| DOCKETED | |
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| **Filer:** | Patty Paul |
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| **Submitter Role:** | Commission Staff |
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# Staff TDV & Metrics Summary and Recommendations

## Building Standards Office

## California Energy Commission


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**May 18, 2020**

# TDV Update
# October 2019 Workshop

October 2019 Lead Commissioner Metrics Workshop:

1. Introduced new 2022 weather files
2. Introduced updates for NG and electricity TDVs
   - Flat retail adder for electricity
   - Mid IEPR and Policy values for natural gas – Policy results in modest fuel switching signal
3. Introduced the 2-EDR approach
   - EDR1 sets carbon limit for the building, based on long term marginal source energy
   - EDR2 is the “traditional” TDV for efficiency, PV, and demand flexibility
   - Buildings must simultaneously comply with both EDRs to comply

This approach was well received by the stakeholders

Commenters made significant comments about the shape of the retail adder

# TDV Update
# March 27, 2020 staff Workshop

Staff and consultants presented new updates in response to public comments

1. Retail Adder – Staff considered three scenarios for the retail adder shape
   - 100% and 50% RA – Devastating impact on PV and daylighting controls; outsized credit for load shifting strategies; little impact on "traditional" envelope and efficiency measures
   - 15% RA – Modest reduction in PV credit; modest boost in load shifting strategies signal; little impact of efficiency measures
2. Natural Gas Methane Leakage – Included impacts of behind the meter methane leakage, using the 100-year GWP impact
3. Stakeholder Reactions:
   - Generally supported the 15% RA shape, though some felt it didn't go far enough
   - Many stakeholders commented that the Commission should be using a 20-year GWP impact rather than the 100-year for methane leakage; the result is a modest boost for fuel switching
   - There were also host of other comments that are captured in a separate document

# TDV Update
# 20-Year GWP Impact

Staff and consultants analysis shows a modest boost for switching to the 20-year GWP impact for methane leakage

- CARB Reaction – CARB wants to promote their SLCP (short lived climate pollutants) policy, and has encouraged other agencies to use 20-year GWPs as information along with 100 year GWPs. CARB staff have no objection to the CEC using-20 year GWPs for TDVs

If the 20-year GWP impact is adopted on the methane side, on the electricity side, we must also adopt the 20-year refrigerant leak impact; this is still work in progress that will last for the next several months.

# TDV Update
# Results

The followings are the results for the 2700 sf prototype prepared by Wilcox; NORESCO provided slides for nonresidential buildings.

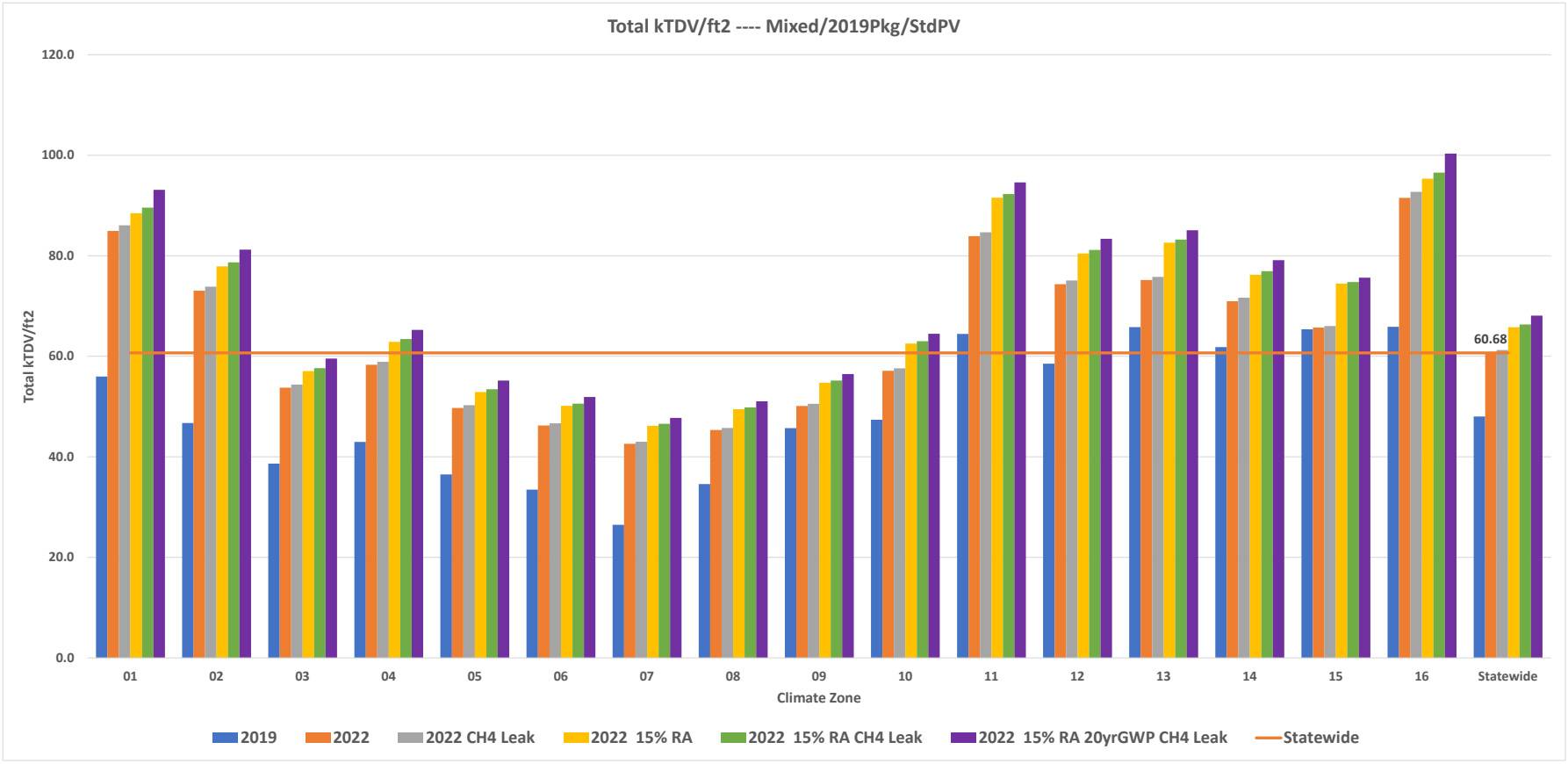
# **Alternative TDV Metrics (**Time Dependent Valuation)

## Presenting 6 alternative TDV Metrics

| | |
|---|---|
| 2019 | - Current 2019 weather, TDV and rules |
| 2022 Base | - Base 2022 proposed weather TDV and rules |
| 2022 CH4 leak | - includes (methane) leak for gas |
| 2022 15% RA | - includes 15% retail adder for electric |
| 2022 15% RA CH4 Leak | - includes both electric and gas adders |
| 2022 15% RA 20yr GWP CH4 Leak | - includes 20yr Global Warming Potential |

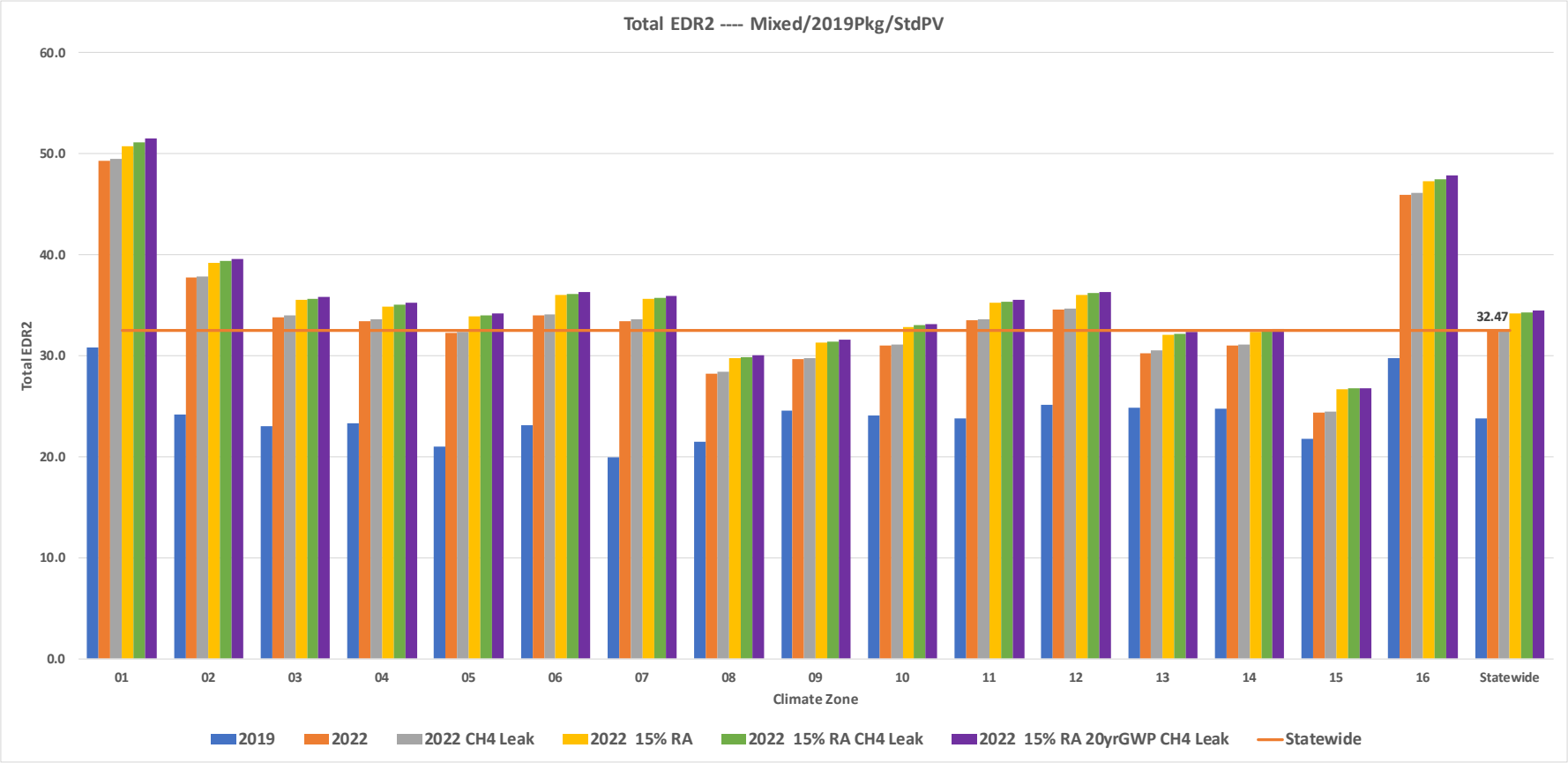
# Total TDV - Mixed Fuel – 2022 > 2019

## 2019 Standard Design with 2019 and 2022 TDVs - kTDV



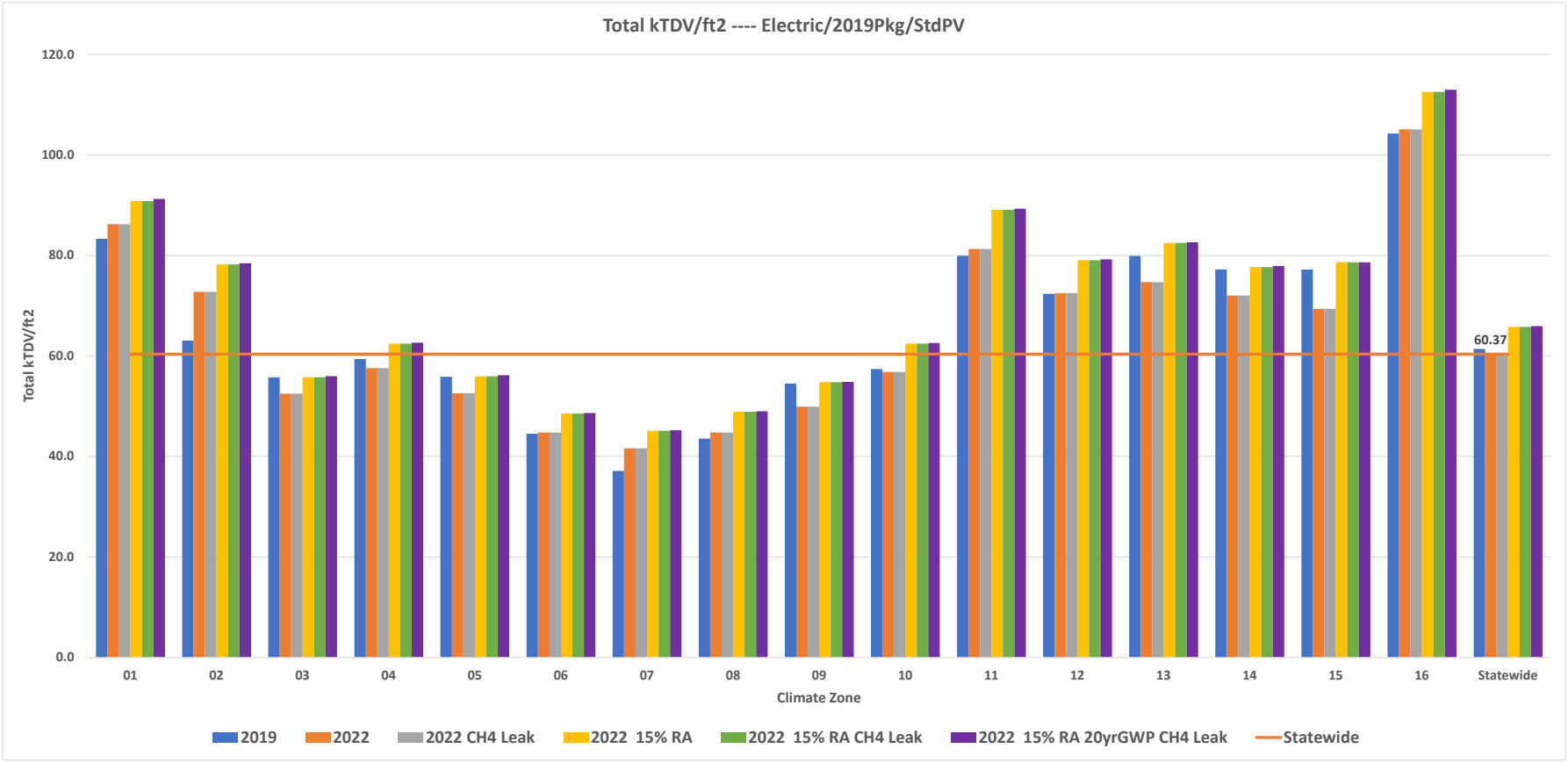
# Total EDR2 - Mixed Fuel - 2022 > 2019

## 2019 Standard Design with 2019 and 2022 TDVs - EDR



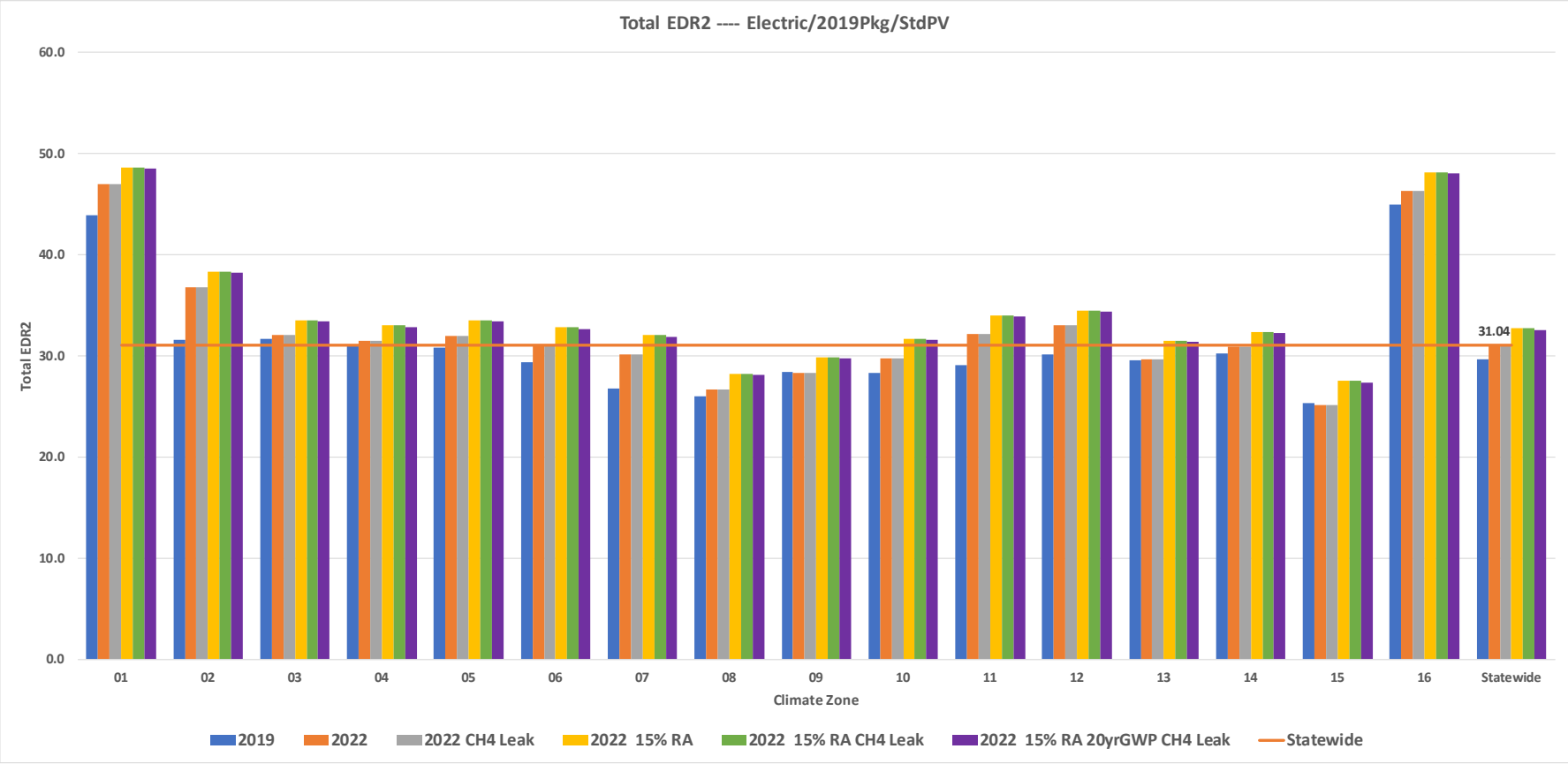
# Total TDV - All Electric

## All-Electric Package with 2019 and 2022 TDVs - kTDV



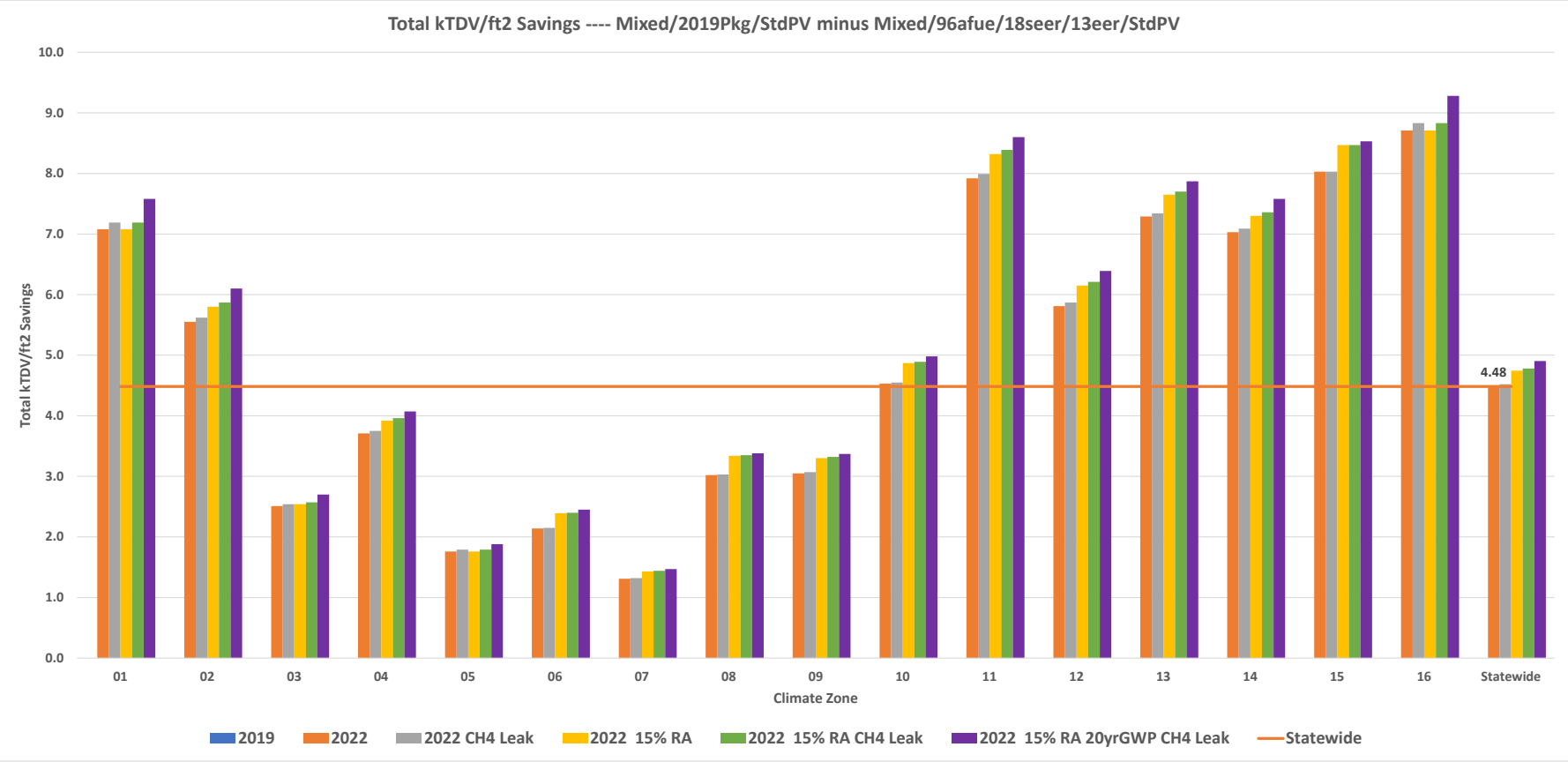
# Total EDR2 - All Electric

## All-Electric Package with 2019 and 2022 TDVs - EDR



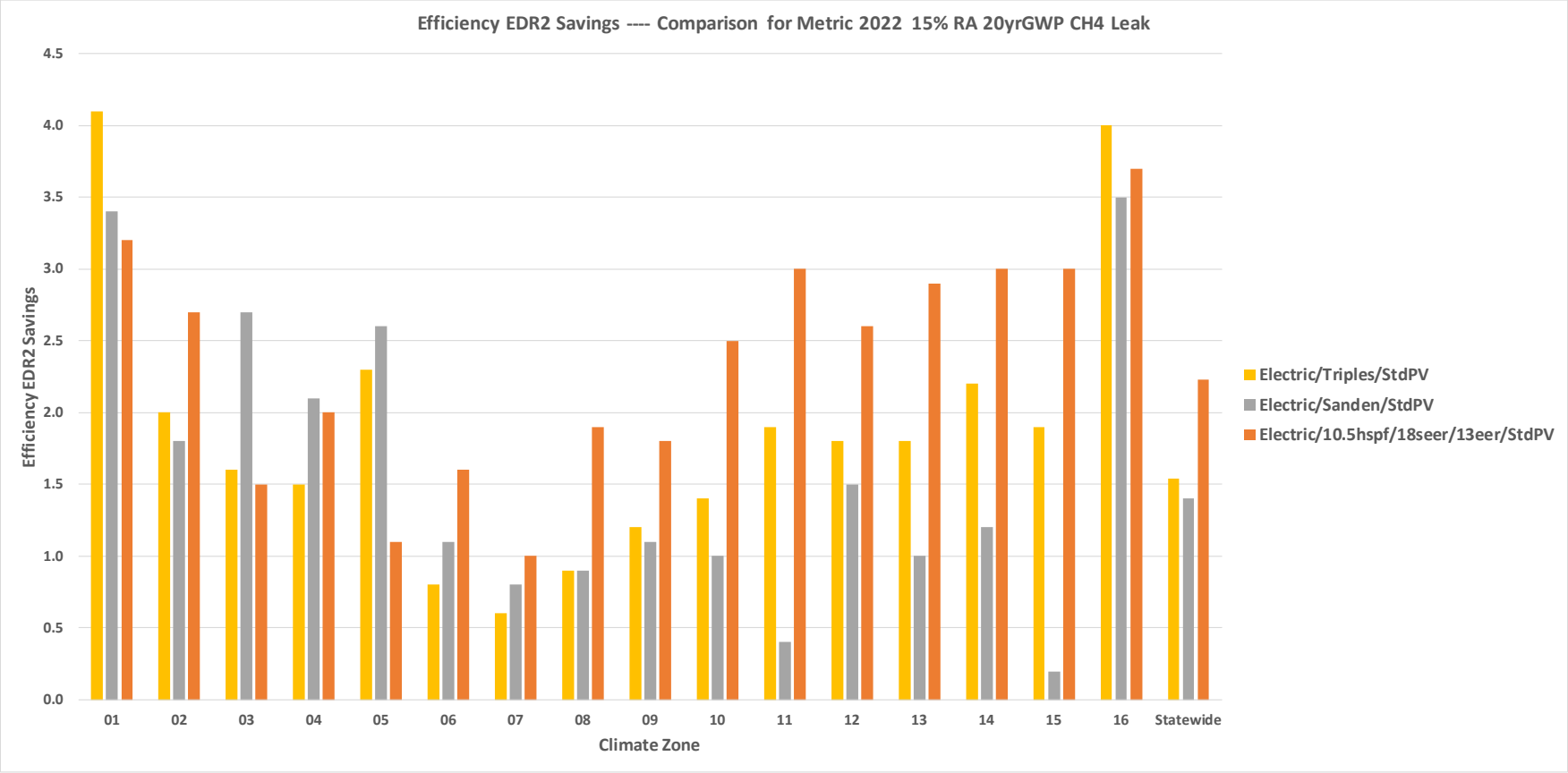
# CH4 Leakage Impact on TDV – CH4 leak minor except 20yr GWP

## High Efficiency Furnace and Air Conditioning Unit - kTDV



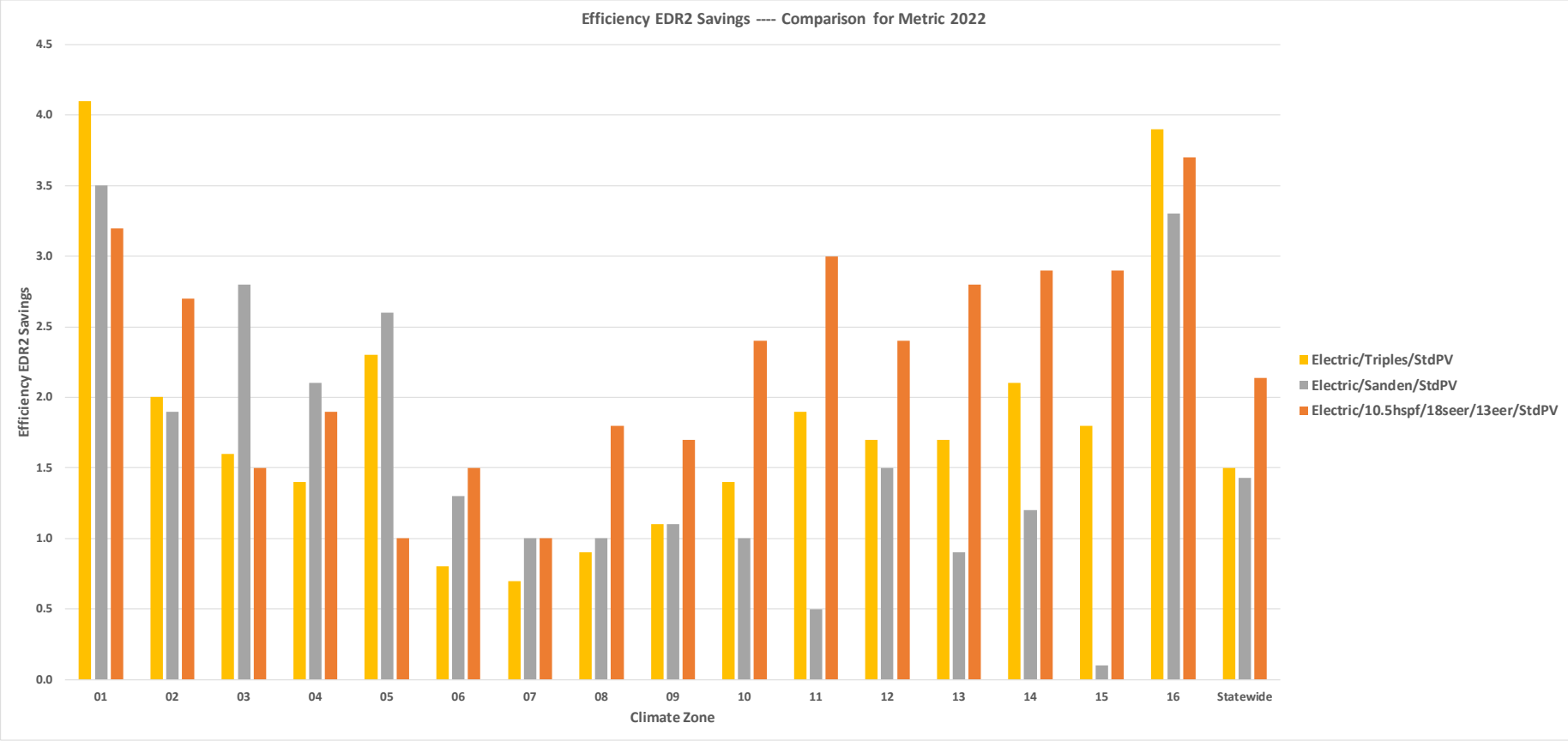
# Efficiency Measures EDR2 Savings - Mixed Fuel

## Efficiency Measures with Recommended Metric - EDR



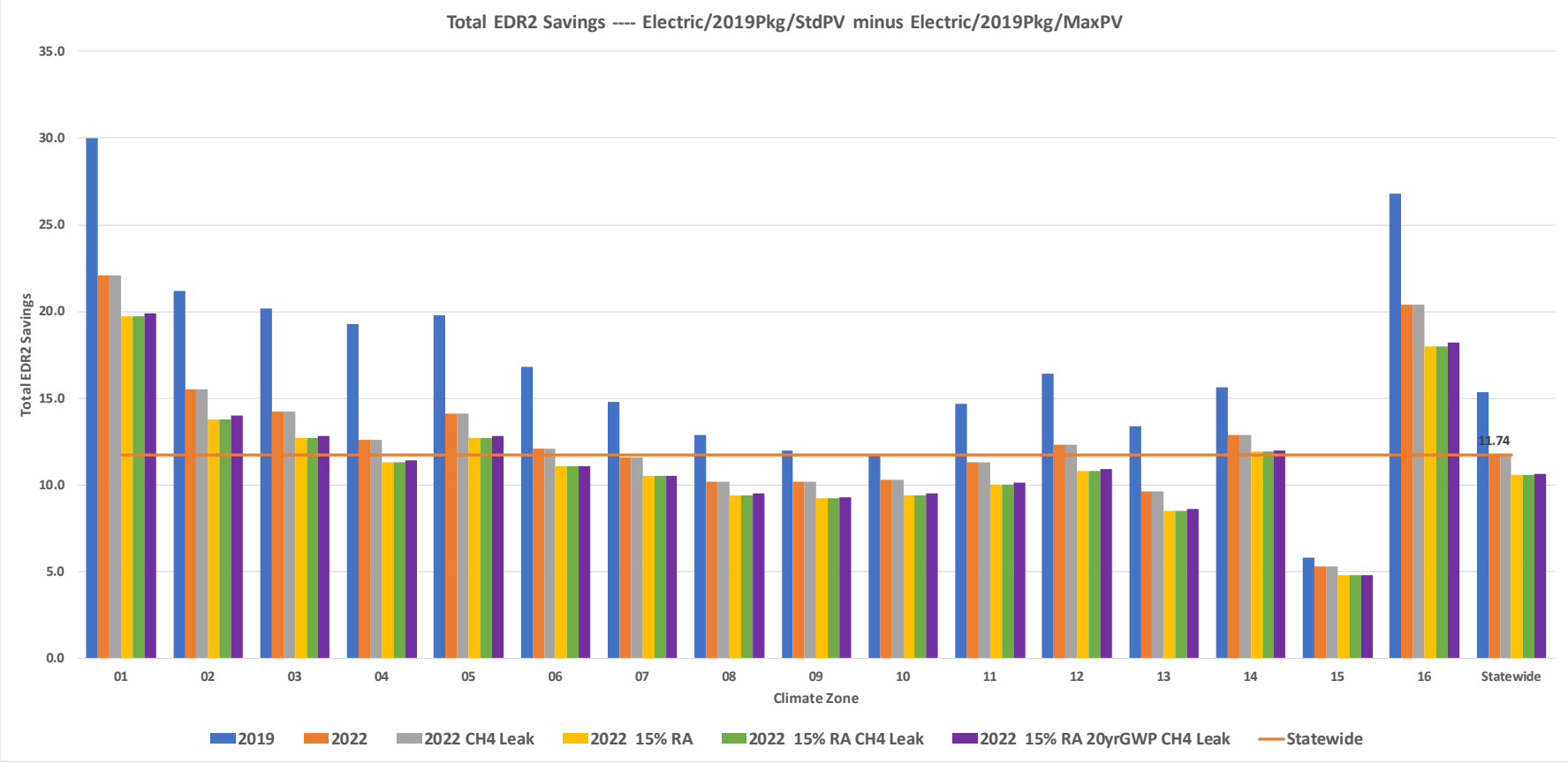
# Efficiency Measures EDR2 Savings - All Electric

## Efficiency Measures with Recommended Metric - EDR



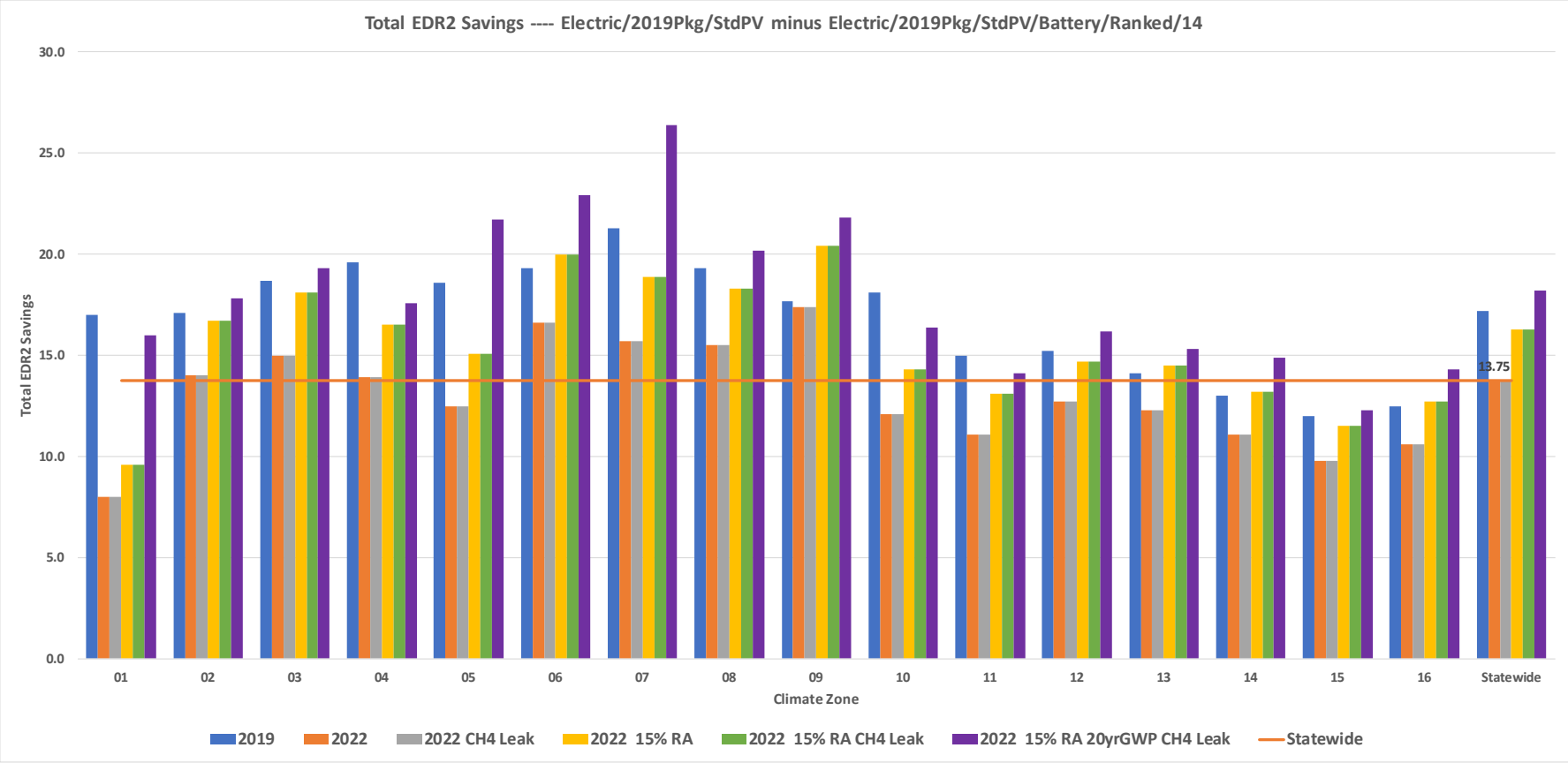
# Savings for Increasing PV - All Electric

## Contribution of PV System - EDR



# Savings for Adding Battery - All Electric

## Contribution of PV System Coupled with Battery Storage - EDR

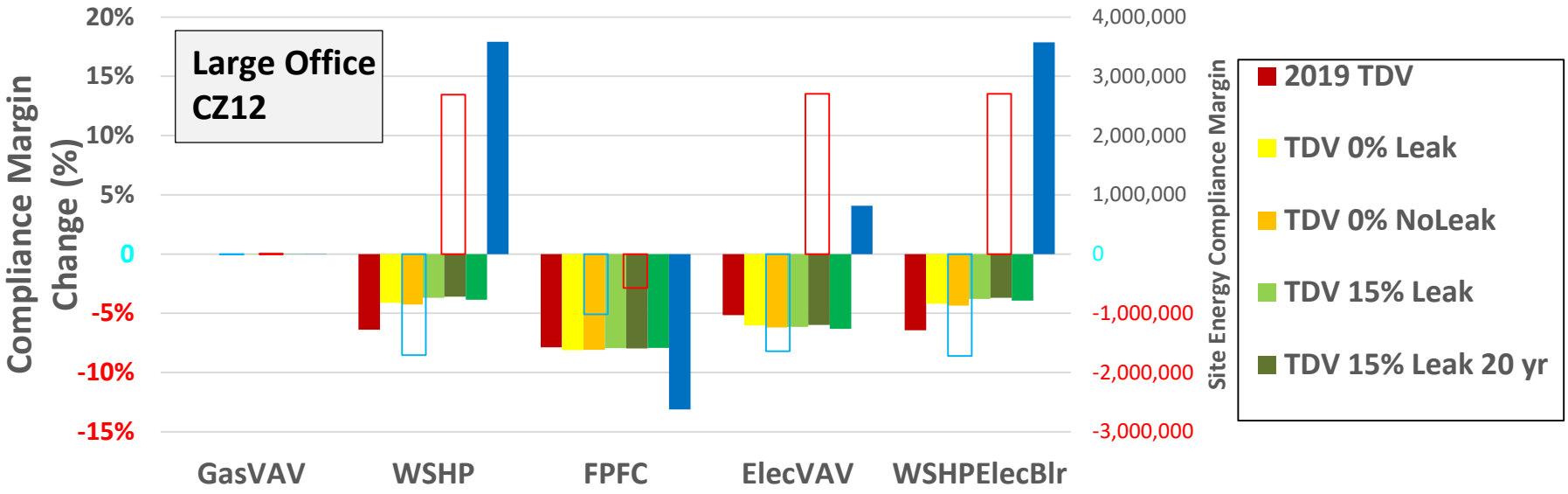


# Fuel Switching

| 2700 sf, CZ12 | | | | |
|---|---|---|---|---|
| **NG Standard Design:** | 2022 Pol 0% RA NoCH4Leak(6) | 2022 Pol 15%RA NoCH4Leak(3) | 2022 Pol 15% RA CH4Leak(5) | 2022 Pol 15% RA CH4Leak-20Yr(4) |
| Compliance Total | 61.24 | 64.21 | 64.85 | 66.91 |
| **Furnace 96 AFUE:** | | | | |
| Compliance Total | 57.41 | 60.38 | 60.96 | 62.82 |
| Margin | 6.3% | 6.0% | 6.0% | 6.1% |
| **HPWH:** | | | | |
| Total Building | 68.85 | 74.90 | 75.38 | 76.87 |
| Margin | 8.9% | 8.7% | 9.0% | 9.8% |
| **HP Space Heater:** | | | | |
| Total Building | 70.71 | 77.26 | 77.62 | 78.79 |
| Margin | 6.7% | 5.8% | 6.4% | 7.7% |
| **All-Electric:** | | | | |
| Total Building | 69.97 | 76.37 | 76.37 | 76.55 |
| Margin | 16.0% | 14.9% | 15.7% | 17.9% |

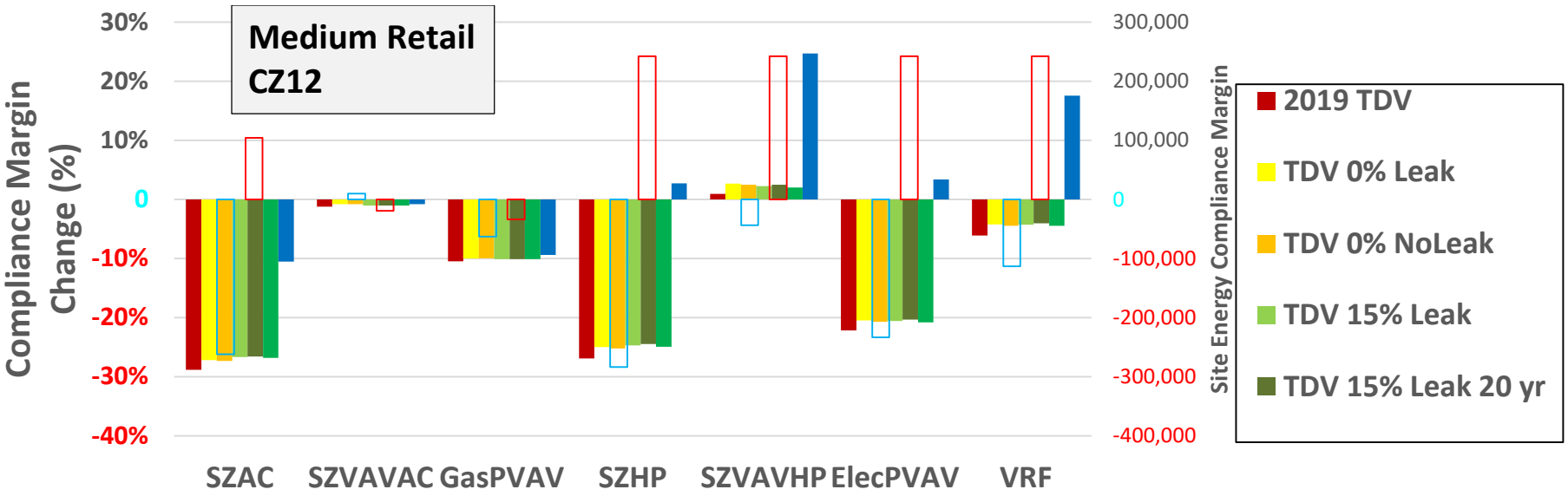
# SYSTEM SWITCHING (INCL. ALL ELECTRIC)

- Large Office – Gas VAV (VAV with chillers and gas boilers) is used in the baseline
- For electric heat systems (WSHP and Elec VAV), improvements needed to reduce TDV deficit
- For gas heat system (four-pipe fan-coil), improvements must be enough to get source to 0



# SYSTEM SWITCHING (INCL. ALL ELECTRIC)

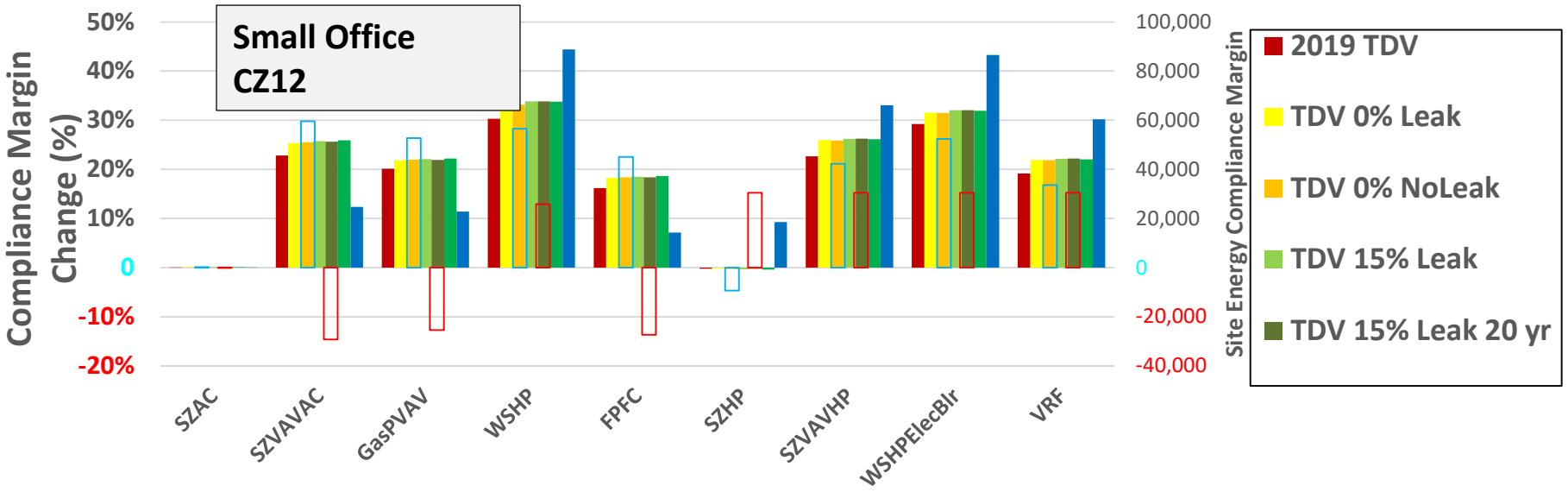
- Medium Retail - SZVAVAC (Single Zone VAV A/C with gas furnace) is used in the baseline
- Similar Trends except for SZAC. SZAC is constant volume fan, so the reduced compliance margin is primarily due to increased fan energy, so TDV is the limiting criterion



# SYSTEM SWITCHING (INCL. ALL ELECTRIC)

- Small Office – SZAC (Single Zone A/C with gas furnace) is used in the baseline
- Similar Trends –

  for electric heat systems (WSHP, heat pumps and VRF), TDV will limit reduced efficiency
  for gas heat systems (SZVAVAC, GasPVAV, FPFC), Source will limit reduced efficiency,
  TDV for electric and gas single zone systems is similar, source very different.



# SYSTEM SWITCHING (INCL. ALL ELECTRIC)

- High-Rise Residential - FPFC (Four-Pipe Fan Coil) in the dwelling units and VAV in the nonresidential spaces, both served by chillers and gas boiler, are used in the baseline. System changes below are only in residential dwelling units.
- Similar trend again
- Water heating is significant, so electric water heating gives large Source benefit

# TDV Update Recommendation

Recommendations:

Adopt the following for the 2022 Standards NG and Electric TDV:

**Pol-15%RA-20Year GWP CH4 Leak**