Empower your Team

ild your organization's capacity

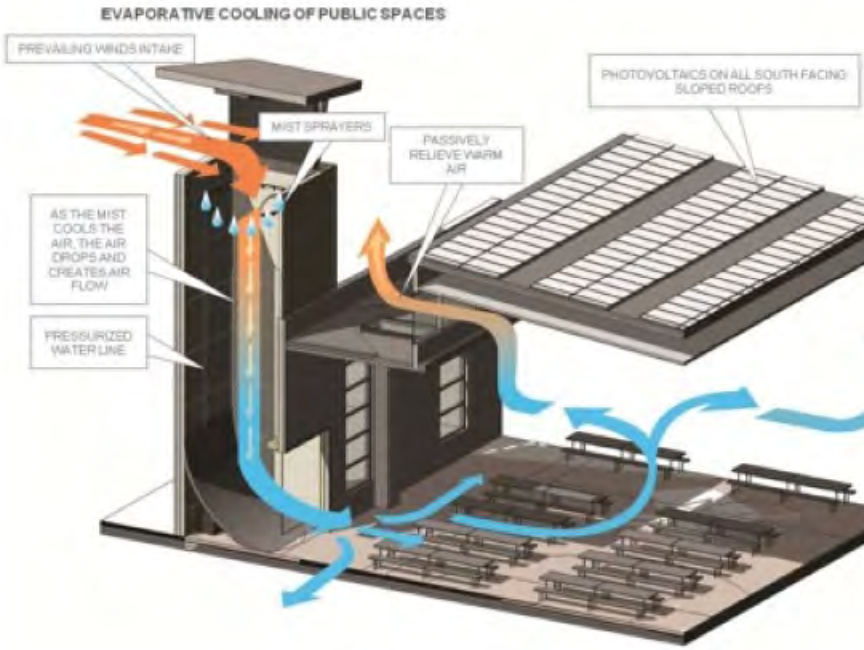
- dentify and conduct needed research
- Evaluate available delivery method options for best likely ZNE result
- Explore alternative financing approaches to help offset costs
- Develop project financial model
- Use integrated development process

Empower your Team

Pilot your Approach

oose an upcoming project to ot your ZNE approach

- Explore proven and new technologies and trategies
- Develop financial model to evaluate osts/benefits
- Document the project and process, bring eam together to discuss lessons learned



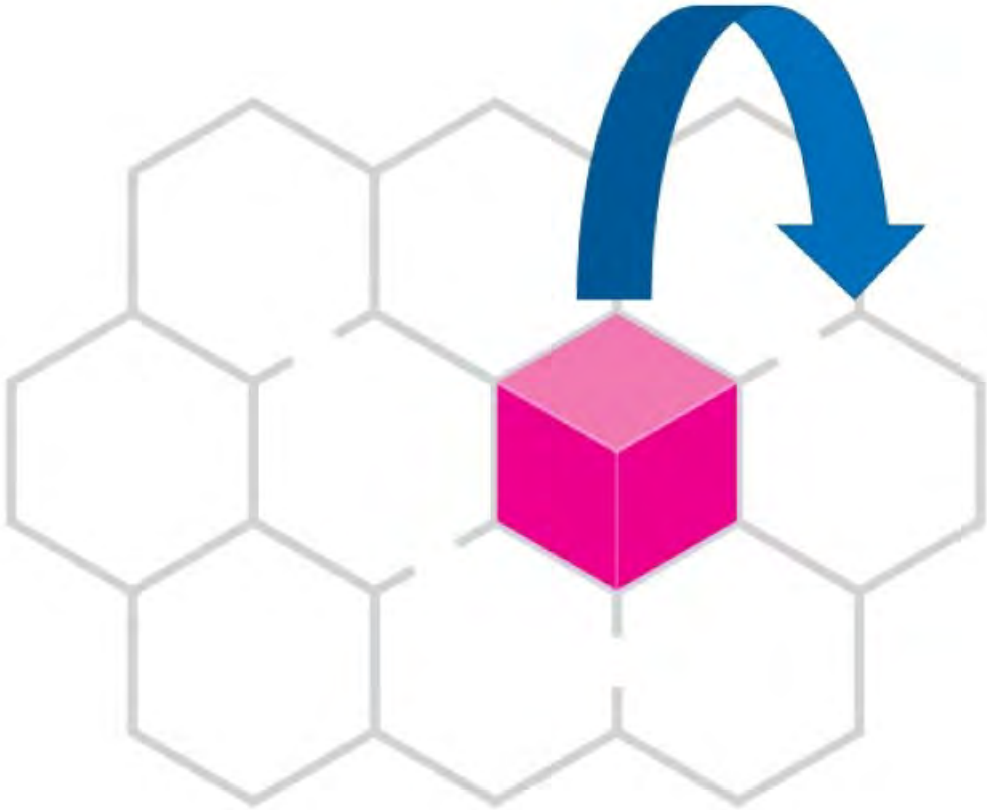
Iterate for Continuous Improvement

uild on success and lessons
arned

efine next steps for your team

xplore opportunities for scaling
campus and district

mbed practices in policies and
rocedures



Path to 0_{net} Energy Schoolhouses

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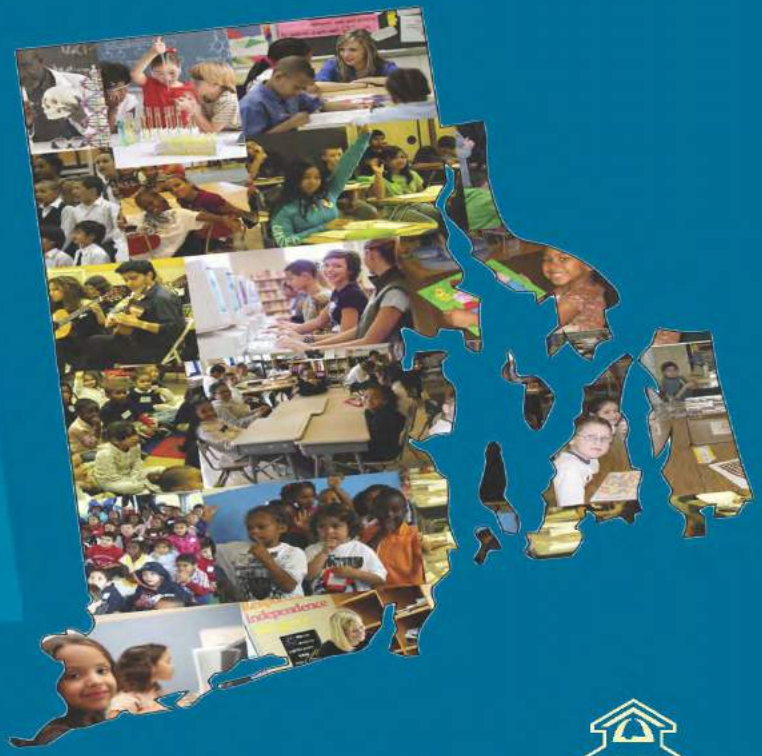


RI School Building Authority

Rhode Island Department of Elementary and Secondary Education

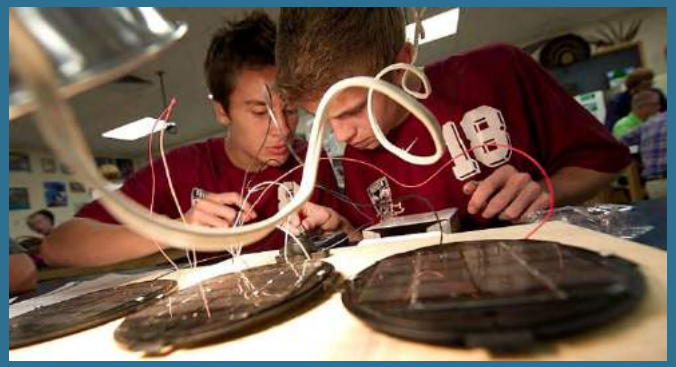
SCHOOLHOUSE ASSESSMENT

What We Did

- Surveyed 307 Schools
- 24.435 million ft2
- Derived Utility Cost Data from UCOA Data
- Benchmarked Energy Use for each school
- Assessed the Condition of Energy Consuming Equipment
- Identified Energy Conservation Measures
- Defined Action Plans to Achieve Net Zero Energy for Each School
- Identified Funding Sources & Execution Strategies

Why We Did This

- Significantly Reduce Energy $
- Net Zero Energy Schools
- Avoid Energy Volatility $
- Reduce O&M Costs
- Improve Cognitive Performance
- Improve Student Learning
- Create Living Laboratories
- Demonstrate Institutional Values
- Preserve Current Staff & Academic Programs



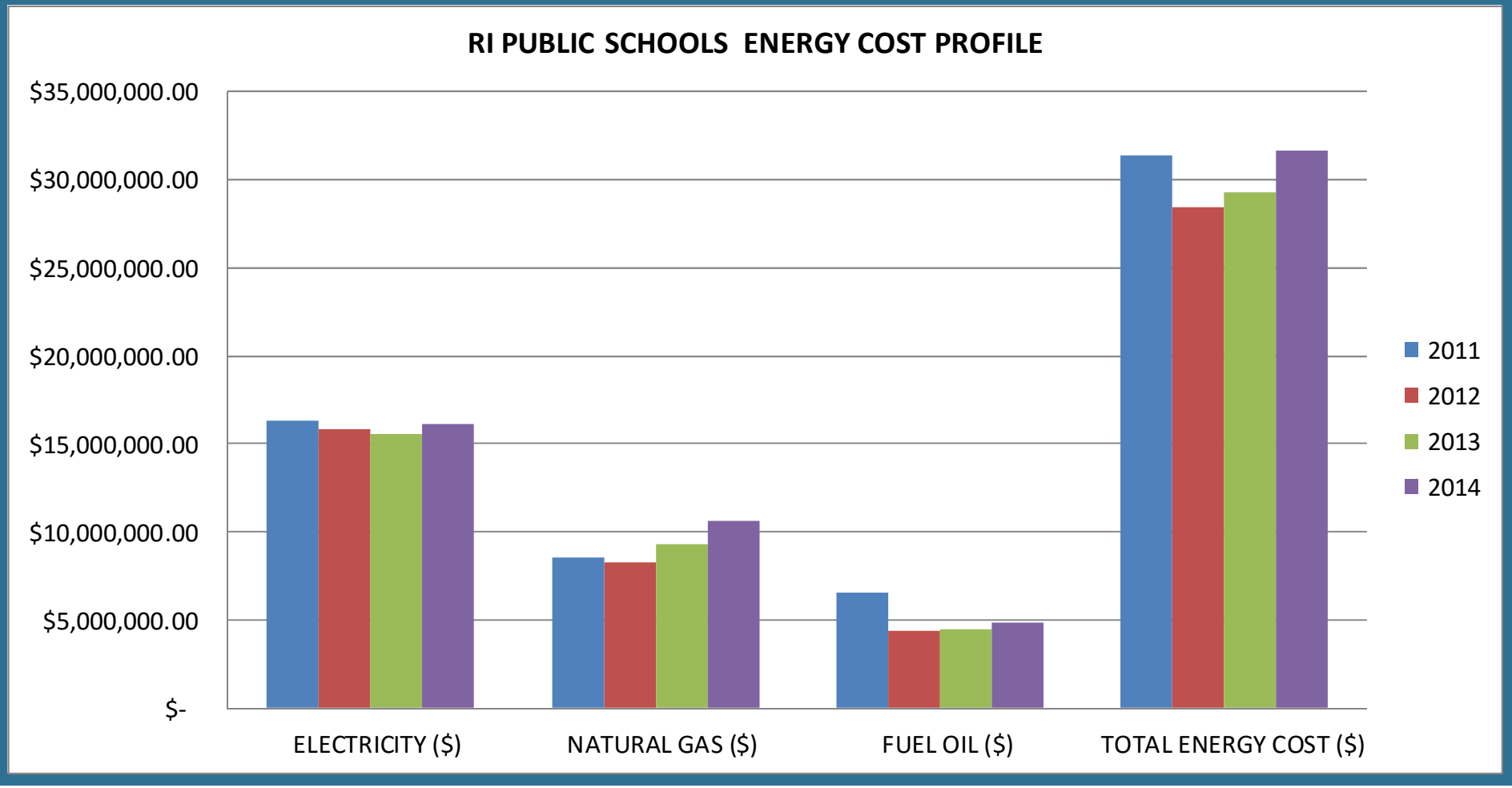
How Did We Do It

- 5 Teams Assessed 307 Schools
- Entered Conditions Data into MAPPS® via Handheld PC
- 4 Energy Engineers Filtered UCOA Utility Data
- Utility Consumption Derived from Cost Data based on Assumptions
- Calculated EUI & $/ft^2 for each School

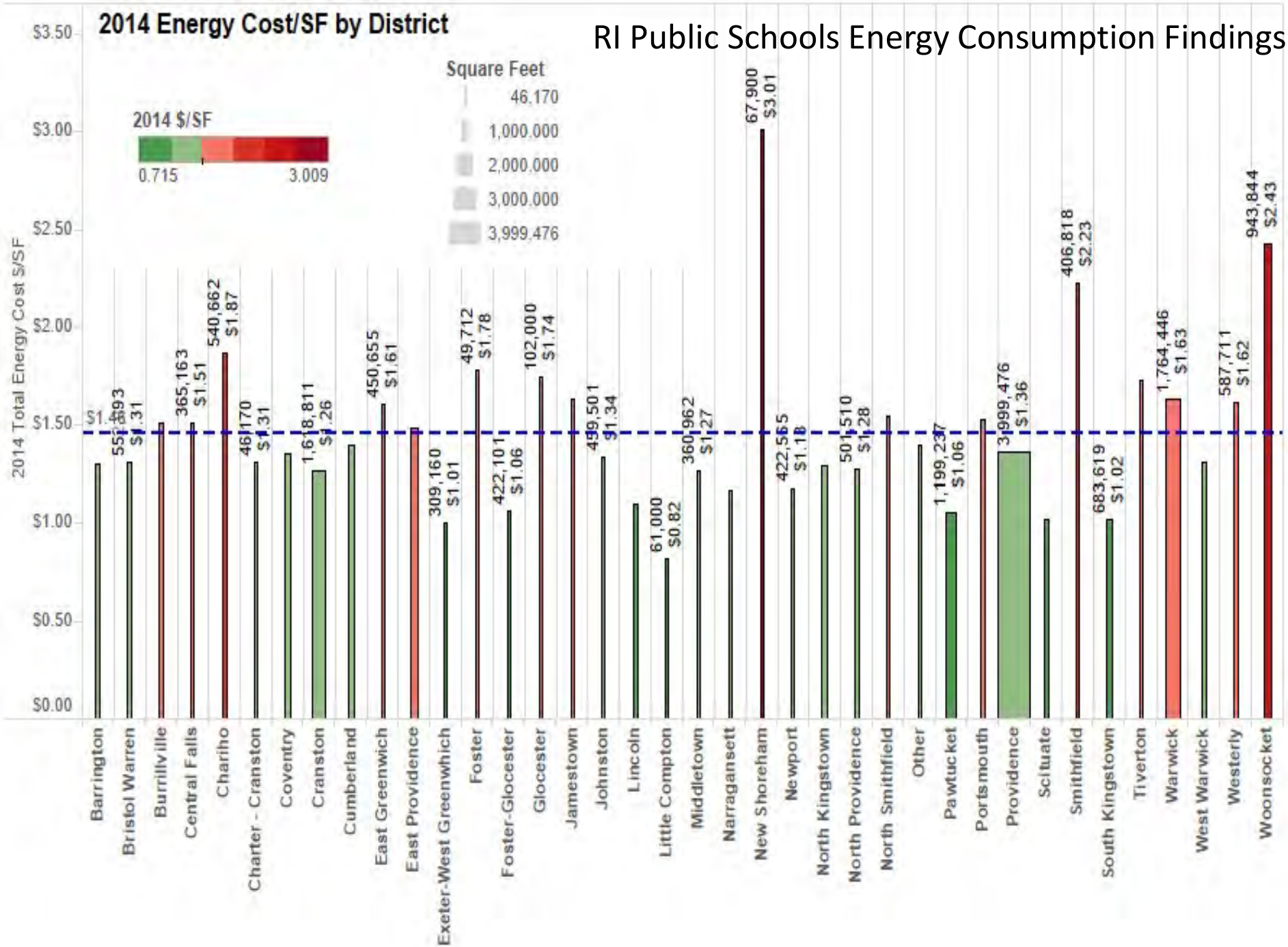
- Identified Energy Conservation Measures
- Defined Action Plans to Achieve Net Zero Energy
- Estimated Costs, Savings & simple payback period
- Utilized Potential Contractors
- Solicited Incentives & Funding Sources

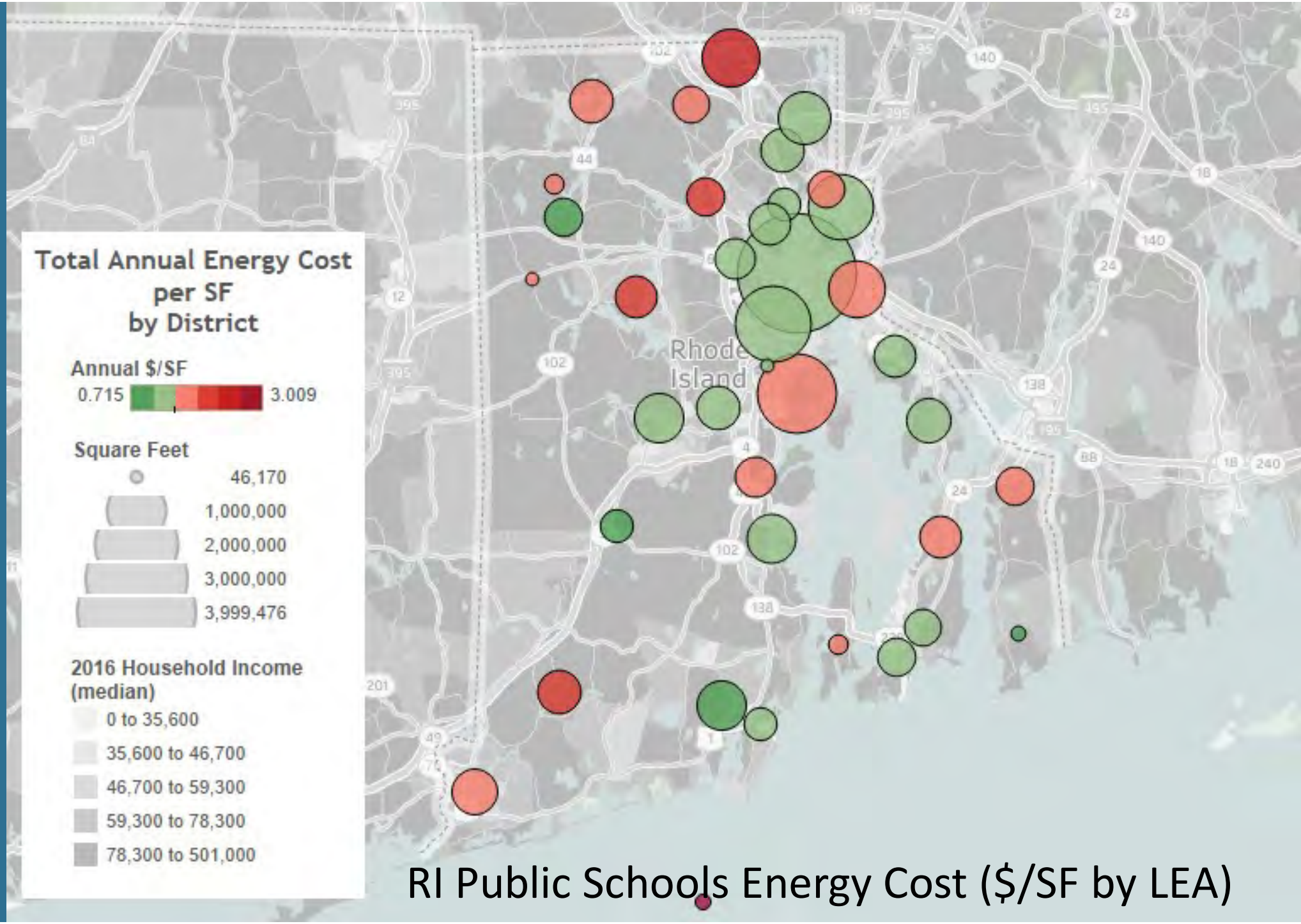
Findings

- Rhode Island 4th highest AVG. Electric Rate in US 18.69 cents/kWh
- Avg. EUI 45.2 -60.7 vs. US Avg. 58.2
- Energy Costs $33.6 Million
- Avg. Age of School 62 Years +/- 30
- Avg. School Energy Cost $1.48/ft^2



RI Public Schools Energy Consumption Findings





RI Public Schools Energy Cost ($/SF by LEA)

Energy Conservation Measures

Energy Conservation Measure	Cost to Implement	Annual Savings (Estimate)	Simple Payback (Years)	System Size
Building Automation System	$4,830,000	$149,920	32.22	
ERVs/DOAS	$6,855,500	$211,411	32.43	
Solar Hot Water	$14,340,000	$345,239	41.54	
Solar Photovotaics	$246,916,430	$13,527,620	18.25	125MW Array generating 150,000 MWH/year
LED Lighting	$64,121,905	$2,796,098	22.93	
Heat Pumps (Geo)	$389,677,907	$20,186,799	19.30	87,000 Tons of geothermal heat pump

Total Need PV Solar Needed

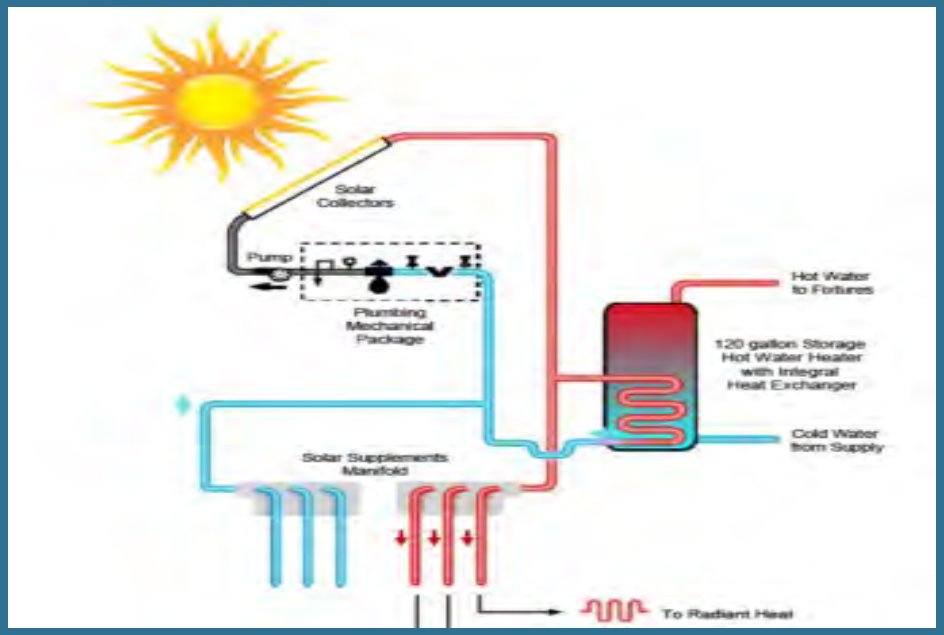
- Enough to generate 106 million +/- kWh/year
- App. 70-80 Megawatts of PV arrays
- Approximate Cost $300 Million (before incentives)
- Annual Savings – App. $15.9 Million/Year
- Simple Payback period 9-18 years (depending on incentives)

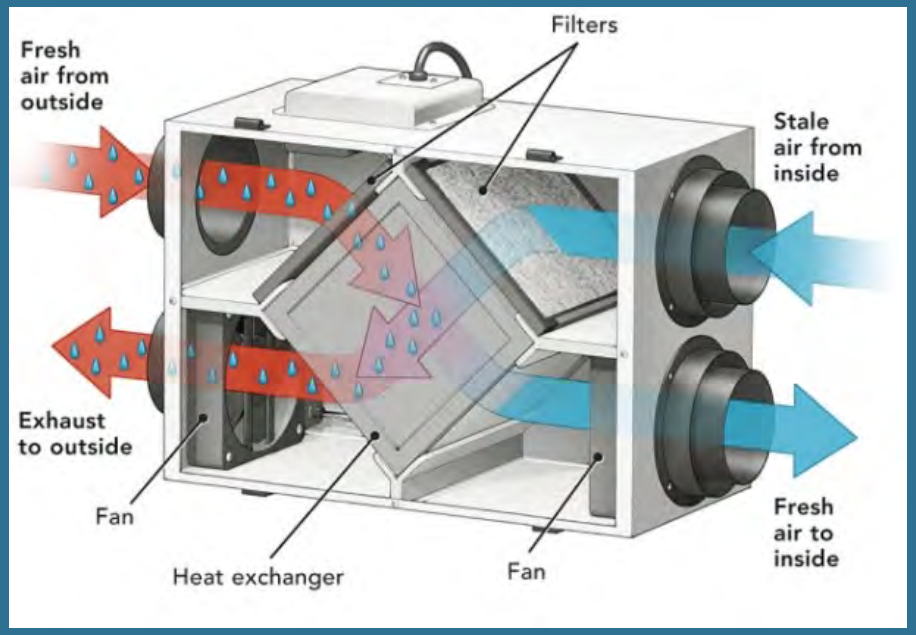
Steps Toward 0_{net}

- ASHRAE Level 2 & 3 Audits
- Bundle ECMs
  - Building Automation System
  - Energy Recovery Ventilation
  - LED Lighting Retrofits
- Bundle Net Zero Energy Measures
  - Solar Assisted Domestic Hot Water Heaters
  - Geothermal Heat Pumps
  - Solar PV
- Utilize RIIB Efficient Buildings Fund
- Prepare RFQs
- Get Projects Shovel Ready
- Prepare RFPs
- Obtain Approvals
- Execute, Monitor, Inspect, Cx, Train

Next Gen - Energy Conservation Measures

- Broader Benefits
- Better for Student Learning
- Longer Pay Back Periods
- Building Automation Systems
- Energy Recovery Ventilation
- LED Lighting Retrofit
- Solar Assisted Domestic Hot Water





Understanding Financing & Incentive Options

- Federal Incentives
- State Incentives & Financing
- Utility Incentives & Financing
- Other Public Financing (Bonds)
- Qualified Energy Conservation Bonds (QECBs)
- Tax Except Lease- Purchase
- Third Party Ownership (PPA)
- Private Financing Options (Bond-PPA Hybrid)
- ESPCs (Energy Service Performance Contracts)
- Renewable Energy Credits (RECs)
- National Grid Energy Efficiency Rebates & Incentives

Funding 0_{net} Energy

Establish a revolving loan fund

LEAs Borrow from fund to implement Net Zero Action Plant

Derived savings repay the loan fund

Next Gen - Energy Conservation Measures

- Broader Benefits
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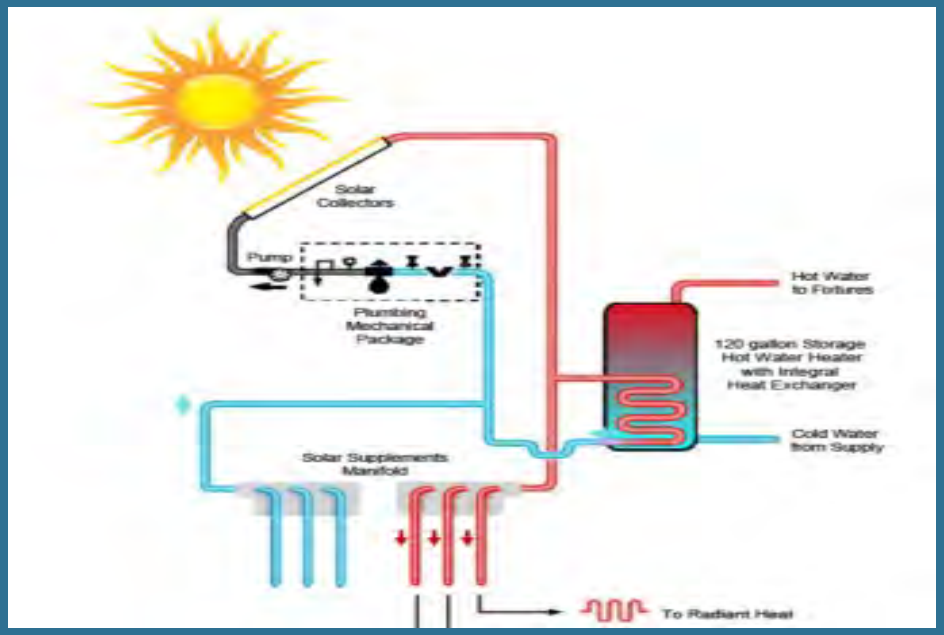

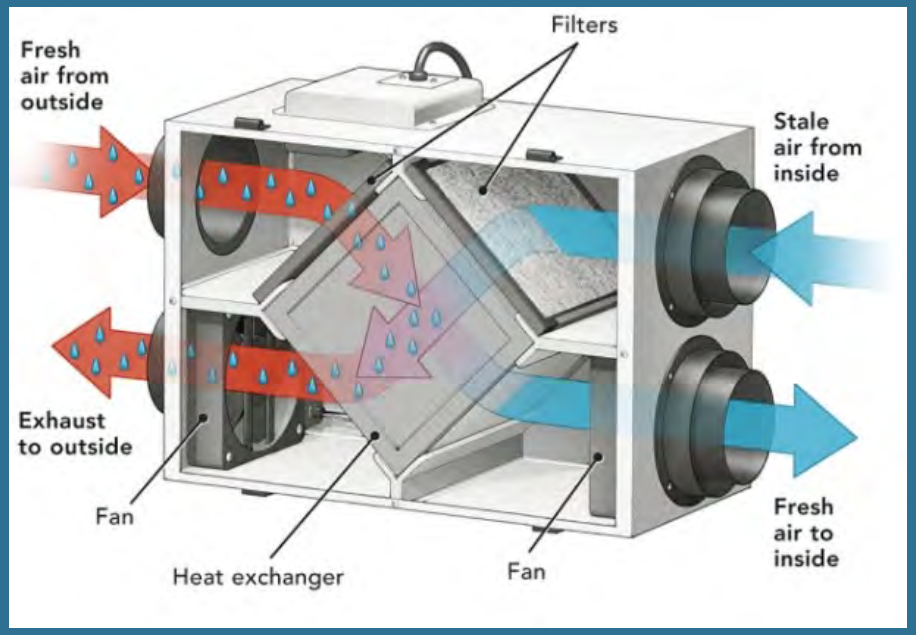

Energy Conservation Projects

LED Lighting Retrofits:

- Reduce Lighting Electricity by 30%
- Takes Advantage of Existing Lighting Controls
- Optimizes the use of natural daylight

Building Automation:

- Reduces heating energy by up to 10%
- Turns unnecessary equipment off
- Turns thermostats down when unoccupied
- Allows scheduling for vacations and holidays
- Reduces associated electrical energy by 5%

aiborne Pell Elementary (ZE Capable)

ewport, RI

General Information

Location: 35 Dexter Street Newport, RI 02840
Scope: 105,565 gross square feet of new construction
Cost: $28 million
Completion: 2013
Enrollment: 865 PK-4th graders

Architect: HMFH Architects, Inc.
Engineer: Garcia Galuska Desousa Engineers Inc.
Certification: NE-CHPS Verified;
US Department of Education Green Ribbon School

- 35 EUI
- $116,855 annual energy savings
- 80%+ construction waste was recycled
- 40% reduction in potable water
- 77% of classrooms utilize daylig and photosensors/occupancy se to maintain adequate lighting w conserving energy

La Escualita Education Center

- Oakland USD
- Public School
- First CHPS® Verified Leader School in CA
- NBI Emerging ZNE School

Library 6,300 sf
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300/sf
ced: 9 mo.
14 mo.
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Building
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E Pilot Project
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Greywater added approximately 3000 kWh to the actual metering data – not originally expected

EUI of 16.1 or 13.2 if not including greywater

	Fans	Heating	Cooling	Lighting	DHW	Gray/Rain Water System	Misc/Plug	Total Use	PV Generation
1/13	952	3030	229	135	7	116	623	5092	2367
2/13	937	2984	226	133	7	114	613	5014	2966
3/13	486	778	459	143	7	269	618	2760	4246
4/13	580	86	313	100	7	226	463	1777	5337
5/13	603	90	326	104	7	237	481	1848	6645
6/13	365	54	197	54	1	364	434	1469	6198
7/13	324	48	175	54	5	401	435	1442	6703
8/13	361	54	195	74	18	340	479	1521	5956
9/13	600	89	324	103	7	316	486	1925	4756
10/13	514	76	278	137	6	237	633	1881	3678
11/13	408	653	386	120	6	225	519	2317	2589
12/13	757	2409	182	107	6	92	495	4048	2289
2013 Total	6887	10351	3290	1264	84	2939	6279	31094	53730

How can you make a school a teaching tool?

School As Tool

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