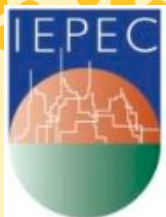
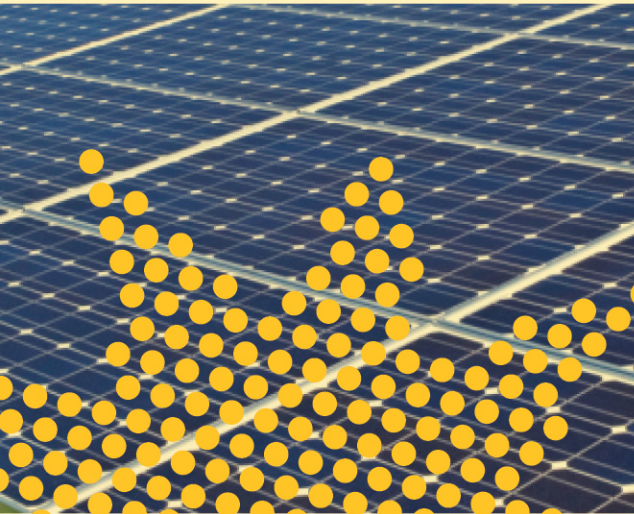


Assessing the Impact of Distributed Energy Resources on Line Losses Toward a Methodological Approach



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Josh Mondragon
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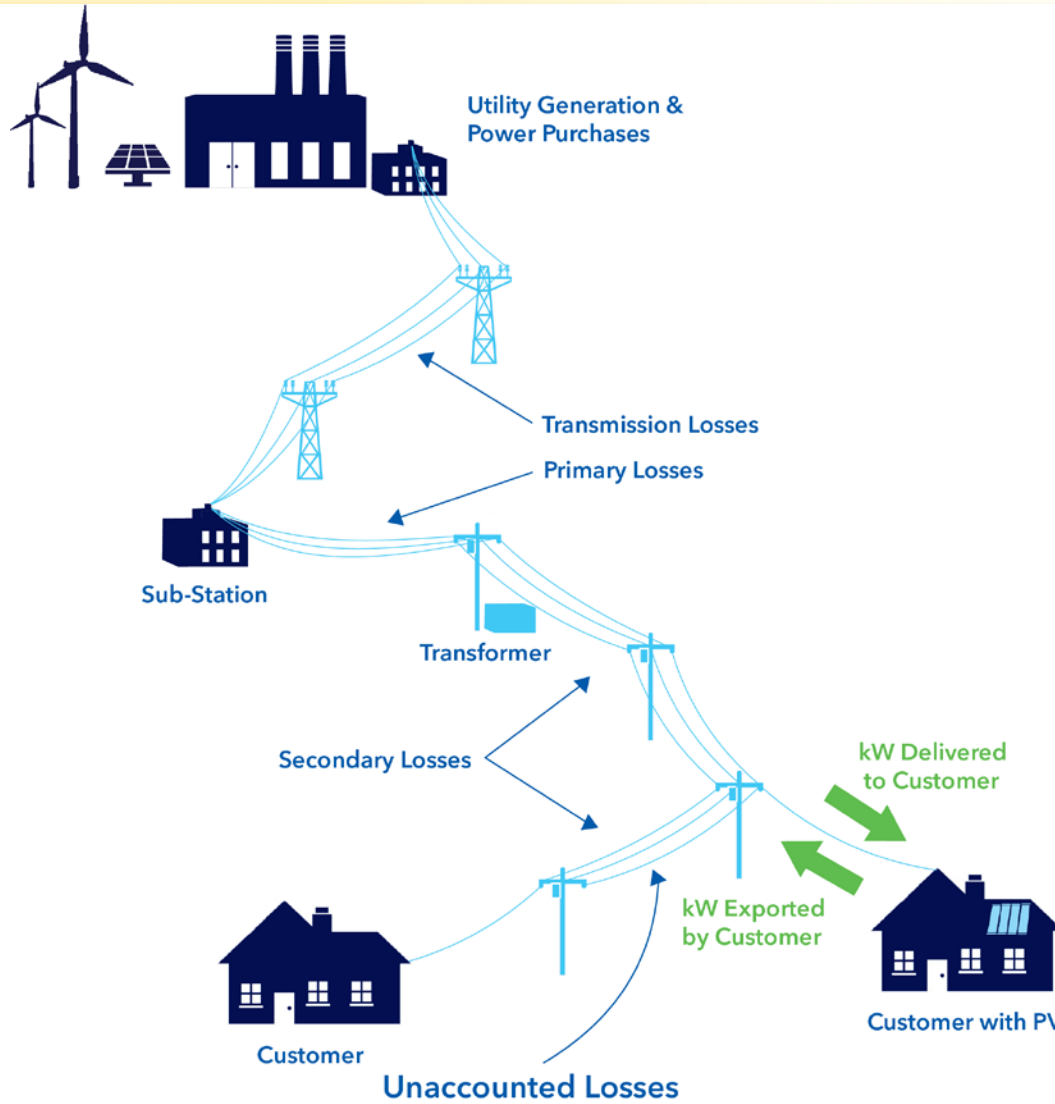
Paula Ham-Su
DNV GL Energy Insights

What are Line Losses and why do we care?

- Line losses are energy lost simply from using a wire to move electricity from Point A to Point B
- Line losses are an unavoidable part of the cost of generating and distributing electricity
- Line losses are calculated using methods developed in the 90s
- **These methods estimate losses from utility-scale generation and energy purchases. They are not designed to account for Net Energy Metered Distributed Energy Resources (NEM DER)**
- In other words, the effect of NEM is not quantified in current line loss methodology



Where do line losses occur?



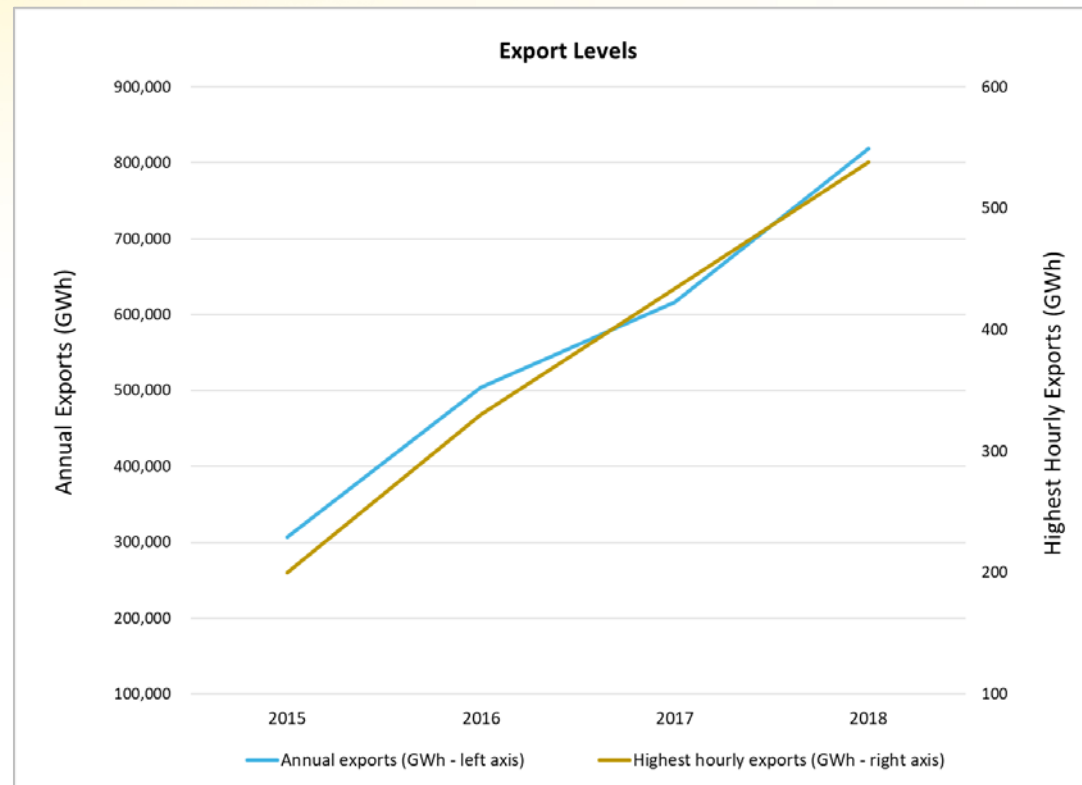
Export Levels of Net Energy Metered Distributed Energy Resources (NEM DER)



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Increased export levels result from:

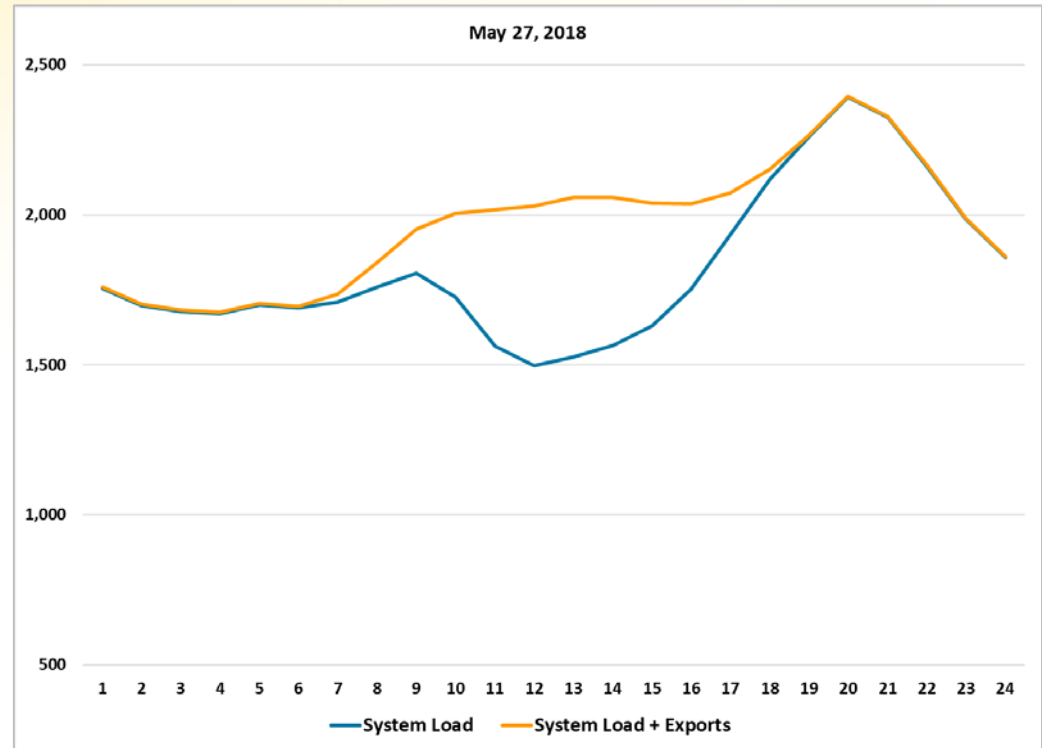
1. Adoption continues to grow
2. System sizes are getting bigger, in part due to falling system and installation costs



Highest Export Level

Spring is when exports are the highest

- Longer sunny days means high generation
- No cooling means low loads
- On this day, exports were equivalent to 24% of midday load
- We do not know how many of these exports went to a consumer



What is the difference between Nessie and the duck?

- The duck stays above water. Nessie (the Loch Ness monster) is underwater
- Nessie is a lot scarier
- SDG&E's residential class pulled its first Nessie in 2019



Illustration credit: <https://www.ozy.com/flashback/the-mysterious-lake-monster-youve-never-heard-of/85276>

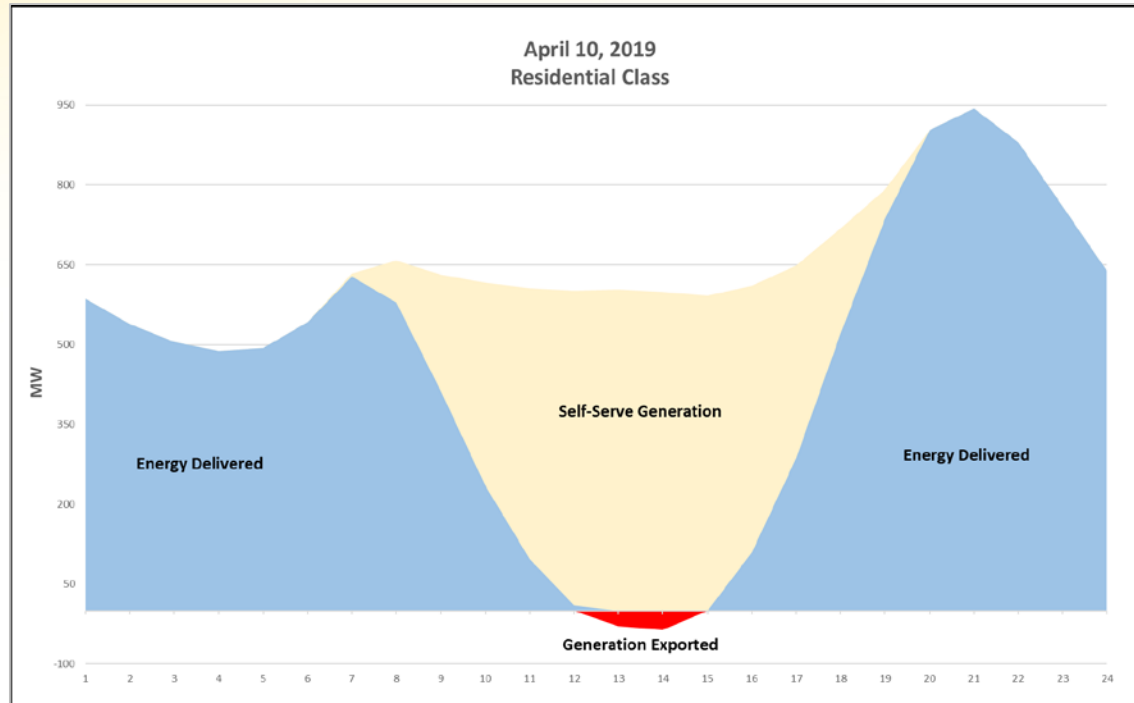


The Residential Class' Nessie



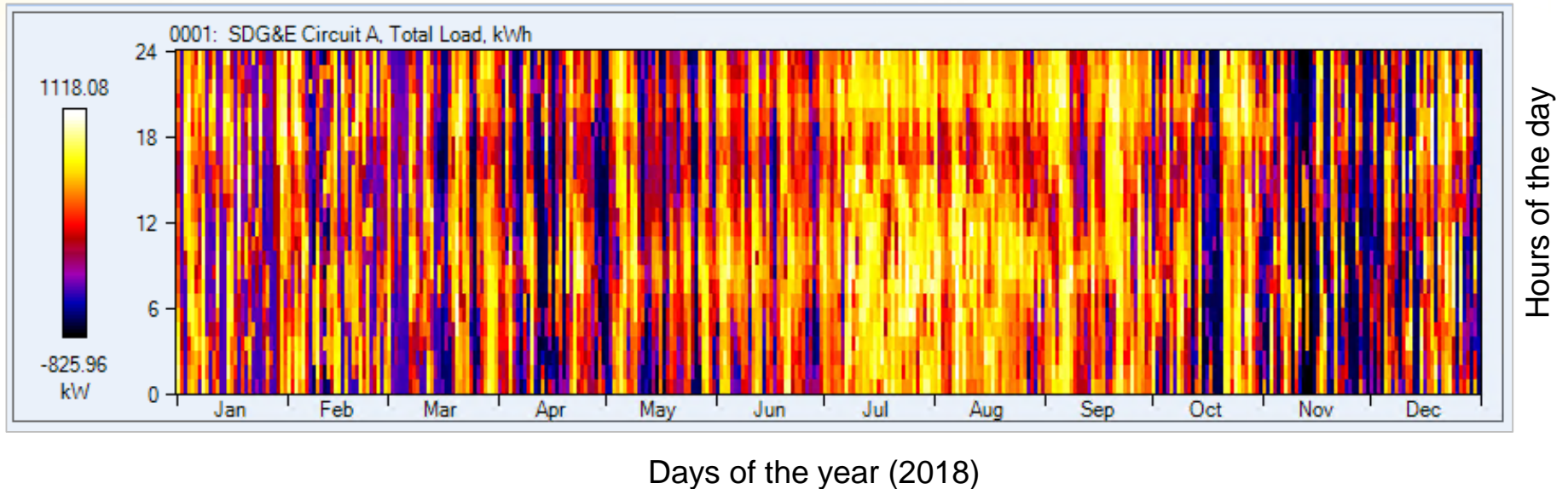
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- High Growth in Residential Solar Adoption
 - More load is being generated than consumed at midday
 - 2019 has seen 9 days like this, so far



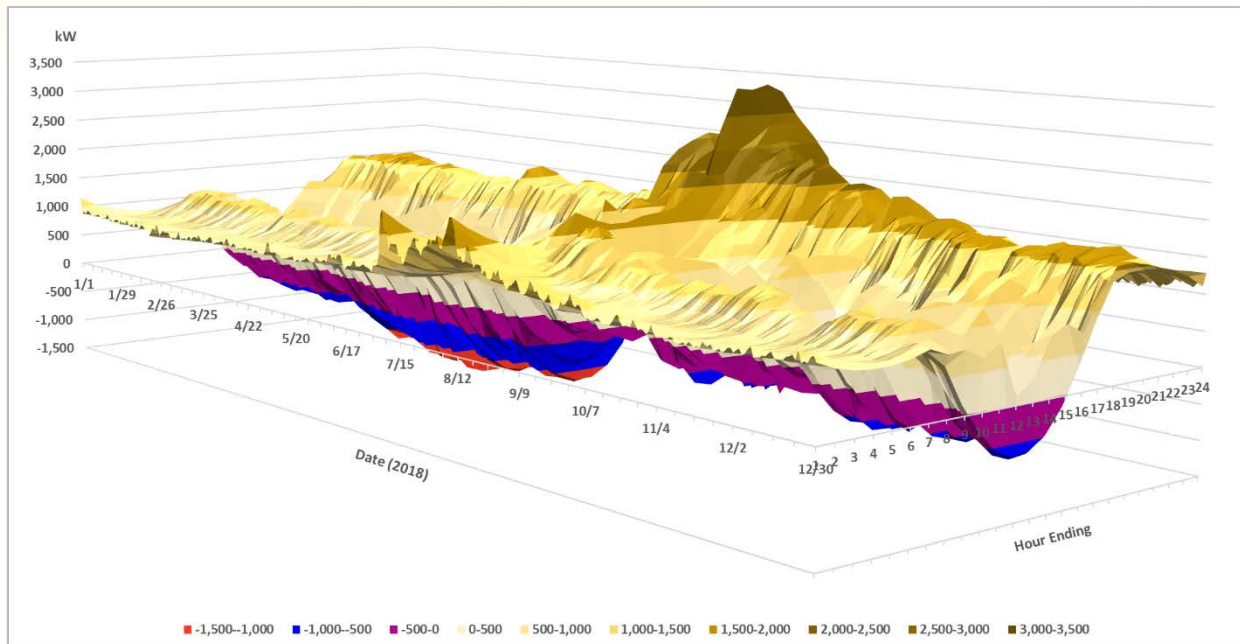
Line Losses at the Circuit Level

- Circuit with High Level of DER
 - Export levels almost as high as import levels
 - About one third of all hours were negative



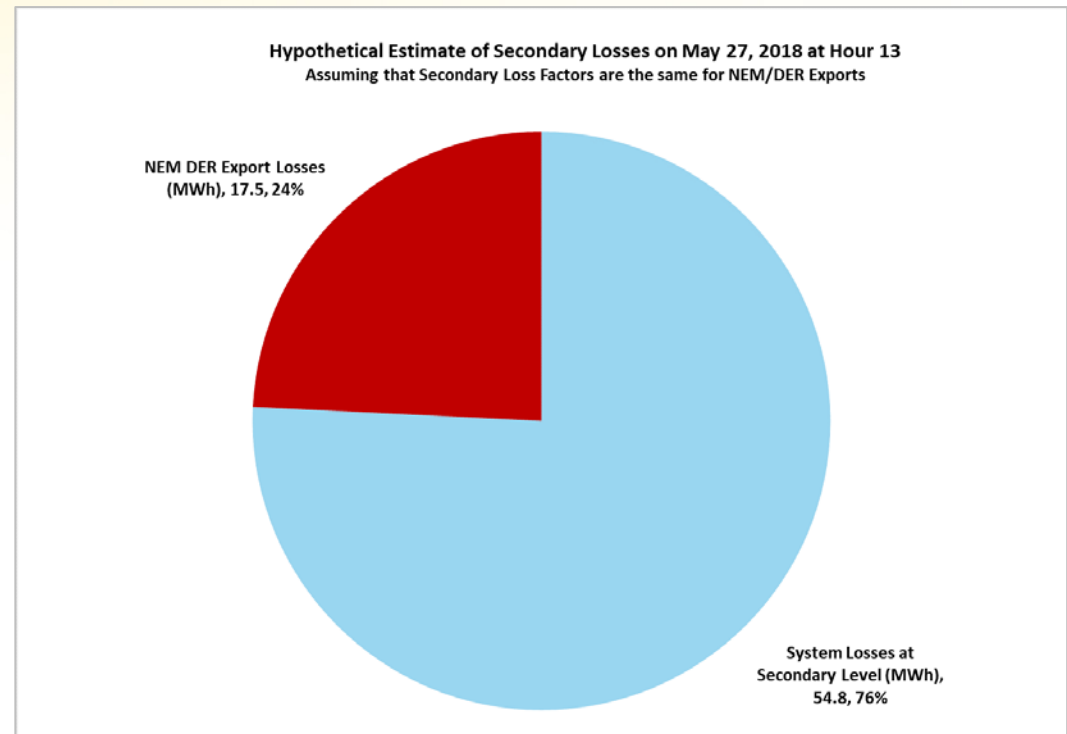
Line Losses at the Circuit Level

- High level of exports results in significant swings in load and ramp up levels, could become strains on circuit
- Almost 10% of circuits went negative for at least an hour in 2018



Hypothetical Estimate of Secondary Losses

- Based on characteristics of loads being exported
- Residential, secondary voltage level of load
 - We apply the secondary voltage level formula to the energy being exported to approximate a max level of losses
 - Certain assumptions need to be adjusted such as distance of energy traveled
 - In this hypothetical estimate, NEM DER losses are 24% of the revised total losses



Recommendations

- A new Losses study should be developed where traditional generation sources have a formula applied, and losses from NEM DER exports are estimated separately
- As DER continues to grow, these studies should be re-evaluated on a frequent basis



Thank you!

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