

Successful Strategies for Meeting Efficiency Goals: The Next Generation of Energy Efficiency Programs

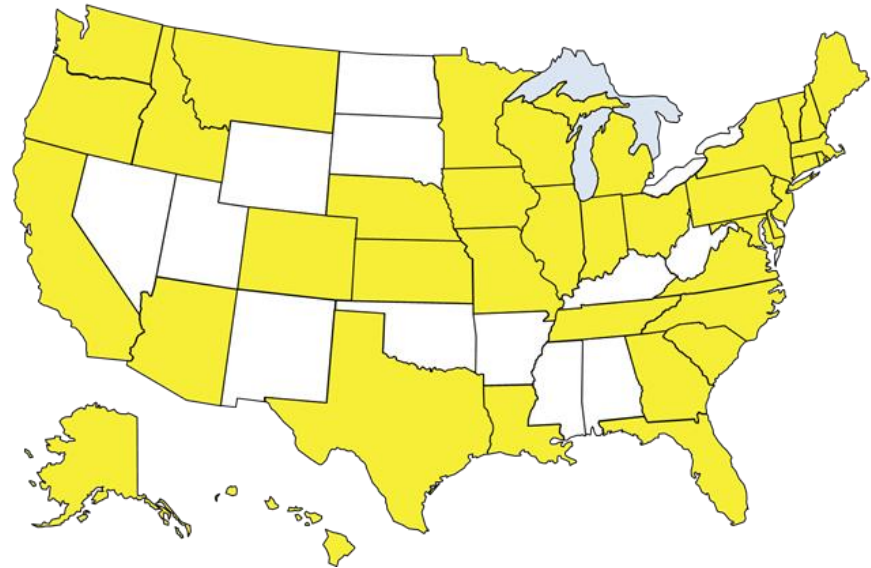
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2017 ACEEE National Conference on Energy Efficiency
as a Resource

November 1, 2017

About VEIC

- Mission-driven nonprofit
- 30+ years reducing economic & environmental costs of energy
- Over 300 staff; offices in Vermont, Ohio, & Washington DC
- Design and deliver:
 - Energy efficiency
 - Renewable energy
 - Transportation efficiency
- We “think and do”
 - 30 Consultants
 - 60 Engineers and TA experts
 - 10 Data analytics and EM&V experts
 - 8 Financing strategy experts



- Clients
 - Utilities
 - Regulators / Consumer Advocates
 - Environmental Groups
 - Foundations

Program Design and Implementation



- For both regulated and voluntary markets
- EE at 1.4 to 3.0 cents / kWh
- Independently-verified savings
- Realization rates of 97-98%



DC
SUSTAINABLE ENERGY
UTILITY



Strategic Focus Today .. and in the Future

Energy Efficiency



Customer Support



Demand Response



Grid Modernization



Distributed Energy



Storage



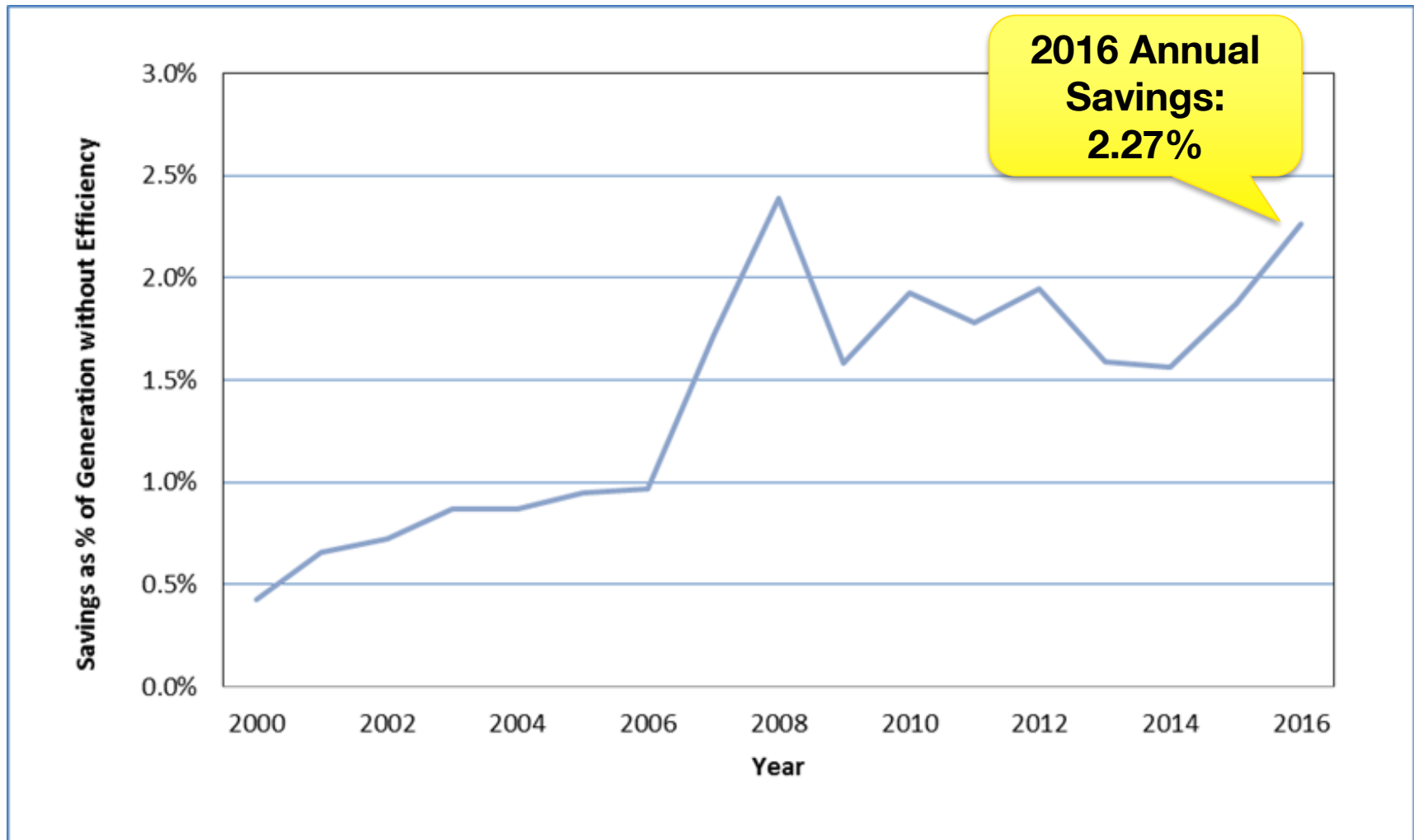
Strategic Electrification





Where are We Now?

Efficiency Vermont Savings (2000-2016)



16% of Vermont load displaced since 2000; 90% of Vermonters have participated



Efficiency Vermont Performance Targets (2015-2017)

- Sound Investment
 - Benefit to Cost ratio is > 1.2
 - Total Resource Benefit (societal) maximized
- Service Equity
 - Low income investment $> \sim \$11$ M
 - Residential investment $> \sim \$35$ M
 - Geographic equity - minimum TRB by county
 - Small business $> 2,000$ businesses served
- Operational Excellence
 - Service quality and reliability
 - Implementation efficiency - key process improvements
 - Spending to budget +/- limit



Performance Targets (con't)

- **Comprehensiveness & Depth of Savings**
 - Business – SMB average savings > 11%
 - Residential – New construction projects > 42% EVT participation
 - Residential - > Comprehensive minimums for retrofit projects
 - Supply chain - > 500 partners with 3+ projects
- **Energy Usage Reduction**
 - MWh and MMBTU savings
 - Peak demand reduction – summer and winter



2016 Efficiency Vermont Results

- 132,826 MWH saved; 136,004 MMBtu saved
- 894,251 tons of CO2 avoided
- For every \$1 invested in EE measures, \$2 were saved
- Lifetime savings = \$82.5 M
- 92 MW of summer peak reduction
- EE sold into Forward Capacity Market provided \$3.4 M in new revenue for programs in 2016, \$26 M total to date
- Deferred \$186 M in transmission and distribution (T&D) upgrades
- Improved comfort, health, safety, and productivity
- Created local jobs as EE work can not be outsourced



How Did We Get Here?

1. Focus on Market Transformation, Not Just Program Delivery

- We train and enable market actors to deliver programs
- With the goal of transforming the market so we can take on the next under-served market and/or new technology with promise



2. Multi-Year Program Planning

- Enables large-scale, multi-year projects, particularly in C&I sector and new construction
- Signals to industry that programs are stable – key to transforming markets



3. Flexibility to Adjust Programs

- Allowed to adjust programs within portfolio without regulatory approval
- Enables nimble adjustments as markets transform and as new savings opportunities emerge



4. Financial Incentives & Technical Assistance

- 47% of budget is financial incentives for customers
- 44% of budget is customer support / technical assistance for customers



5. Experimentation is Allowed - and Encouraged!

- R&D funding used to explore and seed new EE opportunities (technologies and approaches)
- These are often not cost-effective right away, but can yield EE savings long-term





Where are We Headed Next?

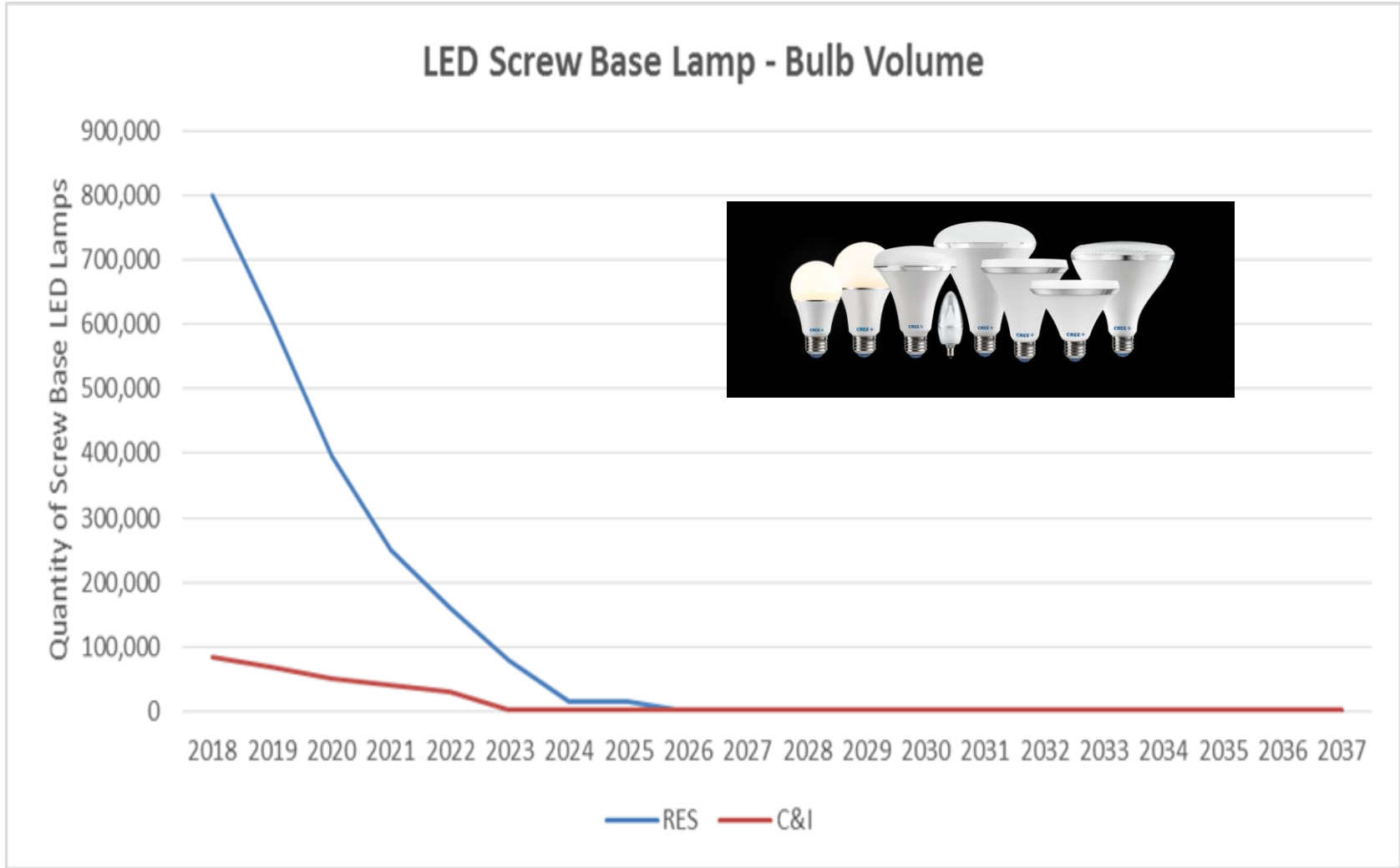
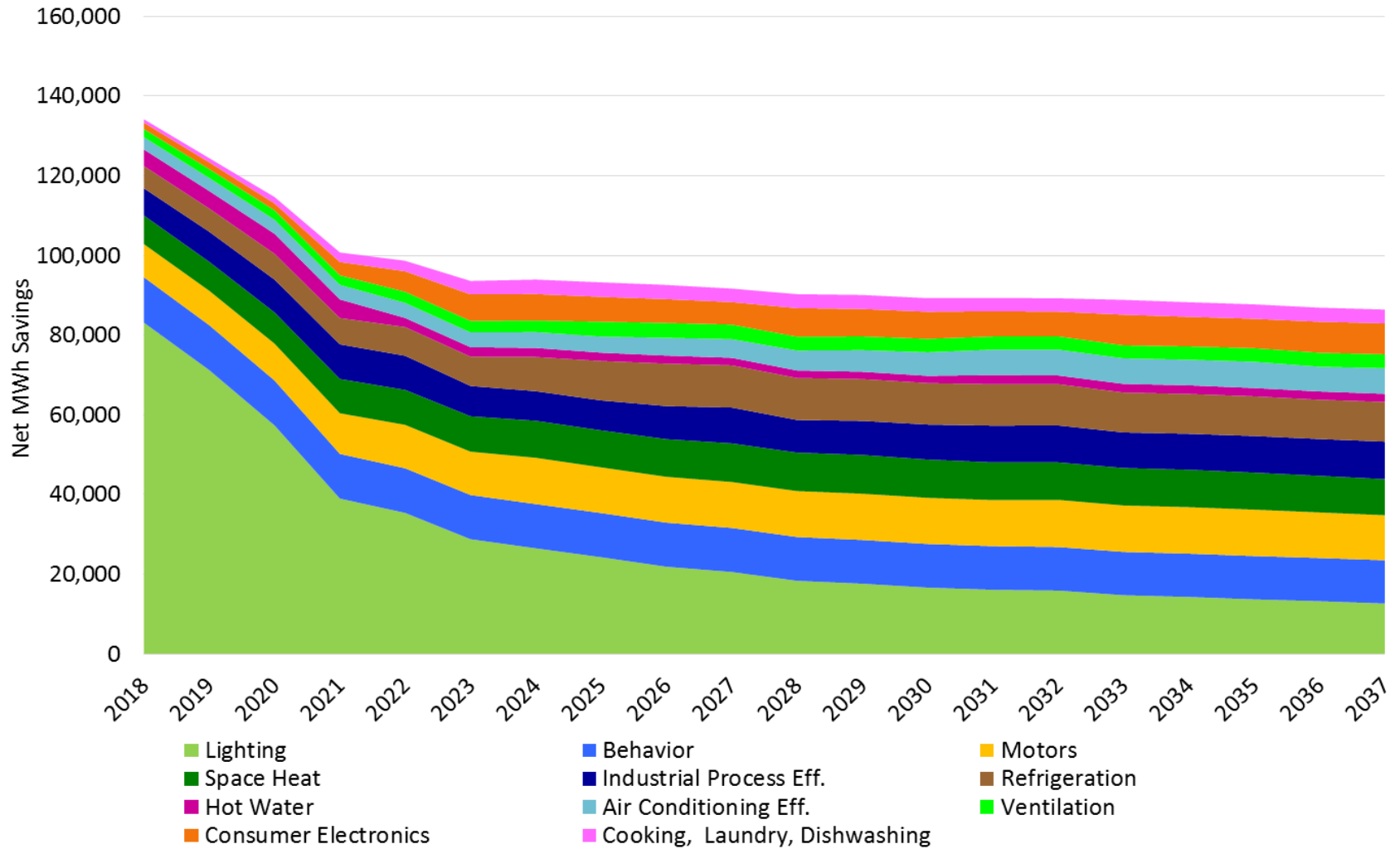
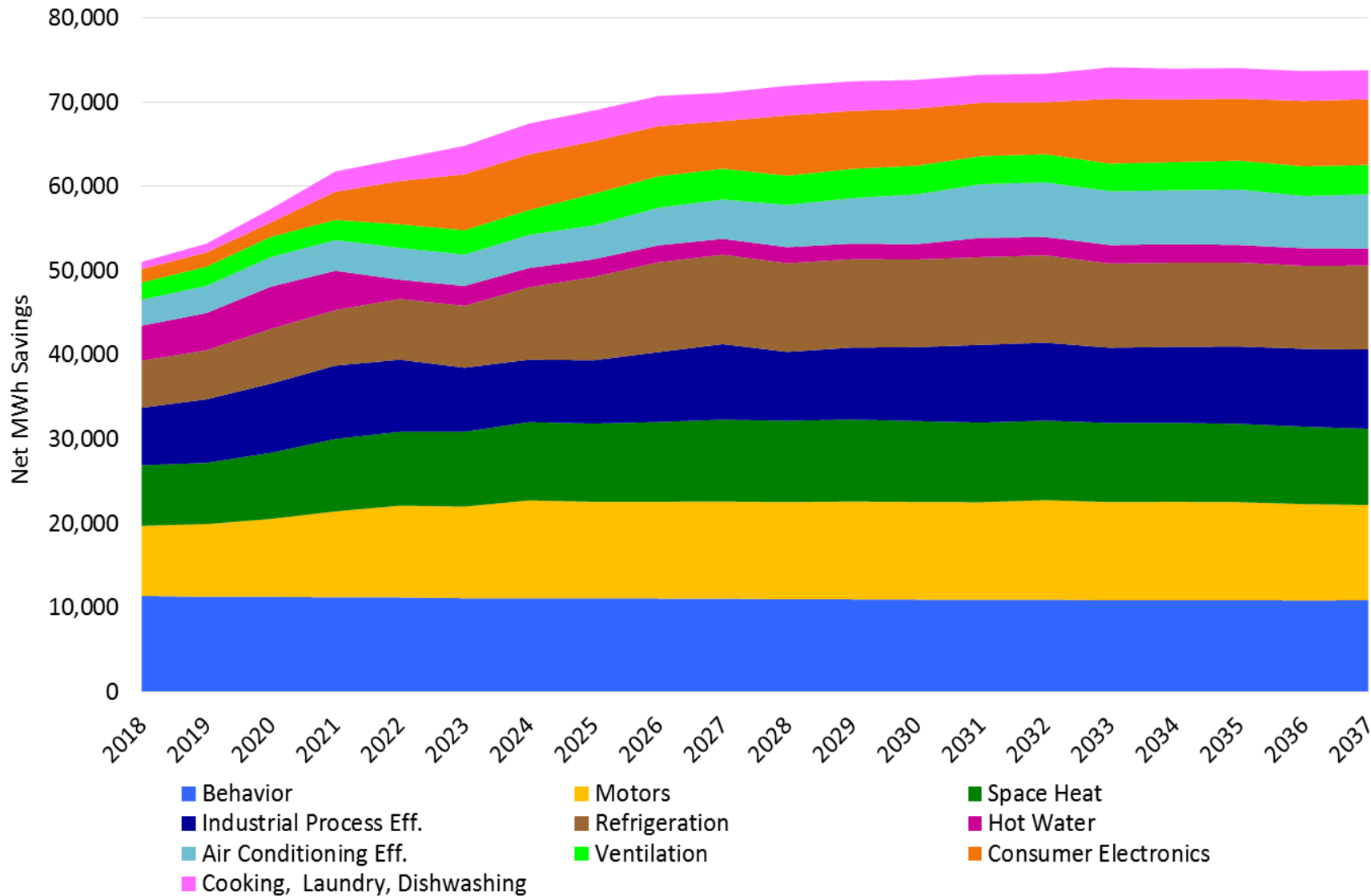


Figure 10. Modeled trends in LED screw-base lamp sales in the marketplace, by market sector.

Final EEC - Portfolio End Use Net MWh Savings



Final EEC - Portfolio End Use (minus Lighting) Net MWh Savings



Key Trends - C&I

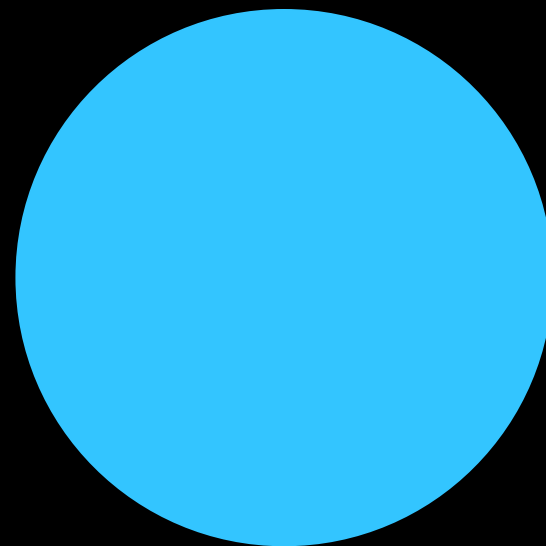
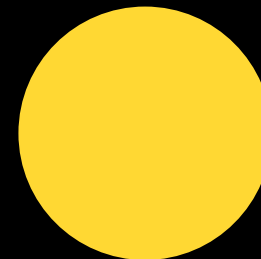
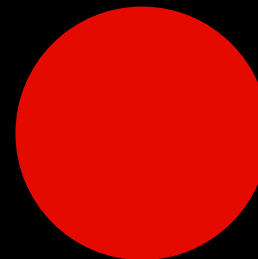
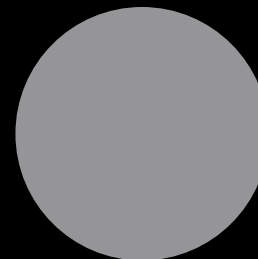
End Use	Portion of C&I Savings from 2018 to 2037
Motors	From 9.2% to 17.9%
Space Heating	Remains flat, about 7 to 8%
Industrial Process Heating	From 8.9% to 17.7%
Refrigeration	From 6.2% to 18.3%
Air Conditioning	From 3.5% to 11.0%
Ventilation	From 2.0% to 4.9%

Key Trends – Residential

End Use	Portion of Residential Savings from 2018 to 2037
Behavior	From 16.5% to 29.1%
Motors	From 2.2% to 5.3%
Space Heating	From 2.5% to 37.8%
Hot Water	From 6.4% to 5.4%
Air Conditioning	From 1.0% to 2.0%
Consumer Electronics	From 2.3% to 22.6%
Cooking, Laundry, Dishwashing	From 1.3% to 10.1%



How Are We Going to Do
This?



Four Over-Arching Strategies

- Integrate new technologies
- Implement new program models
- Increasingly use data to identify new savings opportunity
- Engage customers in new ways



Existing Homes Program

LEDs thru 2020

Connected devices

- Whole house controls
- Smart thermostats
- Smart appliances

Space heat efficiency

- Cold-climate heat pumps
- Thermal shell measures for electrically heated homes

Laundry

- Heat pump clothes dryers

Hot water

- Heat pump water heaters



Residential New Construction Program

- **High Performance Tier**
 - ❑ Incentives for Net Zero
- **Home Energy Advisor**
 - ❑ Total energy roadmap for heating, cooling, hot water, lighting, appliance / electronics, and transportation



Retail Products Program

- Rolling out comprehensive smart technologies program
 - ❑ Home energy management system able to control and manage all connected devices
 - ❑ Will help manage electric vehicles, distributed solar PV, and storage



Smart Thermostat Analytics Toolkit (STAT)

- 2016 patent for envelope assessment algorithm
- The new “energy audit”
- Calculates thermal flow rate, runtime reduction, oversizing, kW and kWh savings
- Open source platform



Low Income Program

- Collaborate with WAPs and foodbanks
 - ❑ Weatherization, free appliance replacements, bath fans, LEDs, cold climate heat pumps, heat pump water heaters, water saving devices
- Multi-Family Behavioral Pilot
- Zero Energy Modular Home



Multi-Family Program

- **Rental Property Rebates**
 - ❑ Free LEDs and low flow showerheads; refrigerator, heating, and bath fan rebates
- **Deep Energy Retrofit**
 - ❑ Funding and technical assistance
- **New Construction and Gut Rehab Rebates**
 - ❑ Thermal and electric



Small to Medium Business Program

- Continued market segment focus
 - ❑ Deep dive focused on specific market segments - retail, grocery, lodging, restaurants
- Deep retrofit pilot going to scale
 - ❑ Savings of 40-50 % achieved in pilot, electric and thermal



Large C&I - Strategic Energy Management (SEM)

- Pilot going to scale
- Deep employee engagement
- EE becomes standard operating procedure
- Savings of 3 - 6% achieved
- Also for NYSERDA in New York, with Cascade



GE Aviation

HUSKY

Keeping our customers in the lead

Energizer *Keep Challenging
Keep Growing*
Household Products

KEURIG
GREEN MOUNTAIN

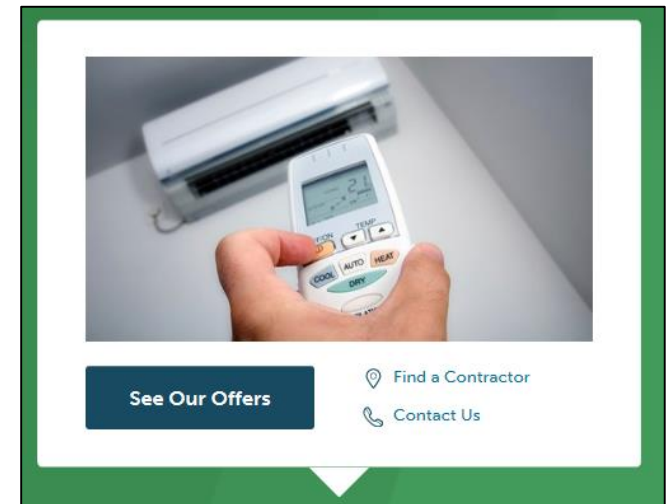


THE
University of Vermont
HEALTH NETWORK
Central Vermont Medical Center



Upstream Program

- Dramatic increases in market uptake in:
 - 8,550% Circulator Pumps
 - 750% Heat pump water heaters
 - 100% Cold climate air source heat pumps
- National Distributed Products Platform
 - With Energy Solutions

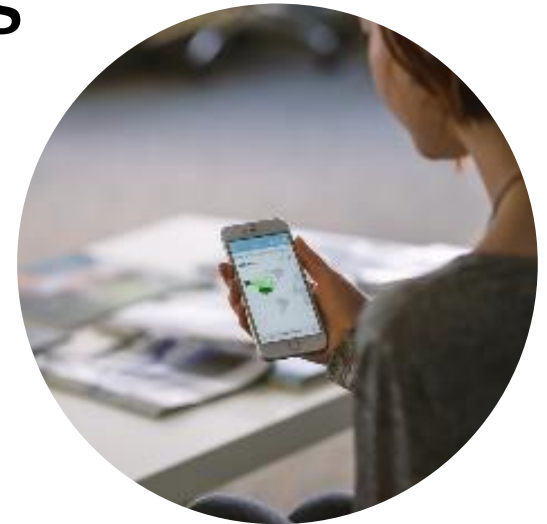




Conclusion

Develop Next Generation Targets

- Look beyond kWh, kW
- Align program targets with policy goals:
 - Grid resilience and load management
 - Carbon reduction
 - Market transformation
 - Affordability and reduced energy burden
 - Green jobs & economic development



2018-2020 Critical to Prepare for Future

- Pilots, pilots, pilots
- Integrate new technologies
- Develop new program models
- Use data to identify new savings opportunities
- Engage customers in new ways



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