

**DOCKETED**

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# Residential Standards

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# Agenda

- 2016, 2019 AND 2022 Compliance
- Example Comparison of Residential Results
  - Savings from the 2019 Update in EDR and TDV terms
  - Savings from high efficiency hot water heating
  - Savings from High Efficiency Heating and Cooling in EDR and TDV terms
  - Comparing Natural Gas Scenario Impact on TDV
  - Savings from high performance walls
  - Savings from high performance attics
  - Savings from high windows and doors
  - Savings from Quality Insulation Installation
  - Savings from PV
  - Savings from a battery
- Hourly Source Energy Examples

# CBECC-Res 2016 Compliance

- Complies if Proposed Design TDV energy use is less than Standard Design TDV energy use

	Compliance Total (kTDV/ft <sup>2</sup> -yr)	Compliance Margin (kTDV/ft <sup>2</sup> -yr)
Standard Design	30.57	
Proposed Design	29.59	0.98

Result: **COMPLIES**

# CBEECC-Res 2019 Compliance

- Compliance by Energy Design Rating (EDR)
  - EDR of Proposed < EDR of Standard Design
- EDR is a rating relative to 2006 IECC
  - EDR is calculated in 2019 TDV terms
  - 100 is equal efficiency to 2006 IECC
  - 0 is ZNE
- Dual Compliance Criteria
  - Efficiency EDR – includes
    - Envelope, HVAC, DHW, and unregulated loads
    - New Self Utilization Credit for batteries
  - Final EDR – adds PV, battery, demand response

# 2019 Compliance Summary

Complies BOTH Proposed Design Efficiency EDR and Total EDR is less than Standard Design Efficiency EDR and Total EDR

○

	Energy Design Ratings:		Compliance Margins:	
	Efficiency <sup>1</sup> (EDR)	Total <sup>2</sup> (EDR)	Efficiency <sup>1</sup> (EDR)	Total <sup>2</sup> (EDR)
Standard Design	49.1	30.2		
Proposed Design	47.3	28.5	1.8	1.7

Result<sup>3</sup>: **COMPLIES**

<sup>1</sup> Efficiency measures include improvements like a better building envelope and more efficient equipment  
<sup>2</sup> Total EDR includes efficiency, photovoltaics and batteries  
<sup>3</sup> Building complies when all efficiency and total margins are greater than or equal to zero

# CBEEC-Res 2022 Compliance

- New EDR Criteria added
  - EDR1 is calculated in Hourly Source Energy
- 2019 Compliance Criteria remain as EDR2
  - EDR2 Efficiency – includes envelope, HVAC, DHW
  - EDR2 Total adds PV, battery, demand response
- Must Meet All Compliance Criteria
  - No tradeoffs between EDR1 and EDR2

# 2022 Compliance Summary

Complies if ALL three Compliance Margins are greater than or equal to 0

	Energy Design Ratings:			Compliance Margins:		
	Source (EDR1)	Efficiency <sup>1</sup> (EDR2)	Total <sup>2</sup> (EDR2)	Source (EDR1)	Efficiency <sup>1</sup> (EDR2)	Total <sup>2</sup> (EDR2)
Standard Design	46.6	49.8	33.5			
Proposed Design	44.9	47.7	31.3	1.7	2.1	2.2

Result<sup>3</sup>: **COMPLIES**

<sup>1</sup> Efficiency measures include improvements like a better building envelope and more efficient equipment

<sup>2</sup> Total EDR includes efficiency, photovoltaics and batteries

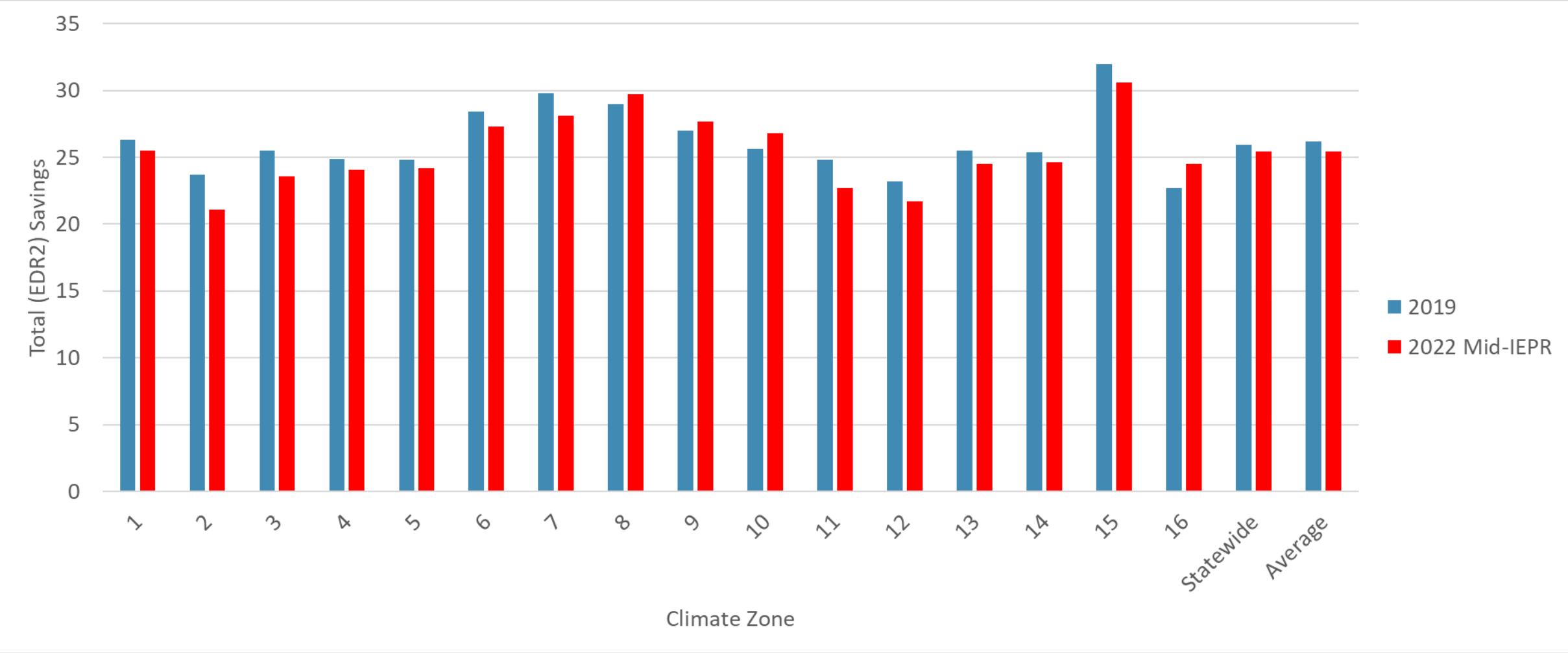
<sup>3</sup> Building complies when all source, efficiency and total margins are greater than or equal to zero



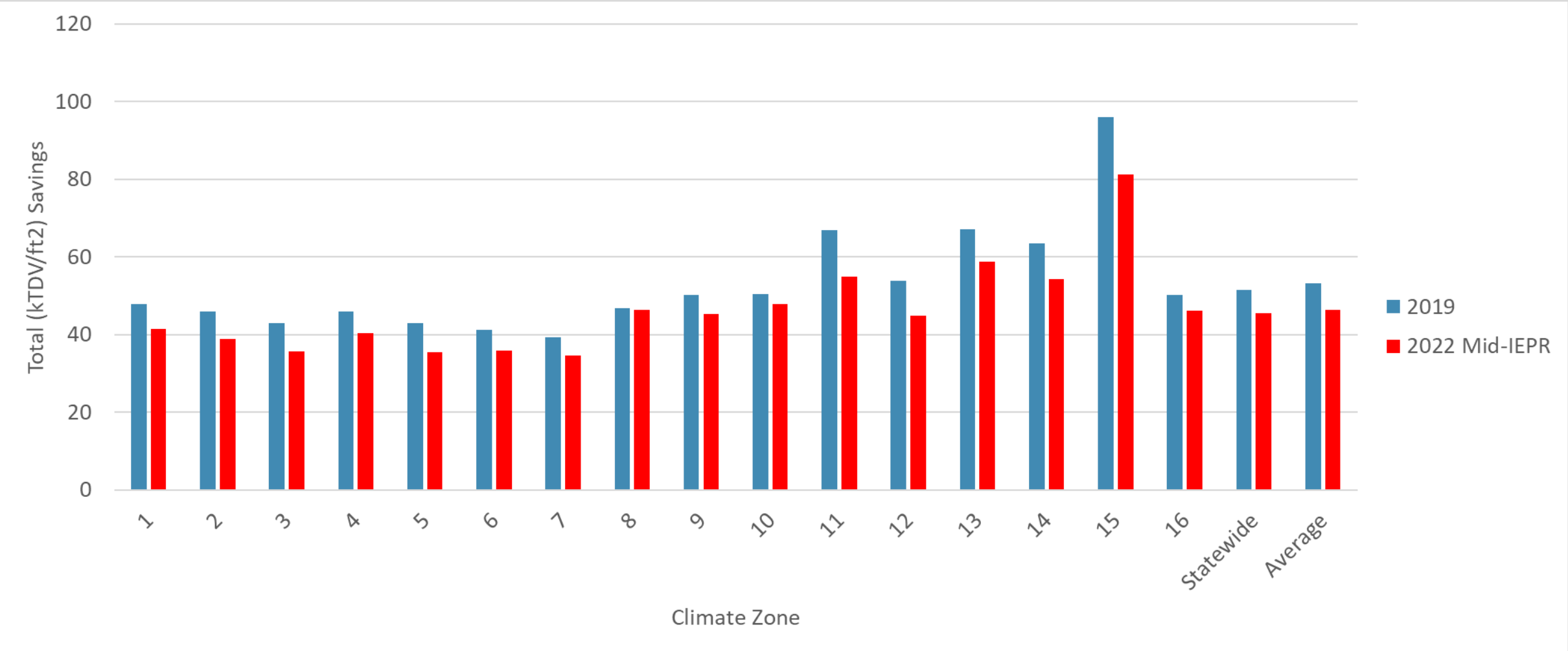
# Example Comparison of Residential Results

- Intended to illustrate combined impact of
  - Changes in Weather
  - Changes in TDV
- All examples calculated for the 2700 ft<sup>2</sup> Prototype
  - 2 Story, 4 Bedroom
- 2 Cases
  - Mixed Fuel
    - Gas space, water heat, cooking, clothes drying
    - Electric cooling
  - All Electric

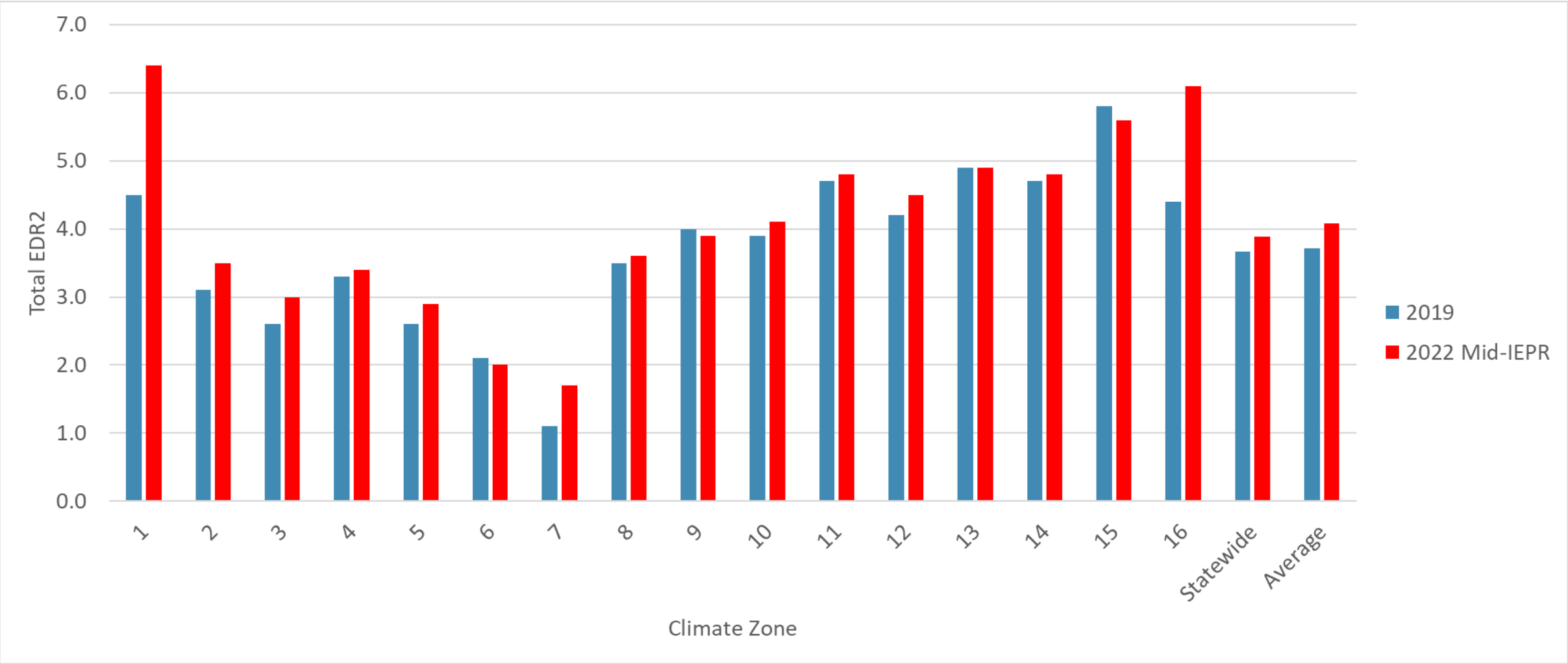
# Mixed Fuel Savings from the 2019 Standards Update In Total EDR2 used for Compliance



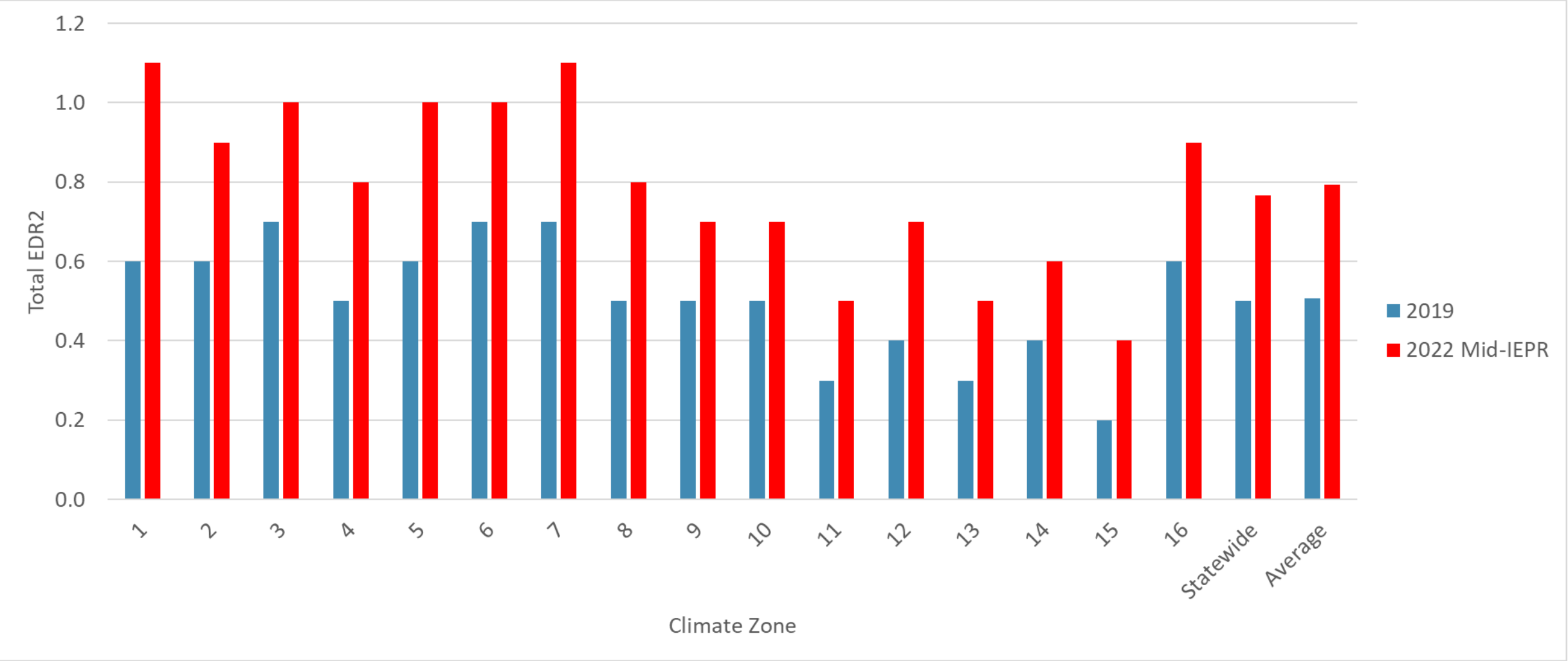
# Mixed Fuel Savings from the 2019 Standards Update In TDV terms used for Life Cycle Costing



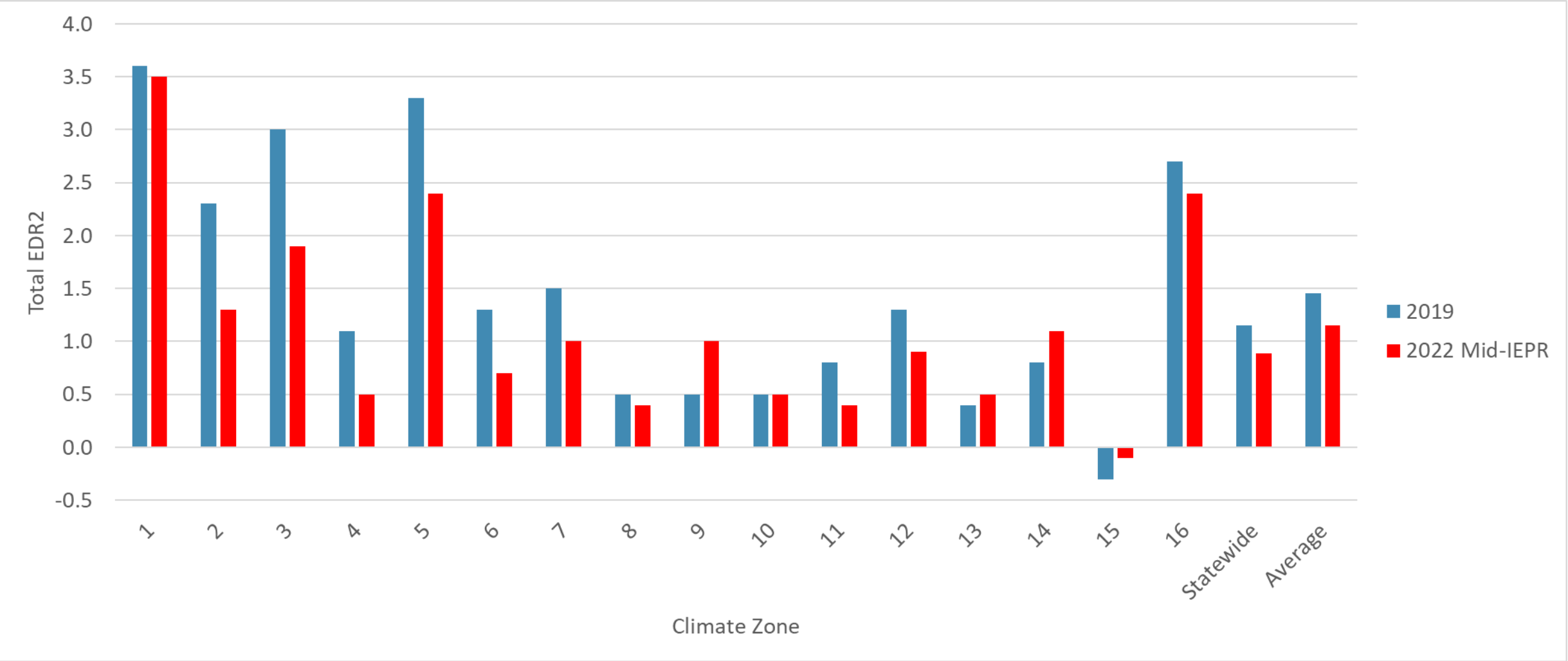
# Mixed Fuel Savings from the 2019 Standards Update without PV In Total EDR2 used for Compliance



# Mixed Fuel Savings from High Efficiency Gas (UEF=0.92) Water Heating In Total EDR2 used for Compliance

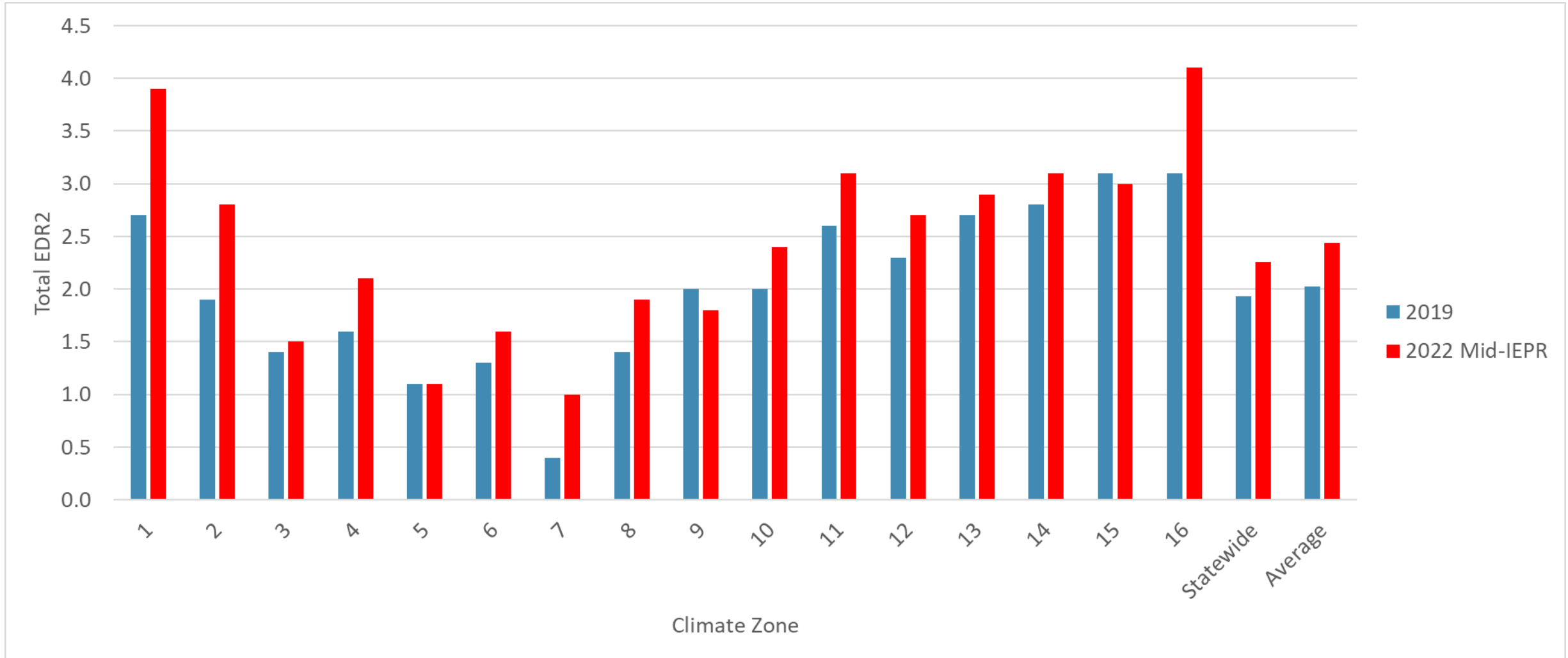


# All Electric Savings from High Efficiency Heat Pump Water Heater (Sanden) In Total EDR2 used for Compliance



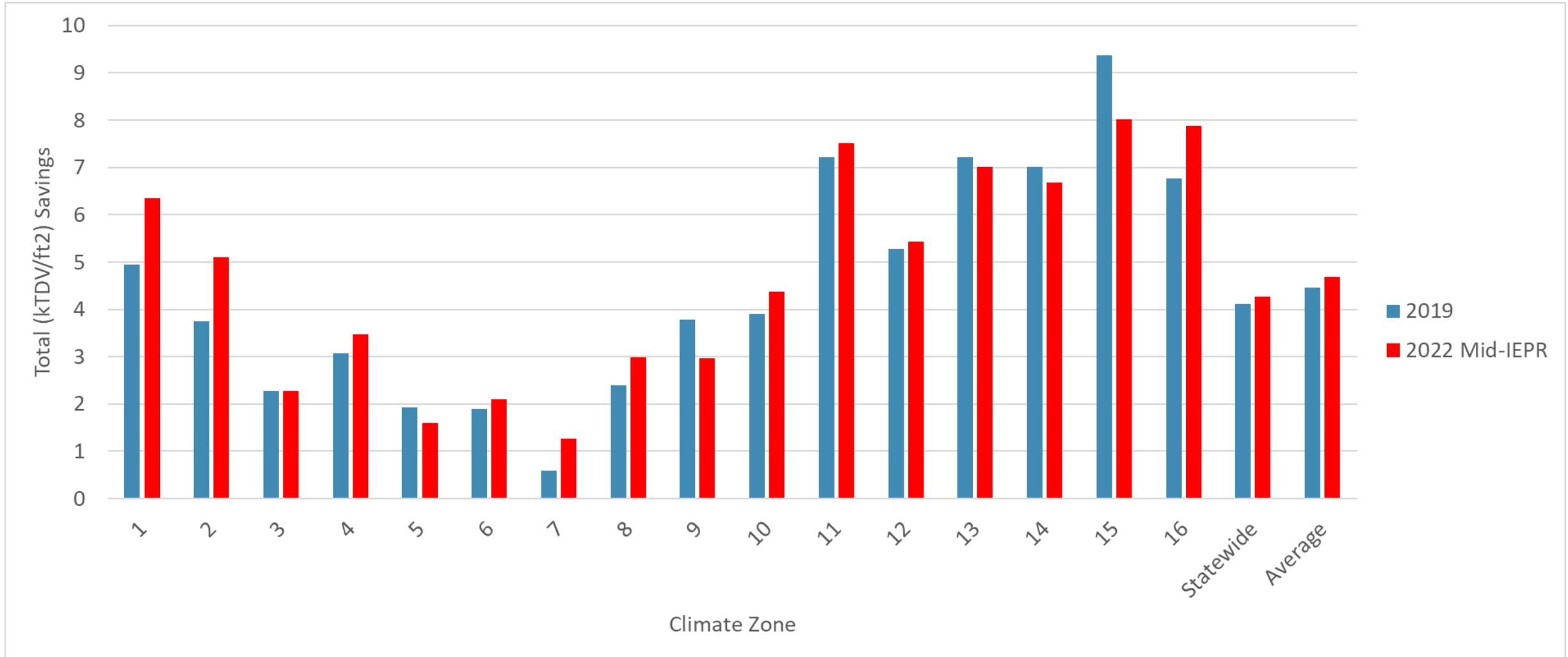
# Mixed Fuel Savings from High Efficiency Heating and Cooling (AFUE 0.96, SEER 18, EER 13)

## Total EDR2 used for Compliance



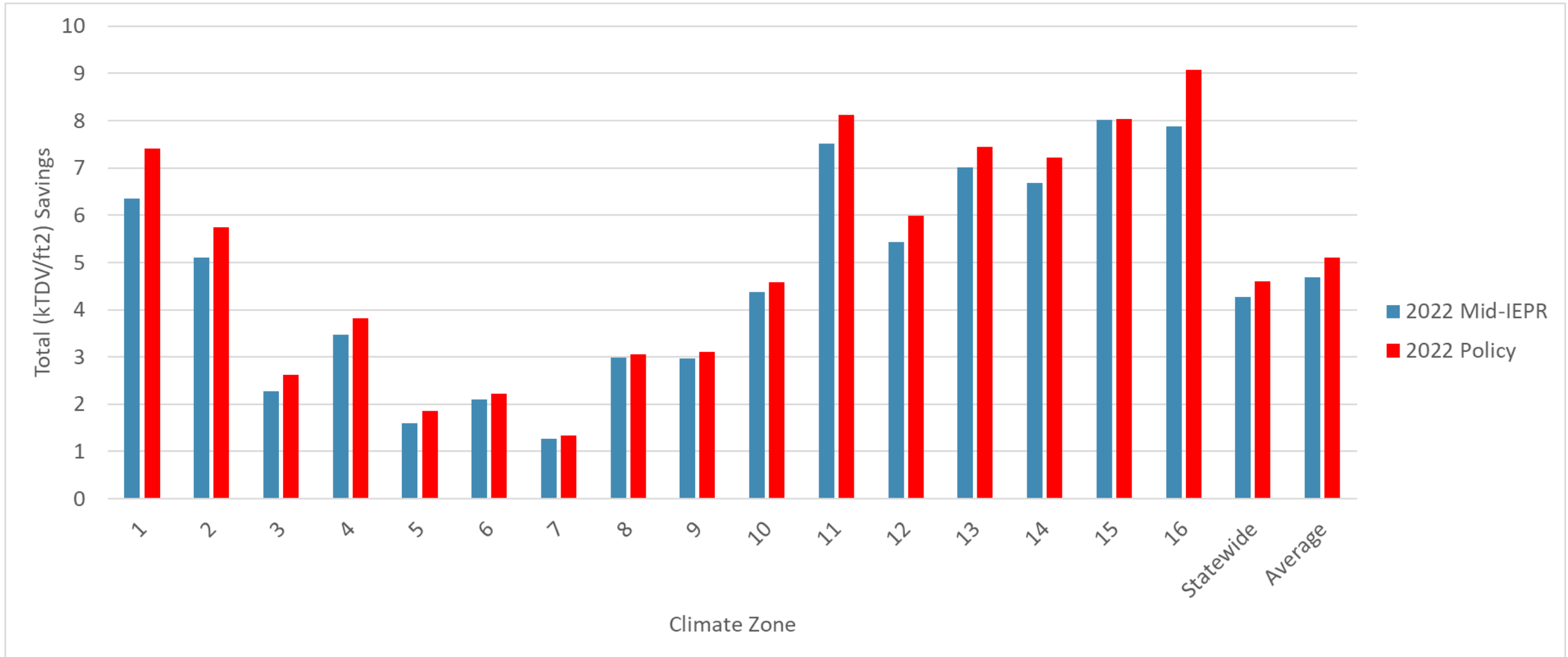
# Mixed Fuel Savings from High Efficiency Heating and Cooling (AFUE 0.96, SEER 18, EER 13)

## Total TDV used for Life Cycle Costing

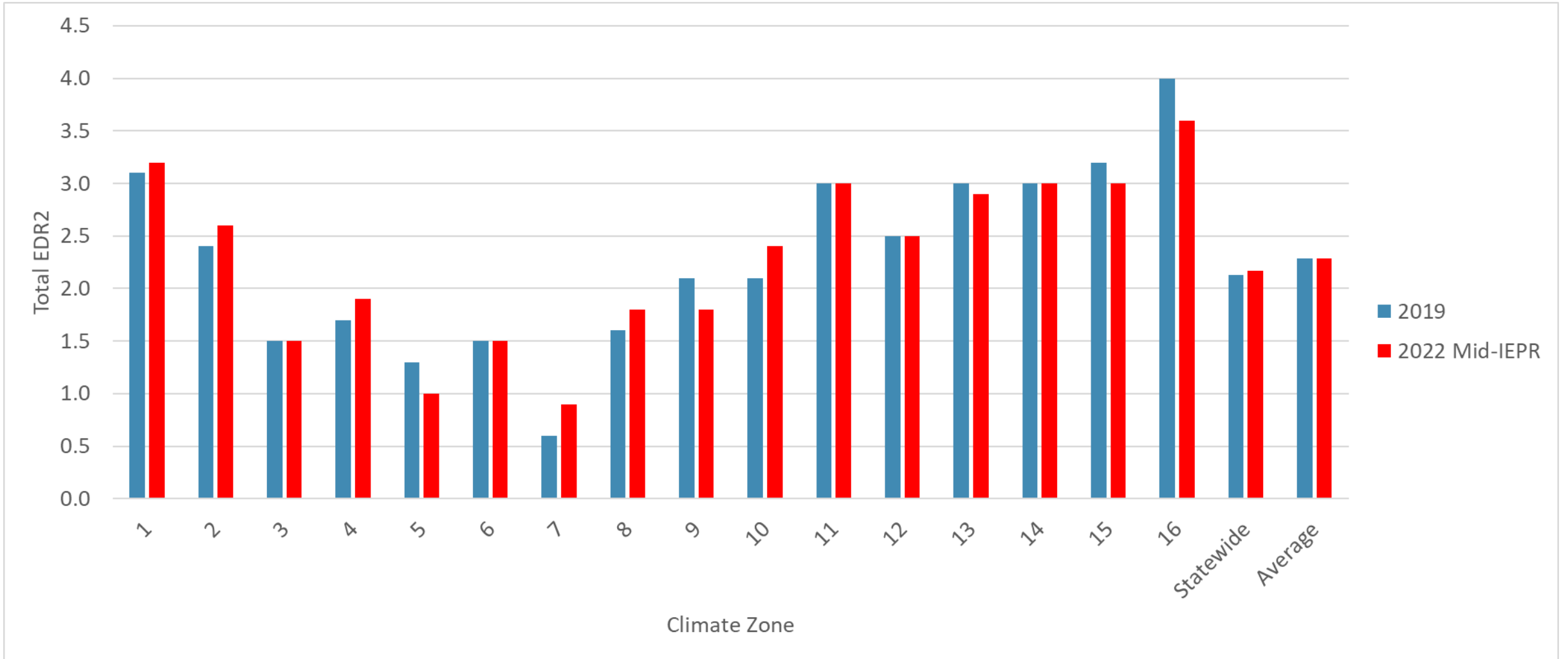




# Mixed Fuel Savings from High Efficiency Heating and Cooling (AFUE 0.96, SEER 18, EER 13) Comparing Natural Gas Scenario Impact on TDV

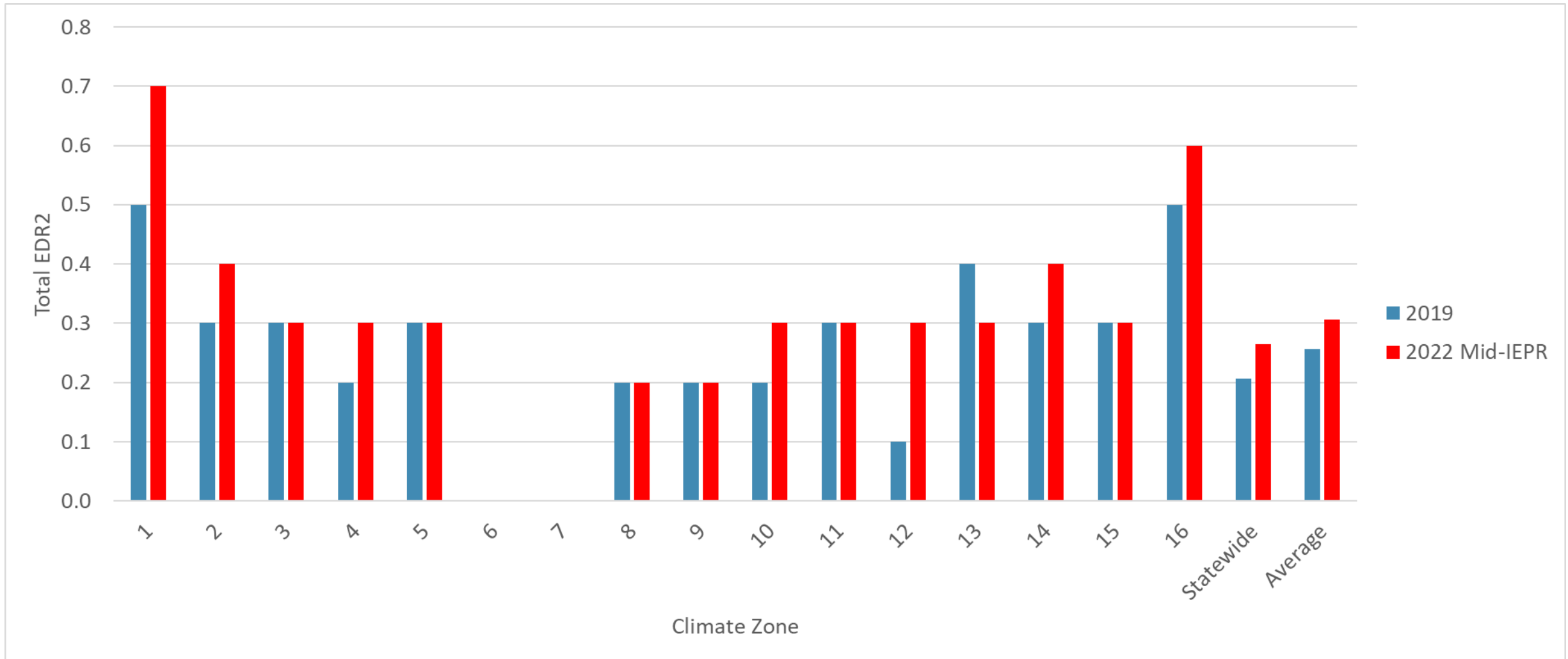


# All Electric Savings from High Efficiency Heating and Cooling (HSPF 10.5, SEER 18, EER 13) Total EDR2 used for Compliance



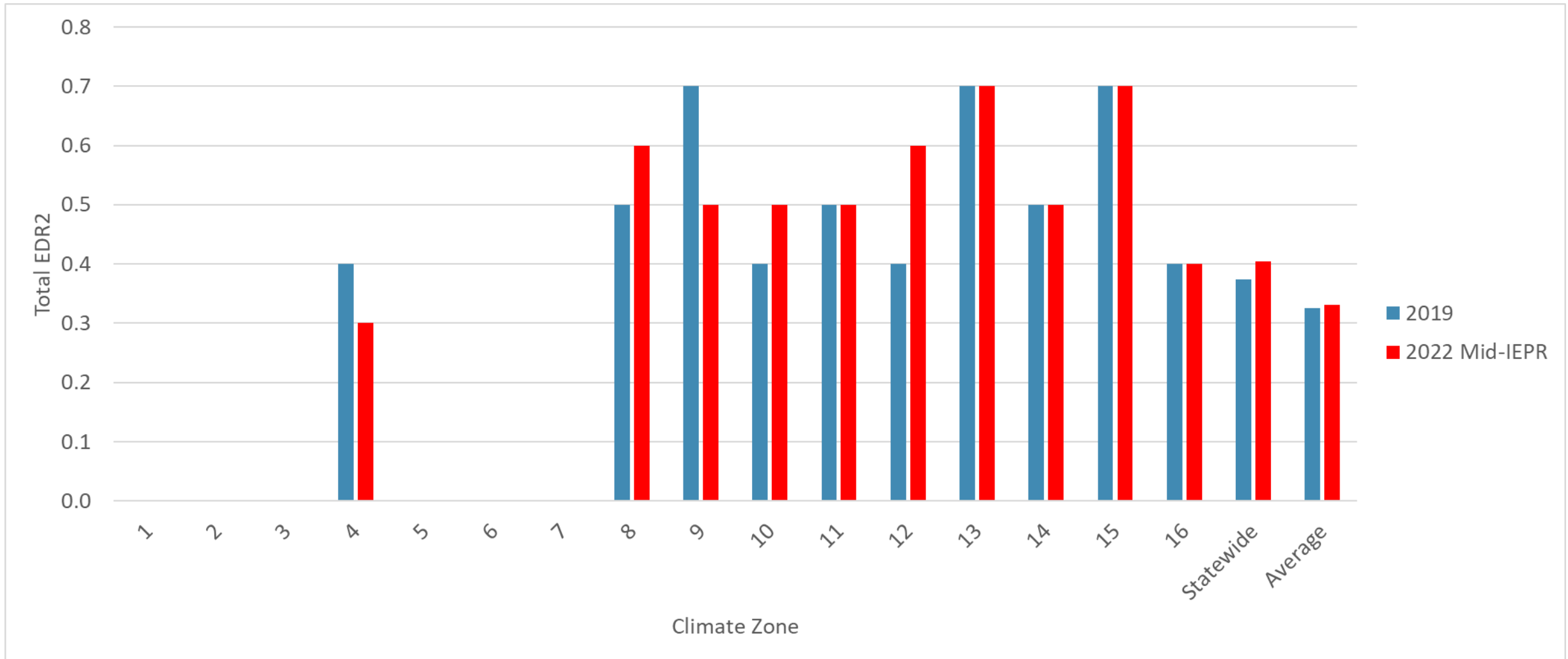
# Mixed Fuel Savings from adding 2019 High Performance Wall to 2016 Package

## Total EDR2 used for Compliance



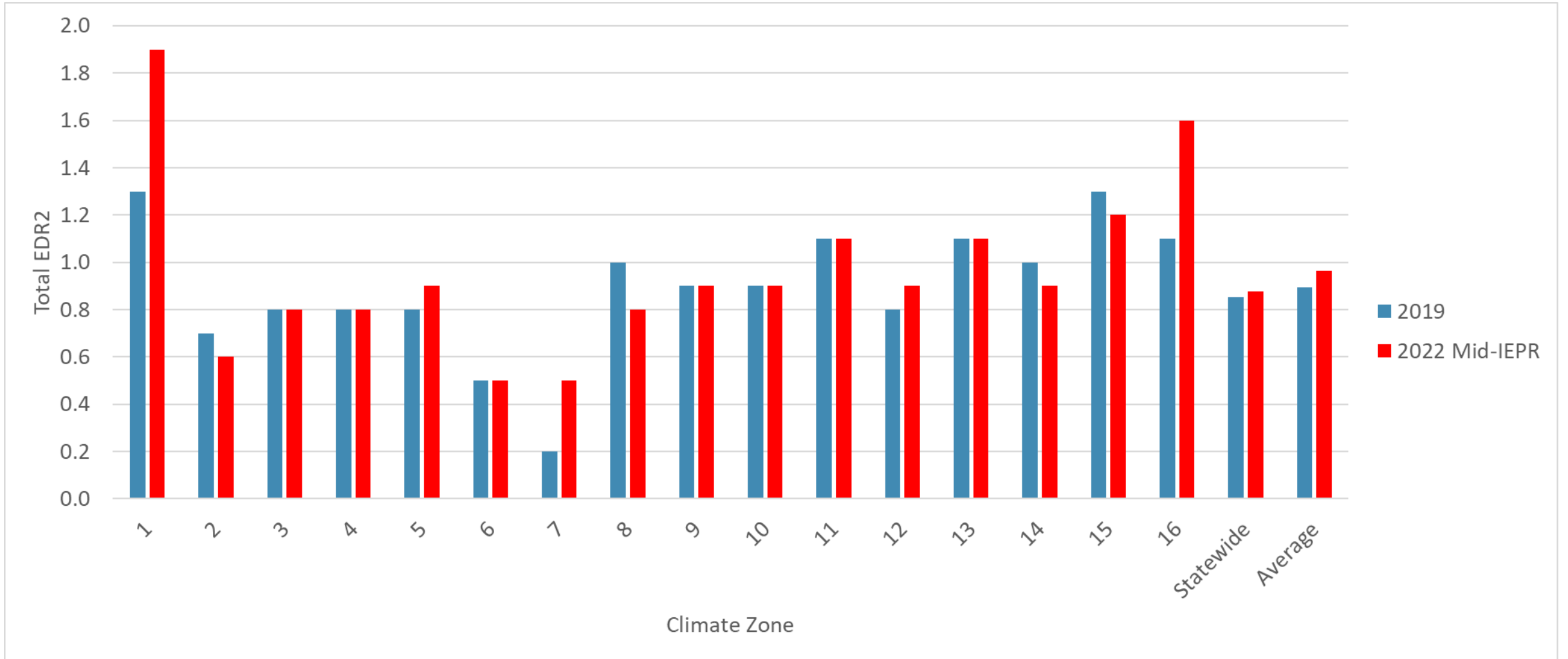
# Mixed Fuel Savings from adding 2019 High Performance Attic to 2016 Package

## Total EDR2 used for Compliance



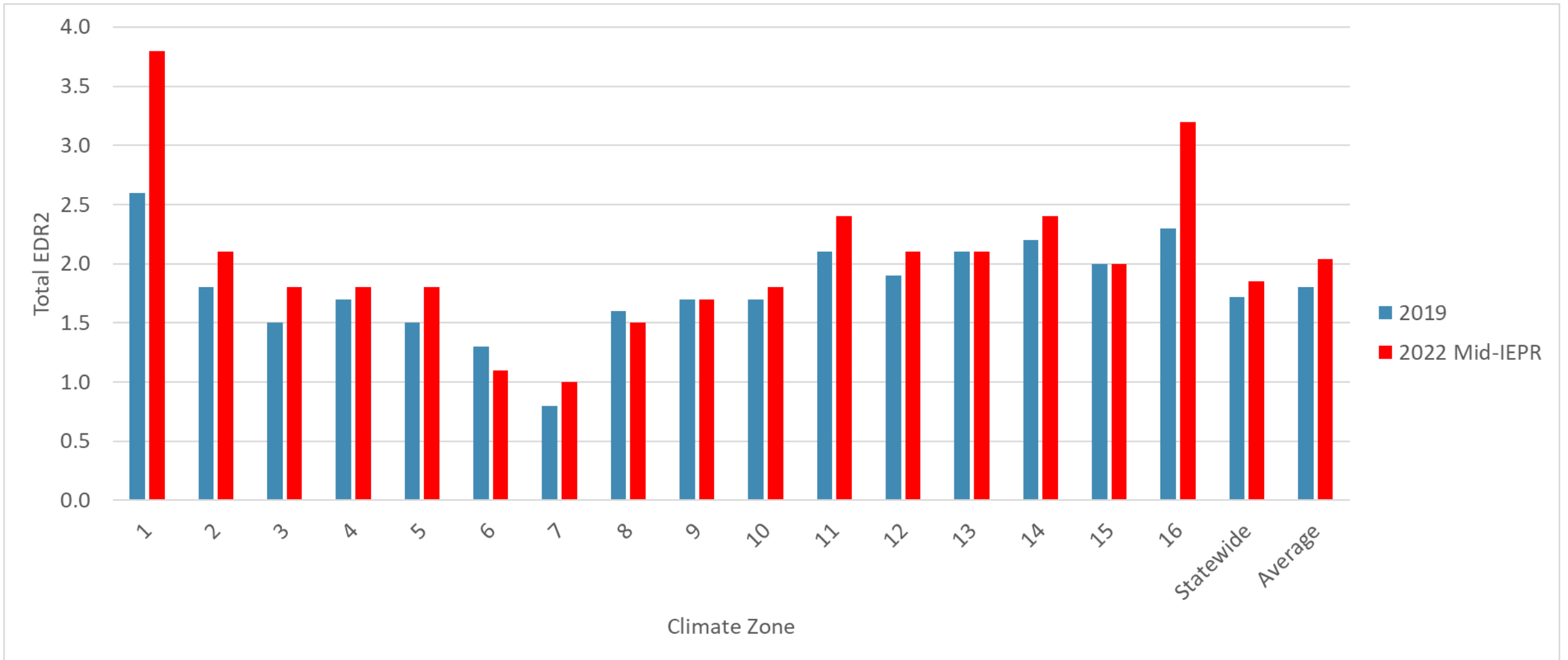
# Mixed Fuel Savings adding 2019 Windows and Doors to 2016 Package

## Total EDR2 used for Compliance



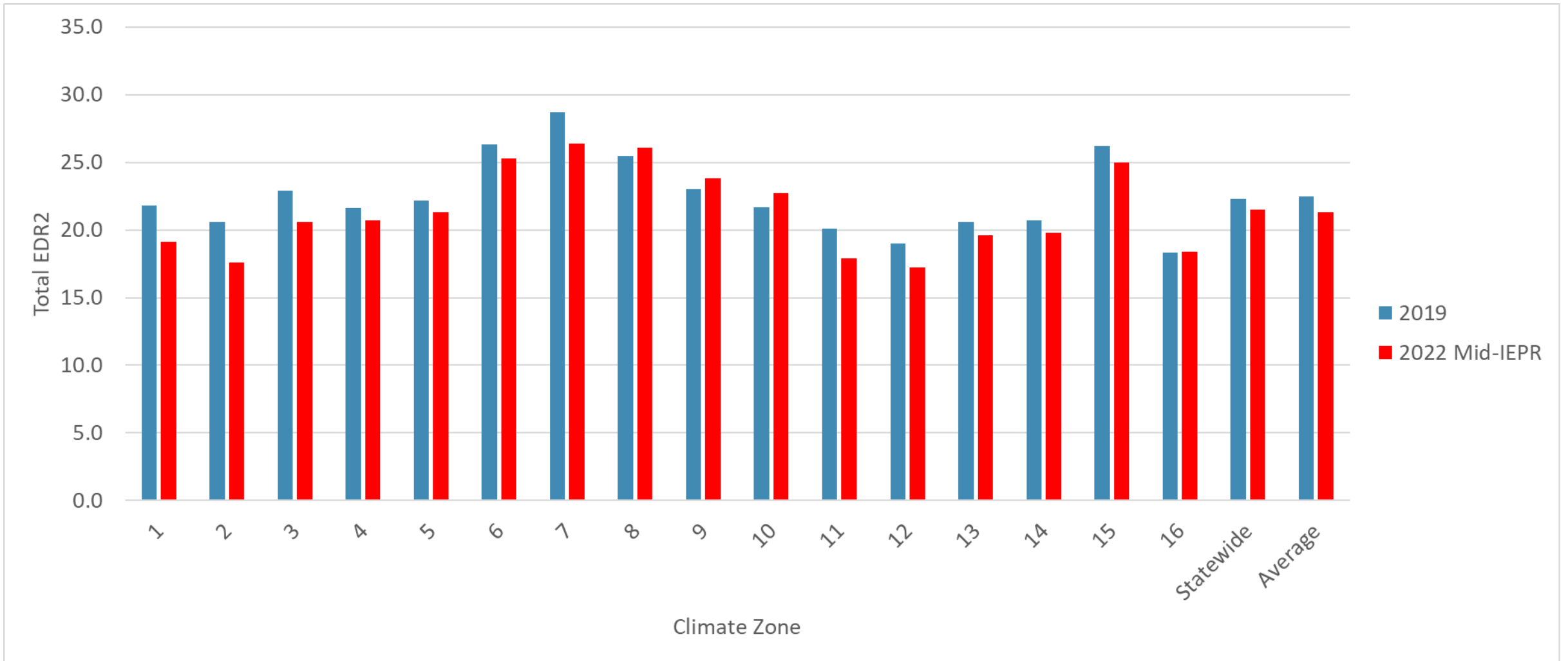
# Mixed Fuel Savings adding 2019 Quality Insulation Installation to 2016 Package

## Total EDR2 used for Compliance



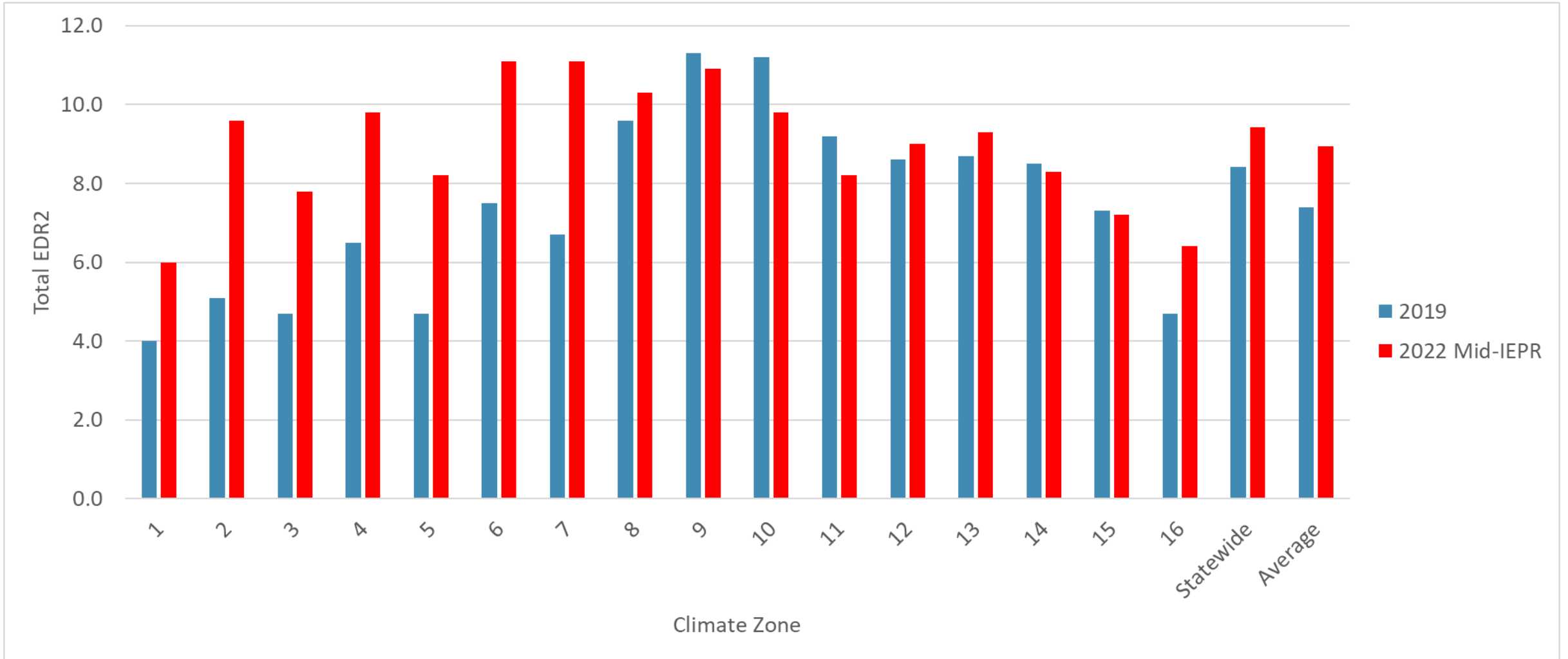
# Mixed Fuel Savings from Adding Standard Design PV

## Total EDR2 used for Compliance



# Mixed Fuel Savings from Adding a 14 kWh Battery with Basic Control

## Total EDR2 used for Compliance





# Hourly Source Energy (EDR1) Controls Compliance in some Cases Mixed Fuel in Climate Zone 12

Measures	Source (EDR1)	Efficiency (EDR2)	Total (EDR2)	Individual Pass/Fail			Compliance  Overall
				Source (EDR1)	Efficiency (EDR2)	Total (EDR2)	
Standard Design	51	51	34				
Remove High Performance Walls and add AFUE 0.96 Furnace	50	51	34	Pass	Fail	Fail	Fail
Remove High Performance Attic and add AFUE 0.96 Furnace	50	53	36	Pass	Fail	Fail	Fail
Remove High Performance Attic and walls and add AFUE 0.96 Furnace	51	54	37	Pass	Fail	Fail	Fail
Substitute 0.63 UEF Water Heater and upgrade to SuperInsulation	53	51	34	Fail	Pass	Pass	Fail

# Questions?

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