-2026 for the Badger-Coulee transmission line suggest that CO2 emissions would continue to increase. The only future where carbon emissions decline over time relies on accelerated energy efficiency, load management, and in-state renewable energy production. The estimated decline occurs when the expansion line is not added.[ix]

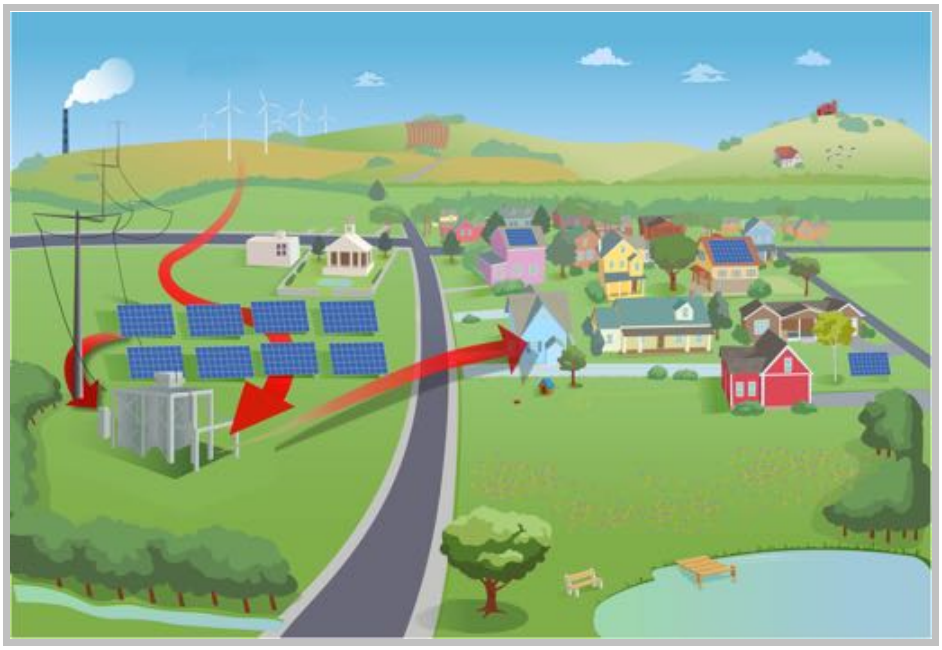
4) ***Improvements in energy efficiency, load management, and distributed generation programs are the most cost-effective means to achieve our renewable energy goals:***

Energy Efficiency has proven itself to be a powerful force in reducing energy consumption and carbon emissions. According to the American Council for an Energy Efficient Economy (ACEEE), if supported through expanded state and federal energy efficiency policies, *efficiency could provide 'one-third of total expected electricity generation needs' by 2030*.[x] Because energy efficiency also reduces peak demand, accelerating Wisconsin's investments in energy efficiency directly reduces need for new transmission.

By adding load management (also known as demand response) to energy efficiency, peak demand is further lowered which prolongs the lifespan of grid infrastructure. While WI utilities rarely use load management, Dairyland Power Cooperative has developed an array of programs that are achieving very significant reductions in peak load.[xi]

As for feasibility of DER development in Wisconsin, Dairyland Power Cooperative has also developed fifteen trend setting utilizations of load management and local power by placing utility-owned and community-owned solar facilities[xii] near or at substations prolonging their lifespans and saving capital costs for all electric customers. Coop members are leasing solar panels for 25 years at a cost of about for $2 per watt.[viii]

A comparison of savings from (a) Accelerated Energy Efficiency (b) Accelerated Efficiency with Solar and (c) Transmission Expansion for a large, Grant County dairy operation demonstrated 20 years savings of more than $800,000 for Energy Efficiency and $2.5 million with investment in Efficiency and Solar. [xiv]



A community solar farm supplying power directly to homes reduces CO2 emissions most effectively by directly reducing use of grid power averaging 74% fossil fuel generation in the Midwest. By lowering power flow through the substation, the solar facility creates three advantages: it prolongs the lifespan of expensive substation components, it shaves peak load lowering electricity costs for all customers and the facility can be installed at rock bottom price. **Online notes:** http://bit.ly/Forum-Action-Packet

Notes (Towards reducing CO2 emissions)

i Data compiled from MISO filing of estimated CO2 impacts on Badger-Coulee PSCW docket, pages 19, 20
http://soulwisconsin.org/Resources/FootnoteHarbour.pdf#page=19

ii A variety of methods end users can make to control use during high use periods and lower demand placed on distribution and transmission line infrastructure.

iii Energy generation and storage systems located close to the point of use.

iv See references and maps on pages 6 & 7, CUB and CLEAN 2011 request to PSCW to restore aspects of Integrated Resource Planning PSC REF#:172038 http://bit.ly/CUB_2011_Restore_IRP_Request_PSCW

v 2016 STATE OF THE MARKET REPORT FOR THE MISO ELECTRICITY MARKET, page 12,
https://www.potomaceconomics.com/wp-content/uploads/2017/07/2016-SOM-Appendix_Final_7-17-17_final.pdf#page=12

2011 STATE OF THE MARKET REPORT FOR THE MISO ELECTRICITY MARKET, page 48,
https://www.potomaceconomics.com/wp-content/uploads/2017/02/2011-State-of-the-Market-Report.pdf#page=48

vi See calculation of state percentage on page 4 here:
https://www.dropbox.com/s/26ha80d2ijcy6j1/EPIC_CHC_EIS_Update_ATC_Planning_20170322_v03.pdf?dl=0

Data sourced from, 2013 ATC Economic Planning, p.9.
http://www.atc10yearplan.com/wp-content/uploads/2014/01/2_2013-Year-in-Review_2014-02-07_r1.pdf#page=9

vii 2016 STATE OF THE MARKET REPORT FOR THE MISO ELECTRICITY MARKET, page 12,
https://www.potomaceconomics.com/wp-content/uploads/2017/07/2016-SOM-Appendix_Final_7-17-17_final.pdf#page=12

viii See declining use of electricity market at an Indiana MISO hub, http://bit.ly/ElectricMarkHUB_Prices_Volume
Data from EIA-supplied Wholesale Electricity Market records: https://www.eia.gov/electricity/wholesale/

ix Data compiled from MISO filing of estimated CO2 impacts on Badger-Coulee PSCW docket, pages 19, 20
http://soulwisconsin.org/Resources/FootnoteHarbour.pdf#page=19

x "The Greatest Energy Story You Haven't Heard," ACEEE, p. 7,
http://aceee.org/sites/default/files/publications/researchreports/u1604.pdf

xi Correspondence with Vernon Electric Coop, a Dairyland Distribution Cooperative, indicates their load management practices realize load reductions of 5-7% in the summer and about 10-12% in winter. Descriptions of the load management programs: : http://www.vernonelectric.org/content/dual-fuel and
http://www.vernonelectric.org/content/storage-heat . Realtime monitoring of load management resources:
http://xso.dairylandpower.coop/lm/LCstatus_xres.html

xii Dairyland Power Cooperative, November, 2016 Press Release
http://www.dairylandpower.com/dcontent/article/DPCannouncesadditionalsolarcontracts.pdf facilities built with map:
http://ruralsolarstories.org/story/dairyland-power-cooperative/dpc-solar-map-600w-2016/

viii Sample solar agreement with Richland Electric Coop,
http://www.rec.coop/sites/rec/files/PDF/Solar%20Agreement.pdf

xiv See chart, page 7 with estimates for three energy investment paths based on $13,000 per month actual electric bill. Assumptions used provided below the chart: http://bit.ly/GrantCoBoardPacket_20171219