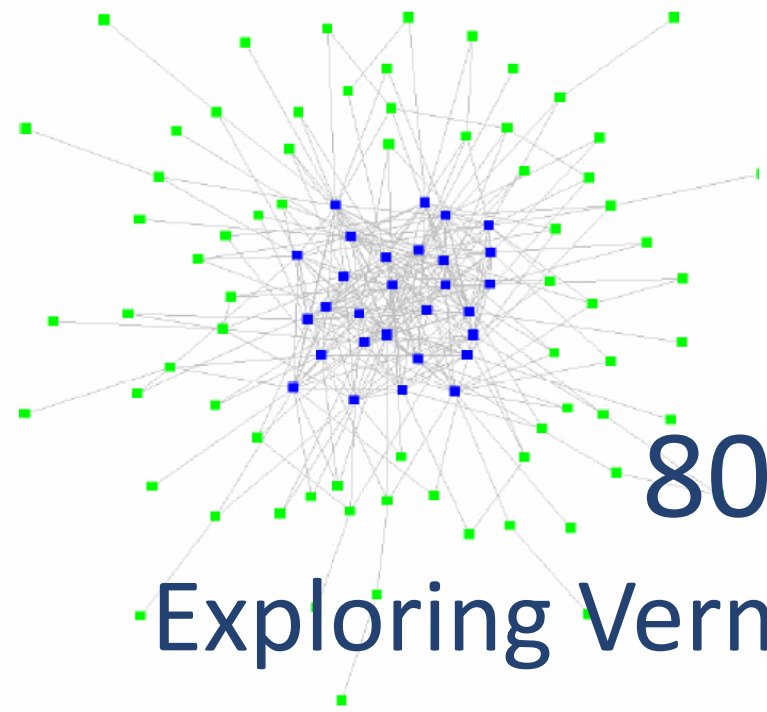


80 by 2030

Exploring Vermont's Energy Options

Leigh Seddon, Chair

Energy Action Network

Energy Action Network

Formation & Purpose

- Collaborative effort to transform Vermont's energy system
  - Create System Map – 2009
  - Identify Leverage Points – 2010
  - Build Network Capacity – 2011
  - Launch Projects – 2012

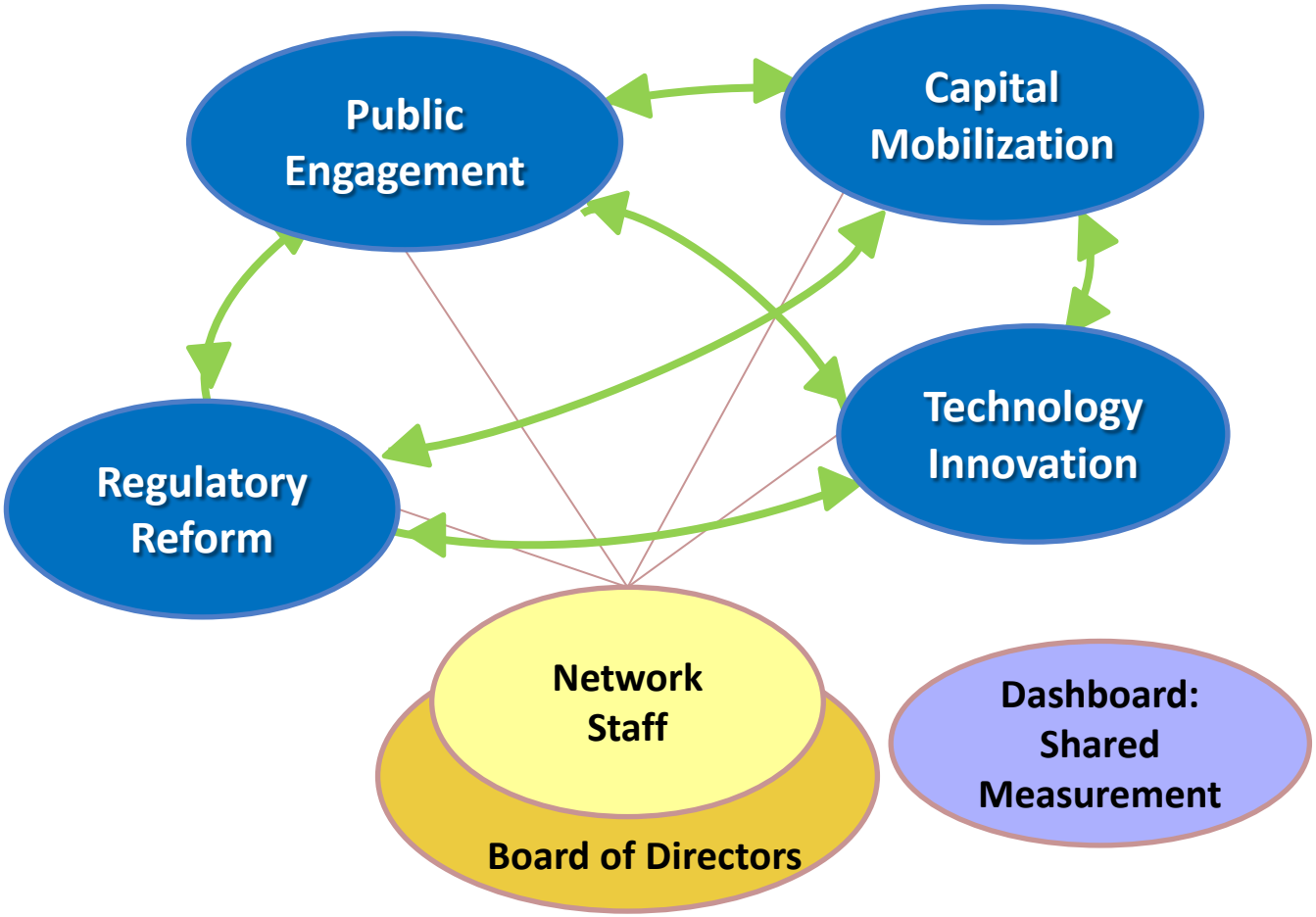
Members

- A network of collaborating businesses, organizations, individuals, and government.

Goal

- To meet 80% of Vermont's 2030 energy needs through energy efficiency and renewable energy.

Working Groups



2030 Energy Scenario

Goals:

- Explore options for future energy use in VT in an informed and consistent manner. Input from VEIC, GMP, DPS, BERC, REV, and others.
- Identify key barriers and opportunities inherent in a 80% renewable energy goal (not a roadmap)
- Serve as a framework for discussion about policy, technology, and economic choices
- Support and stimulate discussion of CEP recommendations and VT's energy choices

Analysis Matrix (2010 Non-RE Energy)

In Trillion BTU (TBTU)

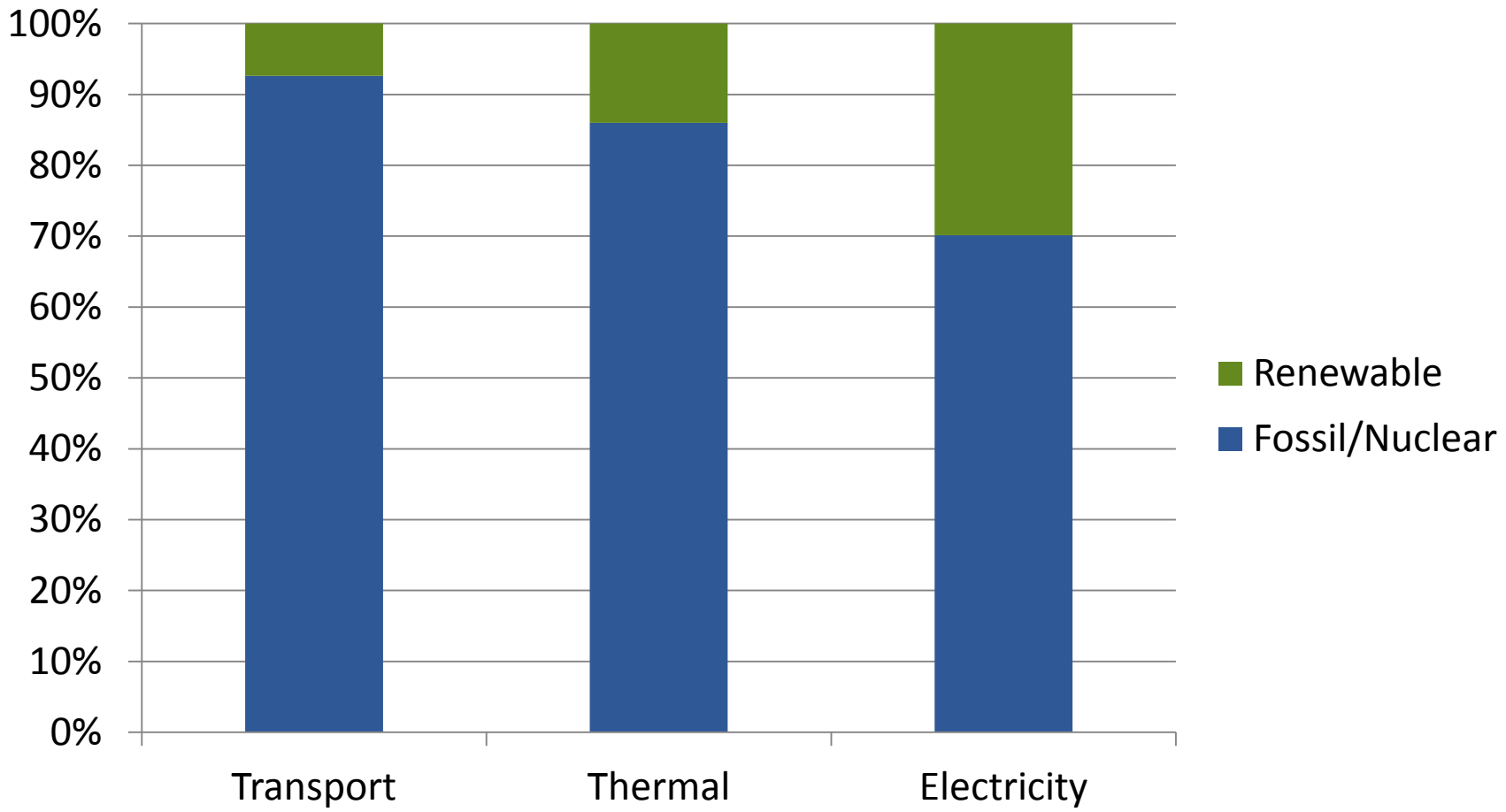
Fuel/Sector	Transportation	Thermal Energy	Electricity
Natural Gas	2.34	8.60	
Distillate Fuel Oil	7.80	19.50	
Jet Fuel	2.90		
LPG		8.60	
Gasoline	34.02		
Other Oil	0.40	1.30	0.52
Nuclear			7.05
Market Power (Nat Gas)			2.28
Generation Losses			11.84
Total Non-Renewable	47.46	38.00	21.69

Analysis Matrix (2010 RE Energy)

In Trillion BTU (TBTU)

Fuel/Sector	Transportation	Thermal Energy	Electricity
Biomass		6.10	1.36
Biodiesel & Biogas			
Ethanol	3.78		
Solar		0.09	0.10
Wind			0.04
Hydro			7.73
Out of State RE			
Total Renewable	3.78	6.19	9.23

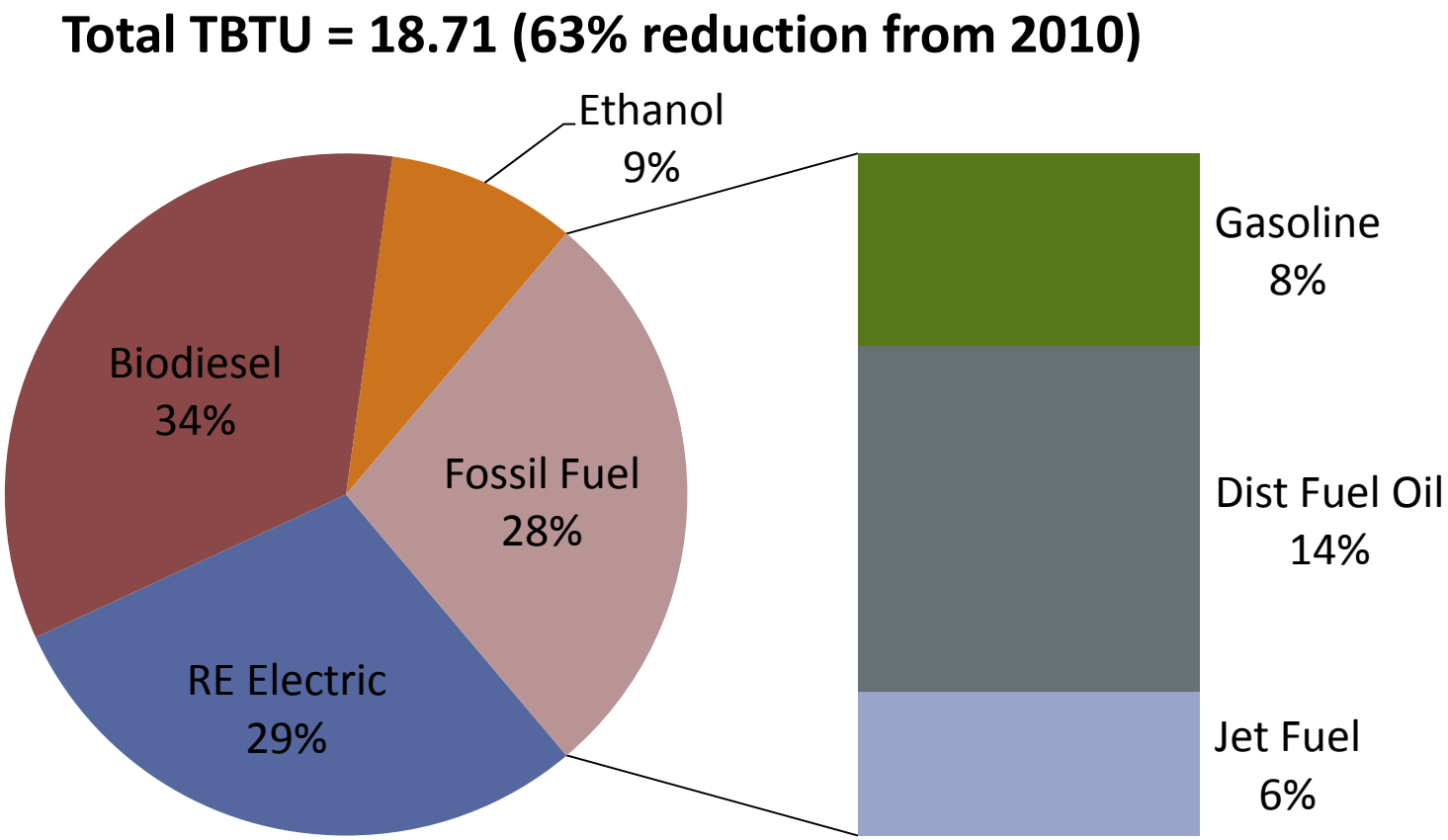
VT Energy Baseline 2010



Transforming Transportation

- Electrification is critical path to achieving 80% goal, greater efficiency, and cost savings in sector.
- 70% penetration of electric vehicles (350,000) by 2030 would raise energy efficiency of sector by over 50% and save over $500M/YR (2010$) in vehicle operating costs.
- Vehicle miles traveled could decline by 25% with more focus on carpooling, telecommuting, and investment in public transport options.
- National CAFE standards could result in 25% efficiency improvement in remaining combustion powered fleet.
- Biofuels could supply 1/3 of sector energy at lower cost than petrol fuels today ($2.50/gal vs $3.50/gal).

Transportation 2030

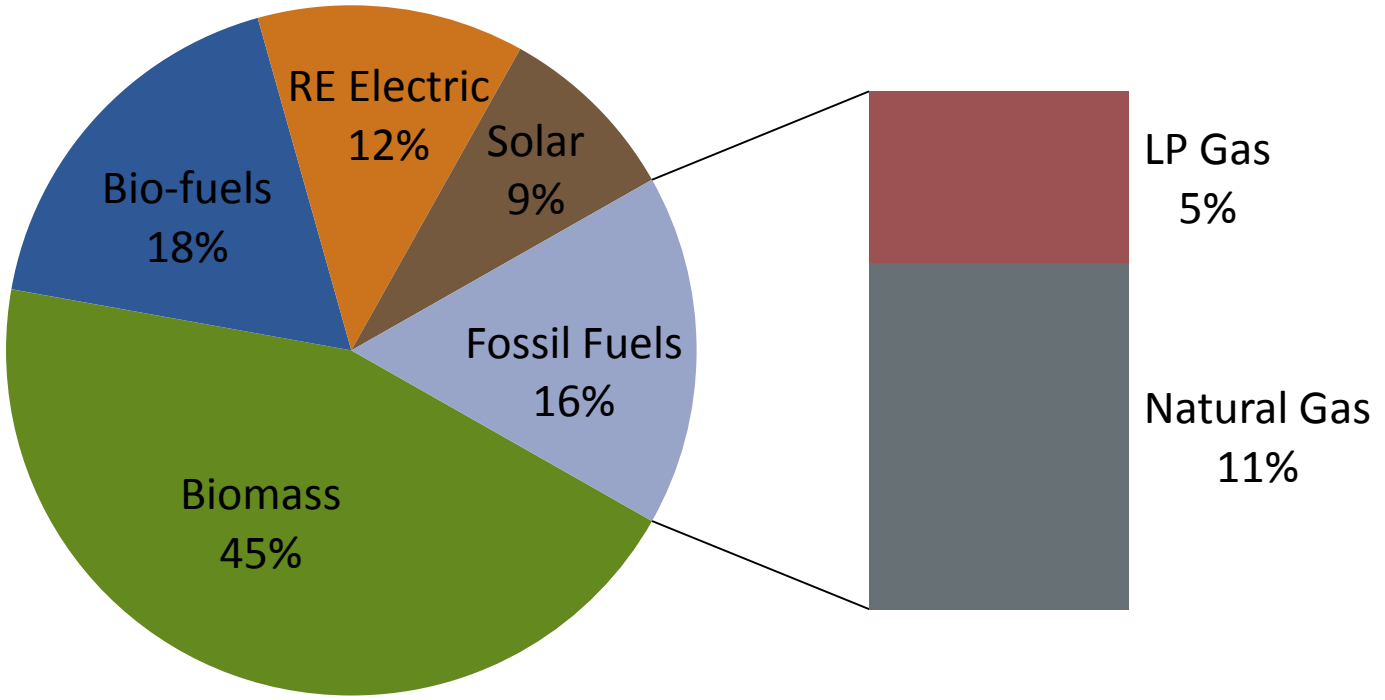


Thermal Sector

- 44% of thermal load is current met by fuel oil.
- Efficiency investment is key to transforming thermal sector.
- 33% improvement in building stock performance is possible with target of 300,000 retrofits by 2030. Current legislative target of 80,000 retrofits by 2020 is aiming too low.
- Efficiency goal would require $6B in investment over 20 years, dramatically lowering energy costs and creating new jobs.
- In 2030, 63% of thermal demand can be met by biomass and bio-fuels if we invest now in new technology and protect VT's forest resource from low value exploitation.
- Electric use will rise as fossil fuel use drops with adoption of heat pumps, especially for new construction.

Thermal 2030

Total TBTU = 36.74 (reduced from 44.19 in 2010)



Electrical Energy

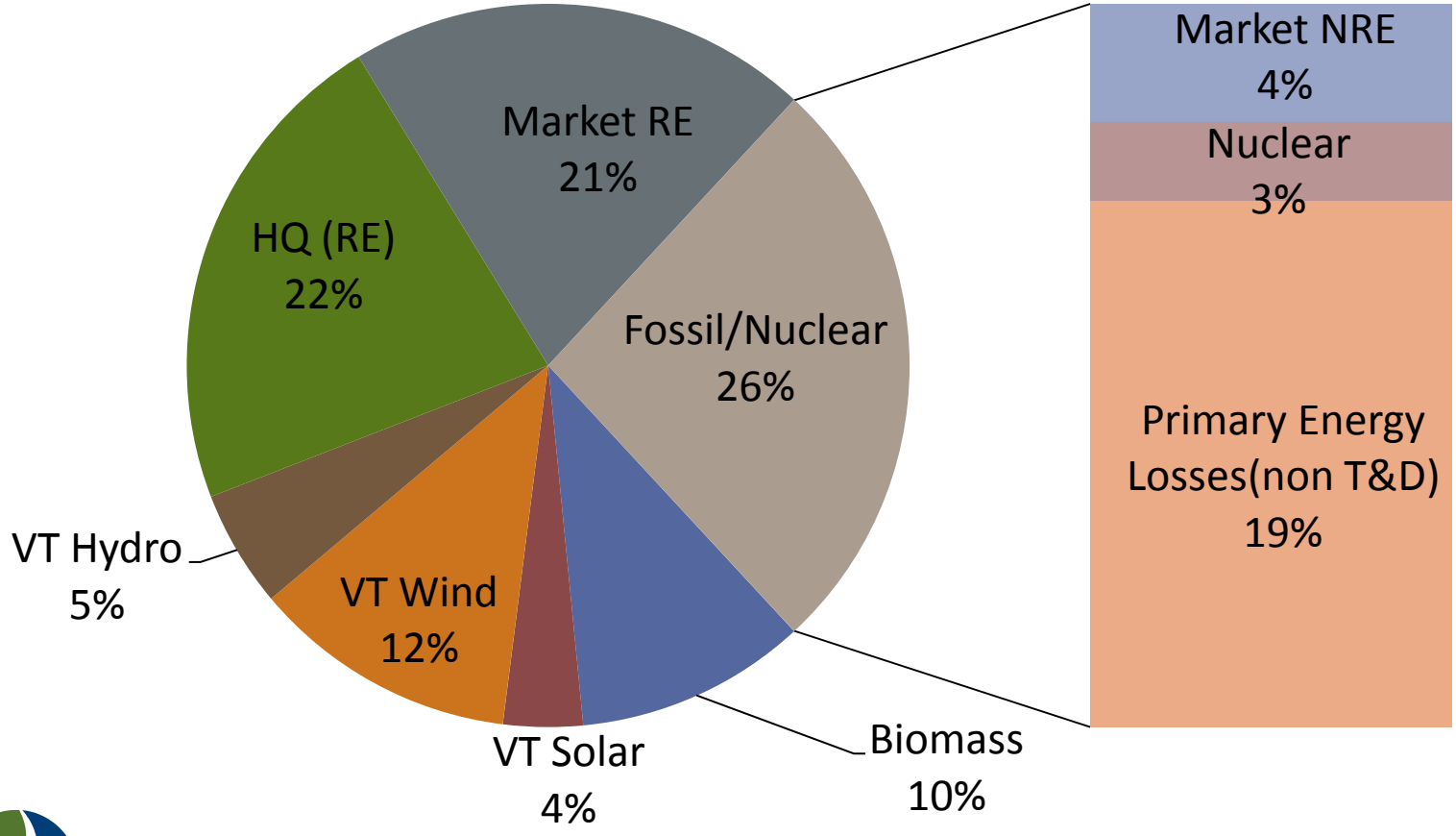
- Annual electrical *end-use* energy will grow 33% from 2010 to 2030 to power transport and thermal heat pumps.
- But total *primary* electrical energy will only grow 12% because of increased efficiency due to RE source additions (less generator and T&D losses).
- Regional and in-state wind can meet a large portion of new requirements at a competitive price.
- Need for “firm” RE power is important consideration as we move to high penetration of RE generation.
- Biomass is limited resource, best used for thermal heating, but can supply 10% of electricity. Combined heat & power (CHP) plants have greatest efficiency(80% vs 26% for Ryegate).

Electrical Sector 2030

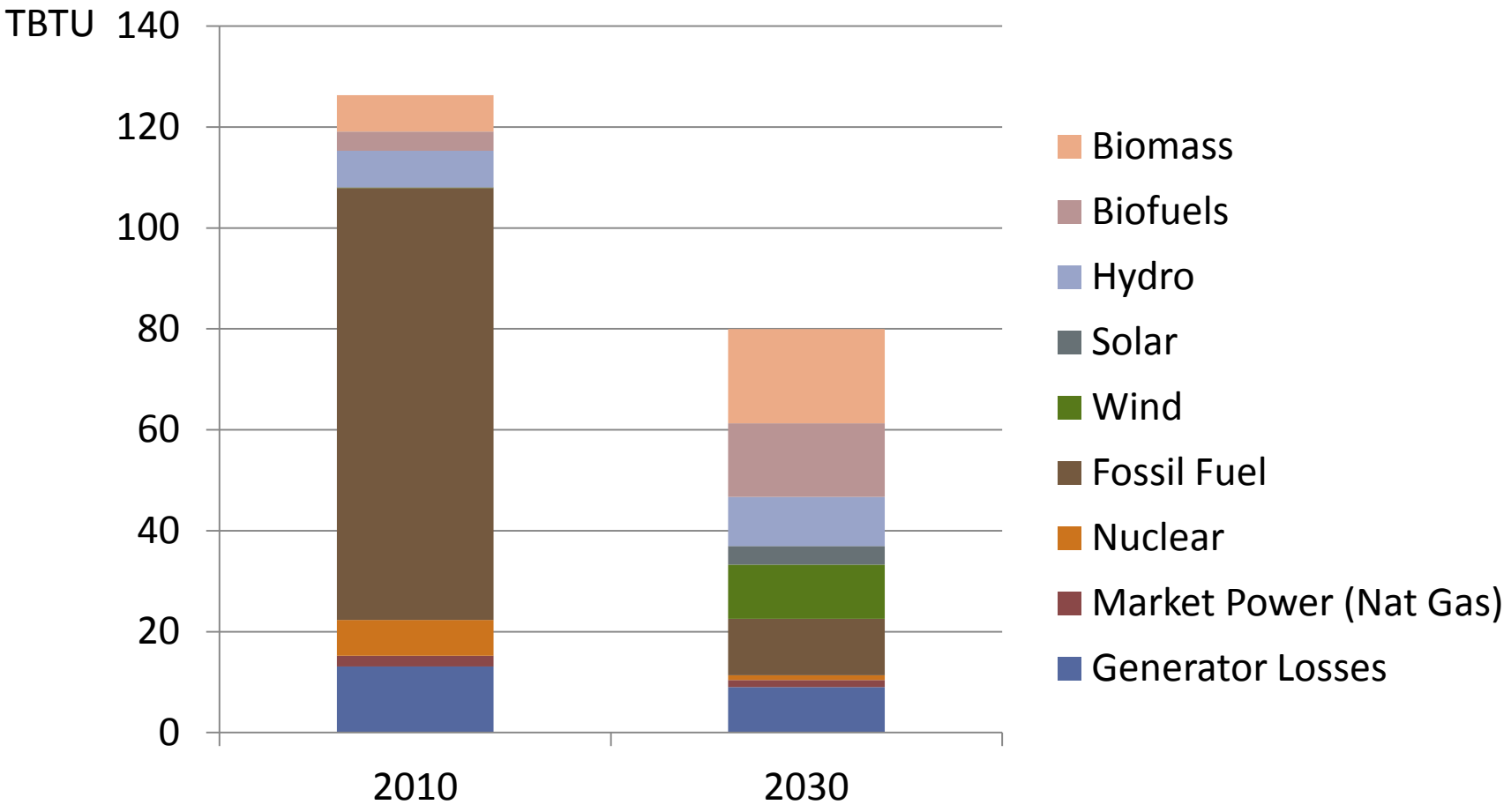
(Includes Transport & Thermal Electricity)

Total TBTU = 34.73

(33% increase in end-use GWH, only 12% increase in total TBTU primary energy)



Transitioning Vermont's Energy Use through Efficiency & Renewables



$28.5 ++ Billion Opportunity

- $14 billion for electric vehicles
- $5.9 billion to retrofit existing buildings;
- $2 billion for in-state larger RE generation;
- $1.95 billion for efficient biomass CHP plants;
- $1.7 billion each for small in-state RE and solar thermal systems;
- $.75 billion for the purchase and installation of residential and commercial geothermal systems.

Starting The Transition

- 80% by 2030 is audacious goal, but it is achievable, and is required for Vermont's social and economic security.
- Achieving 80% puts state on track to meeting its CEP goal of 90% renewable by 2050, a more difficult target.
- Time is of the essence! Vermont's needs to act now to start an orderly transition before energy dislocations make the task an expensive, emergency response.
- The transition is everyone's responsibility, not just energy providers and utilities. Change will be driven by individuals, organizations, communities, and government innovating and working together – the VECAN model.

Questions/Comments?

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Generous support for EAN and its energy mapping work has been provided by the Maverick Lloyd Foundation