



# Scoping Water Heating Systems Workshop

Energy Budget in Title 24

July 16, 2013



- Energy Budget is the maximum of TDV energy that a proposed building can be designed to consume
- Time Dependent Value (TDV) Energy is the time varying energy used by the building that reflects hourly costs of energy at a state-wide level



- Prescriptive Standards
  - Specific efficiency measures by building type and climate zone
  - Establishes the Energy Budget in the Performance Standards
- Performance Standards
  - **Energy Budget** (annual energy use / square foot)
    - **Residential:** Heating, Cooling, Ventilation, Water Heating
    - **Nonresidential:** Heating, Cooling, Ventilation, Indoor Lighting, Water Heating, plus some Process Energy Systems
  - Must use Commission-certified Compliance Software
  - **Standard Design** – sets the Energy Budget by evaluating the energy use of the Proposed Building meeting all mandatory and prescriptive requirements
  - **Proposed Design** – Proposed Building must meet mandatory requirements and the Energy Budget, using any features able to be modeled by the Compliance Software



- Hourly Adjusted Recovery Load (HARL)

$$HARL_k = HSEU_k \times DLM_k - HSEU_k \times SSF_k + HRDL_k + \sum_l HJL_l$$

$HARL_k$  = Hourly adjusted recovery load (Btu).

$HSEU_k$  = Hourly standard end use (Btu). (Based on Use Schedule, CFA and  $\Delta T$ )

$DLM_k$  = Distribution loss multiplier (unitless).

$SSF_k$  = Solar savings fraction (unitless)

$HRDL_k$  = Hourly recirculation loop and branch pipe distribution loss (Btu)

$HJL_l$  = The tank surface losses of the  $l^{th}$  unfired tank of the  $k^{th}$  system (Btu)

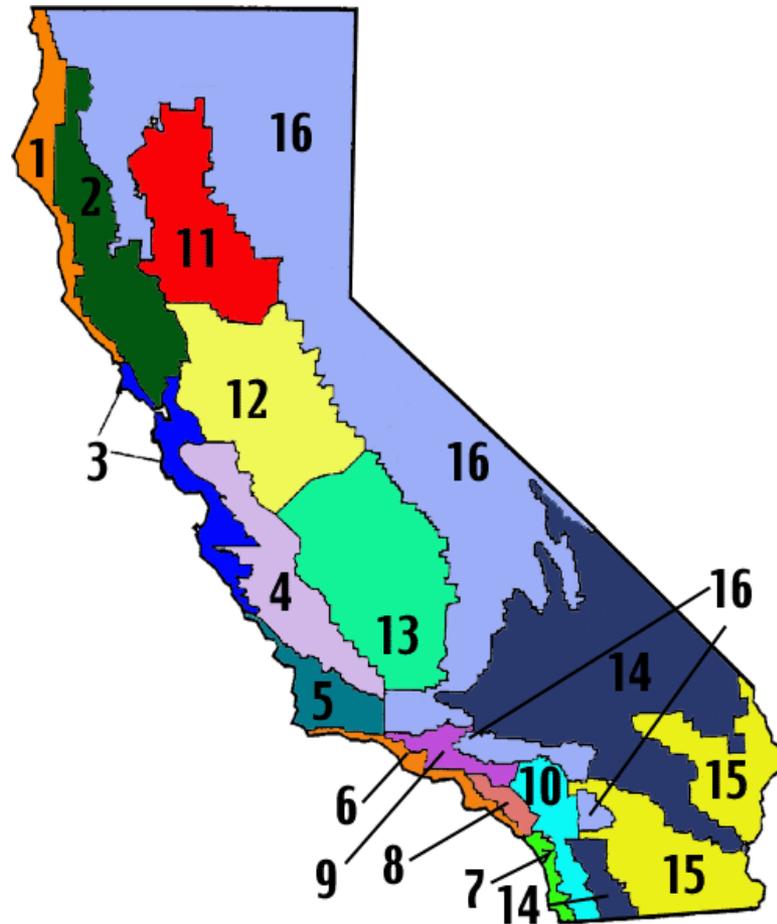


## Distribution Multipliers

Distribution Systems	Assigned Efficiency	Single Family Systems	Individual Unit System in Multi-family	Multi-family with central recirculation systems
<b>No HERS Inspection Required</b>				
Trunk and Branch -Standard (STD)	1.0	*	*	*
Pipe Insulation (PIA)	0.9	*	*	*
Parallel Piping (PP)	1.05	*	*	
Insulated and Protected Pipe Below Grade (IPBG)	1.4	*		
Recirculation: Non-Demand Control Options (R-ND)	6.4	*		
Recirculation with Manual Demand Control (R-Dman)	1.05	*	*	
Recirculation with Motion Sensor Demand Control (R-DAuto)	1.2	*	*	
<b>HERS Inspection Required</b>				
Pipe Insulation (HERS-PIA)	0.8	*	*	*
Parallel Piping with 5' maximum length (HERS-PP)	0.95	*	*	
Compact Design HERS)	0.7	*		
Point of Use HERS	0.3	*		
Recirculation with Manual Demand Control (HERS-R-Dman)	0.95	*	*	
Recirculation with Motion Sensor Demand Control (HERS-R-DAuto)	1.10	*		



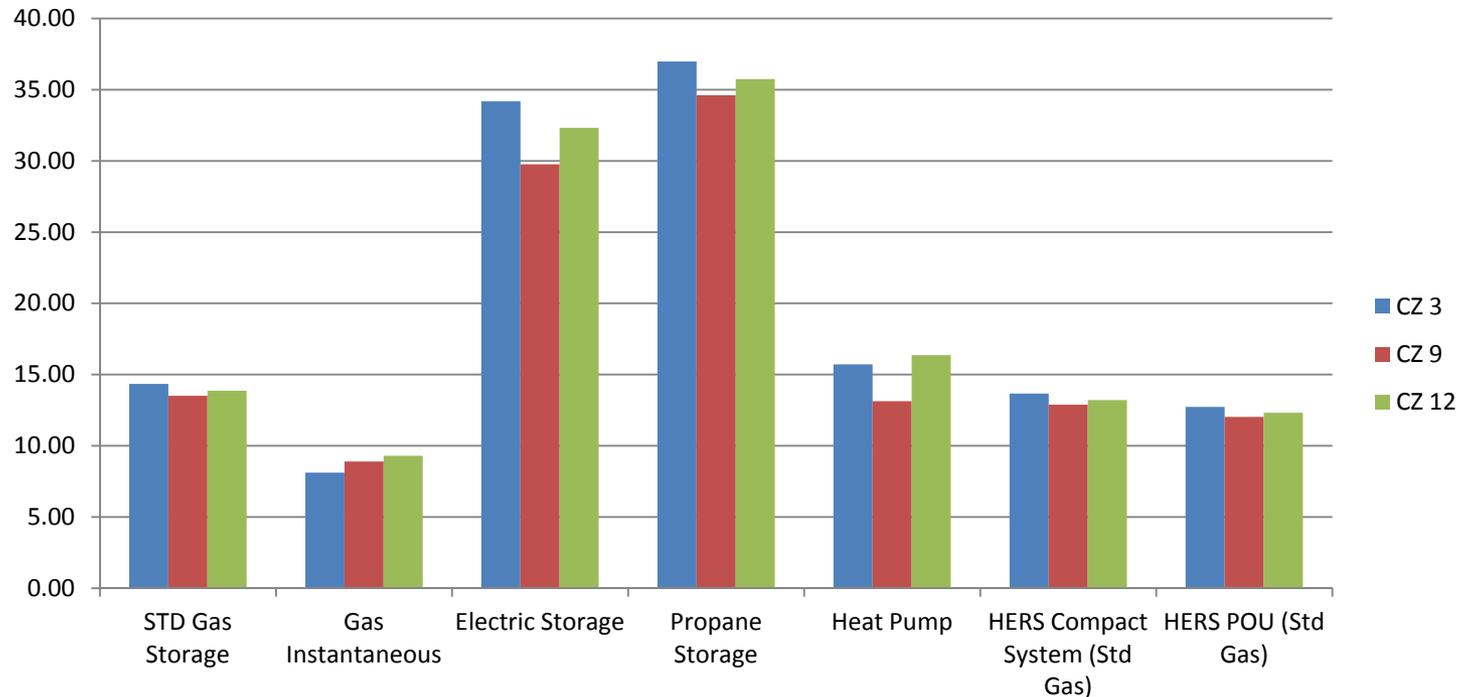
# CA Climate Zones





## 2100 ft<sup>2</sup> Single Story

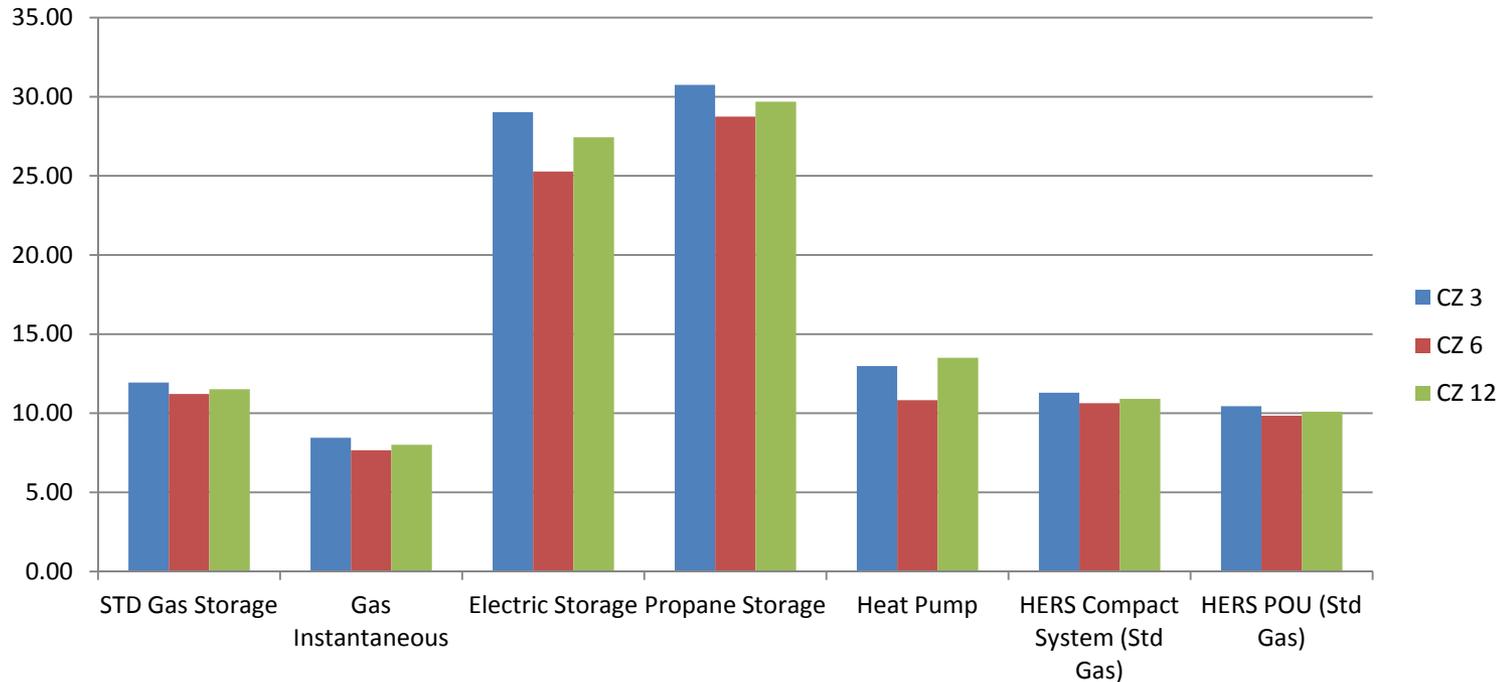
	STD Gas Storage	Gas Instantaneous	Electric Storage	Propane Storage	Heat Pump	HERS Compact System (Std Gas)	HERS POU (Std Gas)
03	14.35	8.12	34.18	36.98	15.71	13.66	12.73
09	13.51	8.90	29.76	34.61	13.13	12.88	12.03
12	13.86	9.30	32.32	35.74	16.36	13.21	12.32





## 2700 ft<sup>2</sup> Two Stories

	STD Gas Storage	Gas Instantaneous	Electric Storage	Propane Storage	Heat Pump	HERS Compact System (Std Gas)	HERS POU (Std Gas)
03	11.94	8.45	29.02	30.75	12.98	11.30	10.44
09	11.22	7.66	25.27	28.74	10.83	10.63	9.84
12	11.52	8.01	27.44	29.69	13.50	10.91	10.09





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Questions?