TOTAL ENERGY STUDY

VECAN Conference

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Public Service Department
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Total Energy Study: What is it?

Analyze (and recommend) policies designed to achieve the GHG (2028 and 2050) and renewable energy (2050) goals in an integrated and comprehensive manner

- Spring 2013: Framing report
- Summer/Fall 2013: Stakeholder meetings
- Dec 2013: Legislative report

- Spring/Summer 2014: Energy system modeling
- Summer/Fall 2014: Economic modeling
- Fall 2014: TES Final Report released

Energy system modeling

Consultant modeled 4 scenarios defined by **policies**:

- Business as usual (BAU)
- Revenue-neutral carbon tax shift
- Total renewable and energy efficiency standard (TREES)
- TREES with additional local energy requirement

What does 2050 look like under each case?

VT achieves its goals at reasonable cost under each policy case other than the BAU

An aside to explain a surprise

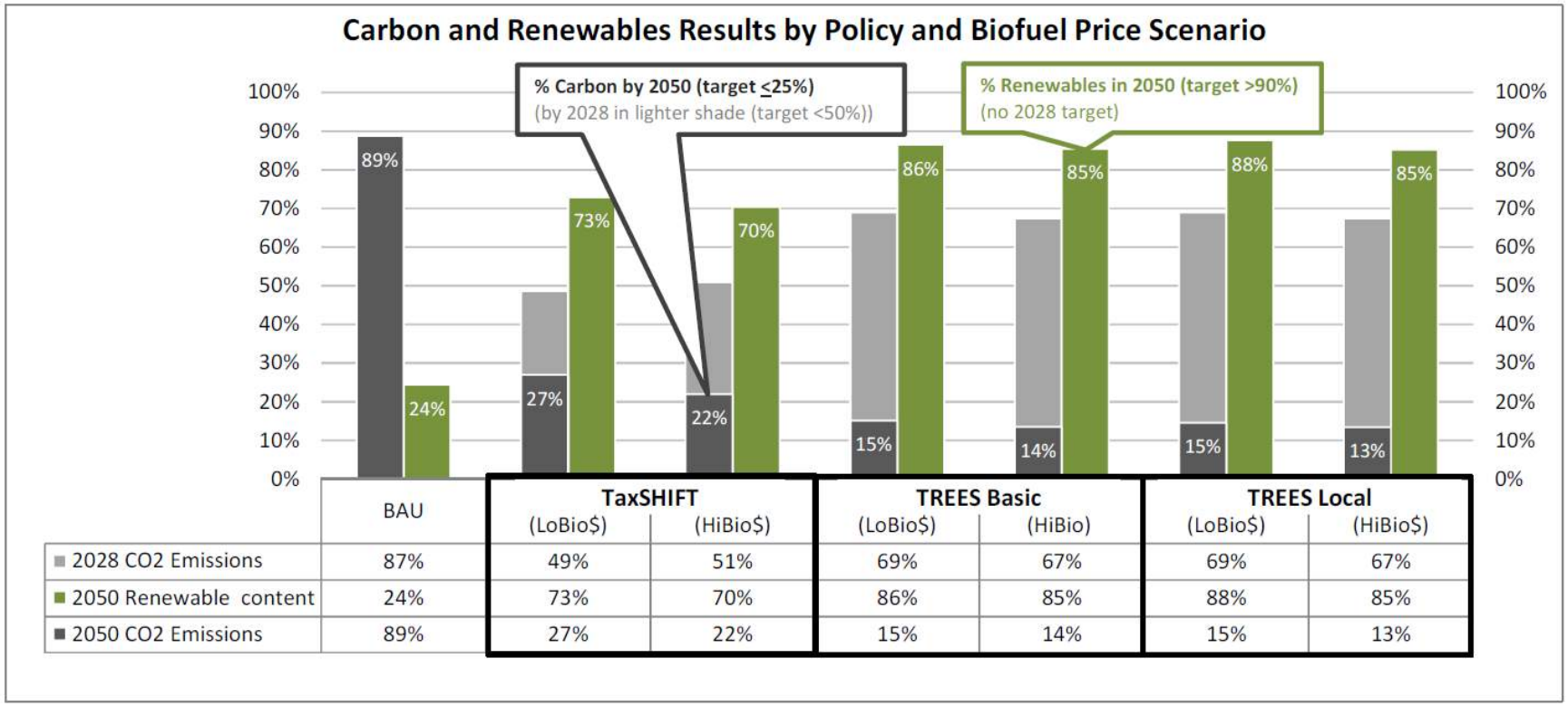
The technological path to 2050, under model assumptions, depends strongly on the price and availability at scale of low-carbon liquid biofuels

- If **yes**: VT can use existing infrastructure with a cleaner fuel
- If **no**: More infrastructure change for electrification and more use of solid biomass (heat pumps, EVs, pellet and wood chip systems, etc.)

- Each modeled scenario has high availability ("low biofuel price") and low availability ("high bio price") flavors

- Economic impact: The low availability ("high bio") cases are more expensive, but also use more local energy resources (efficiency, biomass, electricity)

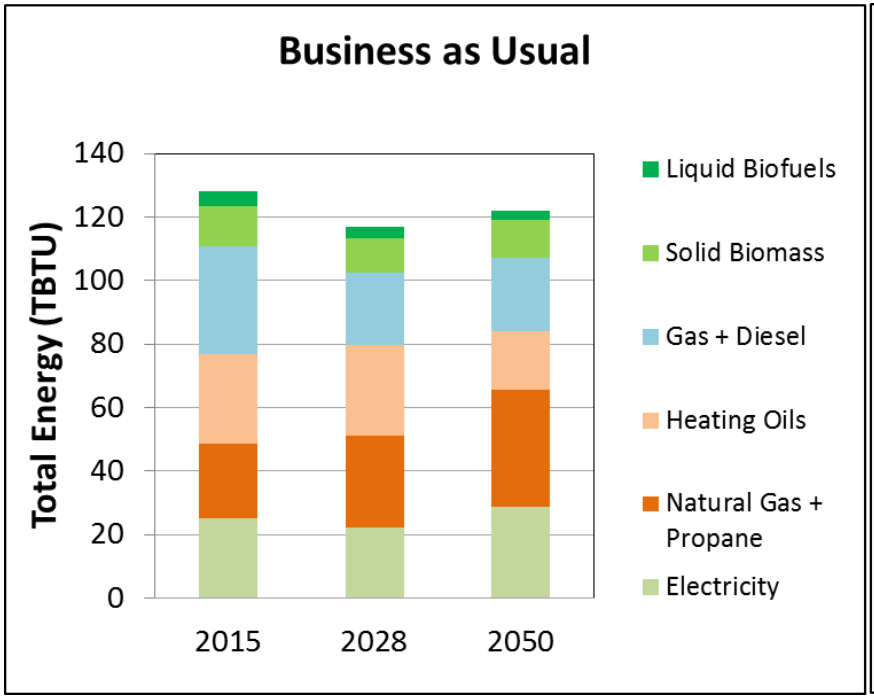
Meeting GHG and RE goals

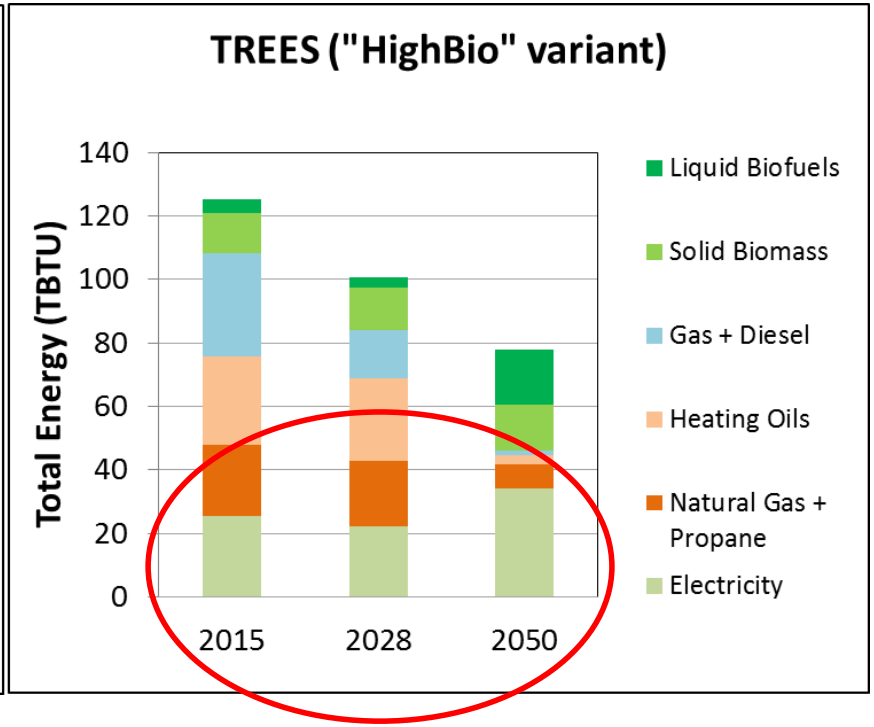


	BAU	TaxSHIFT (LoBio$)	TaxSHIFT (HiBio$)	TREES Basic (LoBio$)	TREES Basic (HiBio)	TREES Local (LoBio$)	TREES Local (HiBio$)
2028 CO2 Emissions	87%	49%	51%	69%	67%	69%	67%
2050 Renewable content	24%	73%	70%	86%	85%	88%	85%
2050 CO2 Emissions	89%	27%	22%	15%	14%	15%	13%

- All scenarios meet 2050 GHG goals
  - As modeled, TREES does not meet 2028 GHG goal
- Carbon Tax Shift alone does not approach 90% RE by 2050

Total Energy – BAU vs. an example policy case





A caveat: This is a **model**, not a forecast. It doesn't capture detailed limitations, but can be used for insights on scale and direction

Energy sector costs

POLICY OPTION	COSTS			
	% change re: BAU		$/ton	
BIOFUEL PRICES:	LOW	HIGH	LOW	HIGH
Tax Shift	2.6%	4.5%	$42	$67
TREES Basic	2.2%	5.4%	$38	$89
TREES Local	3.3%	5.5%	$56	$90

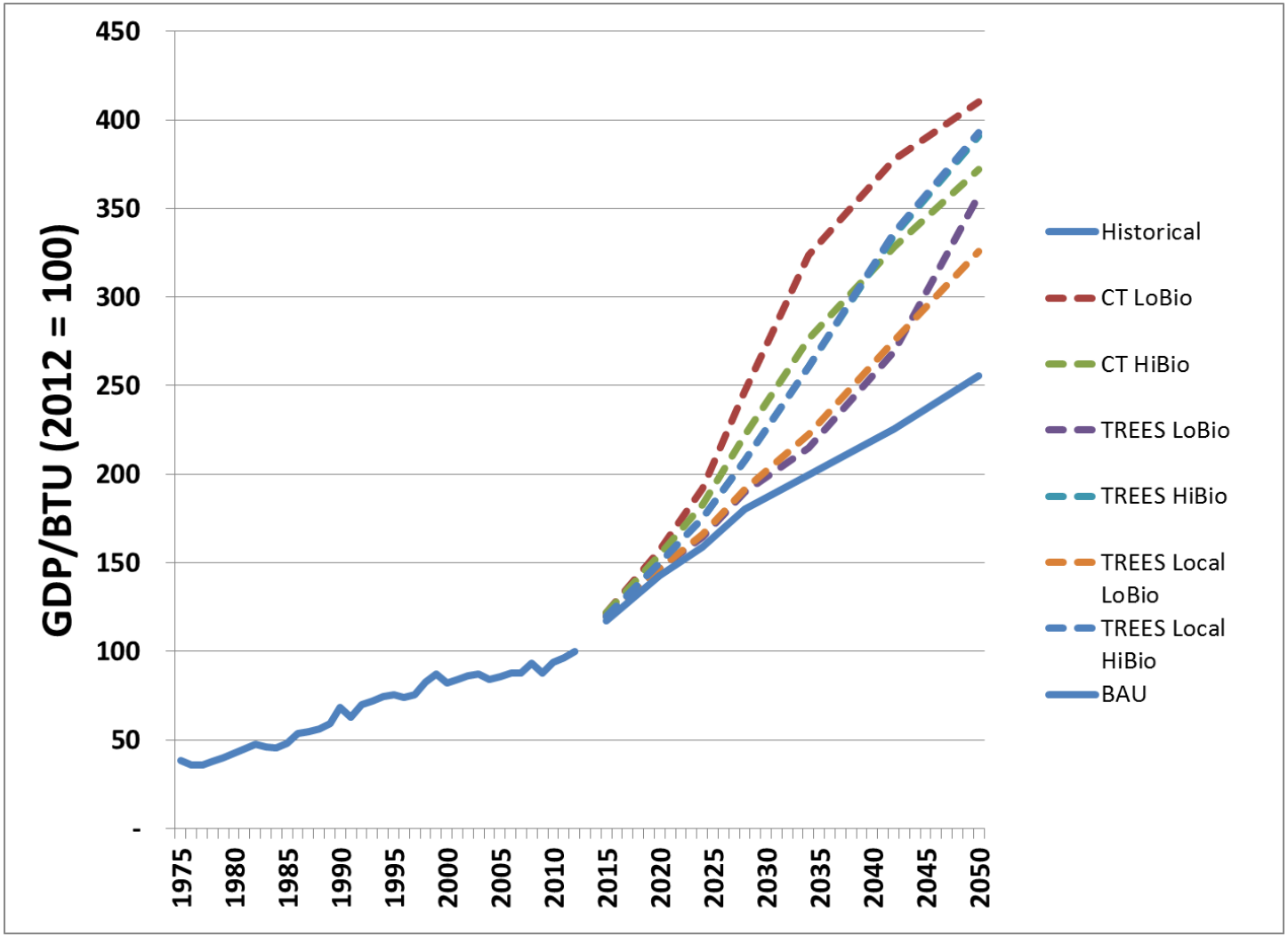
4 conclusions from economic modeling

1. The net economic impacts of implementation of any of the policies examined here are likely to be positive if the policies are designed and implemented well.
2. If other jurisdictions also take strong action to reduce GHG emission and adopt renewable energy alongside Vermont, the net impact of these policies in Vermont is more positive.
3. The net economic impacts are expected to be small on the scale of the Vermont economy.
4. The clean energy sector is likely to thrive if these policies are implemented.

Well-implemented policies result in economic and employment growth

	Gross State Product				Employment
Scenario	2015-2025	2025-2035	2035-2050	2015-2050	2015-2050
Carbon Tax Shift: High Bio	+0.17%	+0.87%	+0.83%	+0.69%	+1.26%
Carbon Tax Shift: Low Bio	+0.08%	+0.15%	+0.32%	+0.23%	+0.44%
TREES Basic: High Bio	+0.03%	+0.70%	+0.53%	+0.45%	+0.90%
TREES Basic: Low Bio	+0.11%	+0.11%	+0.34%	+0.23%	+0.45%
TREES Local: High Bio	+0.09%	+0.58%	+0.58%	+0.47%	+0.85%
TREES Local: Low Bio	+0.11%	+0.13%	+0.40%	+0.27%	+0.51%

Energy productivity up 27-60% over BAU



The importance of working together

Global climate objectives can only be met if all jurisdictions take action. And net economic impacts for states that act are better if everyone acts.

	Together		Alone	
	Δ GSP	Δ Jobs	Δ GSP	Δ Jobs
Carbon Tax Shift: High Bio	+0.69%	+1.26%	+0.28%	+0.41%
Carbon Tax Shift: Low Bio	+0.23%	+0.44%	+0.26%	+0.36%
TREES Basic: High Bio	+0.45%	+0.90%	-0.14%	-0.32%
TREES Basic: Low Bio	+0.23%	+0.45%	+0.17%	+0.39%
TREES Local: High Bio	+0.47%	+0.85%	-0.24%	+0.06%
TREES Local: Low Bio	+0.27%	+0.38%	+0.13%	+0.38%

Technological pillars of the transformation

1. Energy efficiency
2. Fuel- and mode-switching
3. Renewable energy supply

Complementary policies

A “market-based” carbon tax or TREES policy can be aided by three other kinds of policies:

- Information and access
  - Including technical assistance and access to capital
- Strategic investment
  - For example, CEDF’s fostering of digesters, solar PV, and pellets
- Codes and standards
  - Such as building codes, CAFE, land use, and appliance standards

In conclusion…

Vermont can achieve its greenhouse gas emission reduction goals and its renewable energy goals while maintaining or increasing Vermont's economic prosperity. However, to do so will require significant changes in energy policy, fuel supply, infrastructure, and technology.

To the CEP

- The TES provides some insights, but raises more questions
- We need more analysis, input, and answers to design and implement particular policies
- Thankfully, we have another process, starting this winter, to examine these issues comprehensively!
- **Please engage in the Comprehensive Energy Planning process between now and the end of 2015**
  - **Expect opportunities for both written comments and in-person discussion throughout 2015**

Thank you. Questions?

Total Energy Study webpage:
http://publicservice.vermont.gov/publications/total_energy_study

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