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

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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?
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

![Graph showing energy load and exports over time](image-url)
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
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

Days of the year (2018)
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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