Five Decarbonization Myths about Solar and the Grid

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ISES SWC50

Dec 9, 2021

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ENERGY SYSTEMS INTEGRATION GROUP

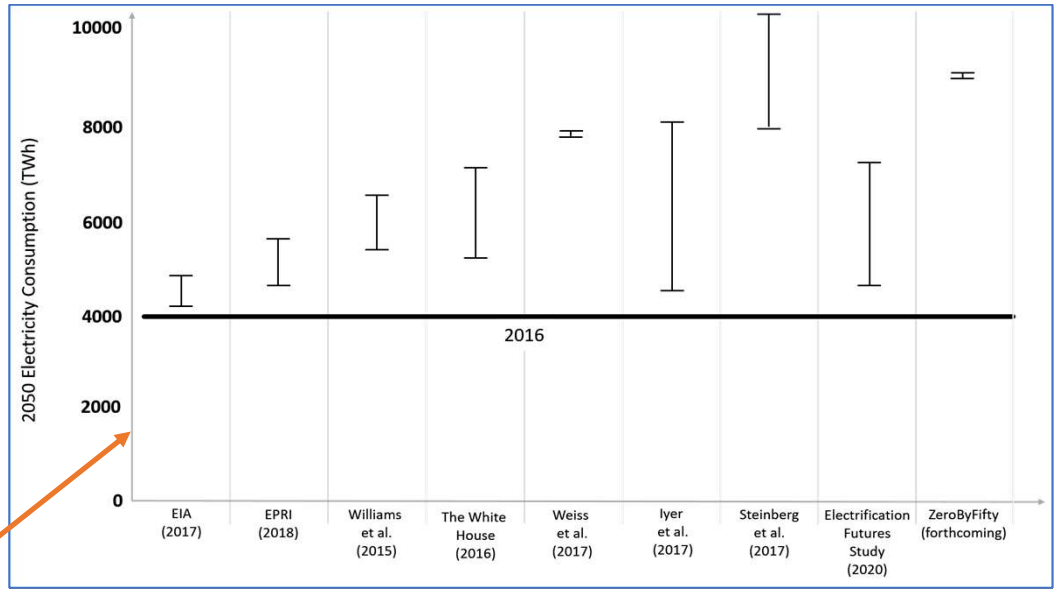
What is ESIG?

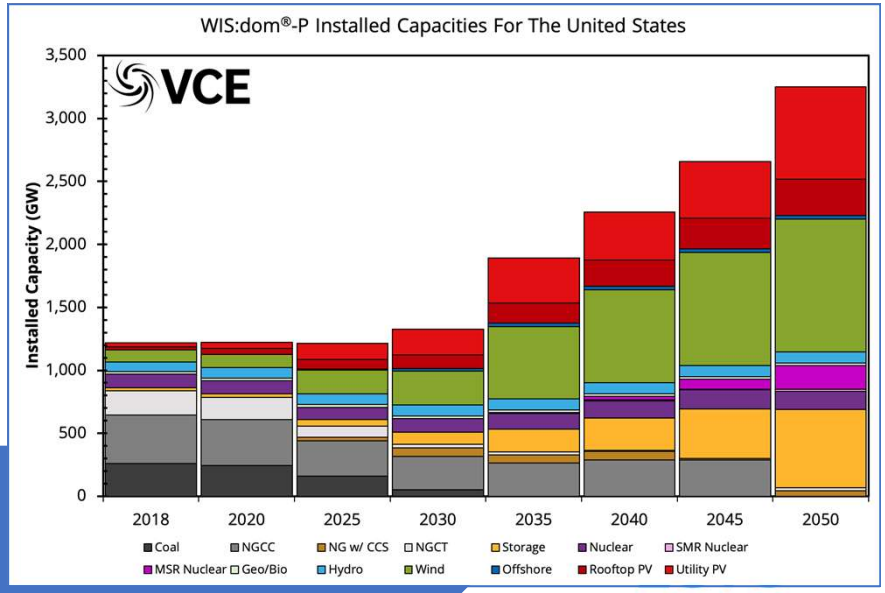
- ESIG addresses the technical challenges for transforming energy systems through collaboration, education and knowledge sharing. Workshops, webinars, reports available freely at esig.energy.
- 180 members worldwide broadly focused on decarbonization and integration of energy systems
- ESIG is part of the Global Power System Transformation Consortium and leads their System Operator Research and Peer Learning pillar.

Myth #1
We don’t need transmission - We can do it all with rooftop solar

Increased demand drives the need for significant new, clean energy resources

- Electrification will lead to significantly increased demand.
- Rooftop solar will contribute but is not sufficient on its own.
- We may need 1000 GW+ of wind and solar to meet 100% clean electricity goals.

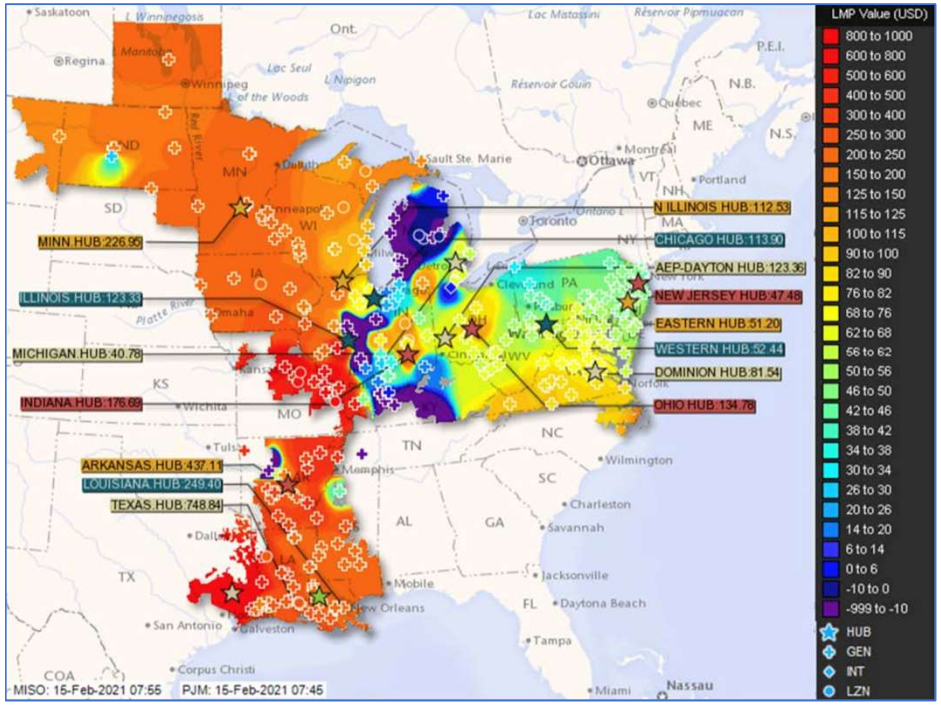




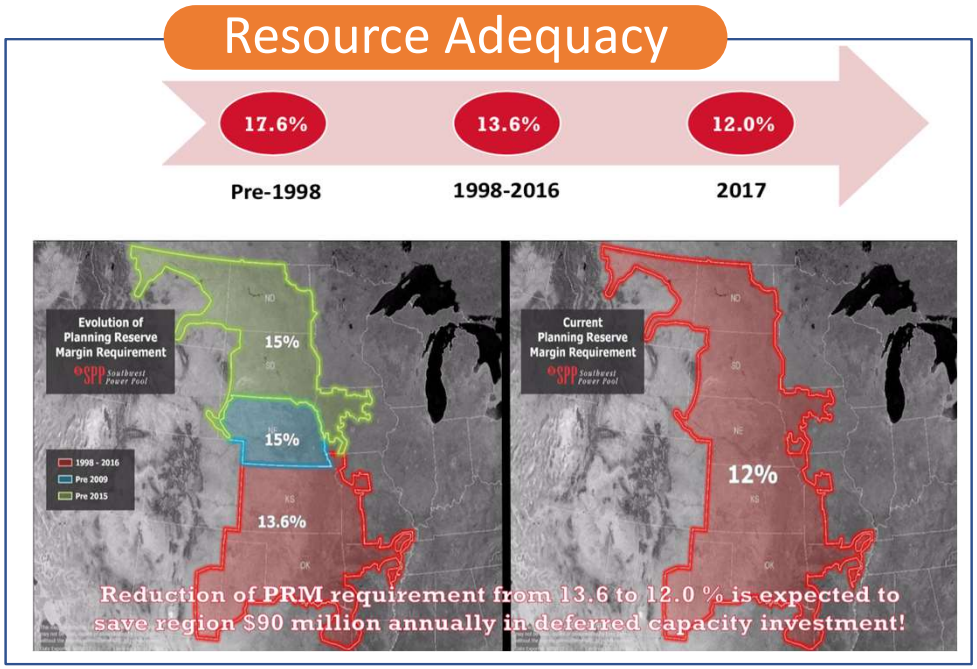
Source: ESIG, Transmission Planning for 100% Clean Electricity, 2021; C. Clack, ZeroByFifty Study 2021

We need transmission for more than just interconnecting new resources

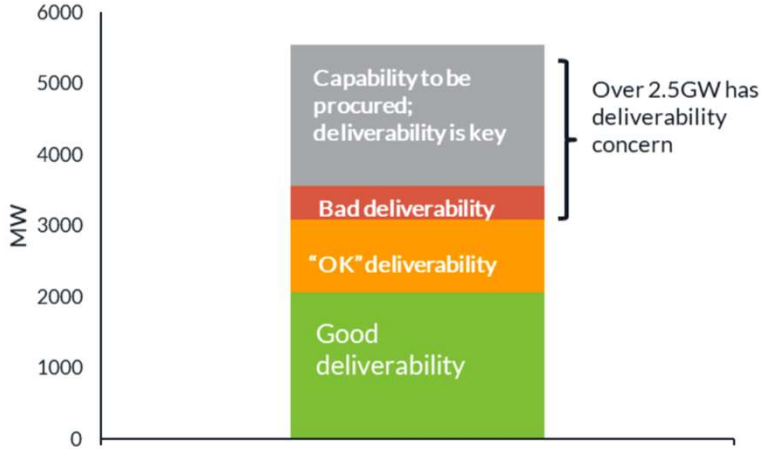
Resiliency



Resource Adequacy



Deliverability of ancillary services



Source: Goggin and Gramlich, July 2021 from Joint and Common Market contour map ; L. Nickell, SPP, CREPC Spring meeting, 2017; MISO, RIIA study, 2021

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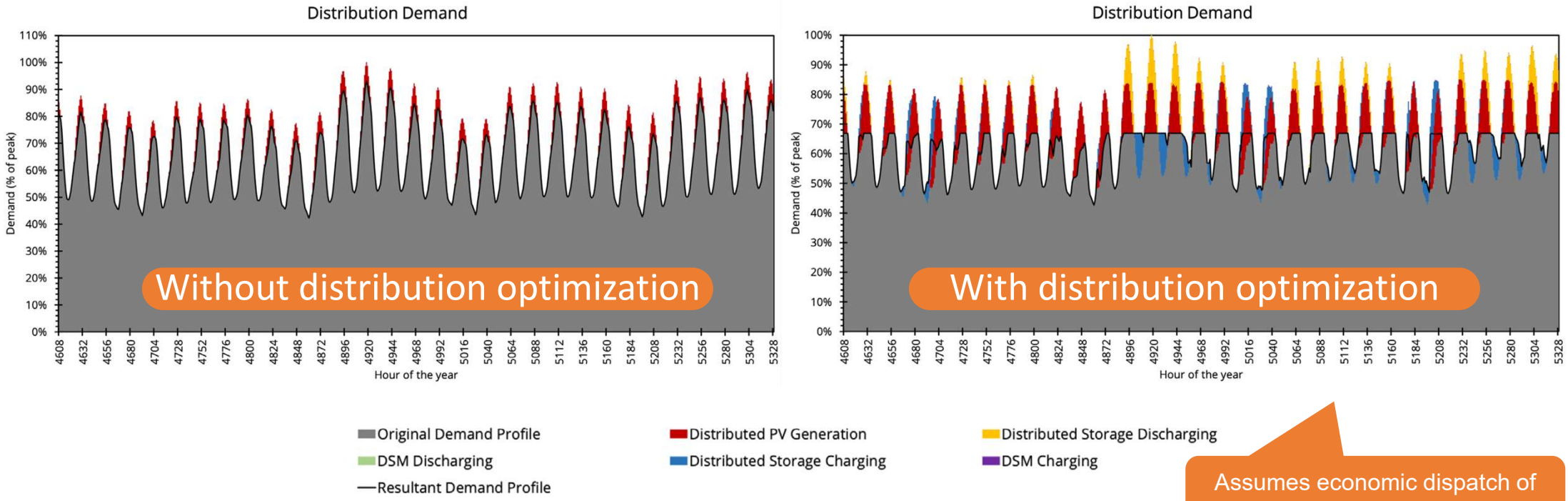
Myth #2
We don’t need distributed solar - We can do it all with cheap utility-scale solar

With high electrification, we will need to manage the distribution system to avoid upgrades

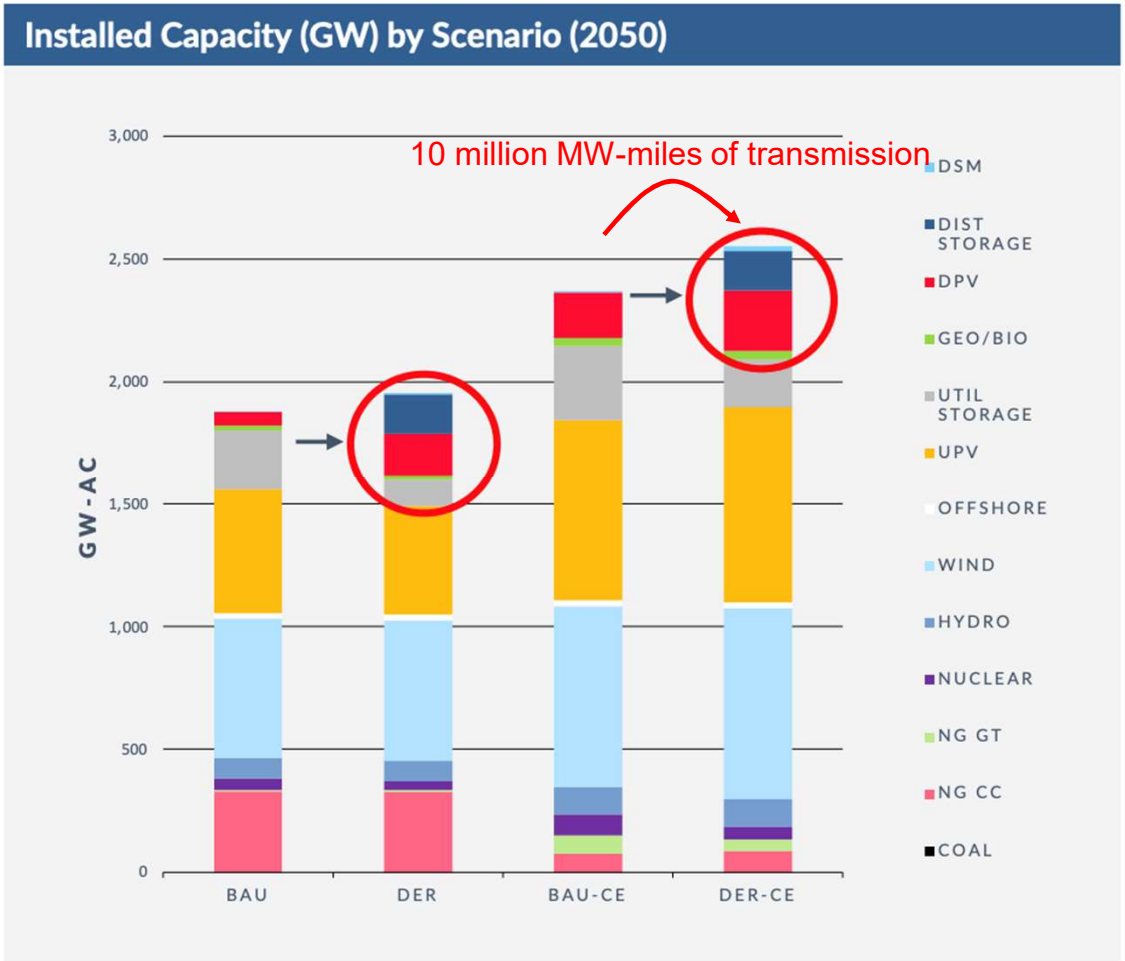


Graphic: Vibrant Clean Energy, "Why Local Solar for all Costs Less", Dec 2020

Assumes economic dispatch of DERs (DPV is NOT must-take)

Consideration of the distribution system changes the solution on the transmission system

- Optimizing G, T&D saves money vs not including distribution in optimization
- Benefits are even bigger if you have clean energy goals - save $473B by optimizing G, T&D
- Optimizing G, T&D builds more DERs and also builds more transmission

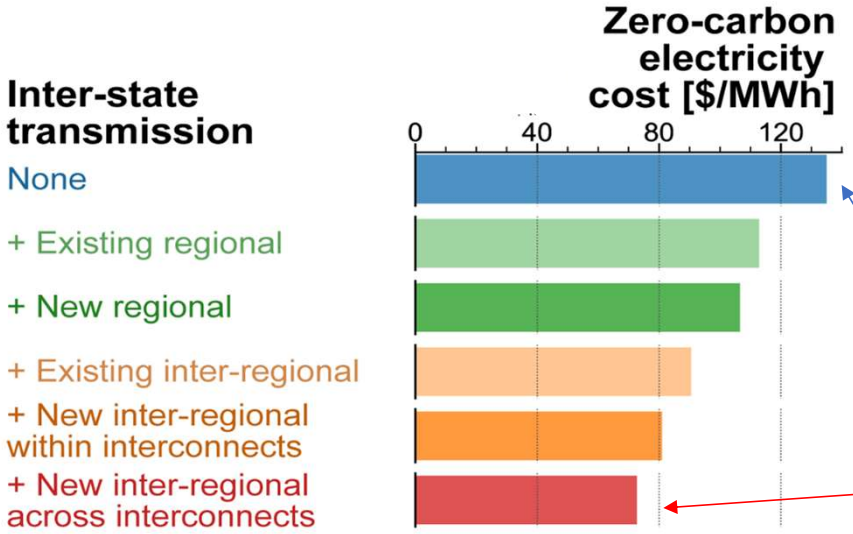


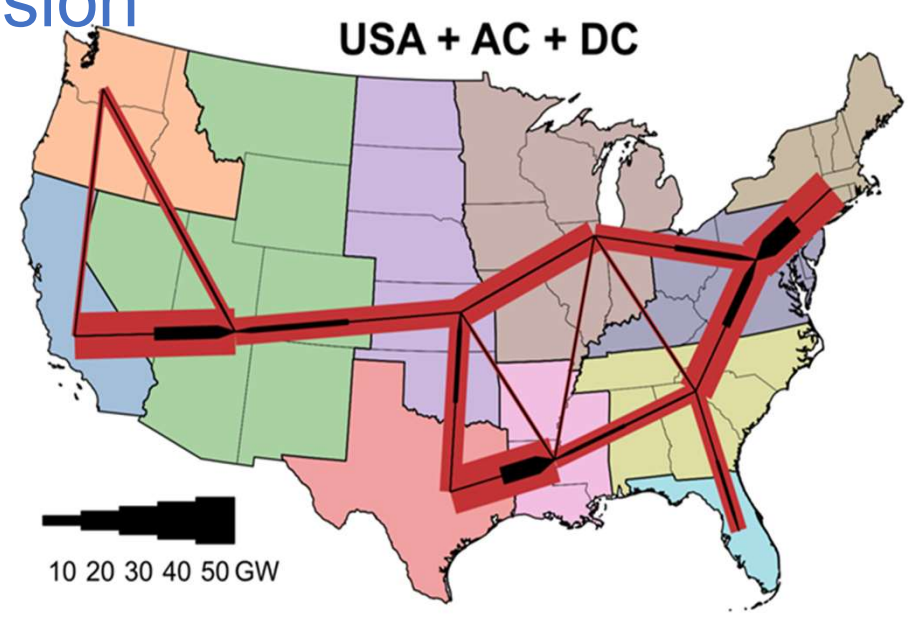
Graphic: Vibrant Clean Energy, "Why Local Solar for all Costs Less", Dec 2020

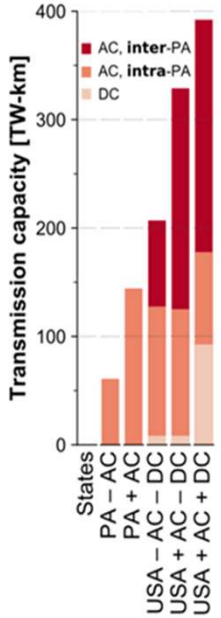
Myth #3
Decarbonization will be cheaper if my state goes it alone

MIT Study - Value of Transmission for Decarbonization

This study examines 100% clean electricity in the US under scenarios with increasing geographic levels of transmission expansion and operations





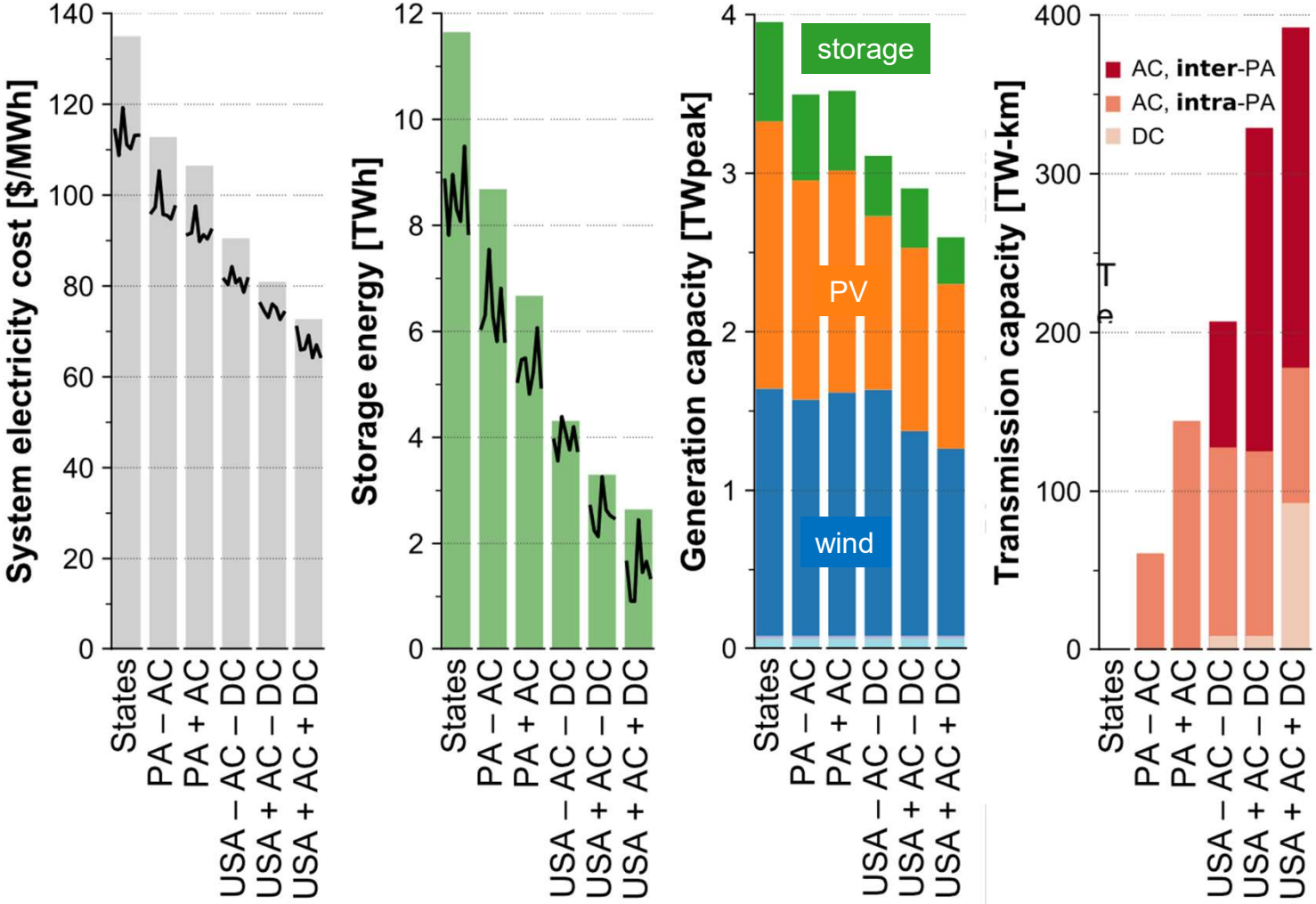


"Every state for itself" costs twice as much ($135/MWh) as the nationally optimized and coordinated approach ($73/MWh)

Source: Brown and Audun, "The Value of Inter-Regional Coordination and Transmission in Decarbonizing the US Electricity System," Joule 5, 1-20, Jan 20, 2021

Myth #4
We don’t need transmission - We can do it all with solar plus storage

To some extent, transmission and storage provide similar services



Source: Brown and Audun, "The Value of Inter-Regional Coordination and Transmission in Decarbonizing the US Electricity System," Joule 5, 1-20, Jan 20, 2021

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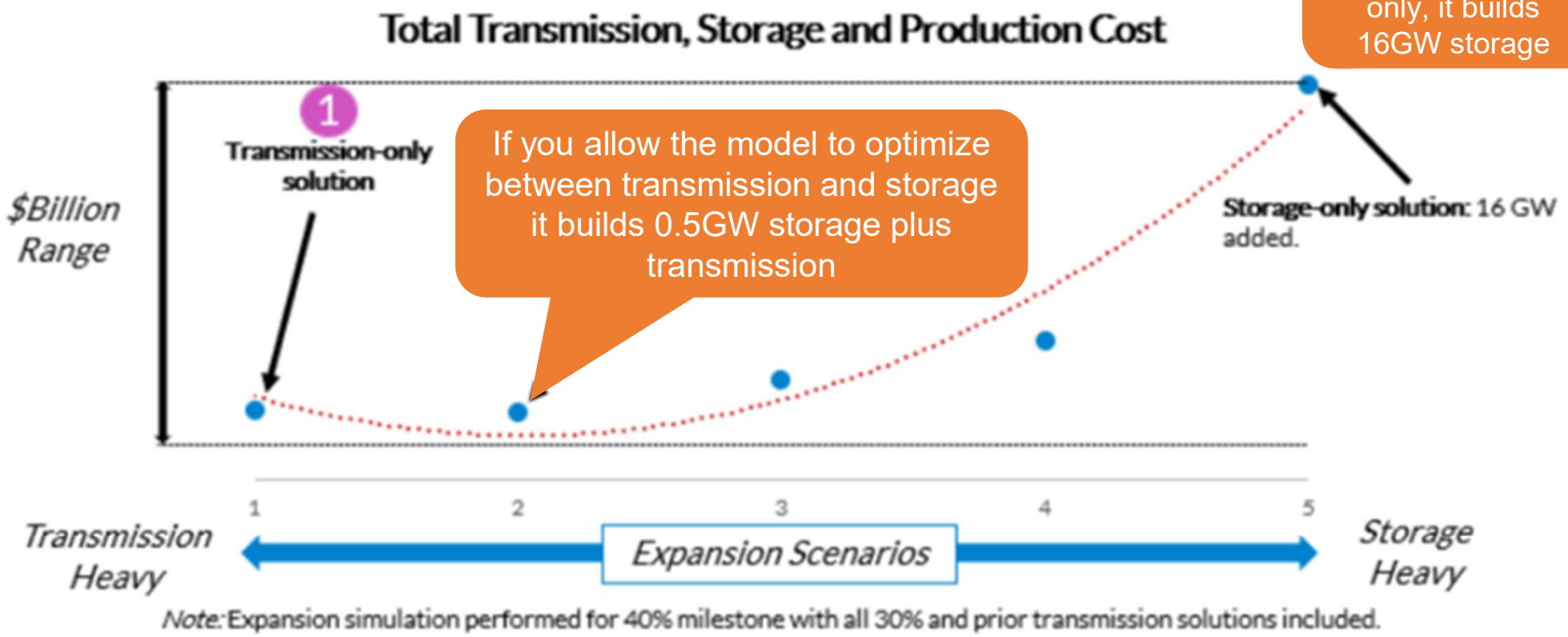
Allowing for transmission + storage solutions is optimal

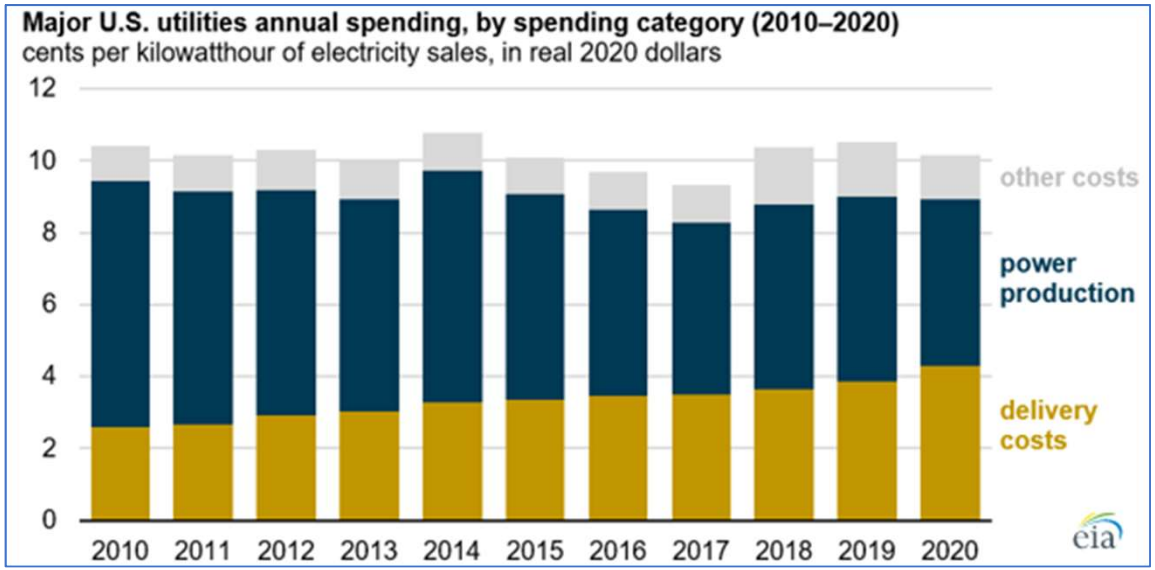
If you allow the model to optimize size of storage only, it builds 16GW storage

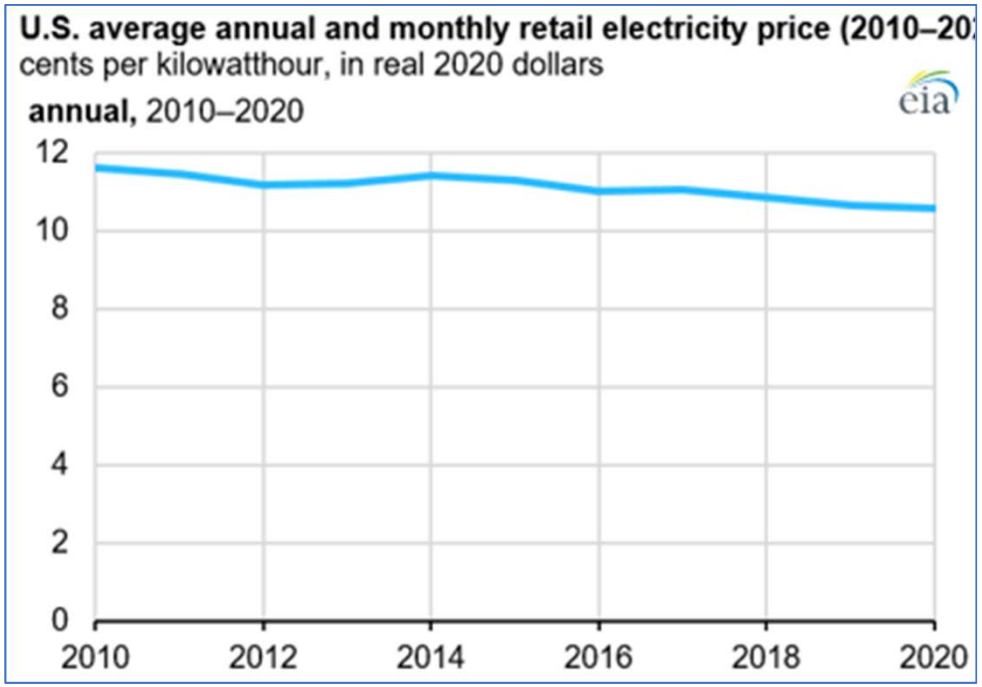


https://cdn.misoenergy.org/RIIA%20Summary%20Report520051.pdf

Myth #5
The grid will be too expensive

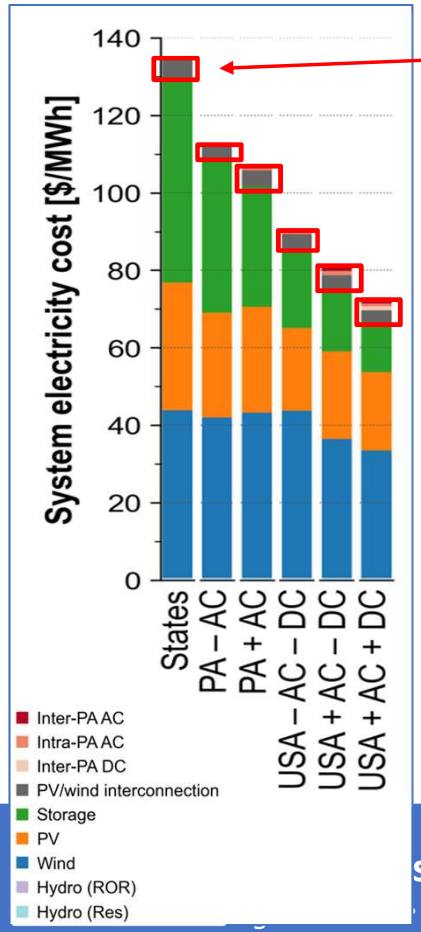
The cost structure will change



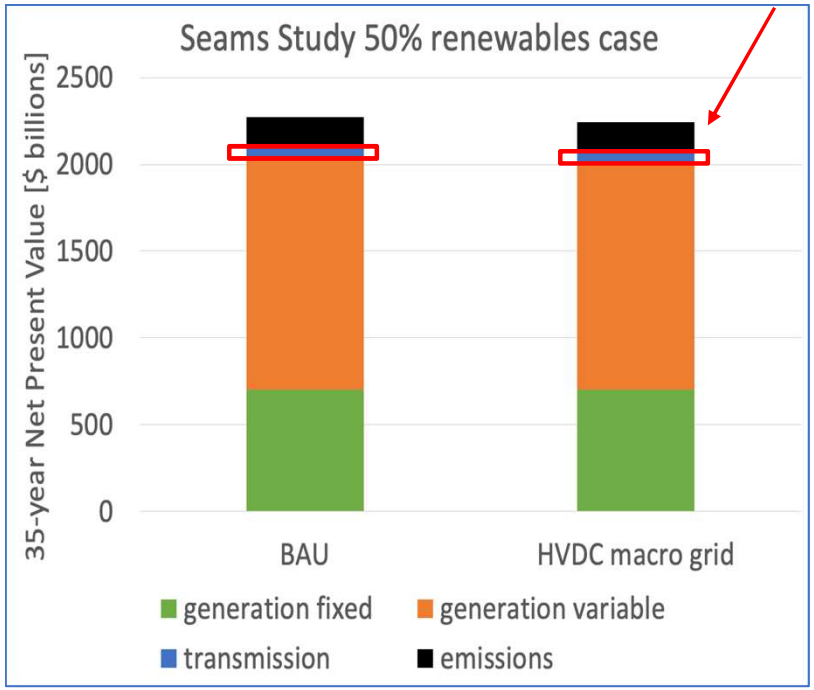


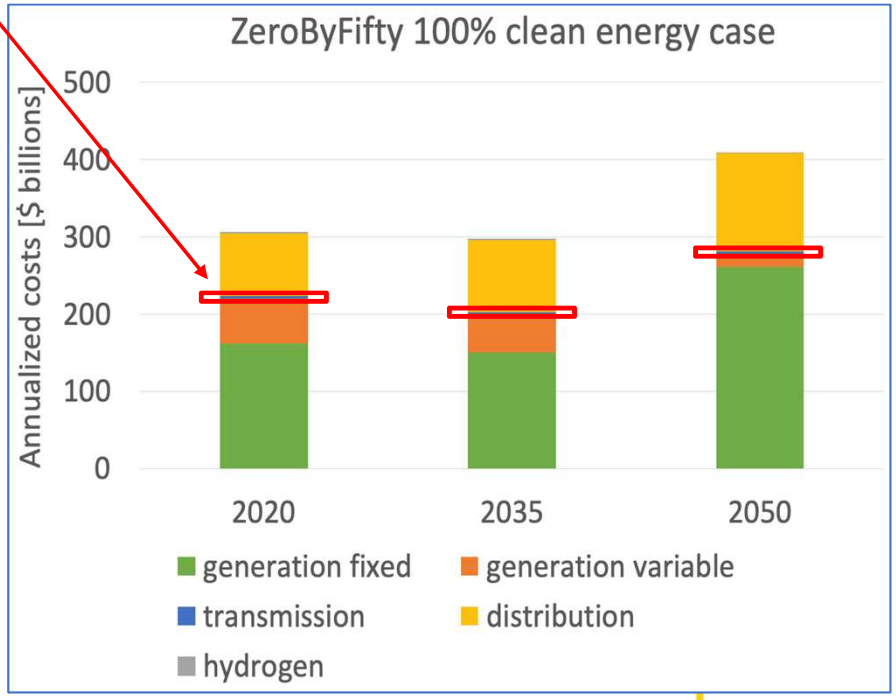
EIA, "Major US utilities spending more on electricity delivery, less on power production," 2021.

Transmission costs are tiny compared to other clean resources/infrastructure



TRANSMISSION COSTS





Brown and Botterud, 2020; NREL Interconnection Seams study; Preliminary results from VCE's ZeroByFifty Study

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