
MEMORANDUM

TO: City of Olympia City Council
FROM: Clean Energy Transition and Stockholm Environment Institute
RE: Methodology for Energy Mapping, Goal-Setting, and Carbon Wedge Analysis
DATE: March 6, 2017

This memo provides background for the City of Olympia on the methodology that the Clean Energy Transition and Stockholm Environment Institute team used to create the City of Olympia's Energy Map and Carbon Wedge Analysis, which are designed to help the city officials and staff understand how to achieve meaningful greenhouse gas emissions reductions by the year 2030.

Olympia Energy Map

To produce the Olympia Energy Map, we used vehicle miles traveled data for transportation obtained from Thurston Regional Planning Council; electricity and natural gas consumption for commercial, residential, and industrial uses obtained from Puget Sound Energy; and projected population growth provided by the City of Olympia's staff.

Recommended Target

We recommend that the City of Olympia aim to achieve **50% reduction below the 2014 level by 2030**. Using this frame for the Olympia Carbon Wedge analysis has several advantages:

1. It is aligned with targets of [other jurisdictions](#) in Puget Sound.
2. 2030 is a practical time horizon to guide the City's action planning.
3. The Intergovernmental Panel on Climate Change has concluded that global investments in low-carbon infrastructure must increase dramatically in the coming 15 years, therefore between now and the year 2030 to limit climate change impacts.

Carbon Wedge Analysis

The Olympia Carbon Wedge Analysis graphics show reduction scenarios for achieving a 50% reduction target in 2030 relative to emissions in 2014. We applied existing laws, as well as suggested carbon reduction scenarios in Olympia's Carbon Wedge analysis.

Analysis of Existing Laws and Policies

We estimated the order-of-magnitude carbon emissions reduction by the year 2030 associated with the following three existing federal and state policies and laws:

- **Federal Corporate Average Fuel Economy (CAFE) standard:** The U.S. Energy Information Administration predicts that the U.S. vehicle fleet will achieve an average vehicle fuel efficiency of 27.3 miles per gallon in 2030 under current CAFE standards. This law is being implemented, but is under political pressure at the national level.
- **State Renewable Energy Standard:** 15% renewable energy and all cost-effective conservation by 2020 are to be achieved by Washington's largest utilities, including Puget Sound Energy (PSE).

This law is implemented but is under consideration for revision as 2020 approaches. In this analysis, we meet the renewable energy standard by assigning load growth to new renewable sources.

- **State of Washington Energy Code:** By state law, new residential and commercial buildings must achieve a 70% reduction in annual net energy consumption below 2006 levels by 2031. This law is being implemented but is under political pressure.

Analysis of Potential Carbon Reduction Strategies

We estimated carbon emissions reduction by 2030 associated with the following target areas, which we identified based on our review of national best practices; relevant State of Washington laws; local strategic climate action plans; extensive work with the cities of Issaquah, Shoreline, Kirkland, Tukwila, and Everett; and the Seattle Transportation Technical Advisory Group (TTAG) analysis conducted for the Seattle Climate Action Plan process.

- **Reduction in transportation carbon emissions by 2030 through: 1) community-wide vehicle miles traveled (VMT) reduction, 2) electric vehicle adoption, and 3) clean fuels/technologies.** For this target, we modeled several mechanisms that could reduce carbon emissions from transportation. These included reduced greenhouse gas intensity of transportation fuels and increased vehicle efficiency for internal combustion engine vehicles. We also considered a reduction in vehicle-miles traveled and an increase in the percentage of electric vehicles in Olympia’s vehicle fleet, the latter modeled on the ambitious electric vehicle adoption target enacted by the City of Seattle. These are the assumptions reflected in the Olympia carbon wedge analysis for transportation:
 - 10% reduction in transport fuel GHG intensity
 - 30% of all vehicles in Olympia are electric by 2030
 - Gas-powered cars are 10% more fuel efficient in 2030 than CAFE standards
 - 5% reduction in vehicle miles traveled in 2030 relative to baseline projections

- **Reduction in energy use (including both electricity and natural gas) for existing buildings community-wide by 2030.** We modeled building energy reductions to achieve by switching residential heating from natural gas to high-efficiency electric heat pumps and by performing more general commercial and residential building energy efficiency retrofits. Pursuing this target will involve deep partnership with building retrofit organizations. These are the assumptions reflected in the carbon wedge analysis for building energy emission reduction:
 - 20% of residential buildings with natural gas heat switch to high-efficiency electric heat pumps
 - 25% reduction in building energy use beyond 2030 state energy code

- **Electricity decarbonization to reduce reliance on coal and increase electricity generation from renewable sources.** We modeled a scenario in which electricity consumption from coal sources is reduced and replaced by electricity from renewable sources. Pursuing this target will involve partnering with Puget Sound Energy. These are the assumptions reflected in the carbon wedge analysis for decarbonizing electricity:
 - Shift from 27% (baseline projection) to 2% of electricity demand met by coal in 2030
 - Renewables substitute for reduced coal generation

- **Net zero emissions from new buildings community-wide by 2030.** Although we did not explicitly model a net-zero emissions new buildings scenario as a standalone wedge, our analysis comments on the importance of reducing energy consumption and emissions in new construction as a way to meet community emissions reduction goals, help the Puget Sound region move toward a low-carbon, low-cost fuel mix, and show regional leadership.

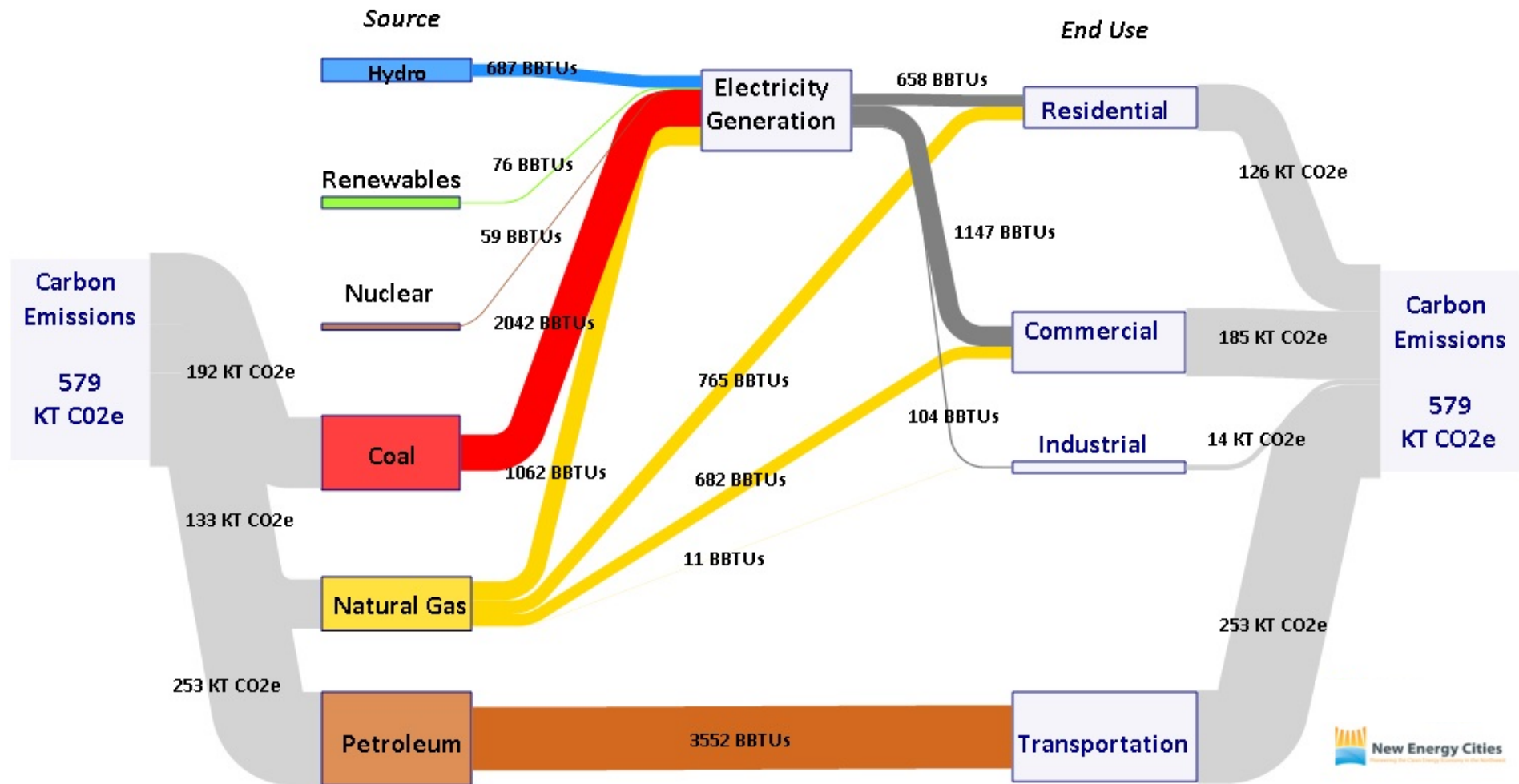
Our analysis drew as much as possible from existing resources, including state, regional, and local reports, plans, and policies.

Conclusion

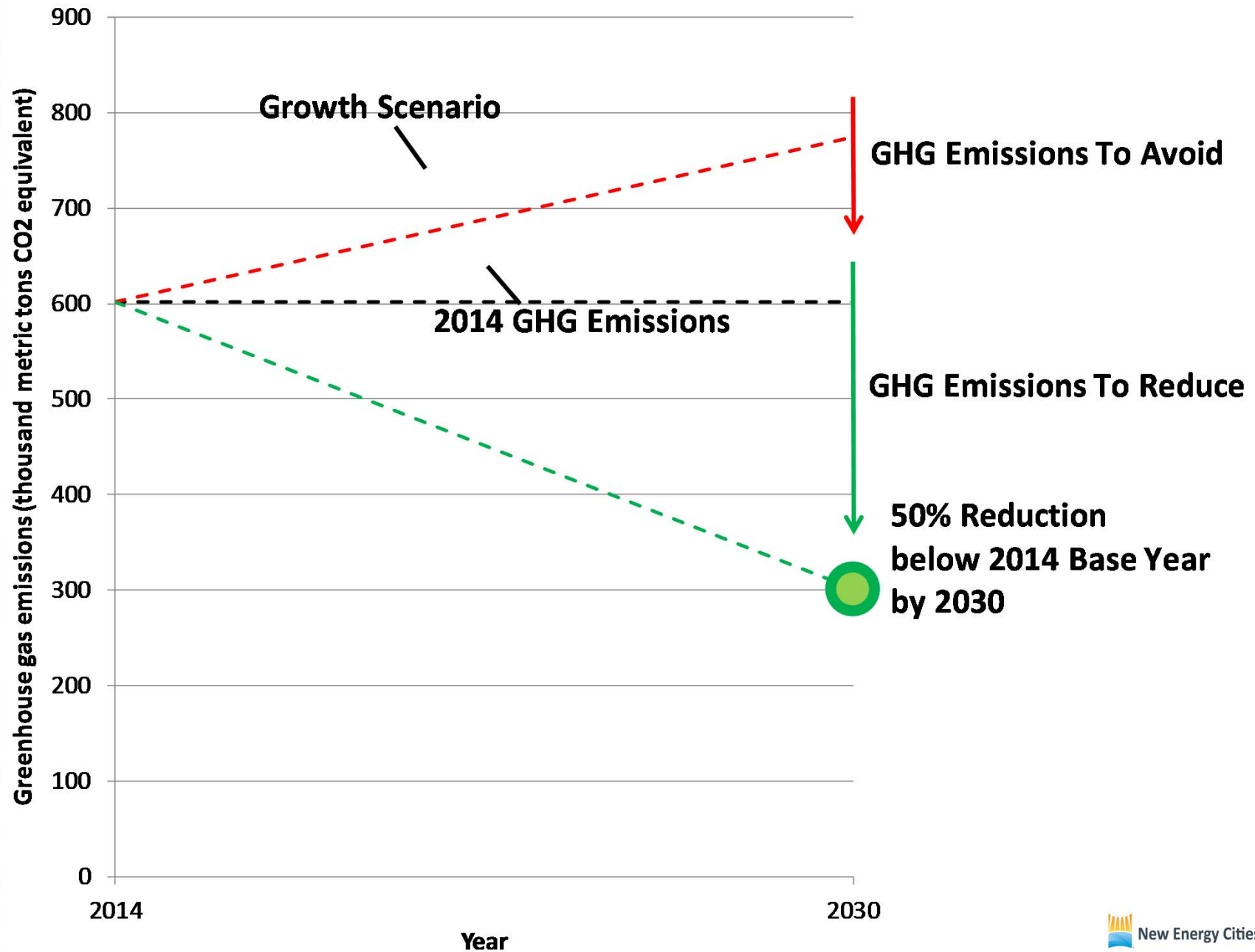
Clean Energy Transition and Stockholm Environment Institute developed the Olympia Energy Map and Carbon Wedge Analysis based on the above approach. We are excited by the opportunity that this project offers us to support a forward-looking city in its carbon reduction efforts, as well as to apply lessons from this work. Thank you for your leadership and partnership on greenhouse gas reduction in Olympia.

Olympia 2014 Energy and Carbon Footprint

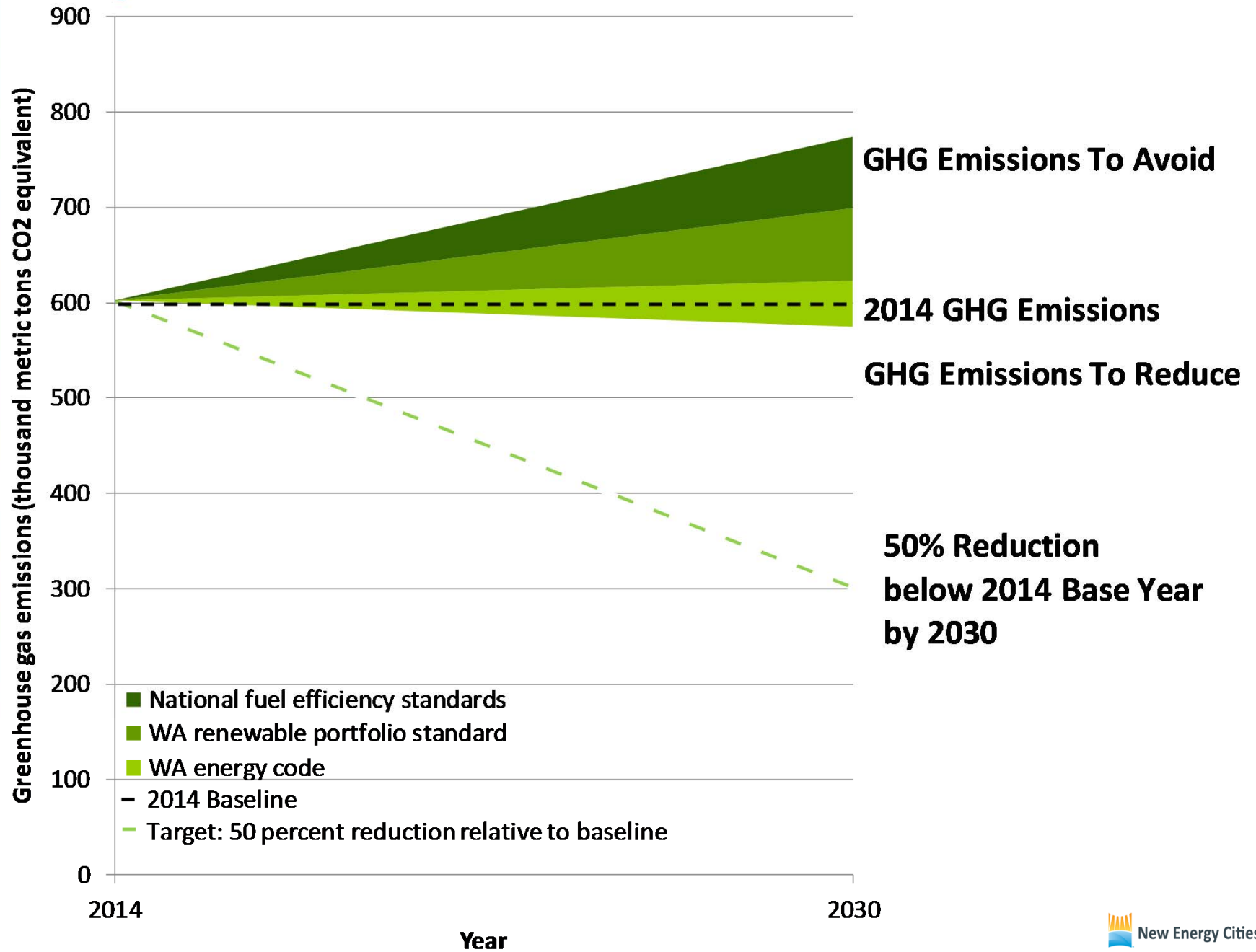
Estimated Olympia Energy Flow 2014



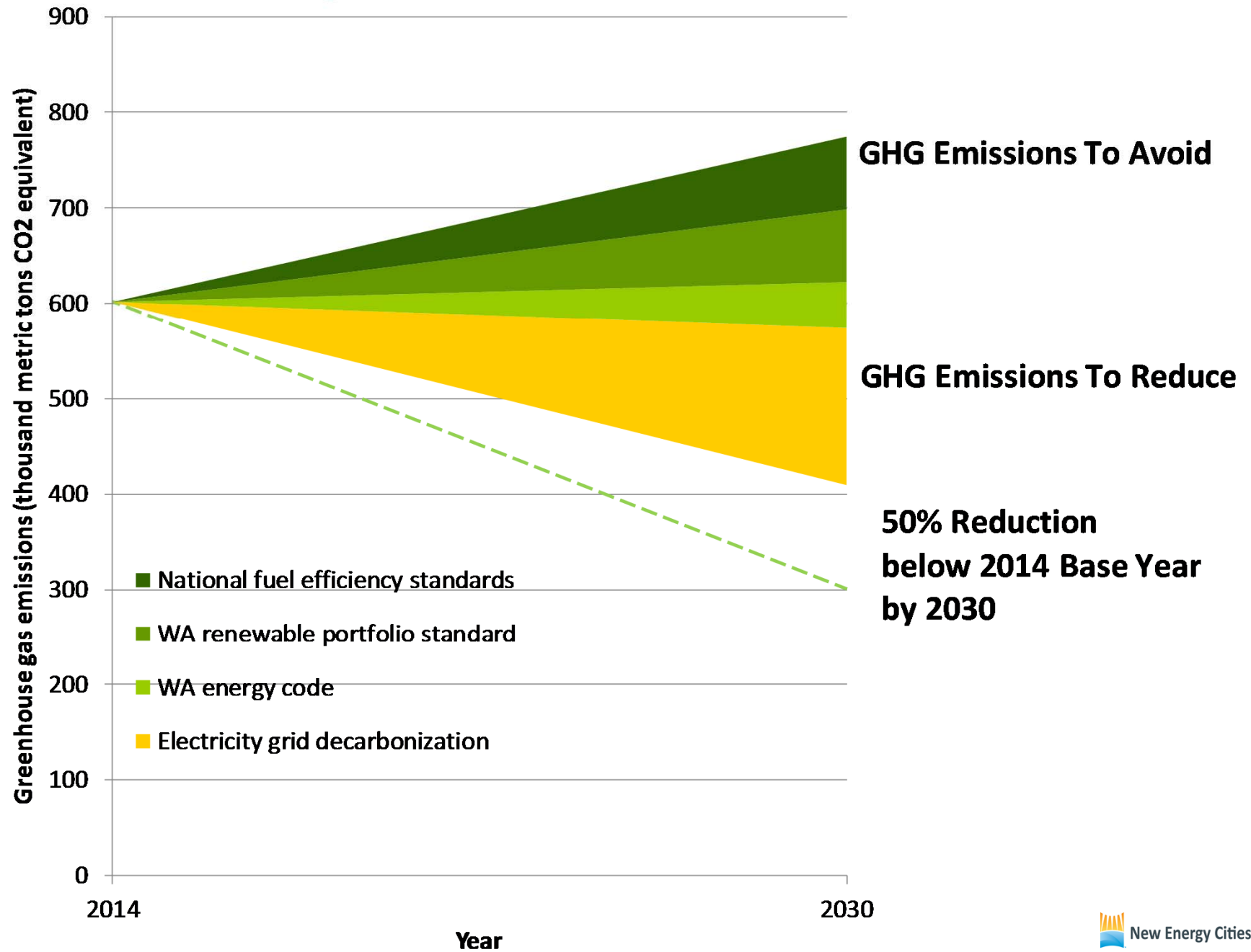
50 x 2030: What Will It Take?



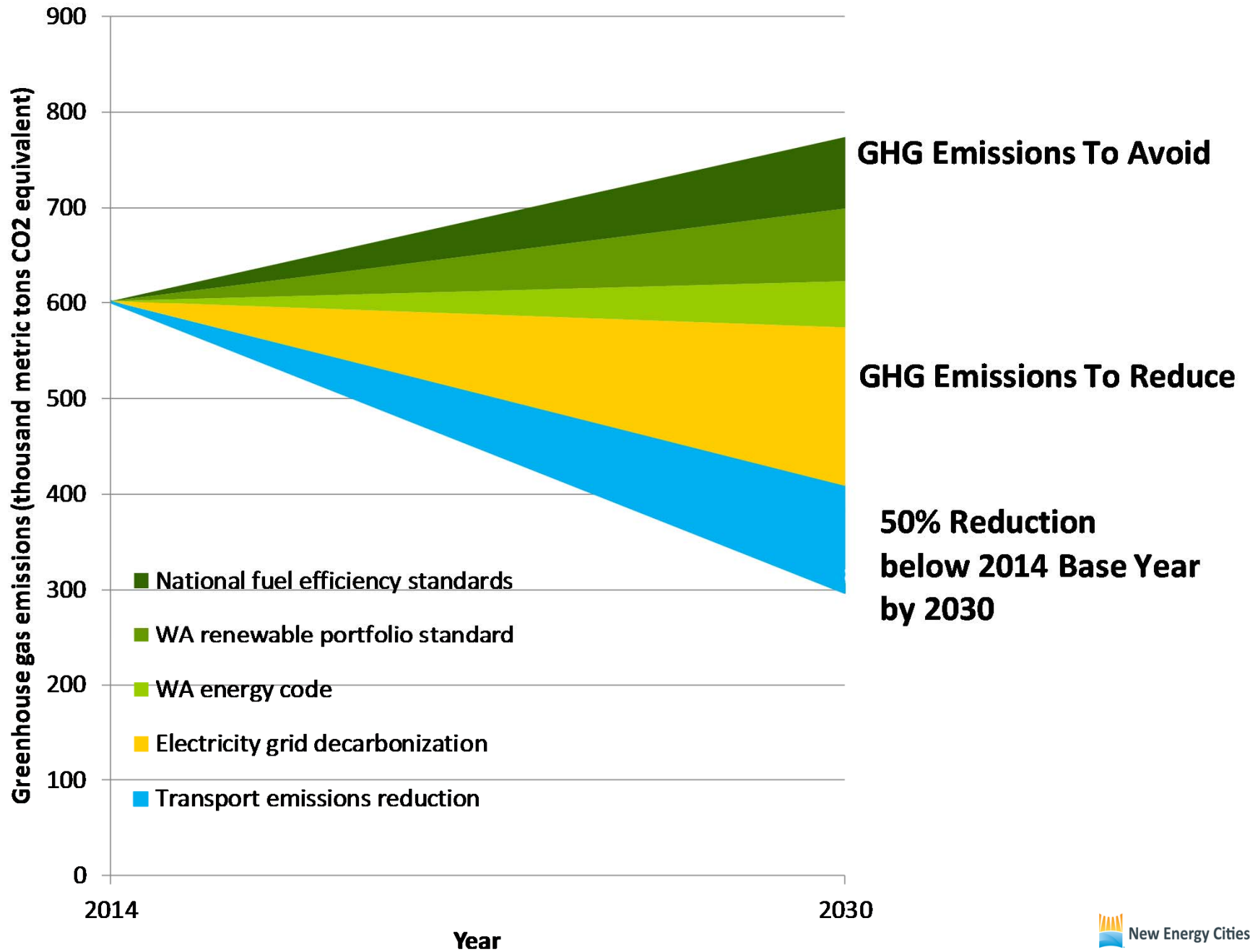
Impact of Federal and State Policies



Potential Targets to Meet 50 x 2030 Goal



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