Envisioning Pennsylvania's Energy Future

Report Webinar

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Delaware Riverkeeper Network

- The Delaware Riverkeeper Network (DRN) was founded in 1988
- DRN is the only advocacy organization working throughout the four states of the Delaware River watershed and at the federal level to champion the rights of communities to a Delaware River and tributary streams that are free-flowing, clean, healthy, and abundant with a diversity of life.
- DRN's six inter-related program areas are: Advocacy, Awareness-to-Action, Habitat Restoration, Litigation, River Tech, and Water Watch.
- More information is available at www.delawareriverkeeper.org

Synapse Energy Economics and EQ Research

Synapse Energy Economics

- Founded in 1996 by CEO Bruce Biewald
- Leader for public interest and government clients in providing rigorous analysis of the electric power sector
- Staff of 30 includes experts in energy and environmental economics and environmental compliance

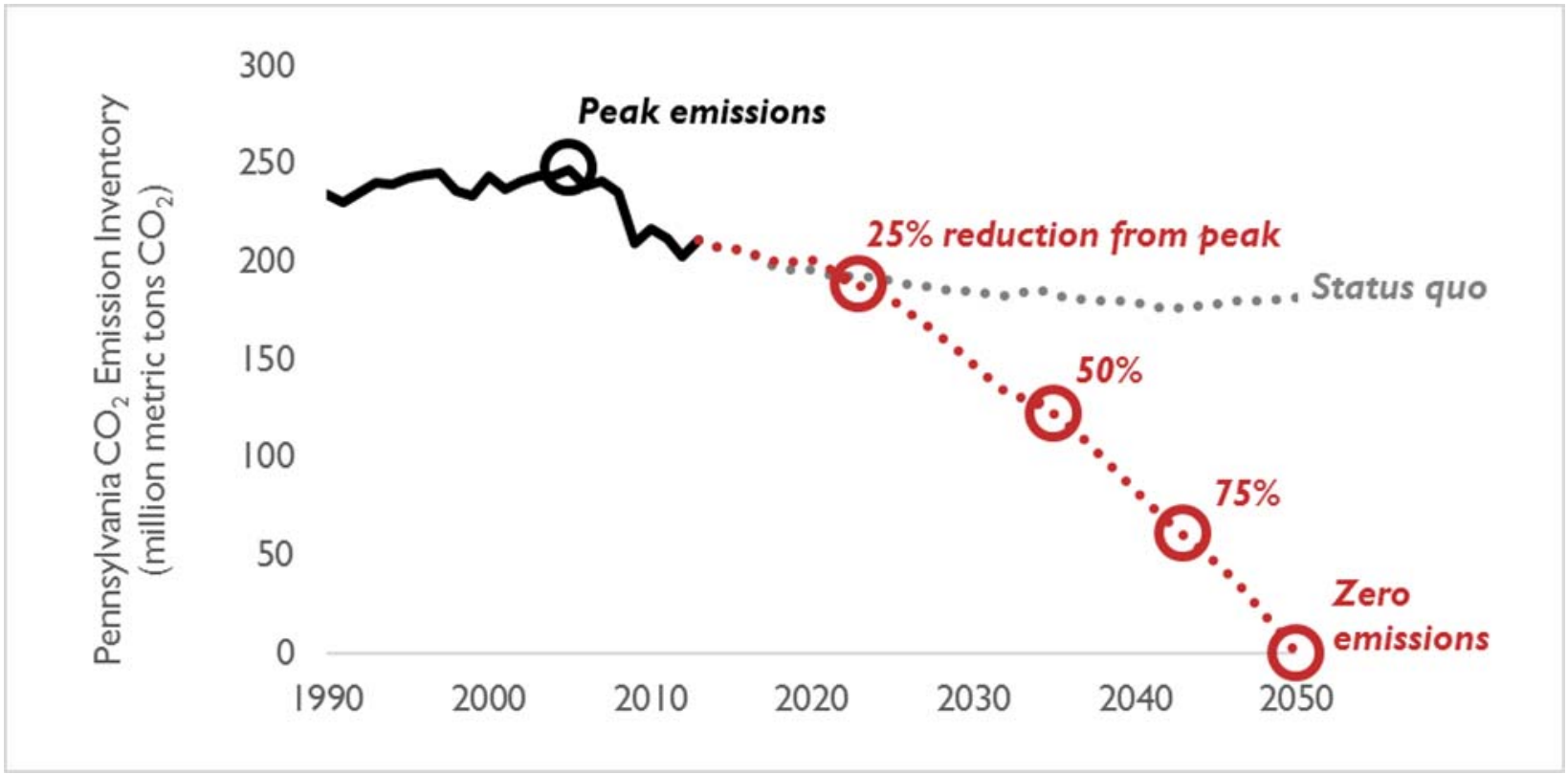
EQ Research

- Provider of policy research, analysis, and incentives data services to businesses, non-profits, and other clean-energy stakeholders
- Diverse expertise in state clean energy policies and programs

Envisioning Pennsylvania's Energy Future

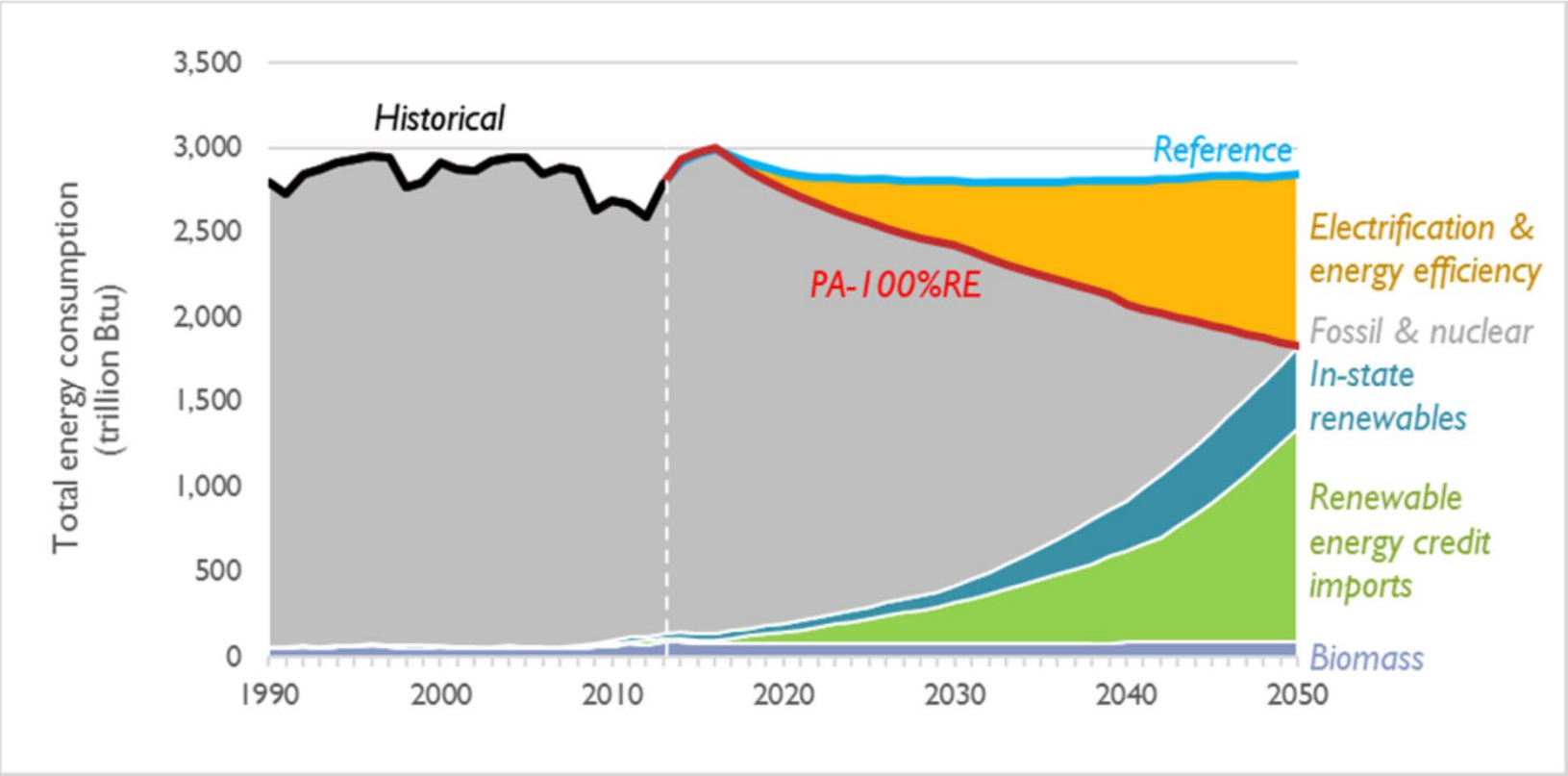
- This report examines a set of policies that result in zero CO_2 emissions by 2050 from Pennsylvania consumers
- Outlines plans for:
  - Broader electrification
  - Increased investment in renewables
  - Improvements to energy efficiency
- Offers guidance for developing a clean energy future in Pennsylvania that can serve as a model for states around the country
- The 100% renewable scenario would result in:
  - Energy savings of $134 billion from 2015 to 2050
  - $9 billion in electric bill and fuel cost savings in 2050 alone
  - A net increase of nearly 500,000 jobs over the same period

Pennsylvania's path forward to zero emissions



Pennsylvania's CO_2 emissions inventory reaches zero million metric tons by 2050.

Energy consumption in Pennsylvania



Electrification and energy efficiency reduce energy use in the policy case, called "PA-100%RE," compared to the Reference case. In-state renewables and renewable imports ensure the remaining energy use is carbon-free.

Current landscape

Current regulations

Energy Efficiency

Energy Efficiency Resource Standard (EERS): Cumulative 2017-2021 savings of 5.7 million MWh (3.67% of 2010 sales)

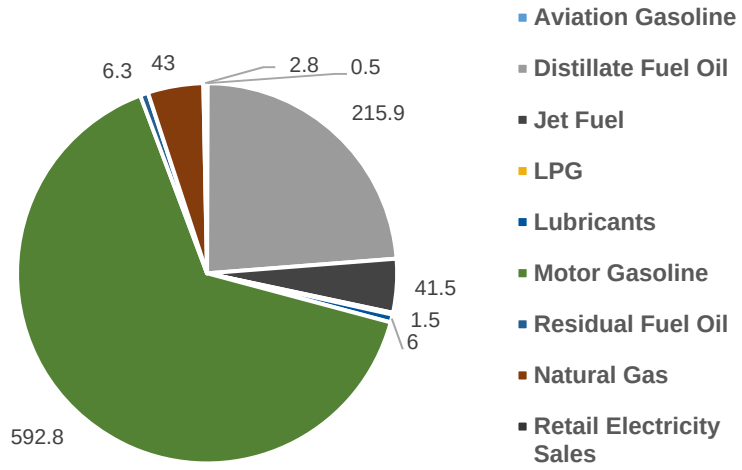
Renewable Energy

- Alternative Energy Portfolio Standard: 18% of retail sales from "alternative energy" by 2021; 0.5% from PV
- Net Metering (A) & Interconnection (B) under Freeing the Grid 2015

2.5 Times Reference Scenario

33 Times 2014 %

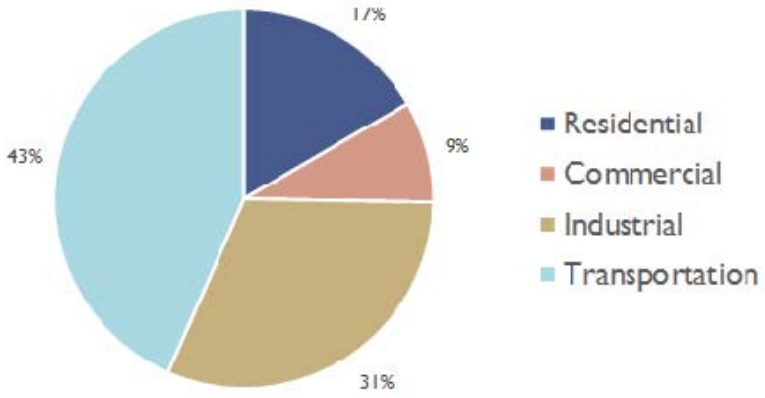
Current landscape



Transportation (trillion BTUs)

Current regulations

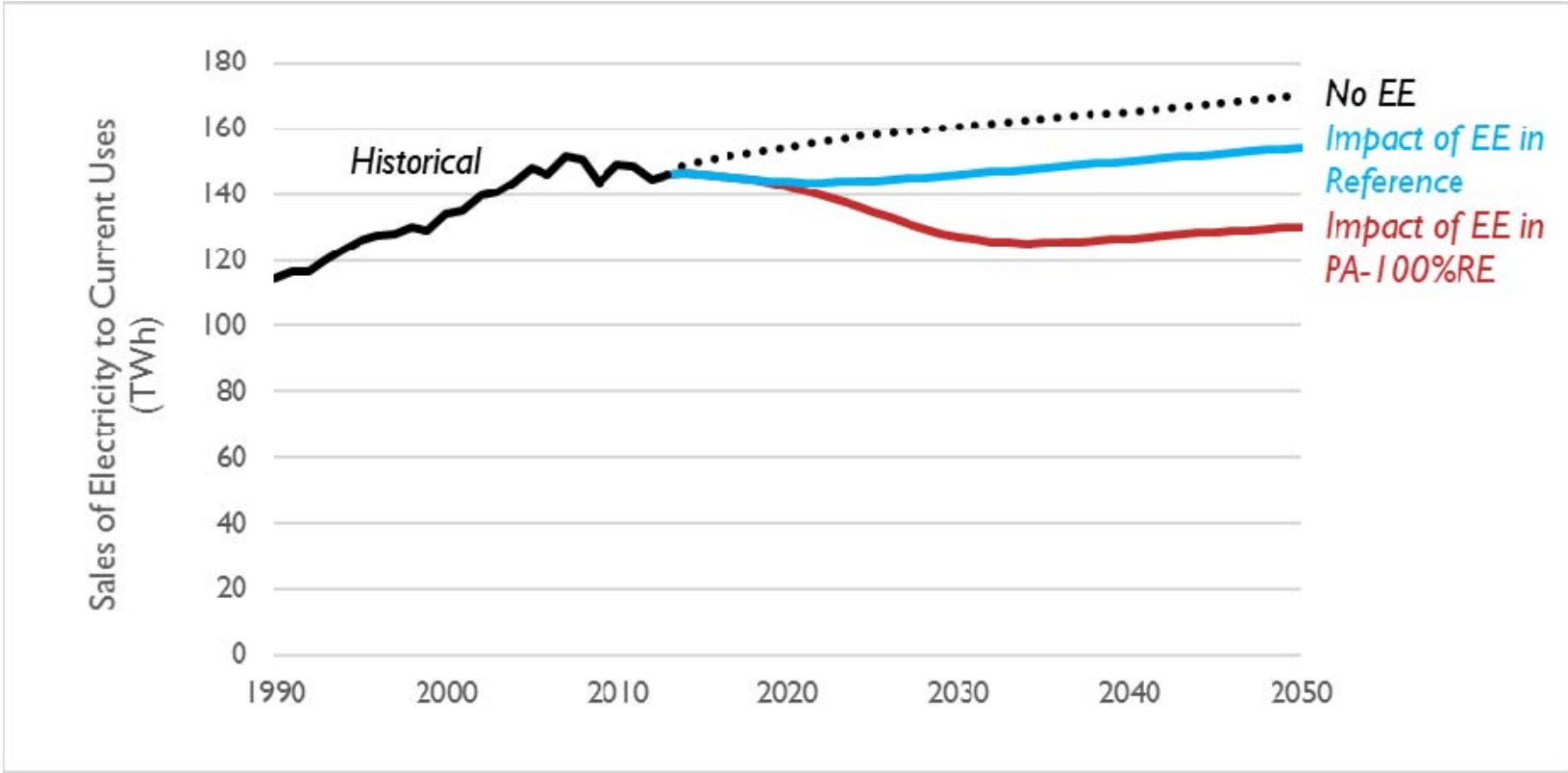
- Only minor alternative fuels incentives and grant programs
- Emission standards



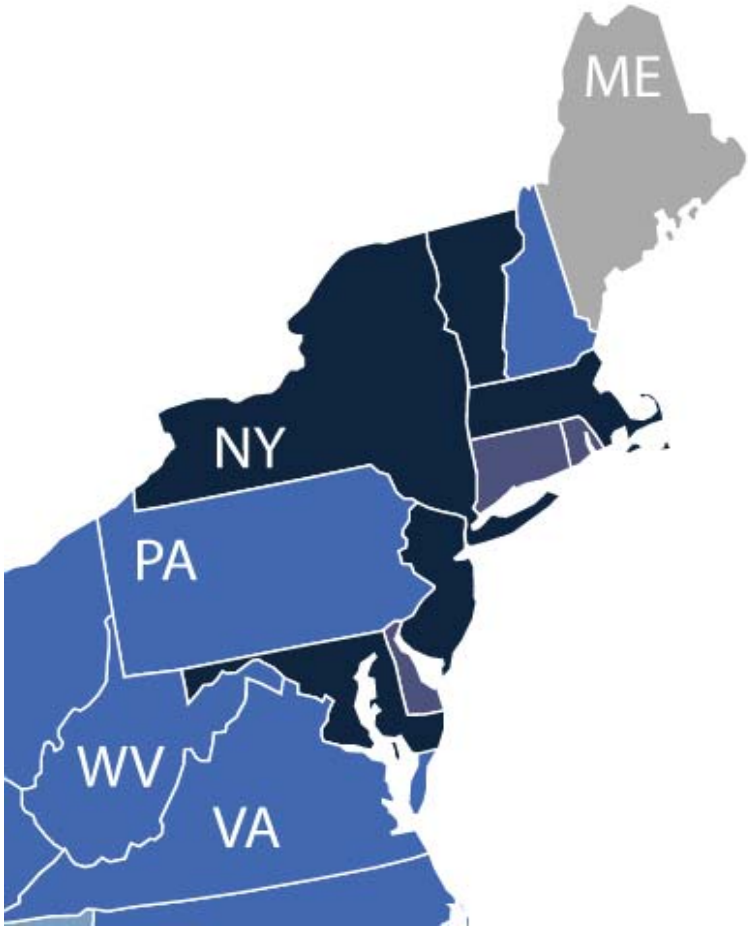
Electrification

Indirect via EERS; some EERS program incentives counter-productive

Energy efficiency reduces the need for electricity



Bolstered energy efficiency programs reduce sales to existing end uses by 14 percentage points, compared to the Reference case.



Meets or exceeds the **2015 IECC** or equivalent

Meets or exceeds the **2012 IECC** or equivalent

Meets or exceeds the **2009 IECC** or equivalent

Meets or exceeds the **2006 IECC** or equivalent

No statewide code or predates the 2006 IECC

Source: Building Codes Assistance Project, "Residential Code Status"

Energy efficiency

Energy Efficiency Resource Standard

- Increase to 3% annual incremental savings
- Broaden to include all PA utilities

Building Energy Codes

- Update code to 2015 IECC
- Promote Green building codes

Other Policy Mechanisms

- Appliance standards
- Financing programs
- Building energy disclosure

Photo credit: Lydia, "Electricity pylon" from http://bit.ly/2e0aoF5. CC BY 2.0

Energy efficiency

Electric Industry Policies

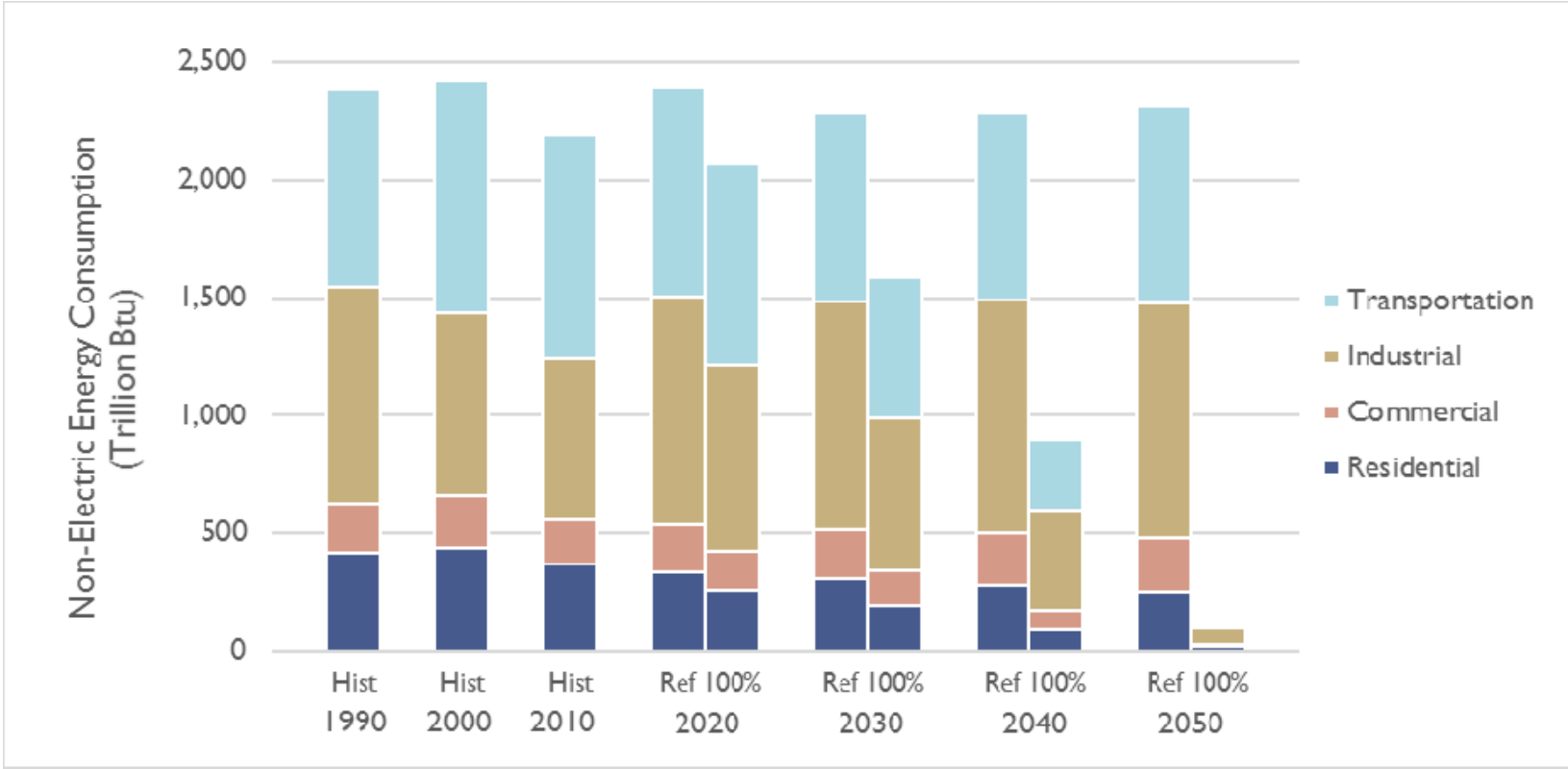
Incentivize end-users

- Inclining block rates
- Reduced fixed charges

Incentivize electric utilities

- Energy efficiency as a priority resource
- Decoupling
- Performance-based ratemaking

Electrifying end uses



End uses in the transportation, industrial, commercial, and residential sectors (such as cars, trucks, space heating, and water heating) are fully electrified by the year 2050.

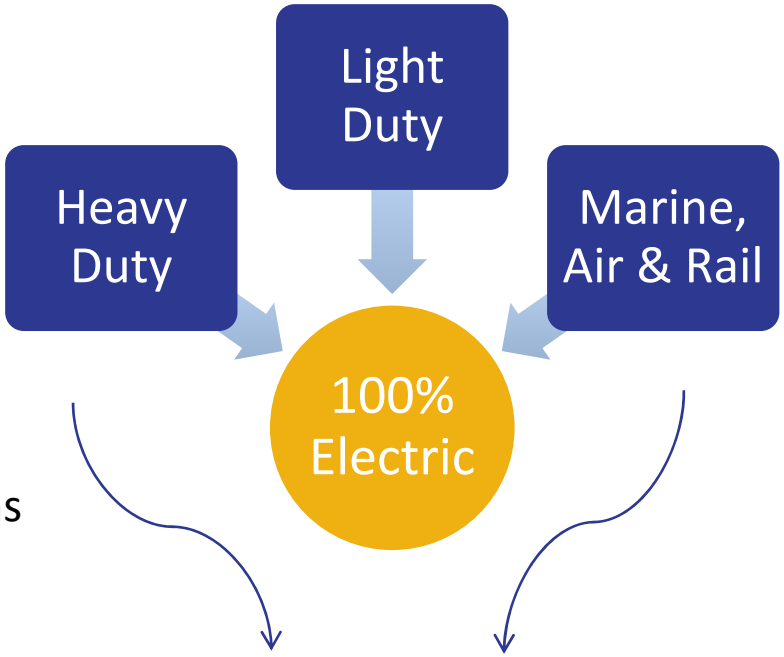
Total electrification by 2050

	2020	2030	2040	2050
Transition of motor gasoline powered vehicles	4%	33%	75%	100%
Transition of non-gasoline powered vehicles (electric vehicles)	2%	15%	50%	100%
Transition of planes (hydrogen fuel cell vehicles)	0%	0%	50%	100%
Transition of heating to heat pumps (residential and commercial)	25%	40%	75%	100%
Transition of water heating (residential and commerical)	35%	45%	80%	100%
Other electrification (residential and commercial)	2%	15%	50%	100%
Industrial amenable to electrification	20%	36%	61%	100%

Transportation, industrial, commercial, and residential sectors (such as cars, trucks, space heating, and water heating) rapidly electrify between 2020 and 2050. A scale of this change requires substantial planning.

Transportation policy tools

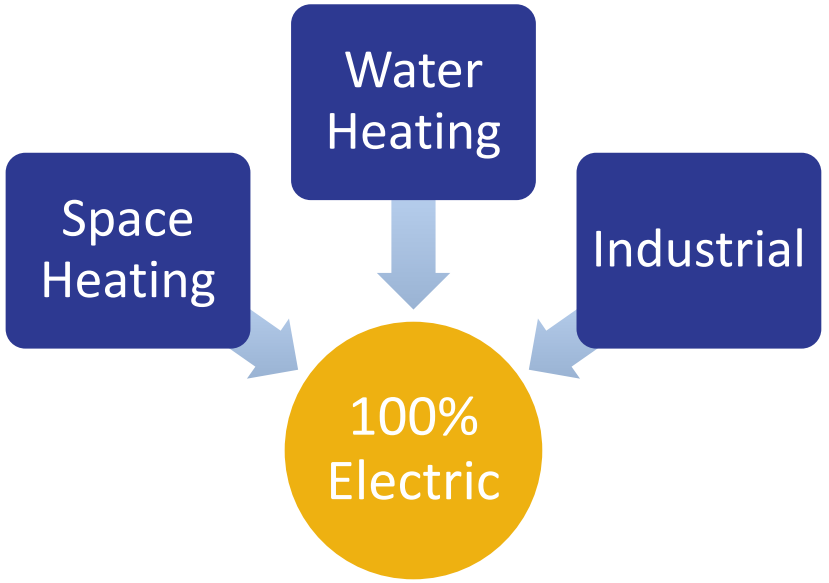
Financial Incentives	Tax credits/exemptions, grants, loans, rebates
Convenience Incentives	HOV lanes, EV parking spaces, free parking
Taxes	Gas taxes, etc.
Vehicle Standards	Fuel efficiency and emissions standards, EV goals, combustion engine bans
Infrastructure Requirements	EV charging infrastructure requirements
Regulatory Changes	Smart grid, rate design, building codes, permitting



Technologic advancements necessary; auxiliary electric in the near term

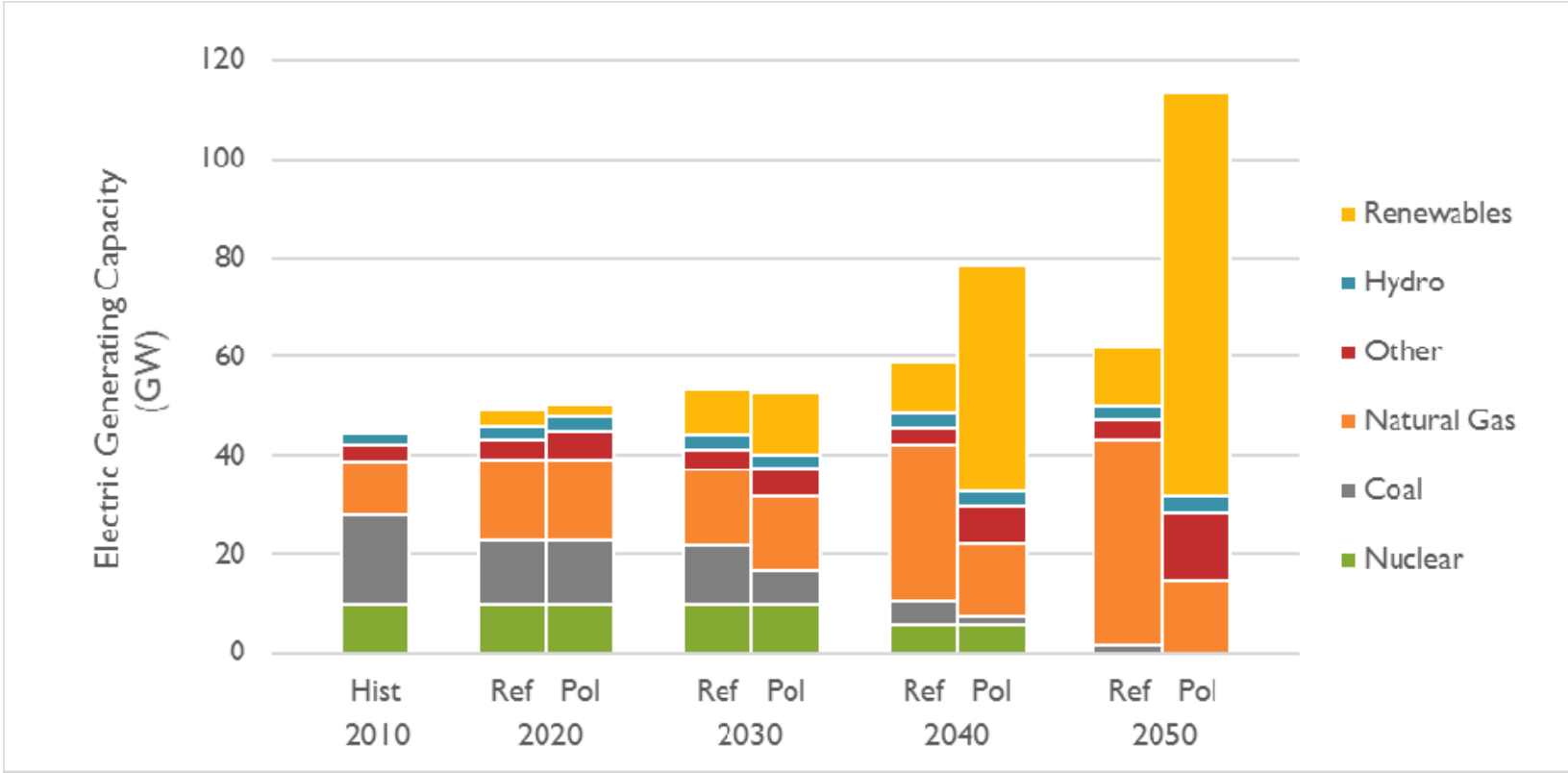
End-use electrification policy tool

Sector	End Use	Electrification/Renewable Opportunities
Residential and Commercial	Heating	Electric heat pumps (ground-, air-, or water-source) Electric resistance heating Building insulation and high-efficiency windows
	Water heating	Heat pump water heating Solar water heating
	Other	
	Clothes Drying	Electric clothes dryer
	Cooking	Electric induction or resistance-heating
	Yard and Landscaping	Electric or push lawnmower; native landscaping
	Backup generation	Solar + storage
Industrial	High-temperature industrial process heating	Electric arc furnaces Induction furnaces Dielectric heaters Resistance heaters Combusted electrolytic hydrogen



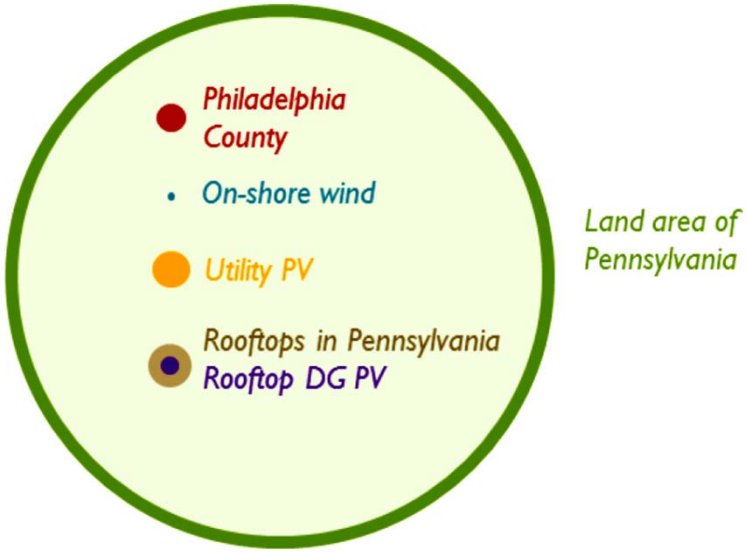
- Eliminate policy/incentive conflicts
- Align tax policy support
- Electric ratemaking
- Technological innovation

New renewables mean cleaner energy



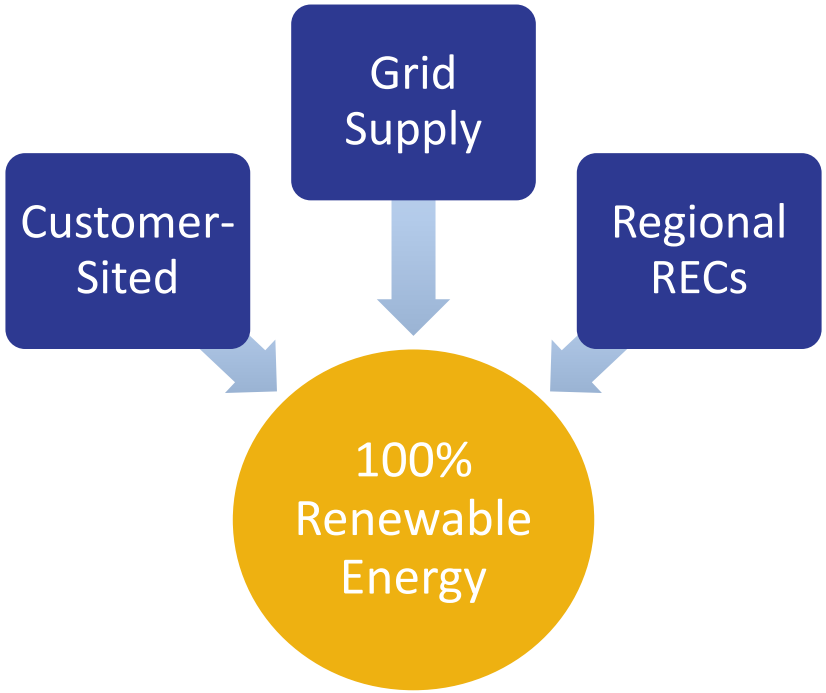
In the "PA-100%RE" case, Pennsylvania's renewable portfolio standard is powered by 81 GW of in-state wind and solar and 138 GW of wind and solar built in nearby states.

Land area requirements



- *The land required for this build-out of new renewable resources is considerable, but small compared to total land in the state*
- *Dot sizes represent relative sizes of land areas required for installations*

Renewable energy expansion



In-State Development

- Pro-active planning to support renewable energy development (e.g., interconnection, permitting, grid modernization)
- Elimination of embedded fossil fuel subsidies or preferences
- Distributed generation-supportive ratemaking

Regional RECs

- Regional procurement adds needed flexibility
- Tide that “raises all ships”

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PA's emissions inventory

IN	OUT
CO_2 emissions	Non-CO_2 greenhouse gases
from	and
Fossil fuel combustion	"Upstream" emissions
underlying	and
Energy	Non-energy emissions
created for	and
Consumption in Pennsylvania	Production in Pennsylvania