eTRM GHG Calculation Update

CALIFORNIA
TECHNICAL FORUM

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Background

- eTRM Phase 3 Enhancement includes GHG calculation
  - Question for Cal TF: How should eTRM GHG calculation be performed?
- Proposed approach discussed December 2019
  - Recap

Today's Update

- Today: New developments
- Feedback from Cal TF on
  - Using new ACC GHG calculation approach
  - New factors – Methane and Refrigerants
  - Other Questions
- Next Step: Subcommittee(s)
  - May wish to have separate committee for POUs

Proposed GHG Calculation for eTRM

- For each measure, an hourly savings profile is assigned
  - 8,760 hour profiles
- A greenhouse gas hourly profile is selected
  - May be utility specific, or may be CAISO profile (from Avoided Cost calculator)
  - One table used for each year

Measure Savings: 45 kWh

Hourly Profile Table

M	D	H	ES
1	1	1	0.02%
1	1	2	0.02%
1	1	3	0.04%
1	1	4	0.05%
…	…	…	…
12	31	24	0.01%

X

CO2 Table

M	D	H	CO2
1	1	1	0.030
1	1	2	0.025
1	1	3	0.025
1	1	4	0.025
…	…	…	…
12	31	24	0.040

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Hourly Reduction

M	D	H	CO2
1	1	1	0.00027
1	1	2	0.00023
1	1	3	0.00039
1	1	4	0.00056
…	…	…	…
12	31	24	0.00018
Sum:			2.45

M = Month of year
D = Day of month
H = Hour of day
ES = Energy Saving fraction for Hour
CO2 = CO2 Rate for Hour

Recap from December 2019

The Avoided Cost Calculator (ACC) and IRP GHG calculation approach differed

- IRP used the Clean Net Short Calculator (CNS) (from RESOLVE model outputs)
- The ACC used forecast hourly electric prices, which it converted to equivalent CO2 values based on certain heat rate assumptions in the calculator

- POUs have different supply stacks and might prefer to use different GHG profiles
  - SMUD, LADWP develop their own GHG hourly profiles
  - Other POUs have used neighboring IOU profiles as viable proxies for their own dispatch profiles

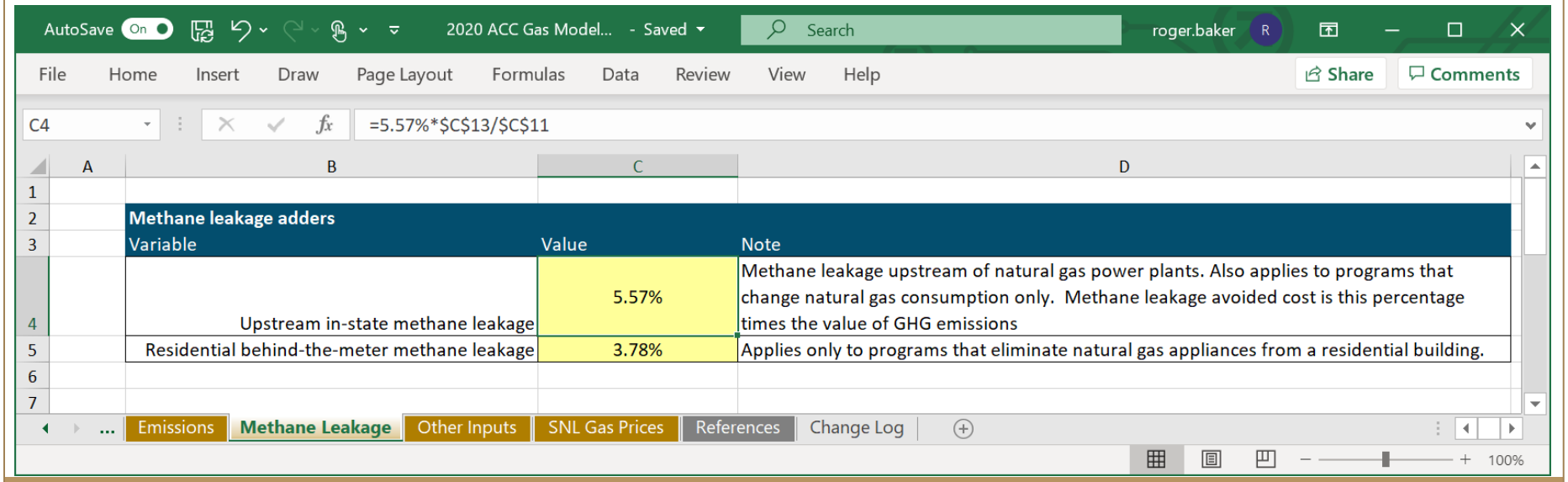
New Developments

- New ACC now uses the same GHG calculation methodology as the IRP for Electric GHG
  - 2020 ACC GHG calculation methodology expected to be incorporated into CET for 2021

- New Considerations: **Beyond CO_2**
  - **Methane** (CH_4) emissions from natural gas
    - Global Warming Potential (GWP) of CH_4 about 30 times greater than CO_2
  - **Refrigerants** (HFCs and CFCs)
    - GWP of HFCs and CFCs can be thousands of times greater than CO_2

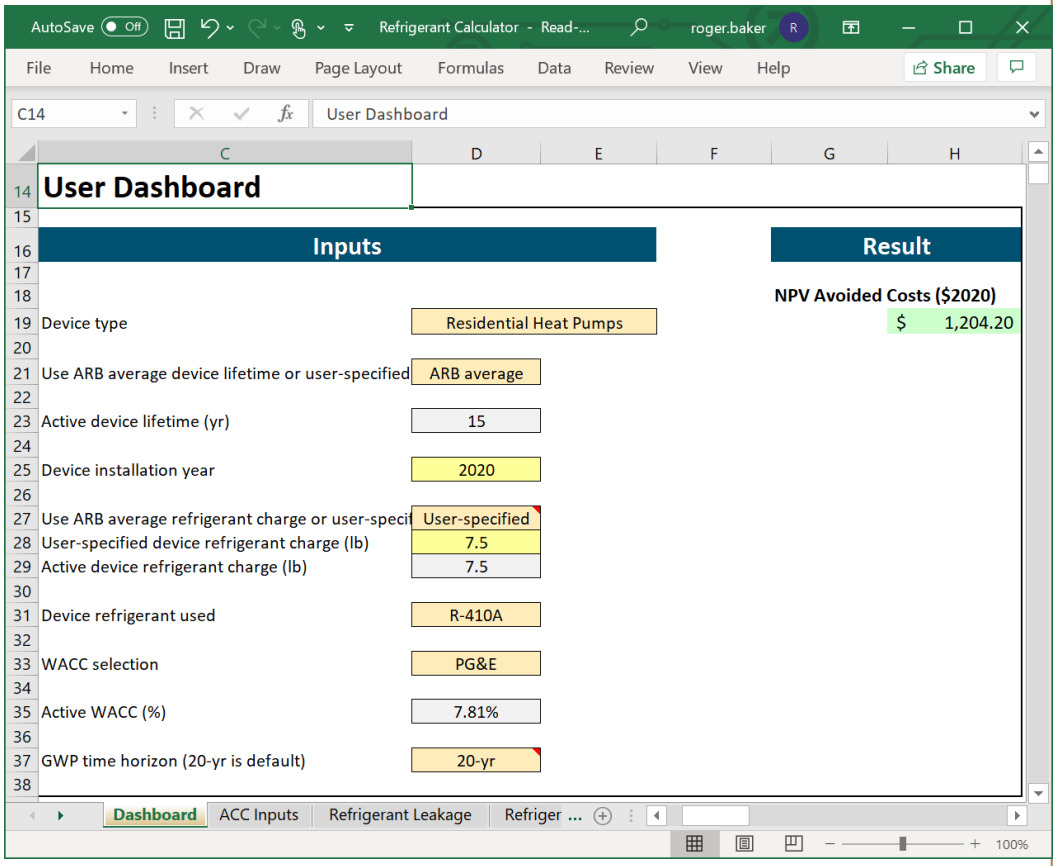
Methane Emissions

- New adders for 2020 ACC
  - 5.57% leakage adder for all measures that affect natural gas consumption
  - 3.78% Behind-the-meter adder (Residential only)
    - Only measures that cause removal of gas-using appliance qualifies



High-GWP Refrigerants

- Special calculator developed by E3
- Calculation is specific to refrigerant being used
- NPV is based on utility WACC
- Outputs include:
  - Annual Leakage (CO2 equiv)
  - End-of-life Leakage (CO2 equiv)
  - NPV Avoided Costs
    - This value can be negative for electrification
    - Needs to be incorporated into Measure C-E tests



Next Steps

- eTRM will utilize hourly CO_2 data from ACC for IOUs
  - No “roll-up” of data (as in CET)
  - Use same two CAISO regions (NP15 and SP15)
  - Will try to align data with climate zones, if possible

Questions

- What approach should be used for POUs?
  - 48 Publicly Owned Utilities in CA
    - LADWP and SMUD develop their own profiles
    - Other POUs historically relied on neighboring IOU profiles
  - It appears that most POUs will rely more on CAISO markets for power over time
  - The two largest POUs (LADWP and SMUD) appear to be notable exceptions
- How should methane and refrigerants be addressed within eTRM?

Questions

- How often should values be updated?
  - May depend on approach selected
- As GHG rates are updated, how should they be deployed to measures?
  - We could update measures, triggering a new version whenever rates change
  - We could store emissions values as separate process in eTRM
    - Decouple emissions rate versions from measure versions
- Do updates need to be applied retrospectively?
  - Example – should 2021 CO_2 update be applied to 2020 measure version

Next Steps

Any additional issues or questions Cal TF should consider as we finalize eTRM GHG calculation approach?

Cal TF Staff plans to form subcommittee to address/resolve open questions

- E-mail Ayad if you would like to be involved
- We may have separate committees for IOU and POU calculations
- Don’t not expect large time commitment

Background Information

- POUs
- ACC GHG calculation approach
- Recent Rulings

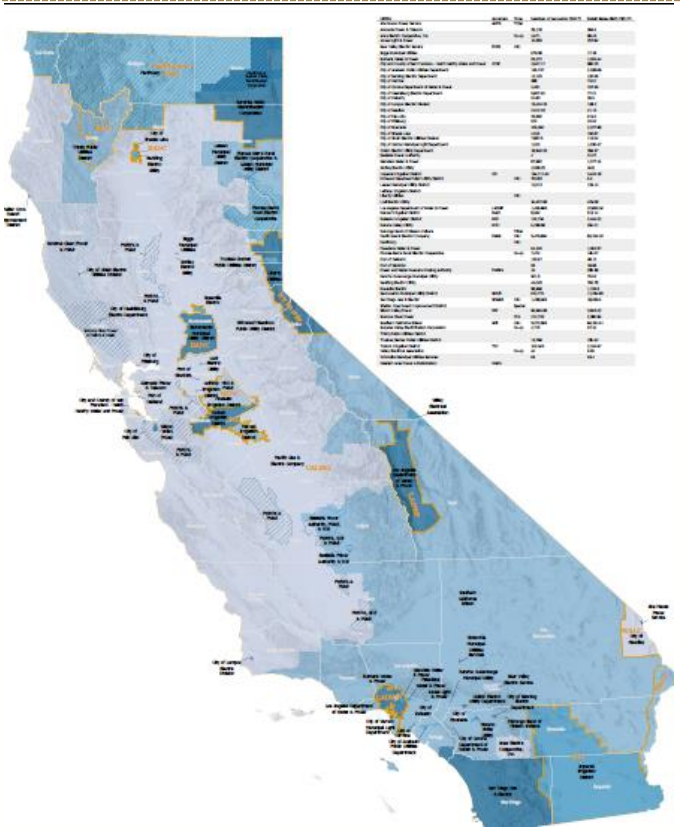
Greenhouse Gas Impact - POU

- 48 Publicly Owned Utilities in CA
  - Not including cooperatives and CCAs
  - 14 POUs outside CAISO
  - Most within BANC
  - Most of the POUs are not required to file IRPs
    - Threshold for filing is annual deliveries at least 700 GWh/yr
    - Only 16 POUs meet threshold
  - It is unclear what data is available for smaller POUs

POU	2030 Net Market Purchases (Pct of annual)
Anaheim	19%
Burbank	-16%
Imperial	20%
Modesto	44%
Palo Alto	7%
Pasadena	32%
Redding	-15%
Roseville	11%
Riverside	34%
Silicon Valley	-3%
Turlock	36%
Vernon	35%
Glendale	3%

Greenhouse Gas Impact - POU

- It appears that POUs generally will rely more on CAISO for power over time
  - Several POU-filed IRPs indicate reductions in native generation and increases in power procurement by 2035
  - A number of smaller POUs are located in CAISO
  - Other POUs outside of CAISO are part of, or planning to join, CAISO's Energy Imbalance Market
- The two largest POUs appear to be notable exceptions
  - LADWP – small amount of market purchases, likely for balancing only
  - SMUD – sizeable sales and purchases, but not significant at net level
    - SMUD also oversees Balancing Authority of Northern California (BANC)
    - Possible that other BANC member POUs have profiles more closely aligned with SMUD's profile than CAISO's



Greenhouse Gas Impact

- 2020 ACC "simplifies" CO2 approach
  - Uses RESOLVE and SERVM modeling outputs
    - RESOLVE optimizes supply mix to satisfy capacity needs and CO2 targets over time
      - Answers question of "what supply mix will achieve policy targets"
    - SERVM models supply portfolio from RESOLVE into 8,760 hour dispatch profiles
      - Answers question of "will supply mix provided by RESOLVE satisfy grid reliability needs (e.g., LOLE less than 0.1)
      - Output includes heat rate of marginal generator for each hour
    - ACC converts heat rate to CO2 at rate of 0.0531 tonnes/MMBTU
  - This dual-modeling approach is also used for IRP
    - Alignment of approaches addresses concerns noted by CalTF last fall
  - 2020 ACC was approved by CPUC on June 25, 2020
    - (Resolution E-5077)
- 2020 ACC expected to be incorporated into CET for 2021

Greenhouse Gas Impact

- 2020 ACC also combines near-term marginal with long-run marginal impacts
  - Near-term reflects impact that EE would have on dispatch of existing power plants
  - Long-run reflects reality that, over time, generation additions and retirements will be modified due to effects of EE and electrification
    - Emissions target will need to be met regardless of how much EE or electrification is done
  - ACC provides two profiles
    - NP15 (North of Path 15, predominantly PG&E)
    - SP15 (South of Path 15, SCE and SDGE)
- New for 2020
  - Methane emissions from natural gas
  - Global Warming effects from refrigerants

Greenhouse Gas Impact

- Electricity CO2 emissions data from ACC is “rolled up” for inclusion in Cost-Effectiveness Tool (CET)
  - Performed using Excel tool (e.g., SCE_PreProc mm-dd-yyyy.xlsm)
  - Uses hourly emissions outputs from ACC
  - Uses hourly end-use profiles from DEER 2011
  - Uses Time-of-Use mapping by utility
    - Addresses on-peak, partial peak, off-peak
    - Summer and Winter seasonal periods
  - Aggregates values to quarterly and annual values
  - Output from pre-processor tool is used to populate CET tables in SQL Server database
- eTRM will utilize hourly data from ACC
  - No “roll-up” of data
  - Use same two CAISO regions (NP15 and SP15)
  - Will try to align data with climate zones, if possible

Greenhouse Gas Impact - POU

- CMUA guidance provides several options
  - Use CEC-forecasted emission rates
    - Need CEC buy-in
  - Use GHG methodology and emission rates developed by CARB
    - Viewed as over-simplistic, not very robust
    - May not be acceptable to CEC
  - Develop POU-specific emission rates
    - Would be most accurate
    - Also most expensive option, perhaps cost-prohibitive for smaller POUs
  - Adopt emission rates based on E3 analyses for IOUs
    - Can be seen as most viable near-term
    - Data already exists, is considered robust by regulators

Recent Rulings

- Avoided Cost Calculator updated to reflect changes in supply mix
  - More renewables
- Fuel Substitution Decision may affect how emissions rates are determined and monetized
  - Currently, ACS uses average emissions rates
  - Load-building activities like gas-to-electric fuel substitution would be better served by using long-term marginal emission rates
  - No change adopted yet, due to complexities involved in modifying existing tools
- These (and other, unforeseen future decisions) may affect the hourly emission rate values

- **However, the methodology proposed for eTRM should be flexible enough to incorporate any changes that may occur in future.**

Greenhouse Gas Impact

- Proposed eTRM methodology will use hourly profiles for energy savings and CO_2 emissions
- This approach will satisfy POU near-term desire for hourly emission impact data at measure level
- It also provides maximum flexibility to address emergent needs
  - Changes in DEER peak methodology
  - Allows rapid incorporation of new measures
    - Once a savings load shape is derived, the emissions profile and impacts can be readily determined in eTRM
  - In the future, it may allow tools like ACC and CET to be streamlined by offloading emissions calculations to eTRM
    - ACC may still monetize GHG at unitary rate and feed that value to CET
    - ACC would still generate avoided cost components, but would feed directly to CET
    - Emissions profile (and savings load shape) can be transmitted to CET from eTRM as part of measure packet
    - CET can then monetize estimated savings using unitary rate provided by ACC
    - This could eliminate the pre-processing step between ACC and CET