FLORIDA SOLAR ENERGY CENTER®

Creating Energy Independence

Methods and Economics of Achieving Florida's ERI Compliance

Rob Vieira

July 20, 2016

Objectives

- Calculate ERIs and Florida Code e-Ratios for typical homes for three scenarios for three Florida cities
  1. Using the required 2009 IECC backstops required by Section R406 of the 2015 IECC
  2. Using 2015 IECC prescriptive measures
  3. Using high efficiency features capable of reaching the Florida required ERI of 58
- Calculate the amount of PV required to meet ERI of 58 for first two scenarios
- Calculate economics for reaching ERI of 58 for all scenarios

Cities

- For this presentation
  - Jacksonville
  - Orlando
  - Miami
- Full Phase I draft report to NRDC has 11 cities across the nation and includes Miami and Orlando.

All Florida Home Characteristics

- Floor area: 2000 square feet
- Volume: 18,000 cubic feet
- Window Area: 300 square feet (15% WFA)
- Slab-on-grade frame construction
- Pipe insulation of R-3 (mandatory R406)
- All Electric
- Mechanical Ventilation per ASHRAE 62.2-2013

Homes Simulated

- Values for Jacksonville and Orlando are always the same. Values for Miami, if different, are in ( ).

Bldg	Ceil. R	Wall R	Fens. U	Fens. SHGC	ACH 50	Duct R	Duct Qn	Heat HSPF	Cool SEER	Air Hand.	Hot Water	Lght % HE
2009 IECC	30	13	0.65 (1.2)	0.30	7	8	.08 Attic	8.2	14	Std	EF 0.95	50%
2015 IECC	38 (30)	13	0.40 (0.50)	0.25	5	8	.04	8.2	14	Factory Sealed	EF 0.95	75%
High Eff	38+ RBS	13	0.40	0.25	5	8	.01	8.6 (8.4)	15.5 (15)	Factory Sealed	EF 0.95	100%

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Jacksonville

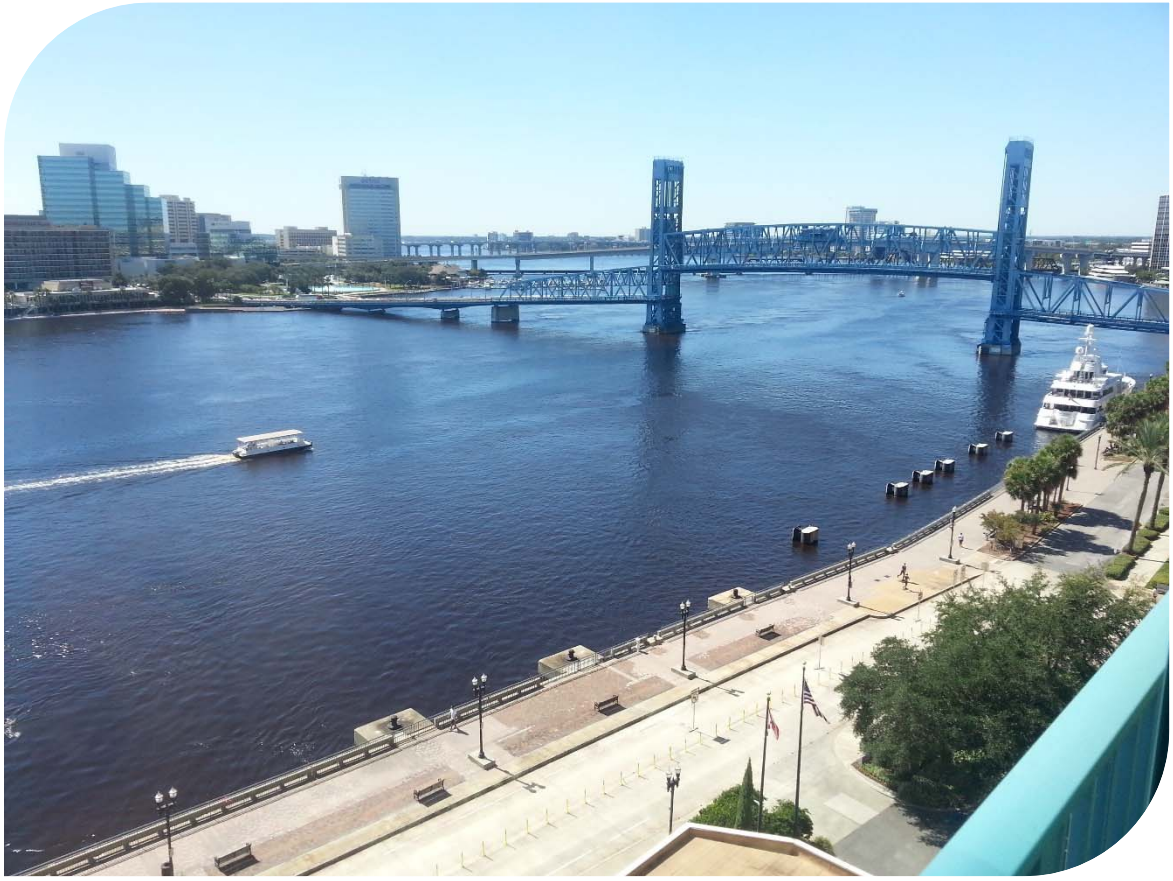
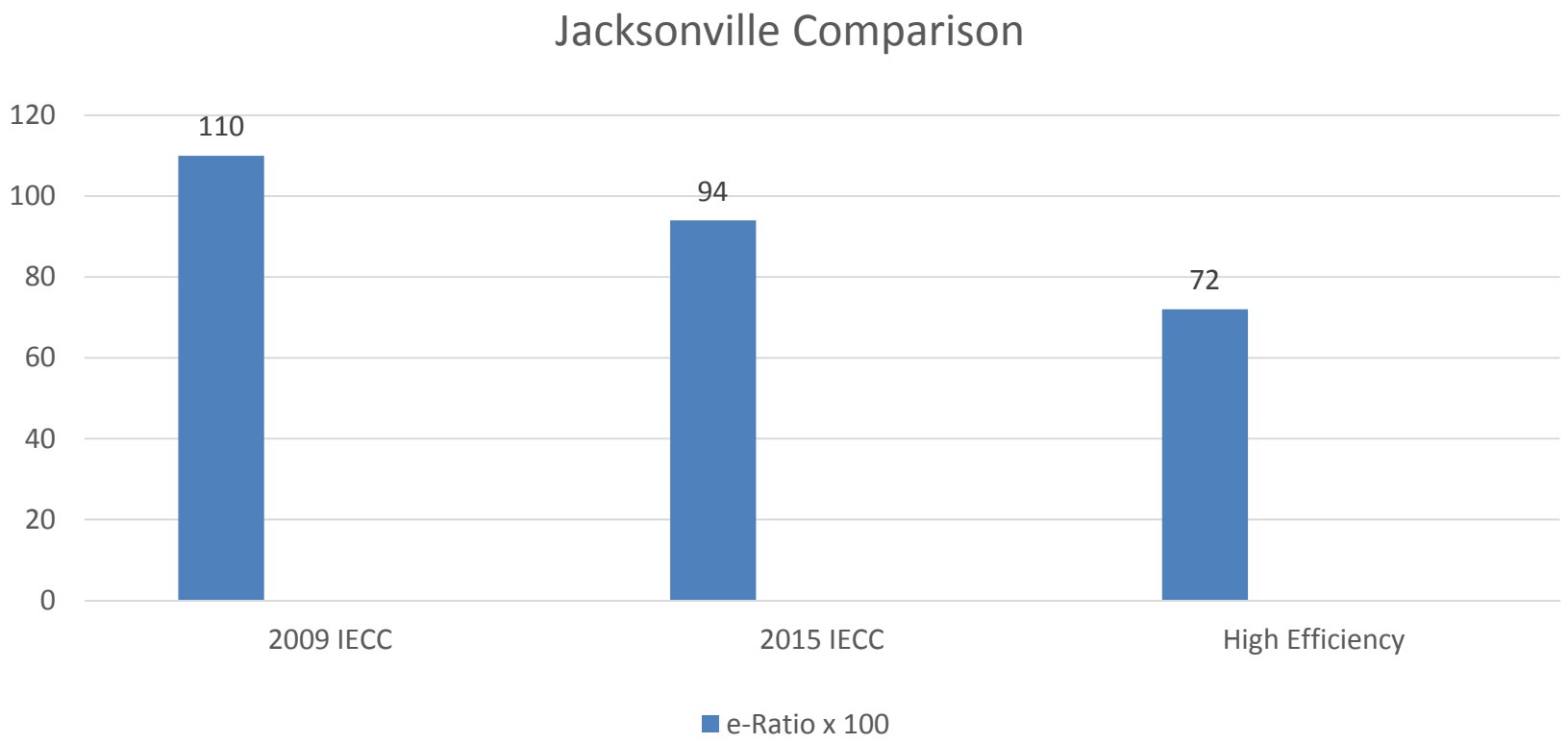


Photo by Rob Vieira

Comparison of e-ratios and ERIs



E-Ratio is July 1, 2016 calculation

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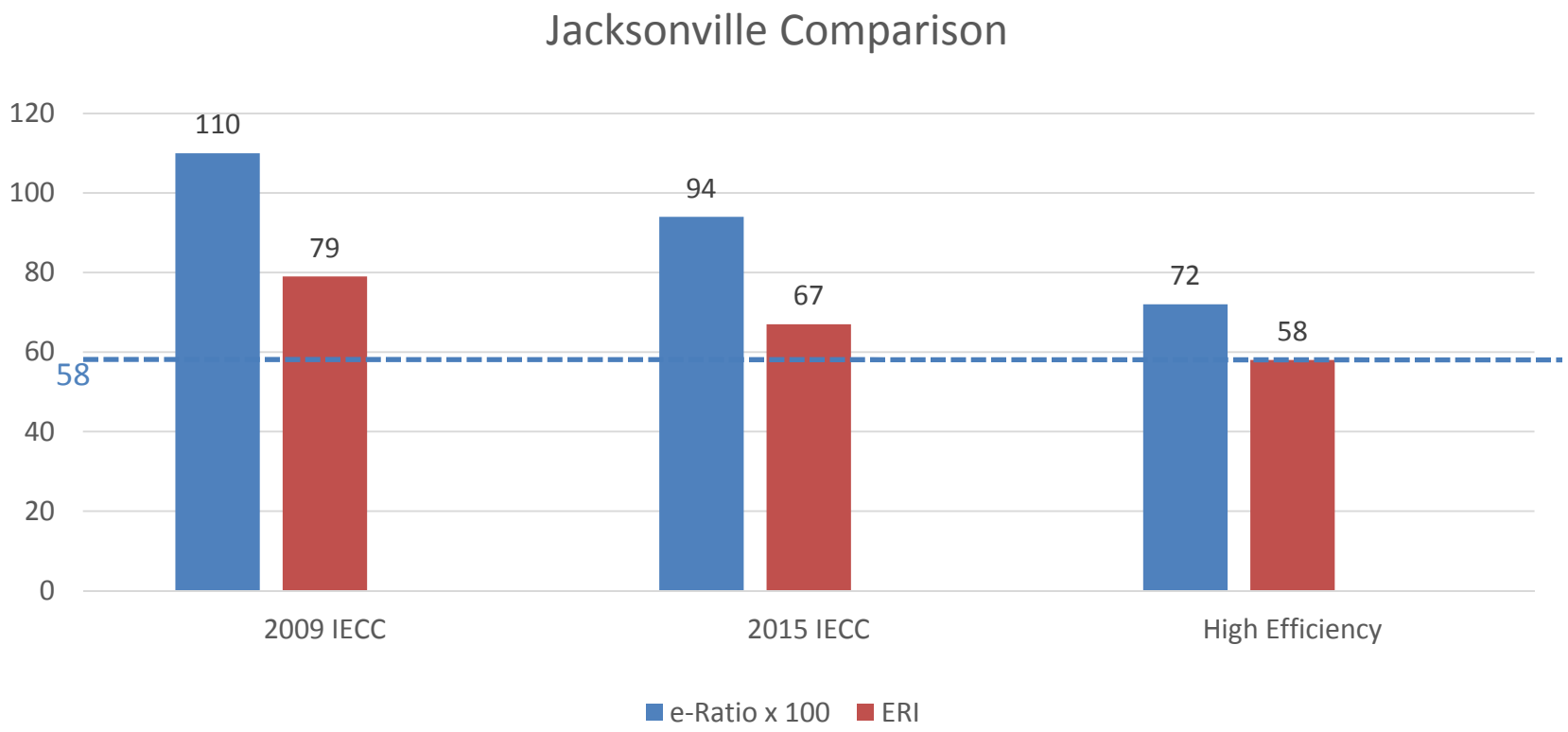

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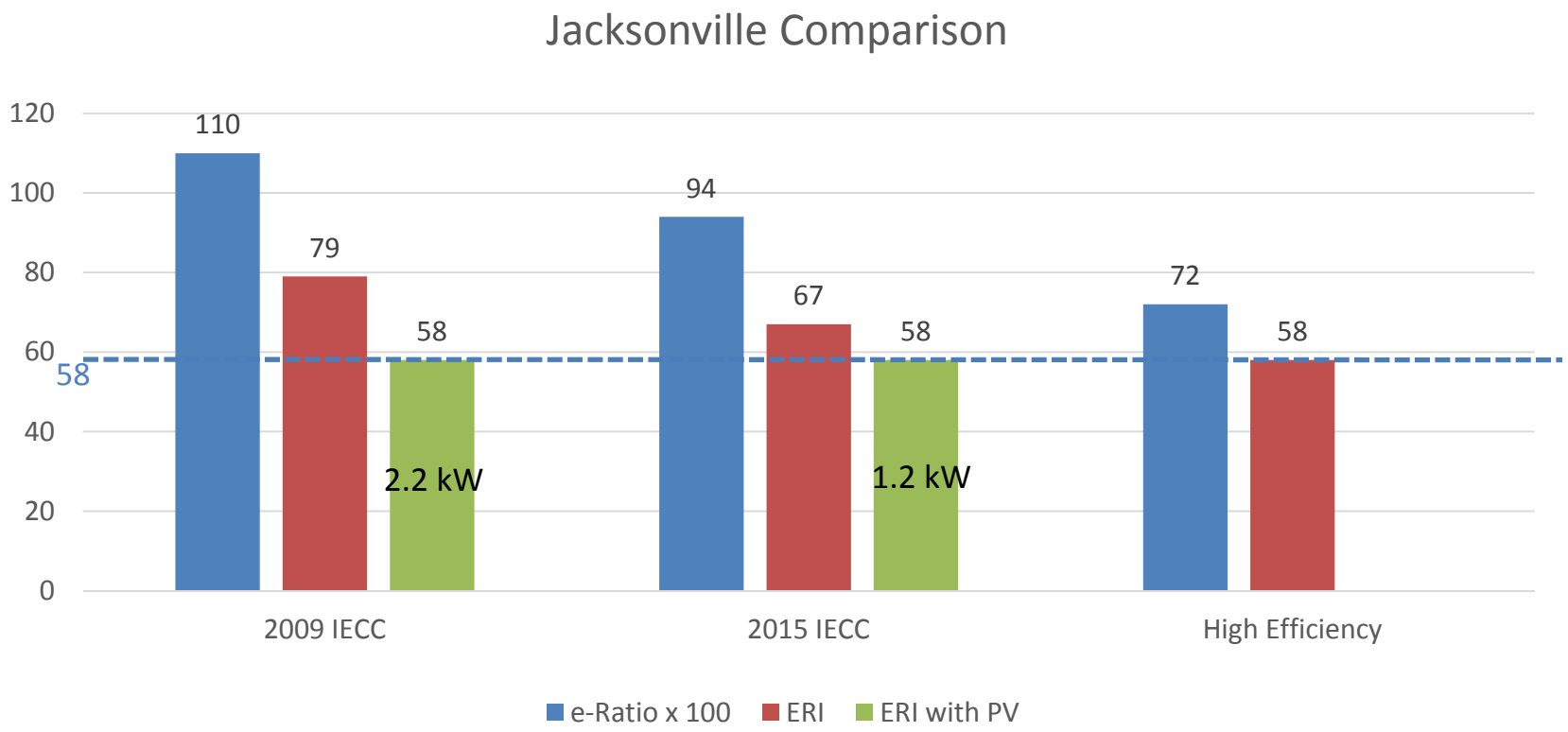

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Solar quantity assumes south facing roof slope of 22.5 degrees with no shading

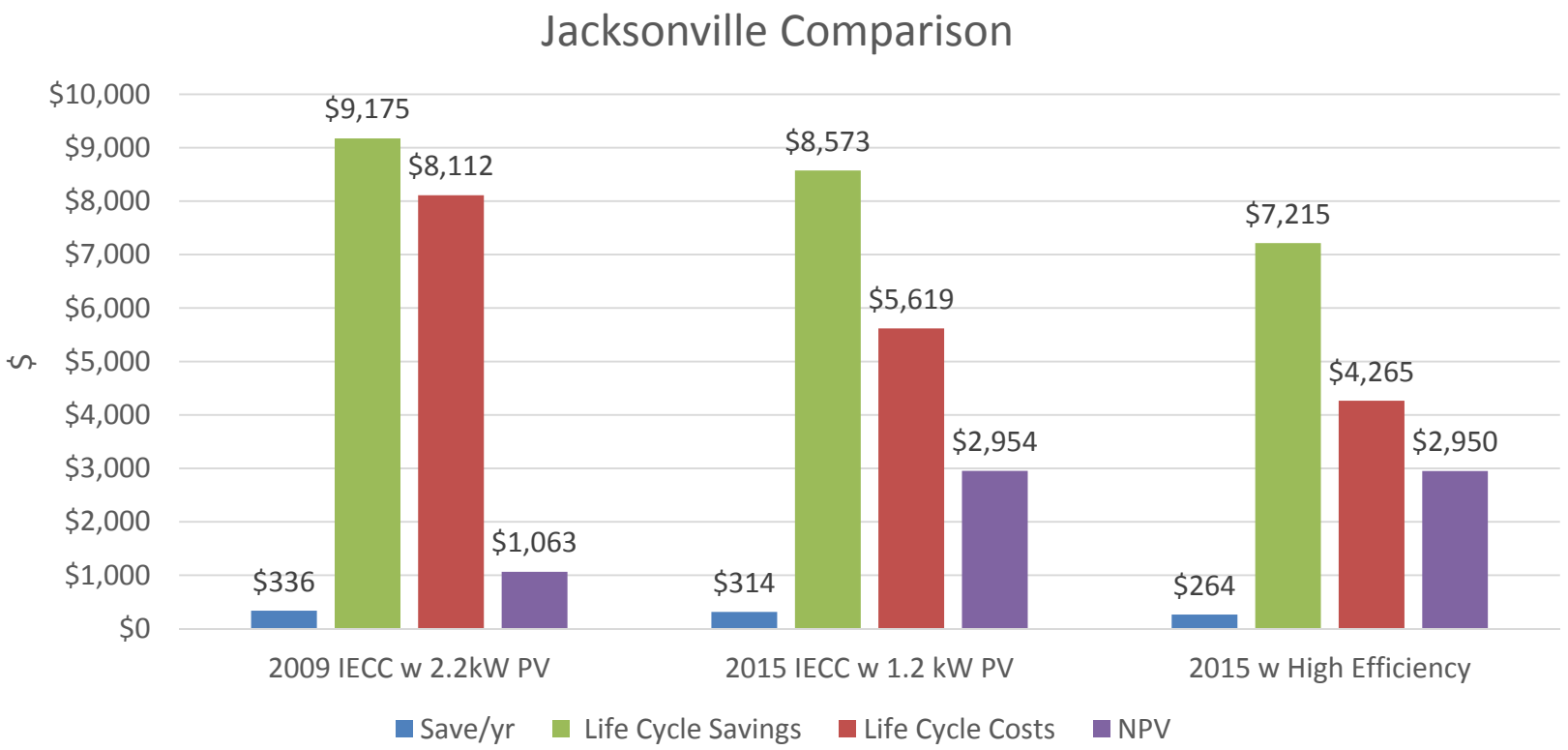
Economics

- Each upgrade priced using data in FSEC report to NRDC: *Cost Effectiveness of Energy Efficiency and On-Site Photovoltaic Power for 2015 IECC Energy Rating Index (ERI) Compliance*
- Rooftop solar price of $3.50 per Watt from PV-magazine.com as national 4th quarter 2015 value. Subtracting 30% income tax credit (ITC) for net cost of $2.45.
- $0.1107 electric rate as Florida residential average for April 2016 from EIA
- Calculated
  - $ Savings per year (save/yr)
  - Life Cycle Costs (LC Cost)
  - Life Cycle Savings (LC Save)
  - Net Present Value (NPV)
  - Savings to Investment Ratio (SIR)

Economics –Rates Used

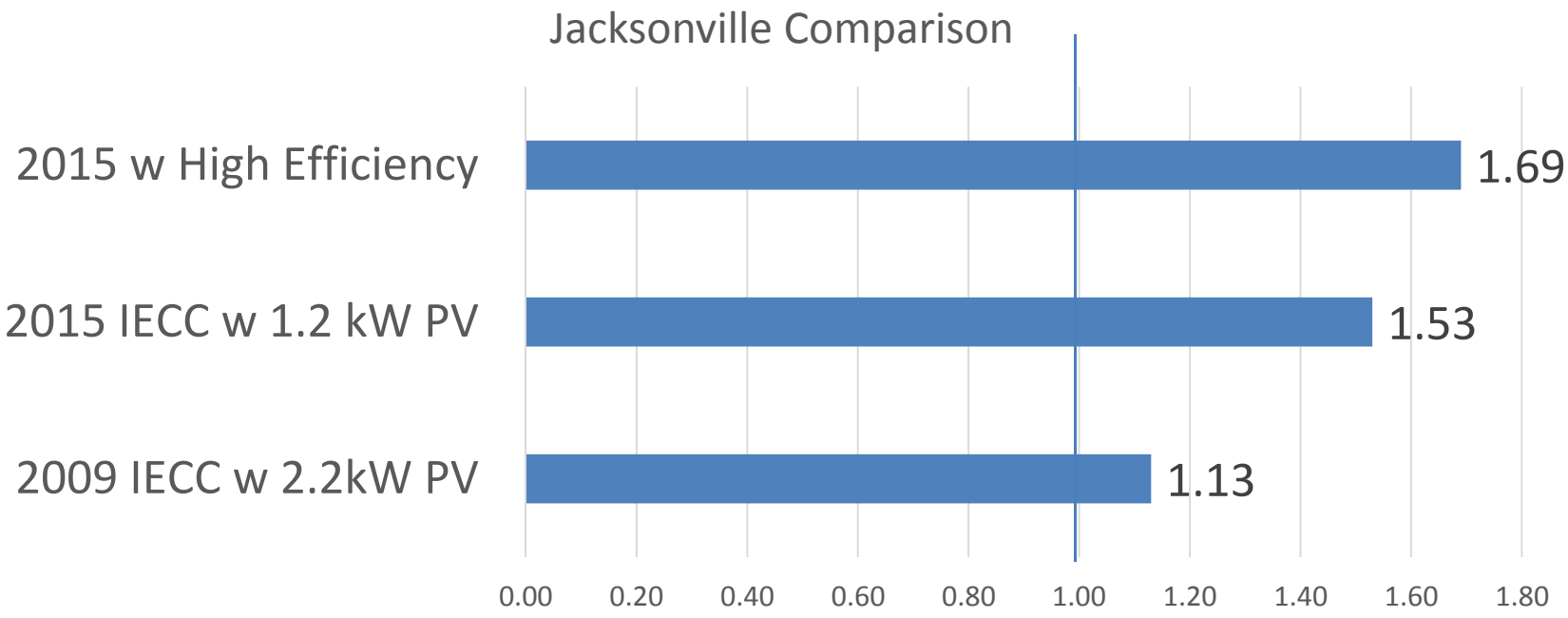
- 30 Year Life-Cycle-Cost Analysis
- Assumed Rates (per RESNET):
  - General Inflation Rate: 2.53%
  - Discount Rate: 4.53%
  - Mortgage Interest Rate: 5.42%
  - Energy Inflation Rate: 4.18%
  - Down Payment Rate: 10.0%

Economics of Achieving ERI of 58



PV at $3.50 – 30% tax credit
Savings per year over 2009 IECC baseline home

Savings to Investment Ratio (SIR) Achieving ERI of 58



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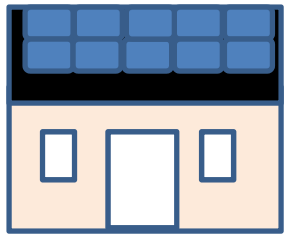
Roof Area Required to Get to Net Zero

- Assumes south roof slope of 22.5°
- Assumes no shading
- Jacksonville example

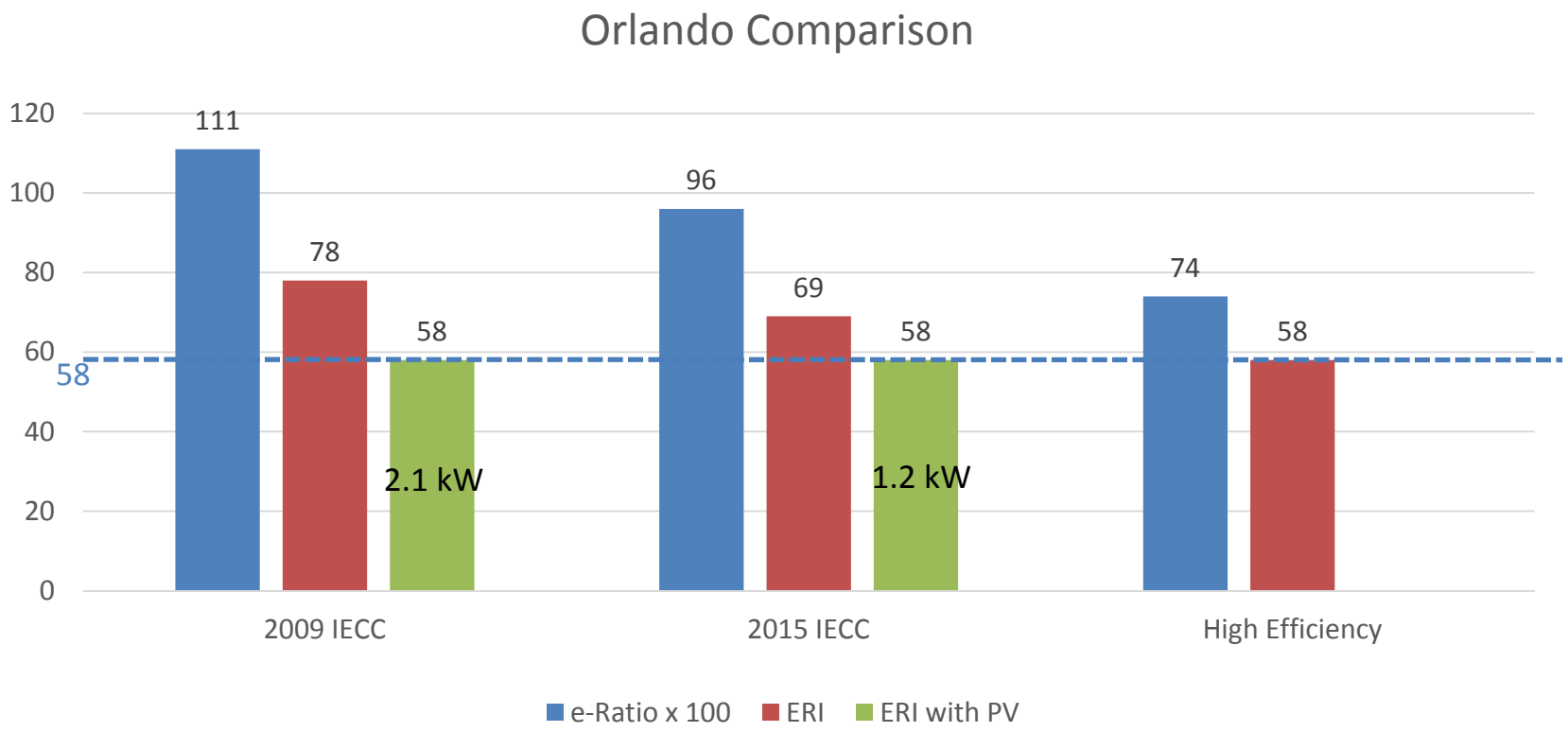


House	Square feet roof required at 10% PV efficiency	Square feet roof required at 20% PV efficiency
2009 IECC w. 8.3 kW PV	765	383
2015 IECC w. 7.5 kW PV	689	345
High Efficiency w. 6.6 kW PV	609	304

Orlando

Photo from City of Orlando website

Comparison of e-ratios and ERIs



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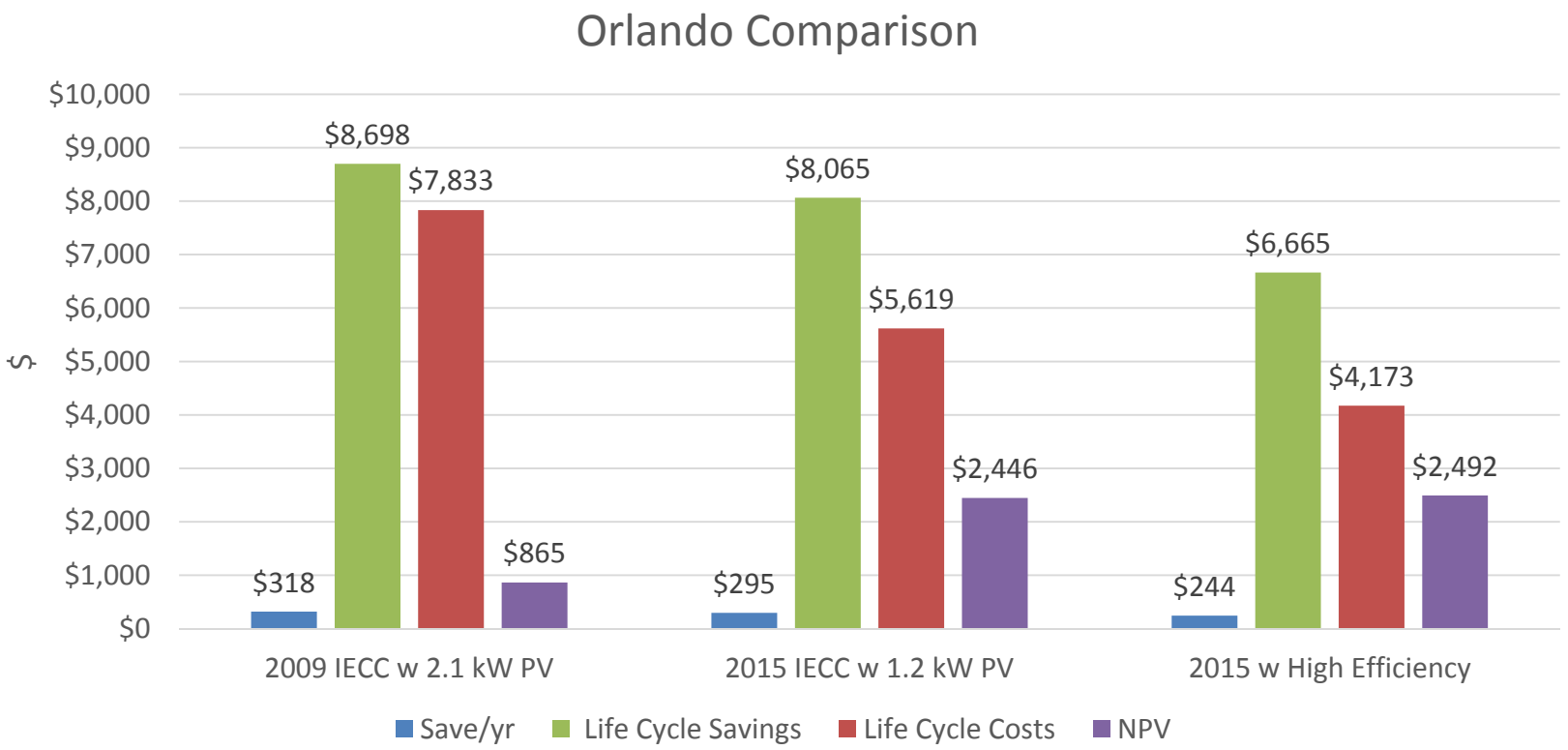

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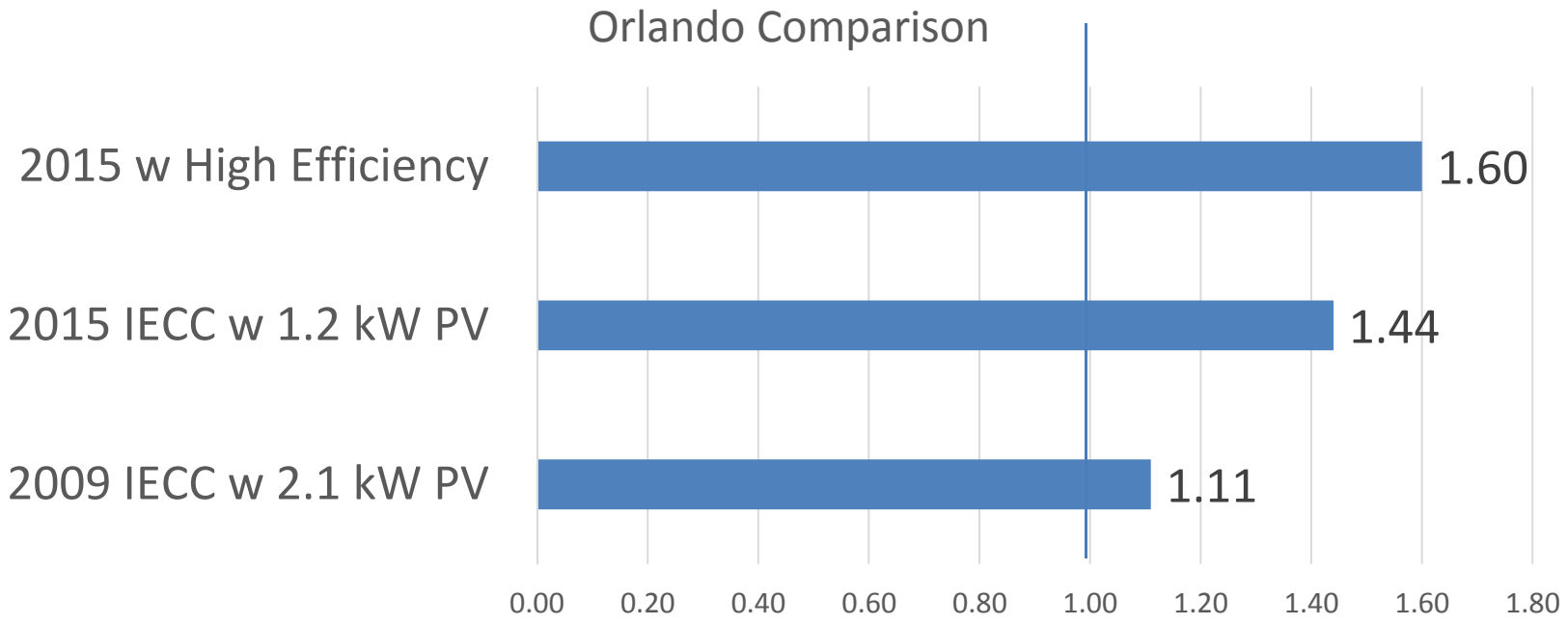

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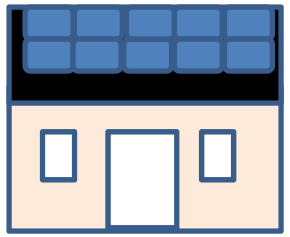
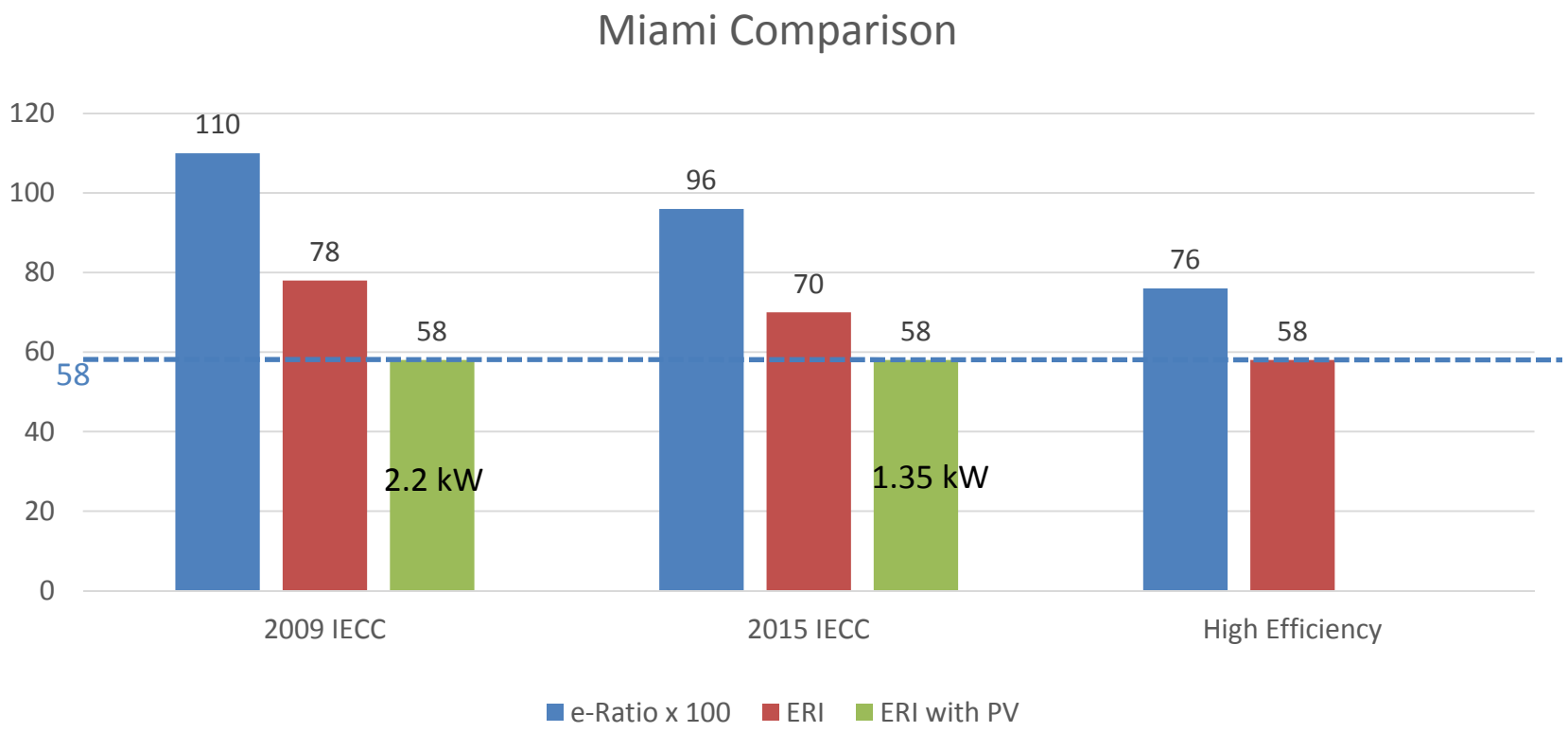


House	Square feet roof required at 10% PV efficiency	Square feet roof required at 20% PV efficiency
2009 IECC w. 8.3 kW PV	754	377
2015 IECC w. 7.5 kW PV	686	343
High Efficiency w. 6.6 kW PV	607	303

Miami

Photo from City of Miami website

Comparison of e-ratios and ERIs



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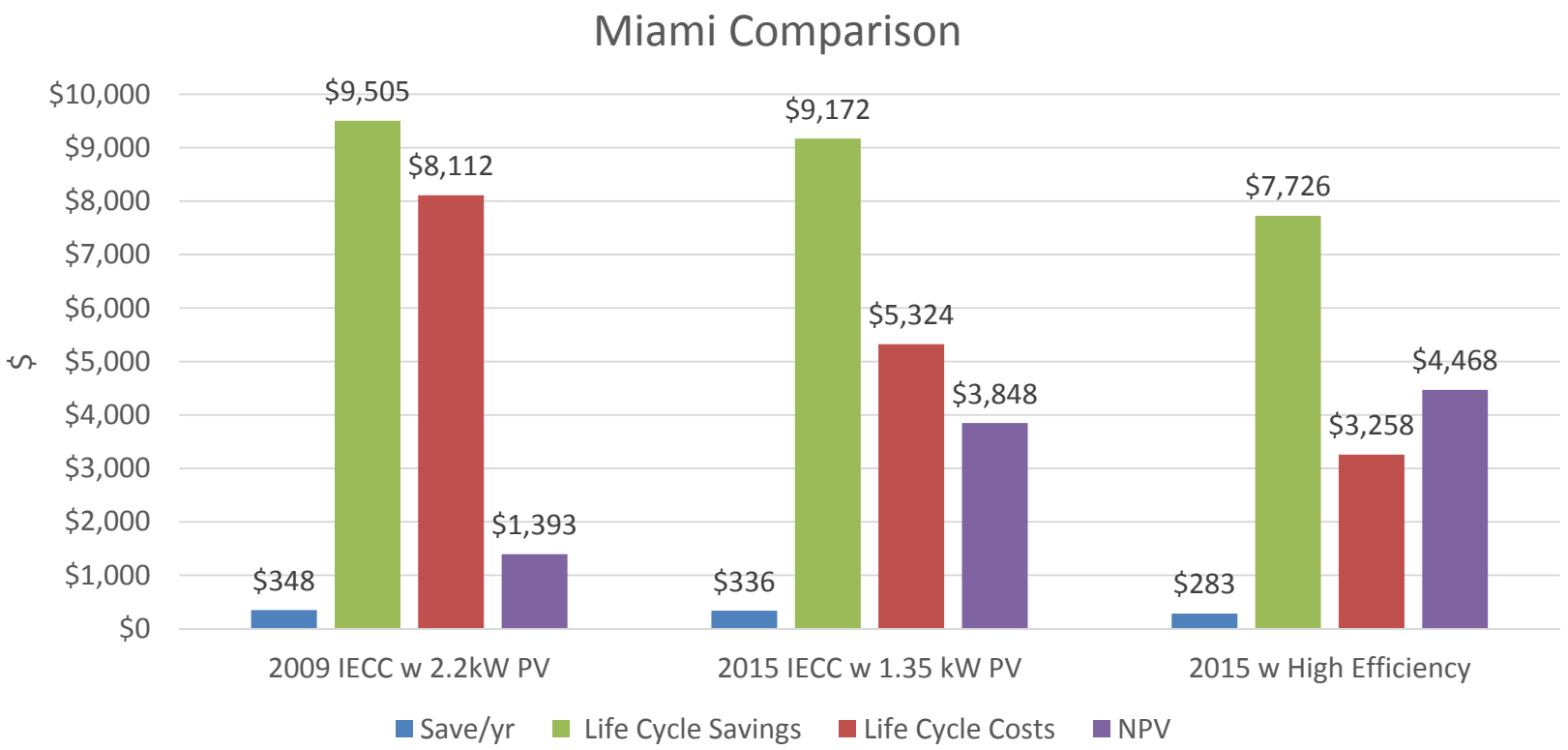

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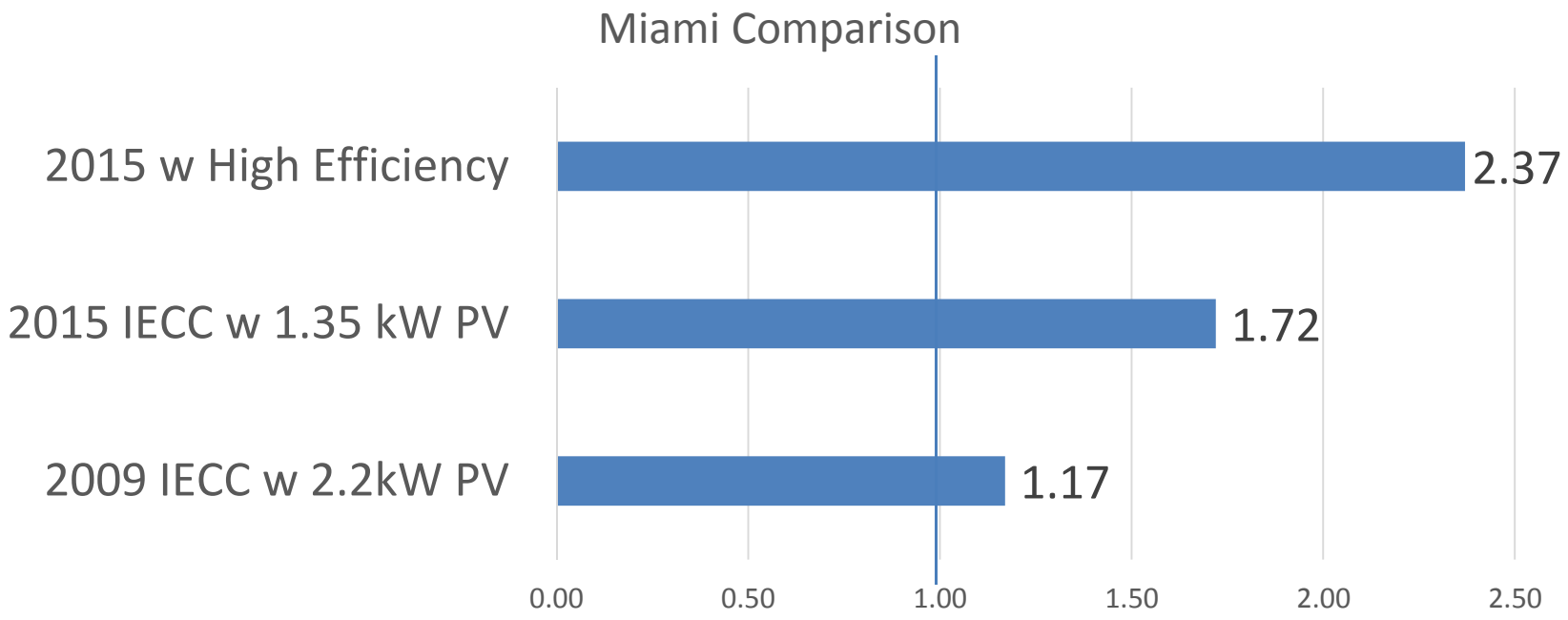

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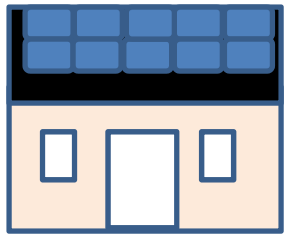

House	Square feet roof required at 10% PV efficiency	Square feet roof required at 20% PV efficiency
2009 IECC w. 8.3 kW PV	791	396
2015 IECC w. 7.5 kW PV	722	361
High Efficiency w. 6.6 kW PV	629	314

What Will Occur in the Marketplace

- If no limit on solar:
  - Will efficiency measures win out based on economics?
  - Will solar win out because it is very visible, high tech and easily marketed?
    - Builders might tout “We provide a solar powered home!” – even if it is only slightly powered by solar.
    - Customers are unlikely to understand that the highly efficient house (can’t see efficiency) without solar and the moderately efficient house with solar will produce about the same energy bill.
    - Ideally we educate consumers about what a HERS index or ERI means. But not realistic. Posting of EPIs hasn’t resulted in education. Mandatory rating system disclosures hasn’t led to an educated public. Difficult task.

Conclusions

- Reaching an ERI of 58 is cost effective using life cycle cost analysis even with solar
  - Currently pure solar option is not as cost effective as high efficiency option or IECC 2015 prescriptive level of efficiency plus solar to get to 58.
- Using solar to reach ERI instead of efficiency will leave less prime solar roof space for ***future*** solar expansion, perhaps reducing ability of some homes to reach net zero.

Thank you

- UCF stands for opportunity

  www.ucf.edu

- FSEC - creating energy independence

  www.fsec.ucf.edu

- Florida Building Commission – your code body

  www.FloridaBuilding.org