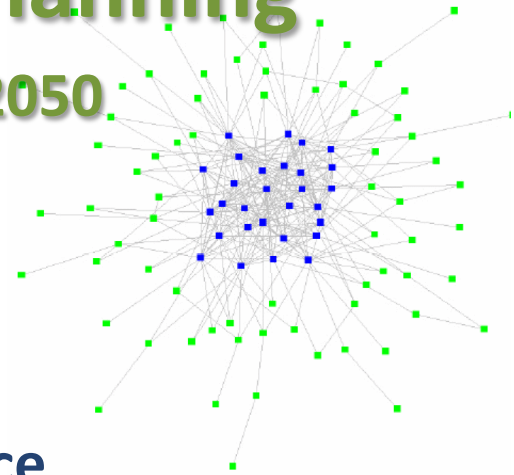




ENERGY ACTION NETWORK

Regional Energy Planning

Getting to 90% by 2050



VECAN Conference

December 6, 2014

Andrea Colnes

EAN Executive Director

**90%^B_Y
2050**



Energy Action Network

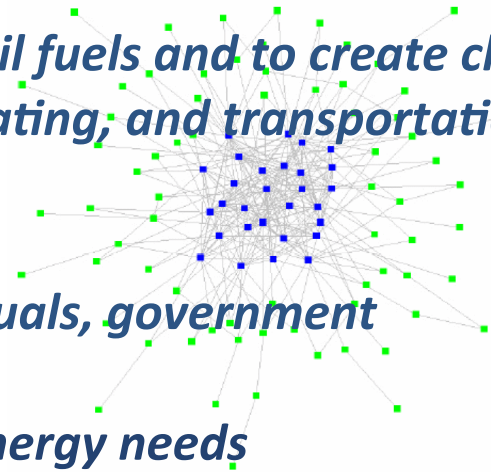


ENERGY ACTION NETWORK

Mission: *To end Vermont's reliance on fossil fuels and to create clean, affordable and secure electric, heating, and transportation systems for the 21st Century.*

Members: *Businesses, organizations, individuals, government*

Goal: *To meet 90% of Vermont's 2050 energy needs through energy efficiency and renewable energy.*



90%^B_Y
2050



EAN Participants

• Peter Adamczyk • Charlie Baker • Amanda Beraldi • Janet Besser •
 • Ludy Biddle • Kathryn Blume • Michele Boomhower • Jeff Bower • Jo Bradley • Aaron Brown • Tom Buckley •
 • Laurie Burnham • Sam Buckley • Megan Camp • Chris Company • Erin Carroll • Marta Ceroni • Andrea Cohen • Andrea Colnes •
 • Steve Costello • Elizabeth Courtney •
 • Paul Costello • Paul Craven • Cairn Cross • Chris D'Ella •
 • Catherine Davis • Alex DePillis • Robert Barton • David Bradbury • Edward Delhagen •
 • Catherine Dimitruck • Lee Boyeau • Joseph Cincotta • Hal Cohen • Paul Burns • Richard Donnelly •
 • Robert Dostis • Matt Cota • Arthur & Anne Berndt • Rich Cowart • Gwen Hallsmith • William Driscoll •
 • Julia Dundorf • Kevin Ellis • Janet Doyle • Tom Ezslin • Rebecca Ellis •
 Peg Elmer • Jamie Ervin • Paul Markowitz • Karen Glitman • Melody Burkins • Margaret Cheney • Paul Comey • Blair Hamilton • Johanna Miller • Jon Erickson •
 • Richard Faesy • James Merriam • Karen Horn • Michael Dworkin • Scott Johnstone • Ronald Miller • Julie Lineberger • Brian Otley • Chad Farrell •
 • Laurie Fielder • Elizabeth Pearce • Bill McKibben • James Moore • Timothy Palmer • William Patten • Ralph Meima • Andy Perchlik • Abby Friedman •
 • Sara Gilbert • Peter Gregory • Janice St. Onge • Kenneth Perine • Susan Allen Picone • Ernie Pomerleau • Mary Powell • Alan Noguee • Steve Greenfield •
 David Hill • John Hollar • William Raap • Chris Recchia • Chuck Ross • Jim Sabataseo • Leigh Seddon • Robert Griffin •
 Asa Hopkins • John Irving • Ron Shems • William Sayre • Rich Sedano • Jeffrey Wolfe • Liz Schlagel • Gabrielle Stebbins • Alison Hollingsworth •
 Ellen Kahler • Thomas Torti • Winn Smith • Bill Stenger • Richard Weston • Ken Jones • Dan Jones • Chris Kramer •
 • Sandy Levine • Mary Margaret Sloan • Karen Yacos • Adam Lougee •
 • Anne Margolis • Deb Markowitz • Wendy McArdle •
 • Linda McGinnis • Michael Miller • Bill Miller • Derek Moretz • Pat Moulton •
 • Melanie Needle • Scudder Parker • Michael Pieciak • John Quinney • Patty Richards •
 • Greg Rieder • Cara Robeck • Dave Roberts • Andrew Savage • Jan Schultz • Justine Sears • Tim Shea • Adam Sherman • Amy Shollenberger •
 • Luke Shullenberger • Sarah Simonds • Darren Springer • Martha Staskus • James Sullivan • Mary Sullivan • Sam Swanson •
 • Gaye Symington • George Twigg • Marianne Tyrrell • Bob Walker • Ben Walsh • Anne Watson •
 • Mary Westervelt • Bonnie Wonniger • Eric Zencey •

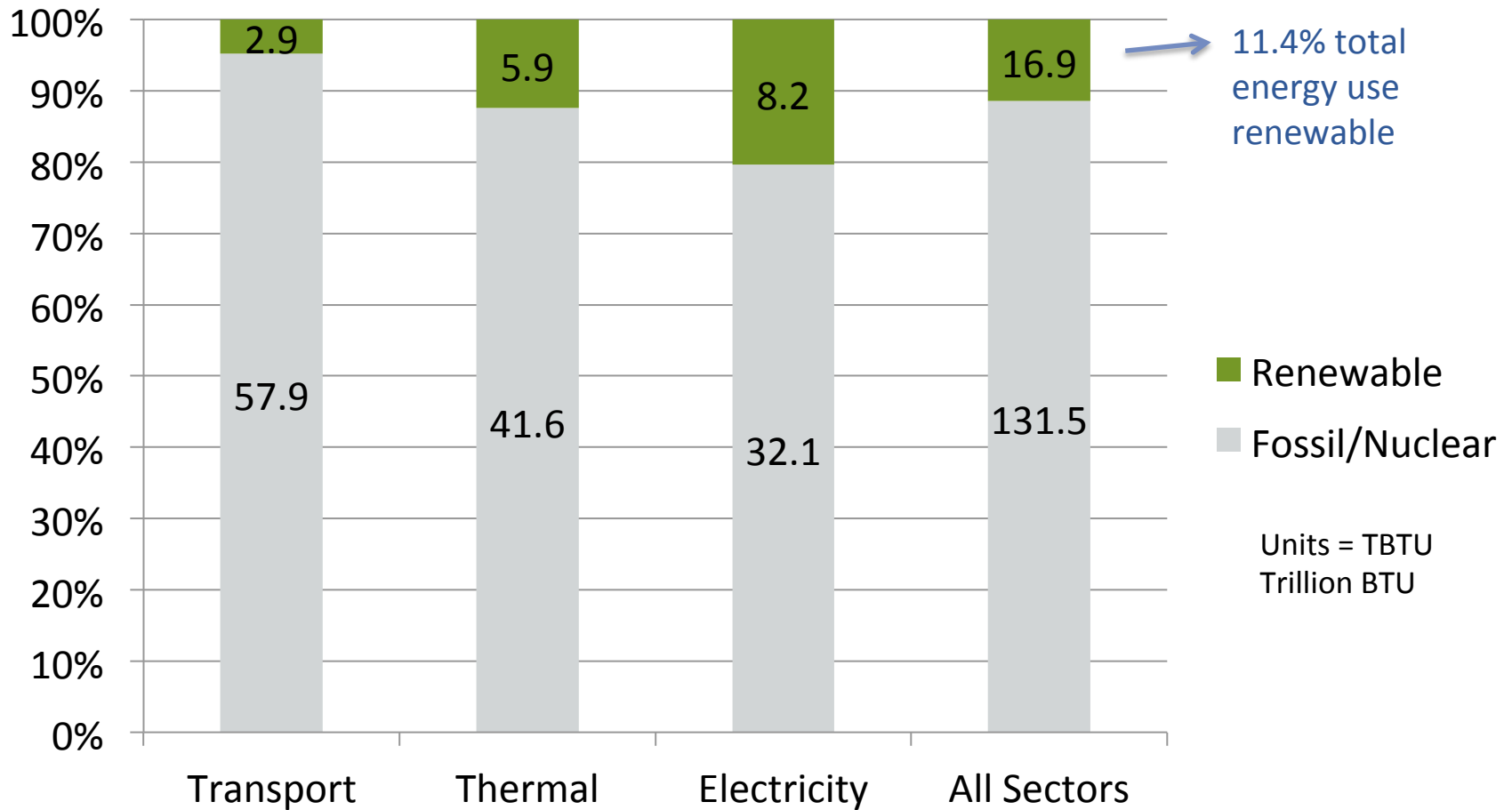


EAN Energy Pathways Report

- Analysis of policy & technology pathways to achieve state's CEP goal of 90% by 2050
- Ranked pathways by impact
- Suggested decade milestones to reach CEP goal
 - 20% by 2020
 - 40% by 2030
 - 70% by 2040
 - 90% by 2050

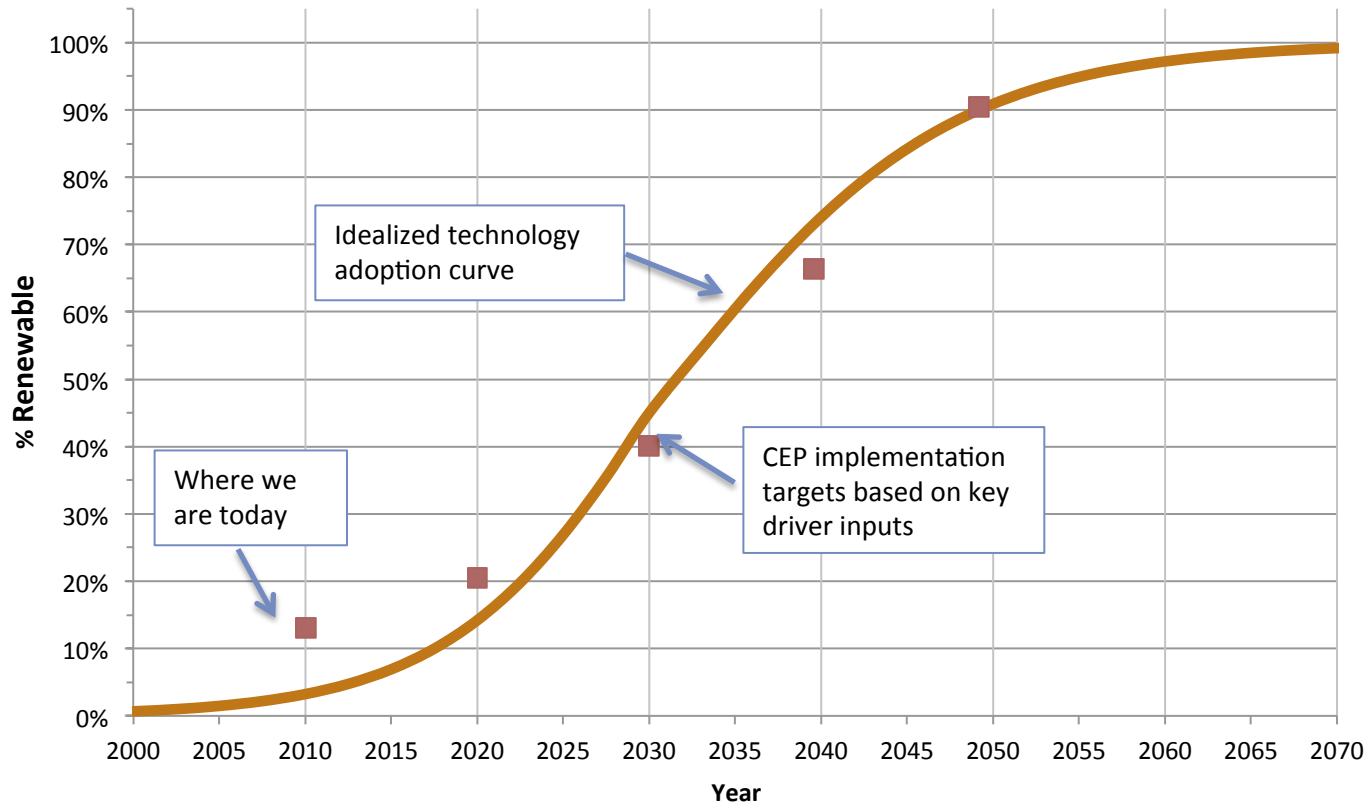


Strategic Context: Our Current Energy Mix



Transformation S-Curve

90 by 2050: Tech Adoption Curve & Milestones



Getting to 20% by 2020

In the next seven years, we need:

- Efficiency – Reduce building heat losses by 5%
 - Requires retrofitting 50,000 buildings with 30% savings
- Electric Vehicles – 10% of light vehicle fleet
 - Requires adding 57,000 EVs and PHEVs
- Biomass – additional 5% of building heat loads
 - Requires 15,000 new pellet stoves or boilers
- Biofuels – 5% of liquid fuel for light vehicle fleet
 - Requires a capacity of 15 M gallons biofuels annually



Getting to 20% by 2020

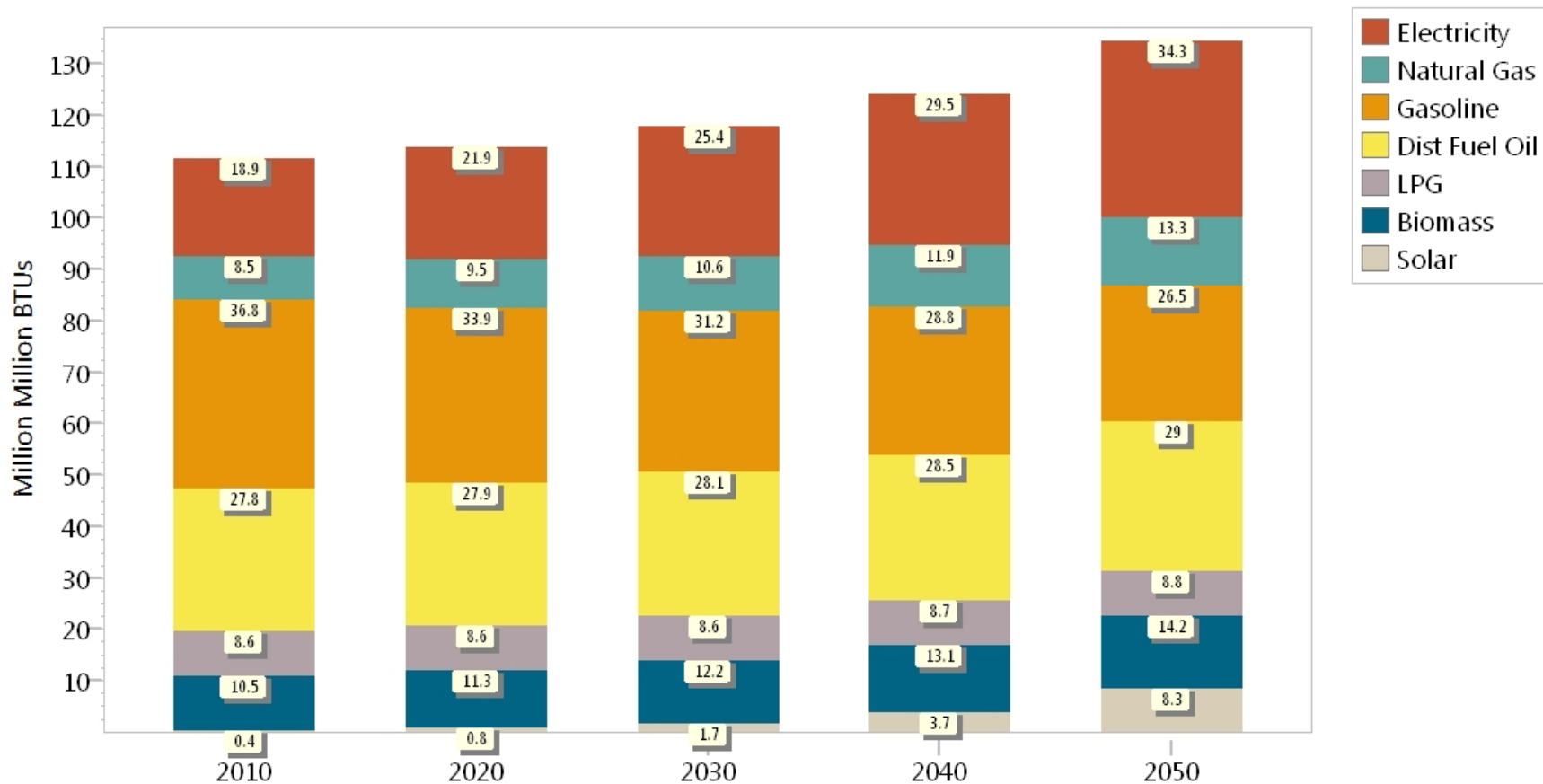
In the next seven years, we need:

- Biomass CHP
 - Build 80 MW of high-efficiency combined heat and power plants, providing 60 MW thermal and 20 MW electric
- Hydro Electric
 - Build or Refurbish 6 MW small-scale hydro capacity
- Solar Energy
 - Build 150 MW new PV capacity (70 “Solar Farms”)
 - Provide 2% building heat & hot water through solar thermal systems (3,000 SHW systems)
- Wind Power
 - Build 50 MW new in-state capacity
 - Contract for 100 MW regional wind farm capacity



Vermont Energy End Use Demand by Fuel Type

Scenario: Reference Case, EIA "Business As Usual"



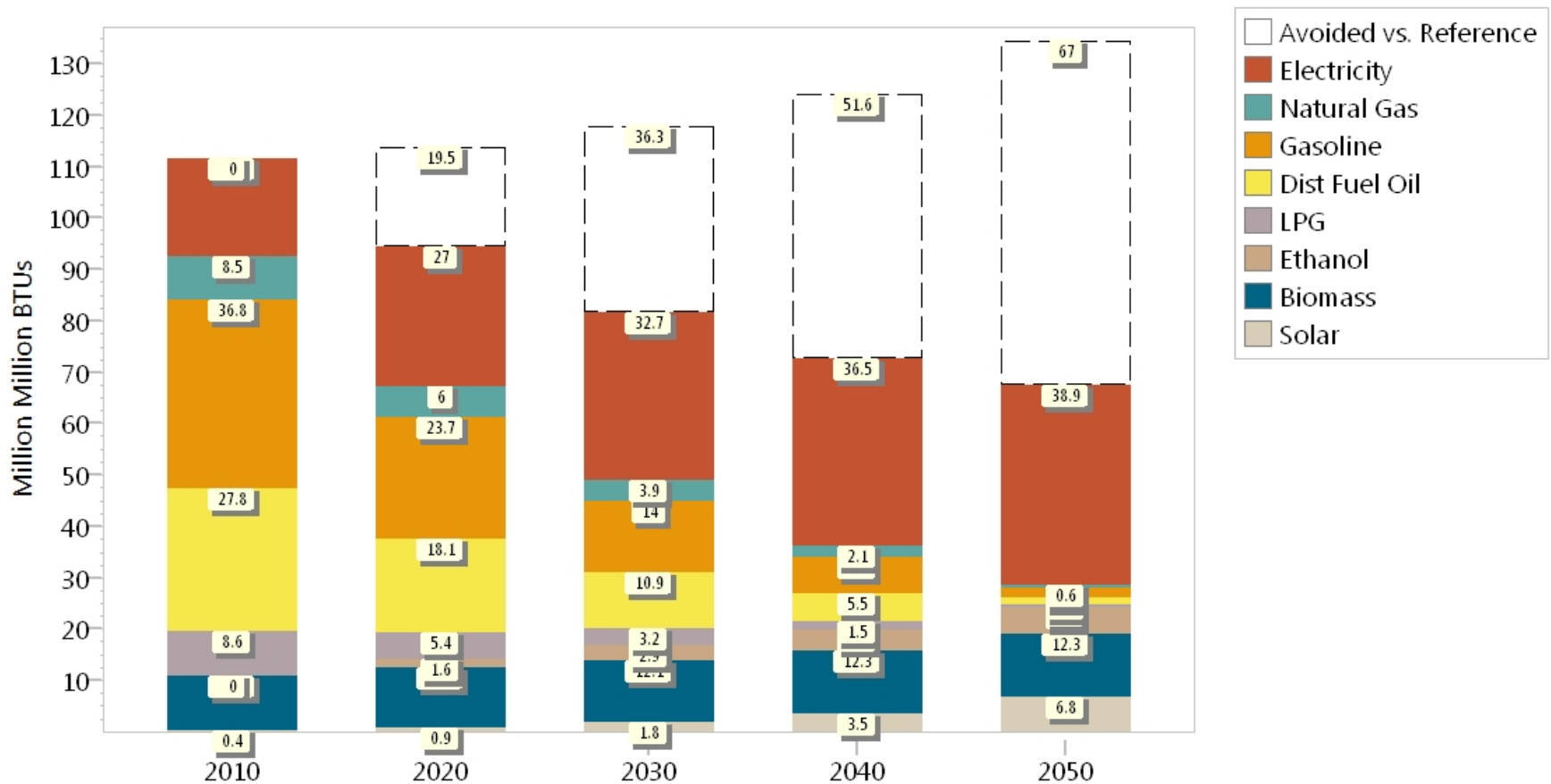
LEAP modeling courtesy of David Hill, VEIC



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Vermont End Use Energy Demand by Fuel Type

Scenario: 90% by 2050 Pathway Example

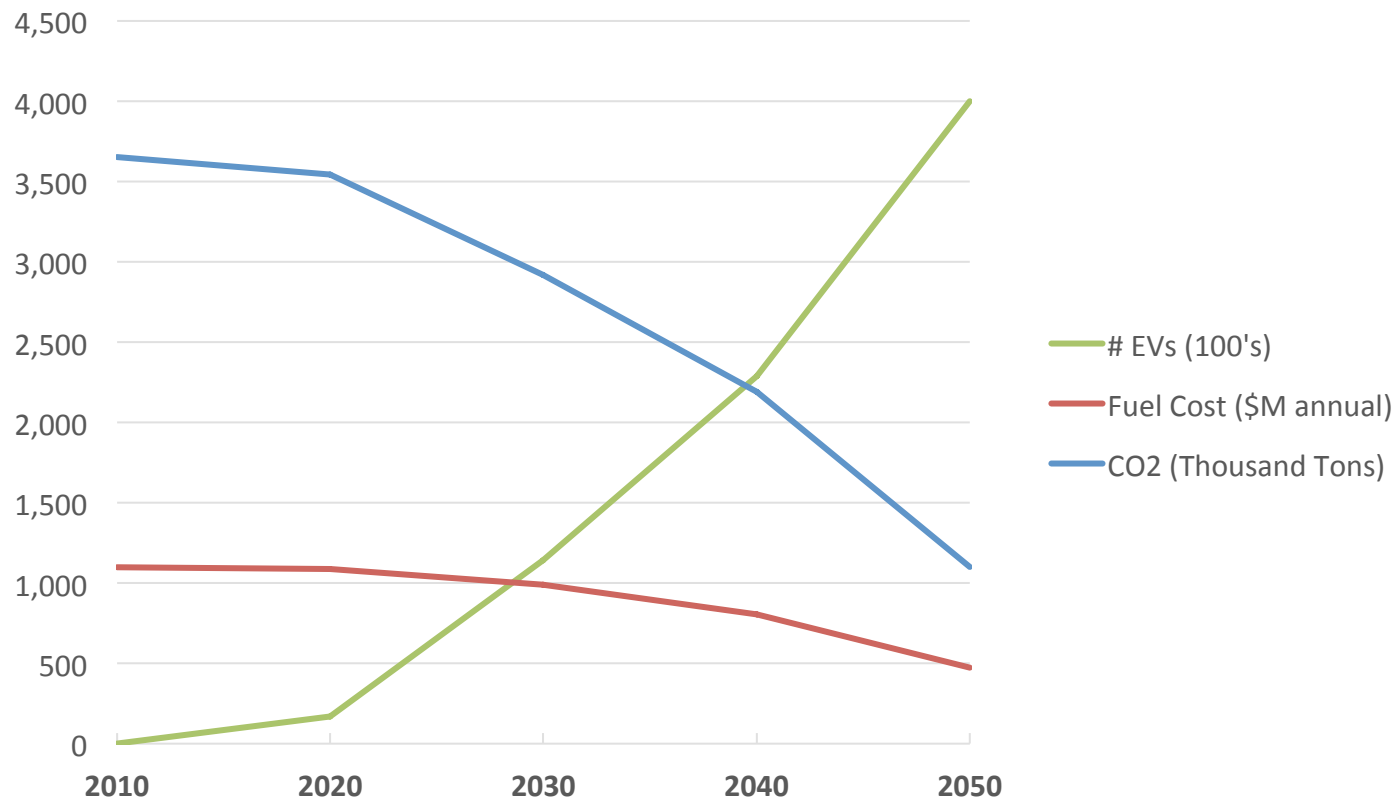


LEAP modeling courtesy of David Hill, VEIC

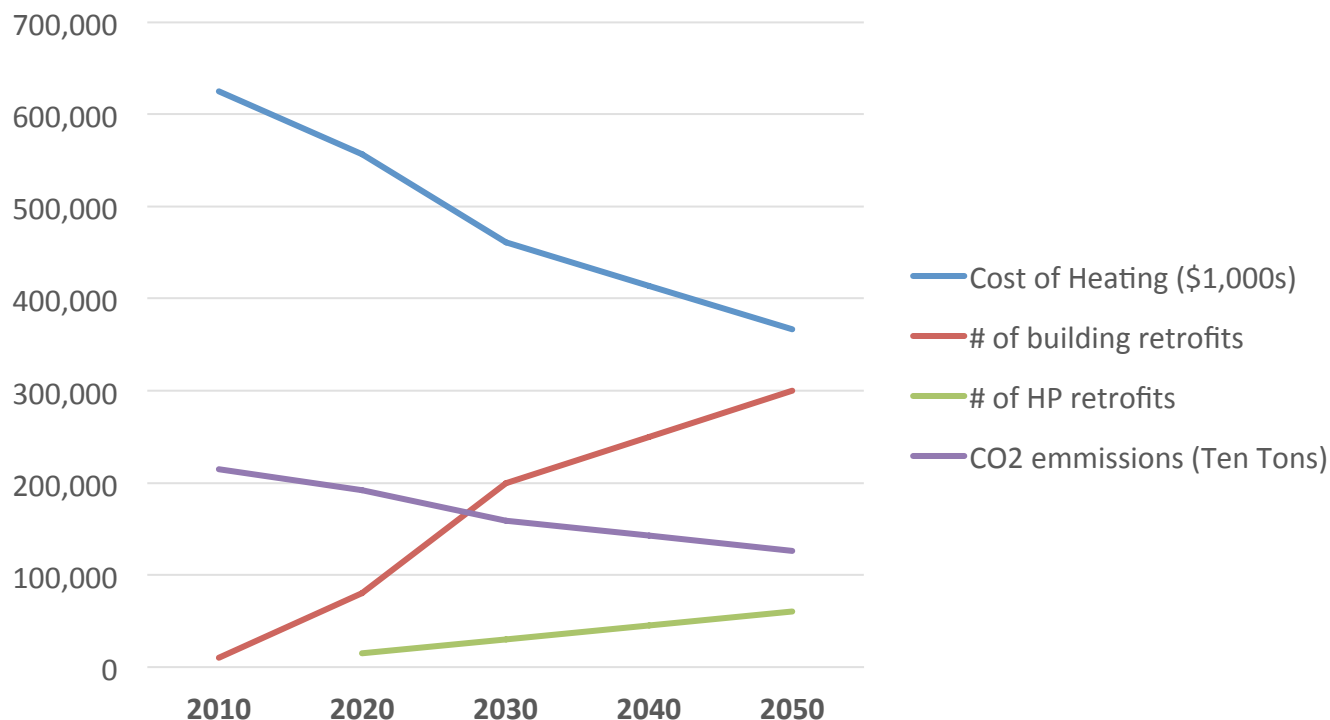


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Effects of Electric Vehicles



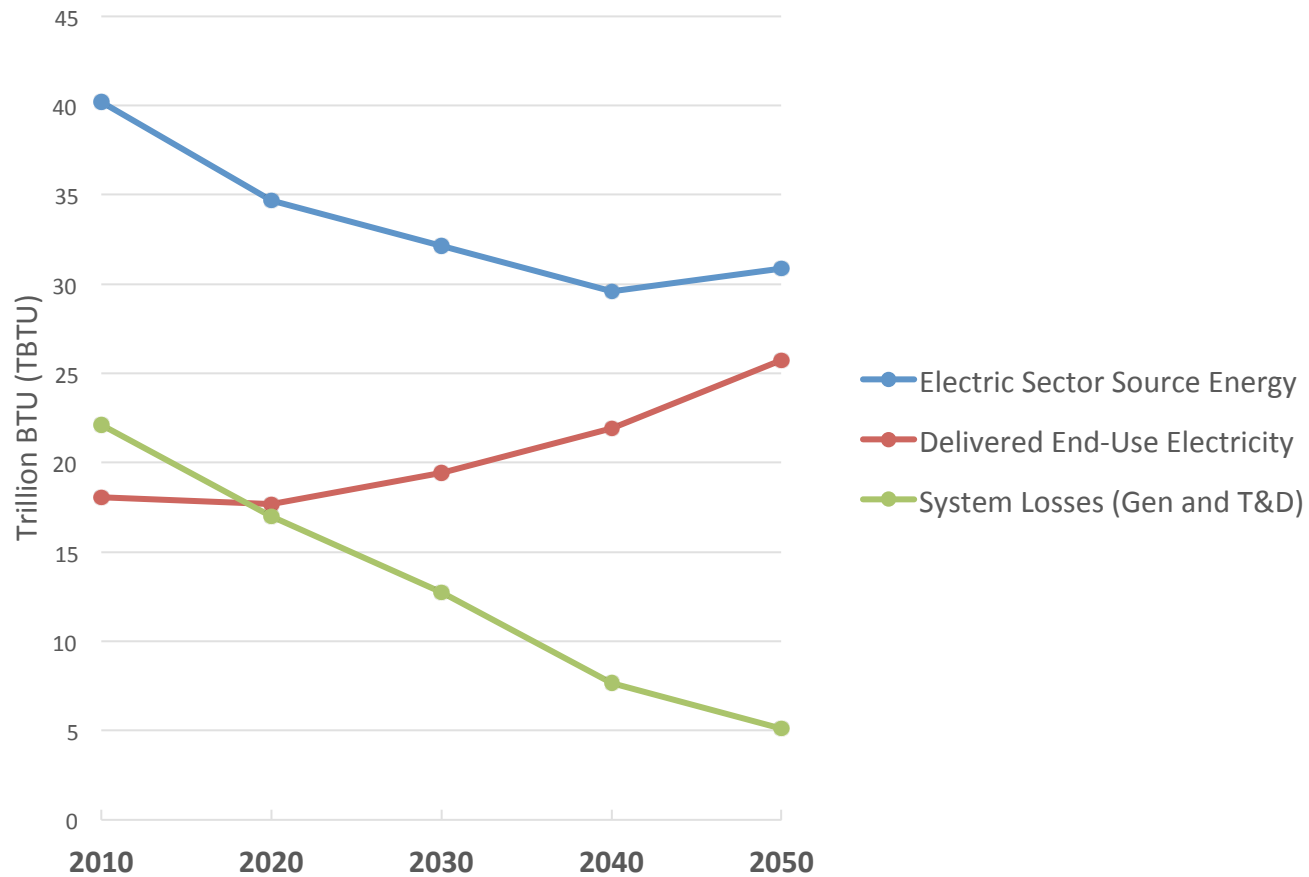
Efficiency & Heat Pump Impact



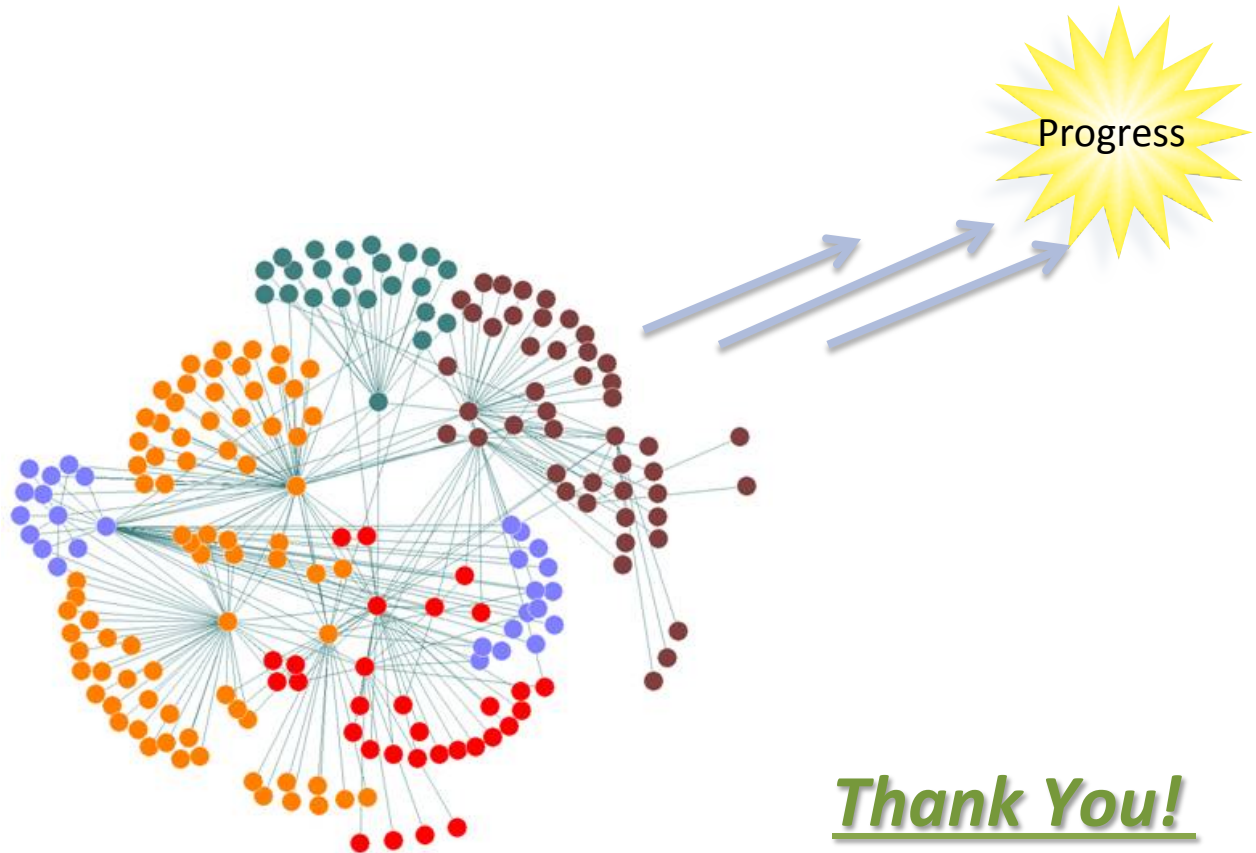
- \$625 M in heating cost in 2010 for residential & commercial purchases of oil, LPG, and NG (EIA).
- Efficiency retrofits have average energy reduction of 30%. Individual building range = 20% to 50%. (VEIC)
- Heat pumps are cold climate air-source units that provide 75% of annual building load.
- ASHP save 40% of energy cost with electricity at \$.146/kWh, oil at \$3.99/gal and LPG at \$2.99/gal (Letendre)



Renewable Electricity Impact



Helping each community add up to... Collective Impact



Questions:

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Thank You!



Energy Action Network

Collaborative Network Initiative, Garfield Foundation