



FLORIDA SOLAR ENERGY CENTER®

Creating Energy Independence

Vision for the ERI: Is a Cost-based Rating Index (CBRI) Viable

Summary Report on CBRI
Task Group Simulation Analysis

Philip Fairey



Acknowledgements

It is important to acknowledge and thank the California Energy Commission (CEC) for their support through the significant and extensive technical, energy simulation and time and effort contributions of Ms. Martha Brook



Analysis

- Significant simulation analysis conducted jointly by CEC (Martha Brook) and FSEC (Philip Fairey) during 2016 study on “CA Harmonization”
- Additional simulation analysis on CA Title 24 Energy Design Ratings (EDR) provided to CBRI Task Group by Martha Brook
- Simulations in five U.S. climates using all electric and mixed fuel homes provided detailed end use results in all formats (i.e. nMEUL, loads, site use, source use, and energy cost).

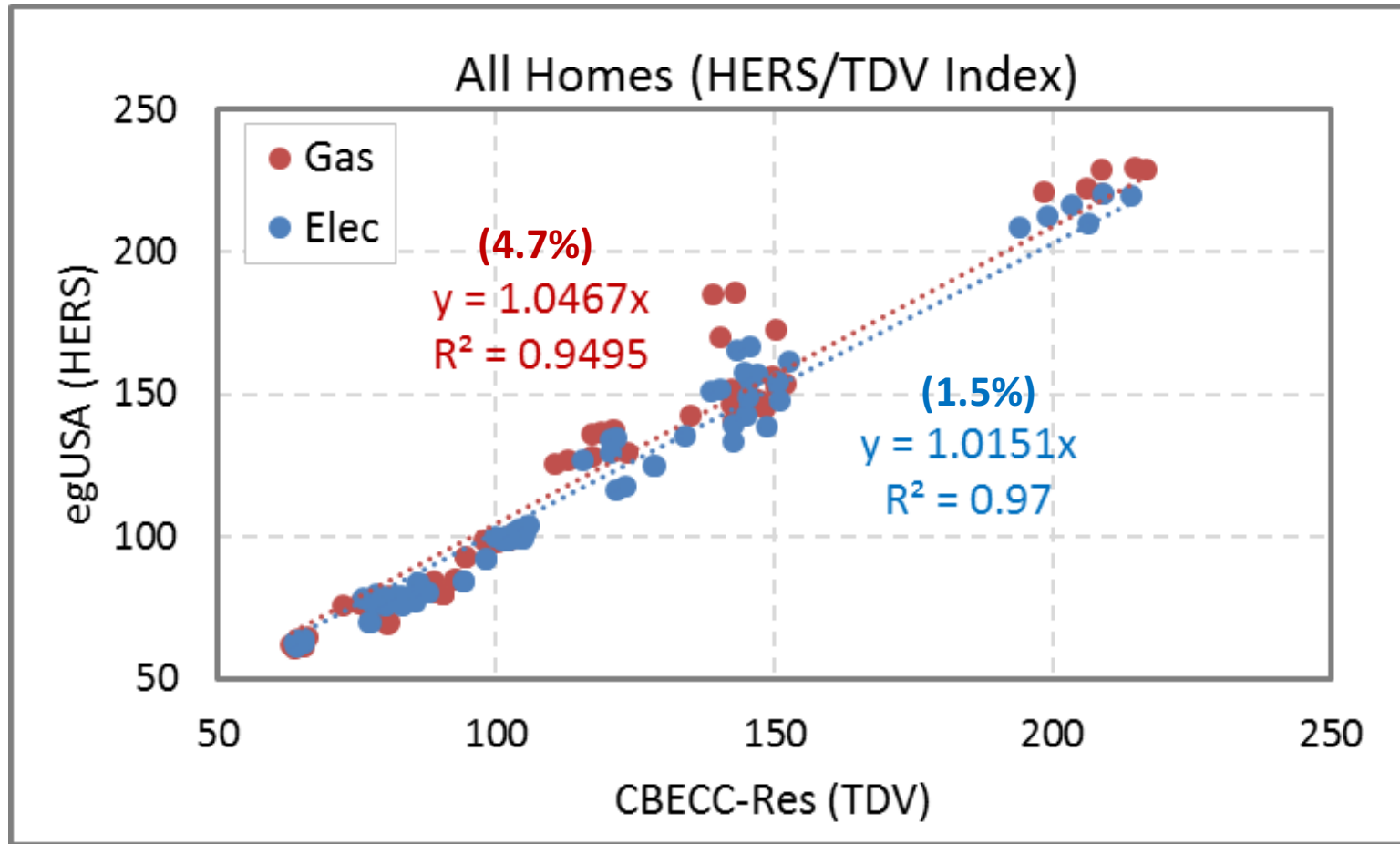


“CA Harmonization” Study

- Broad range of home efficiencies examined with Index results ranging from ~55 to ~230
- Two software tools participated:
 - CBECC-Res (CSE) using Time Dependent Valuation (TDV)
 - EnergyGauge USA (DOE-2.1E+) using HERS
- Results are quite similar when the same Reference case is used in both tools (i.e. RESNET 301-2014).



“CA Harmonization” Results

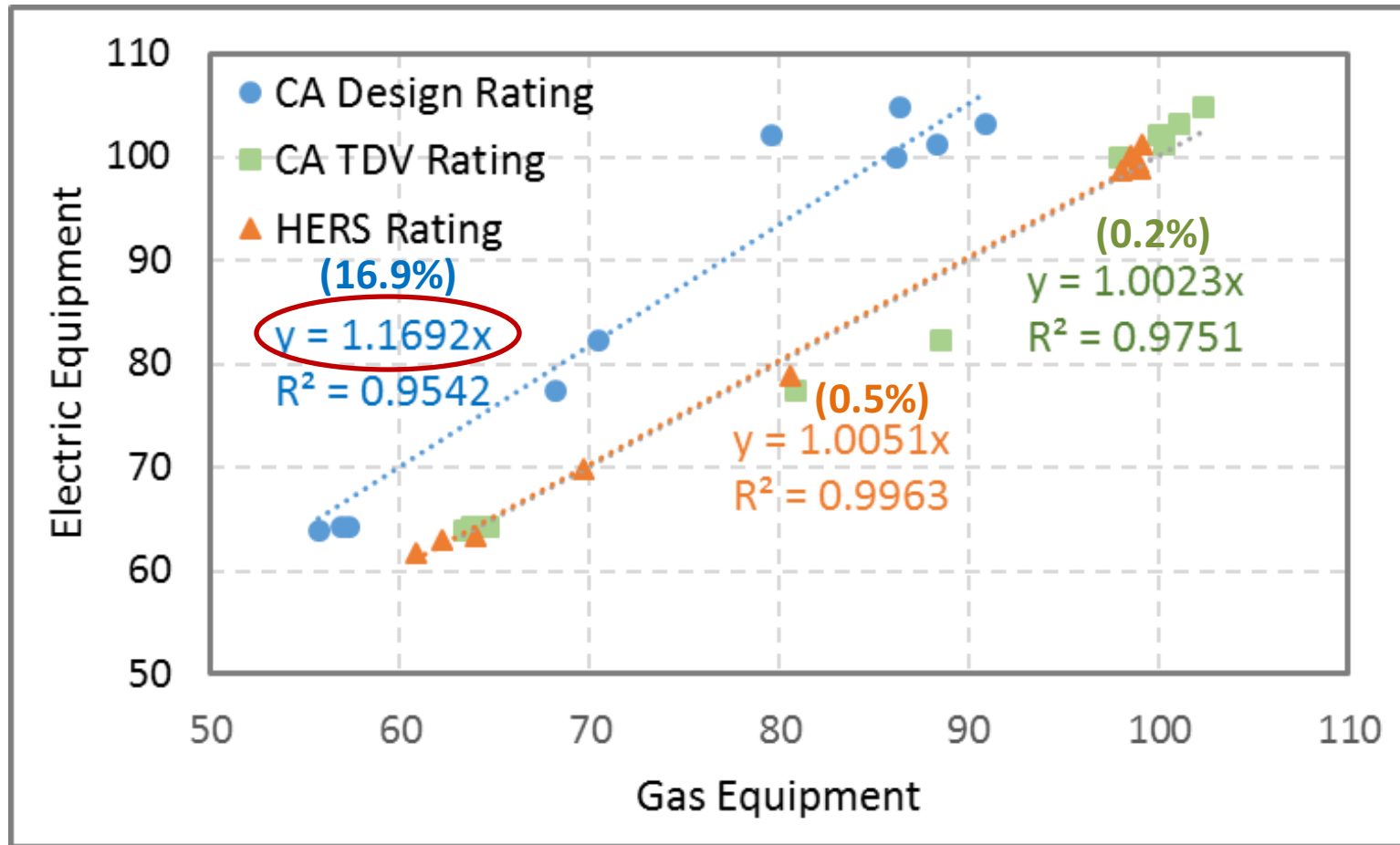


California Energy Design Rating

- California Energy Design Rating (EDR) is significantly different than HERS Rating
- EDR uses single-fuel Reference: electric reference for both electric and gas end uses
- HERS uses dual-fuel Reference: Electric reference for electric end uses and gas reference for gas end uses
- Significant difference with mixed fuel homes that use gas achieving ~17% better Indexes.



Impact of Single-fuel Reference



Cost-based Index Analysis

- Detailed analysis in 5 climates: Miami, Houston, Atlanta, Albuquerque, and Chicago
- Homes designed to be about 50% more efficient than 2006 IECC
- All electric and dual-fuel home designs evaluated in each climate
- Separate results for each end use for both reference and rated homes
- Separate results for nMEUL, loads, site energy use, source energy use and energy cost
- Comparison of nMEUL, single-fuel reference and dual-fuel reference in each climate for each fuel.



Alternative Options (nMEUL is HERS)

City and Energy Choice	Miami		Houston		Atlanta		Albuquerque		Chicago	
	Elec	Gas	Elec	Gas	Elec	Gas	Elec	Gas	Elec	Gas
~50% Improved Home										
Annual Energy Cost (\$)	1,052	979	1,094	994	1,109	969	1,155	981	1,493	1,176
nMEUL Multiple Reference Homes	42	43	45	46	44	43	49	48	48	46
Cost Single Electric Reference Home	49	46	51	47	49	43	52	45	50	39
Cost Multiple Reference Homes	49	50	51	53	49	50	52	55	50	53
Reference Home (nMEUL Index = 100)										
Annual Energy Cost (\$)	2,141	1,957	2,132	1,874	2,274	1,925	2,201	1,778	2,994	2,237
nMEUL Multiple Reference Homes	100	100	100	100	100	100	100	100	100	100
Cost Single Electric Reference Home	100	91	100	88	100	85	100	81	100	75
Cost Multiple Reference Homes	100	100	100	100	100	100	100	100	100	100
Note: Electricity Cost \$0.12/kWh; Natural Gas Cost \$0.98/Therm										

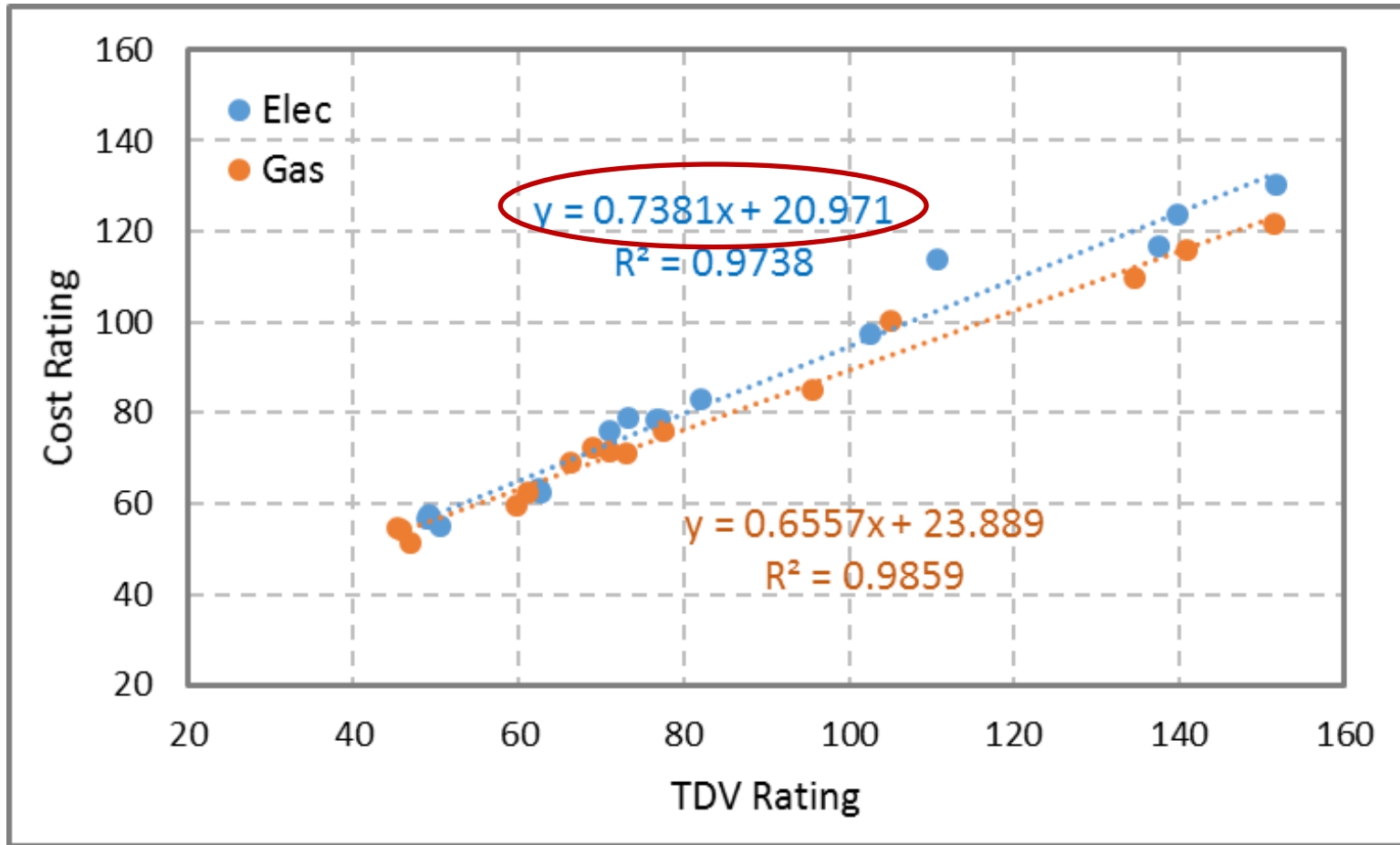


Cost Index vs CA Indices

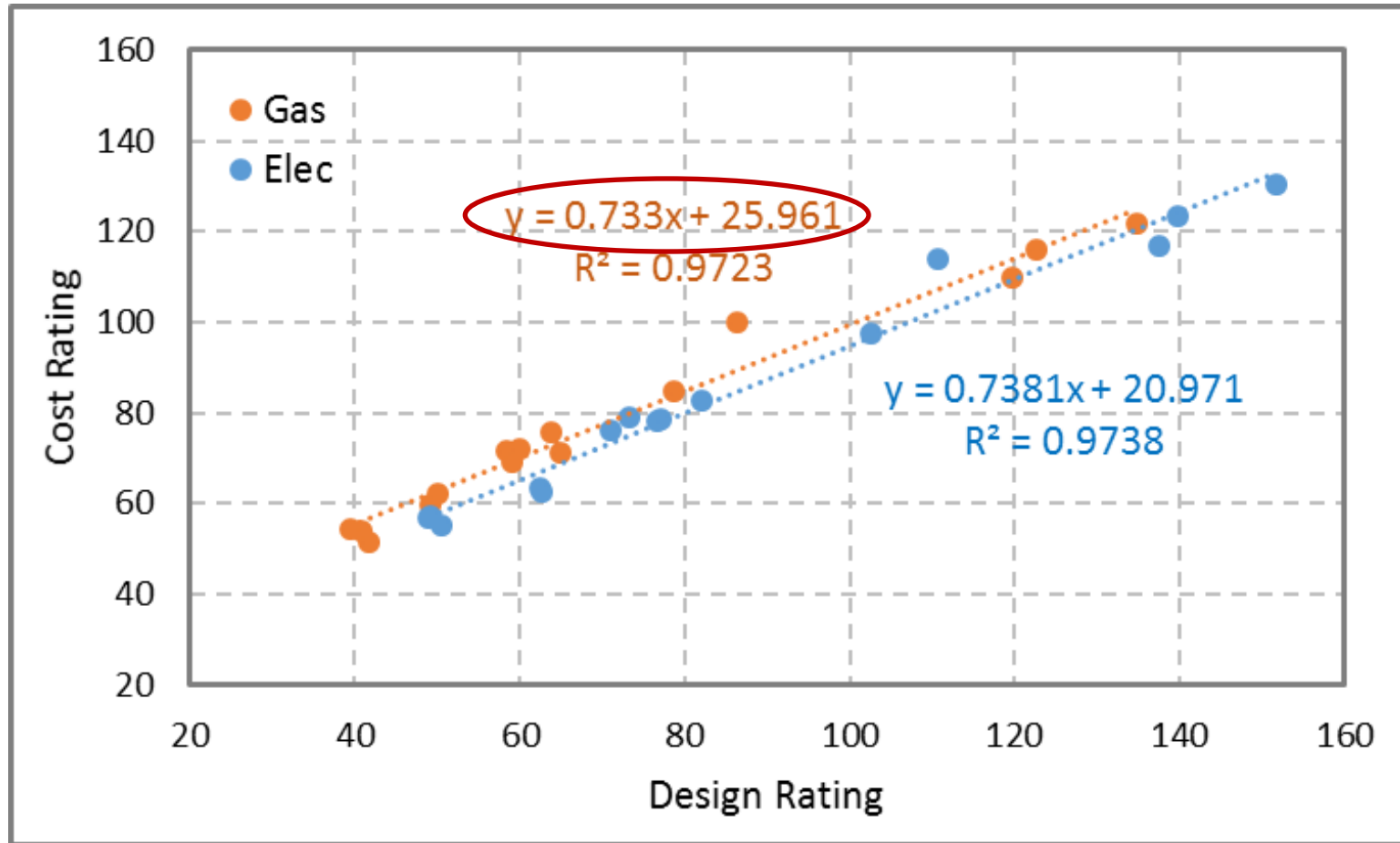
- CEC simulation data used to generate cost Index for range of homes designs in 5 CA climates
- Costs based on California price structure:
 - Electricity = \$0.1699/kWh
 - Natural gas = \$1.117/therm
- Cost Index is significantly different than either TDV Index or EDR Index.



Cost vs California TDV



Cost versus California EDR



Analysis Summary

- HERS Index and California TDV Index are quite similar when the same reference case rules (RESNET 301) are applied
- HERS Index and California EDR Index are very similar for all electric homes but quite different for mixed fuel homes
- Cost Index is quite different than either the California TDV Index or the California EDR Index
- All Indices are sensitive to whether reference case is single-fuel or dual-fuel.





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Questions?

