Collective Energy and Carbon Emissions Projections for Three Largest Arizona Utilities

Prepared by: Arizona State University on behalf of the
Arizona Thrives Alliance

Team Members: William Armstrong, Gary Dirks, Nicole Hill, Jeffrey Burke, Chico Hunter, Josh Steiner, and Jeffrey Yockey

What this Report covers

- The three largest utilities (TEP, APS, and SRP) represent over 80% of electricity production for the state of Arizona.
- Measurements are by load and will account of electricity and associated emissions provided to Arizona electric customers including DG.
- Will include imported electricity from outside sources (such as Four Corners) but overall numbers will be lower than total Arizona power plant generation defined by IEA due to large net exports of electricity from Arizona.
- Projections were made prior to the Coronavirus pandemic
- There has been a substantial reduction in utility emissions since 2005 (projected to be over 30% in 2020) and more is planned.
- Data was provided by the utilities and processed by Arizona State University on behalf of Arizona Thrives to ensure data conformity and fairness.

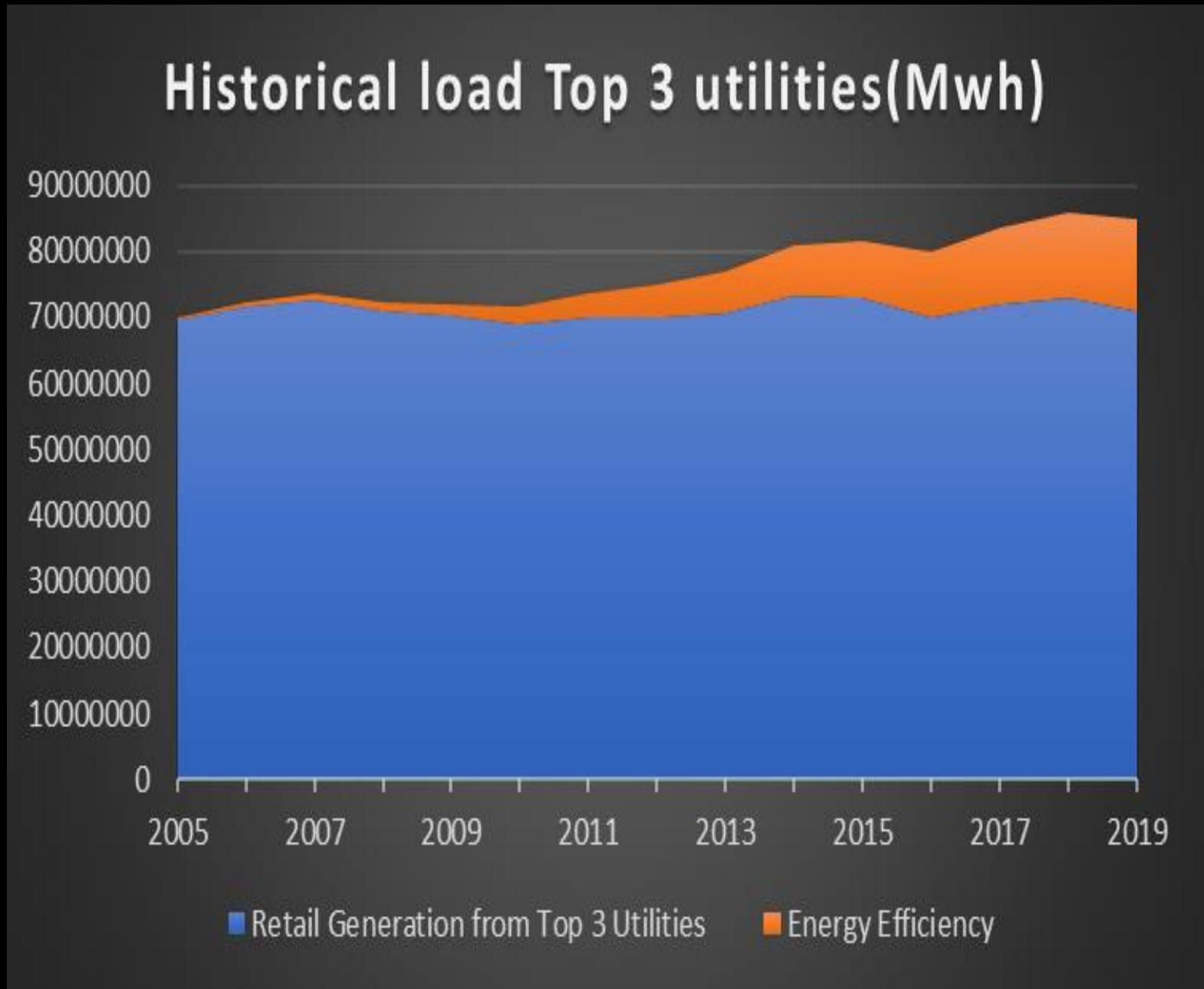
Historical load and energy efficiency

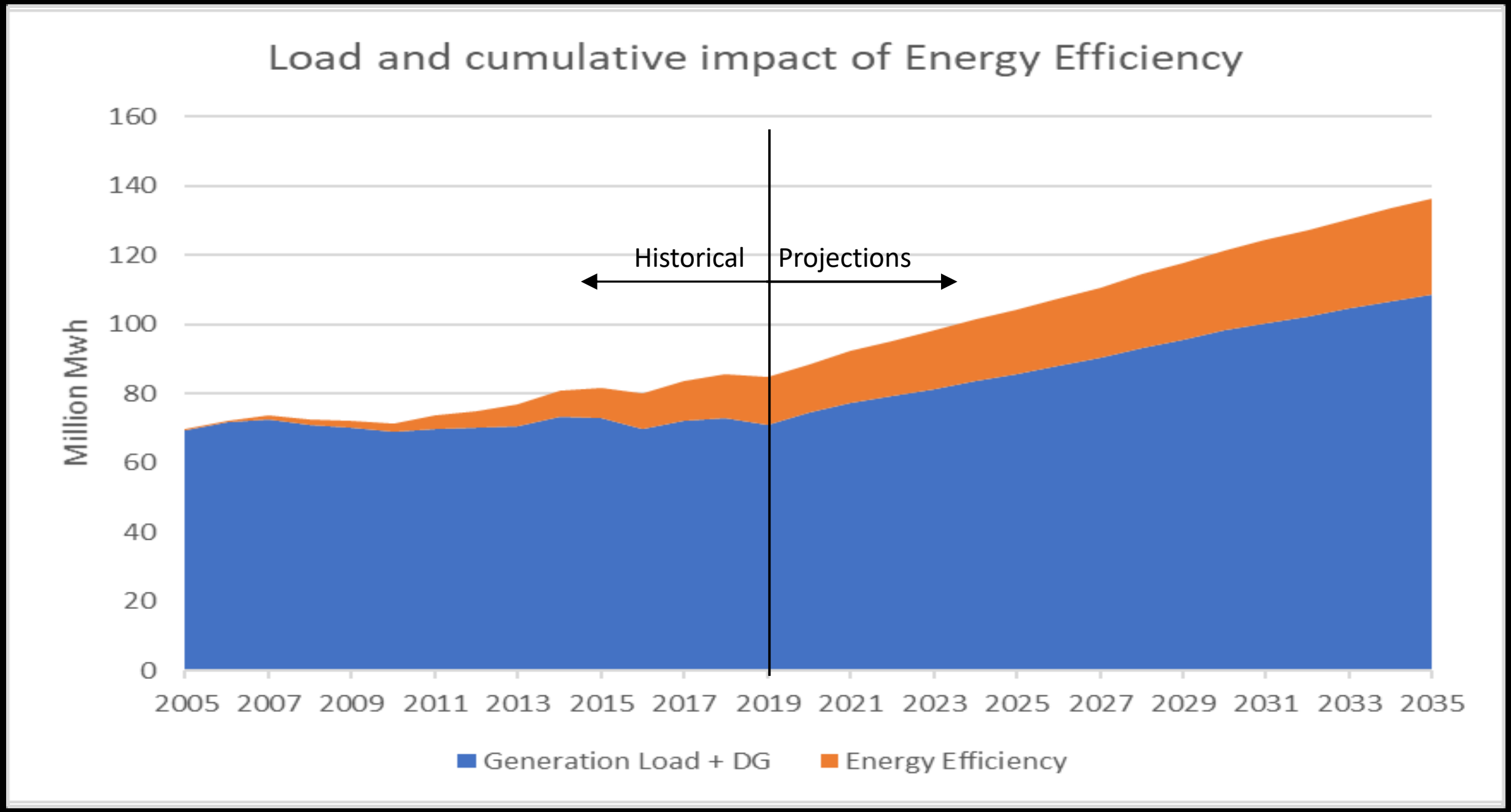
Historical data provided by APS, TEP, and SRP

This slide illustrates the cumulative impact of energy efficiency programs dating back to 2005 for SRP and APS, and to 2011 for TEP. Each utility has a separate method of calculating energy efficiency.

The current impact of energy efficiency efforts reported by the utilities is now equivalent to a savings of over 13 Million MWH annually.

Load growth has been modest over the last decade in part due to investments in energy efficiency, but all three utilities expect this to change in the future.




Load and cumulative impact of Energy Efficiency
160
140
120
100
80
60
40
20
0
Million Mwh
Historical
Projections
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
2025
2027
2029
2031
2033
2035
Generation Load + DG
Energy Efficiency

Load Forecast Assumptions

Utility Forecasts

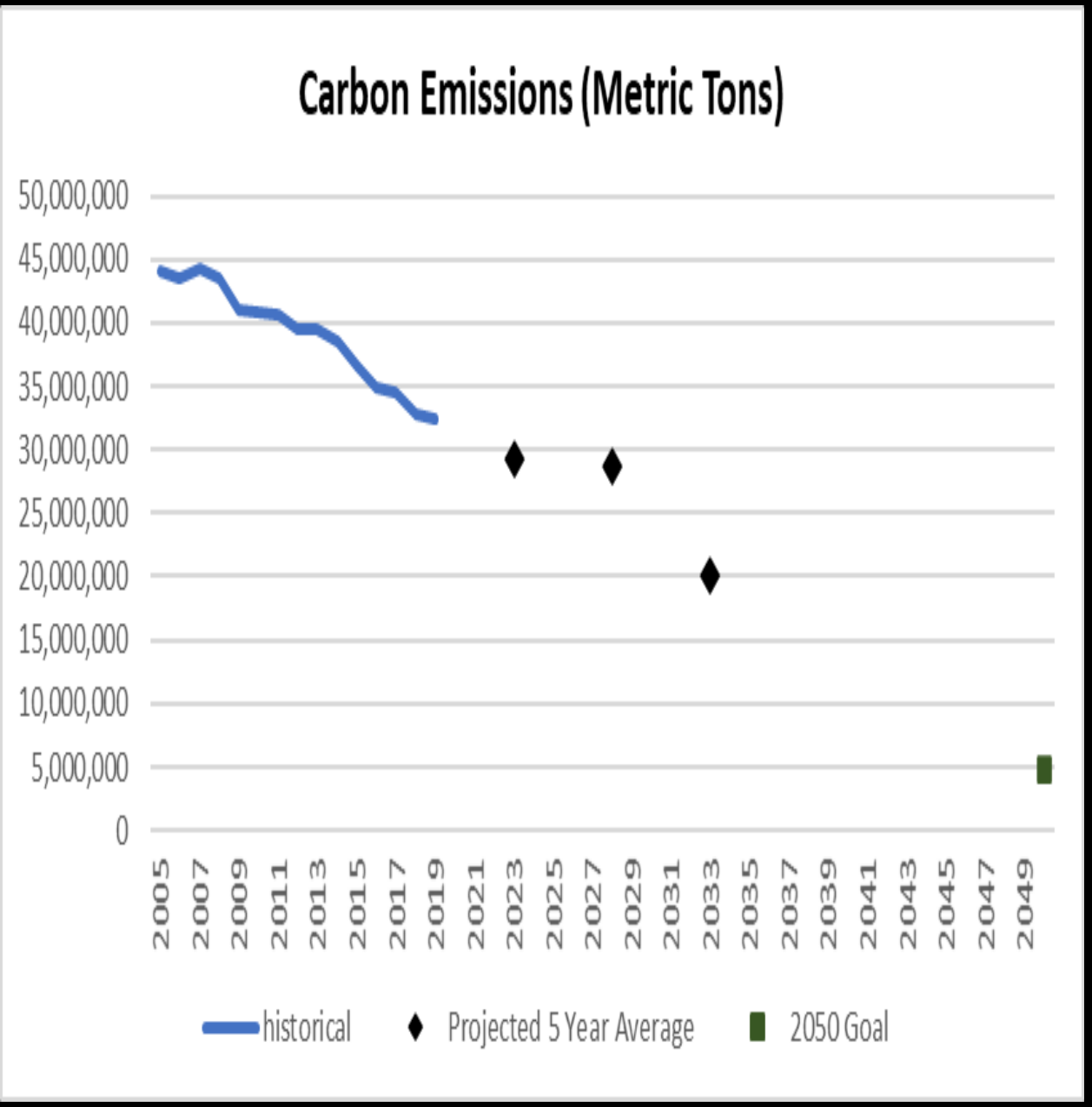
The way in which Arizona grows greatly affects these load forecasts. Changes in any of the following will impact these forecasts:

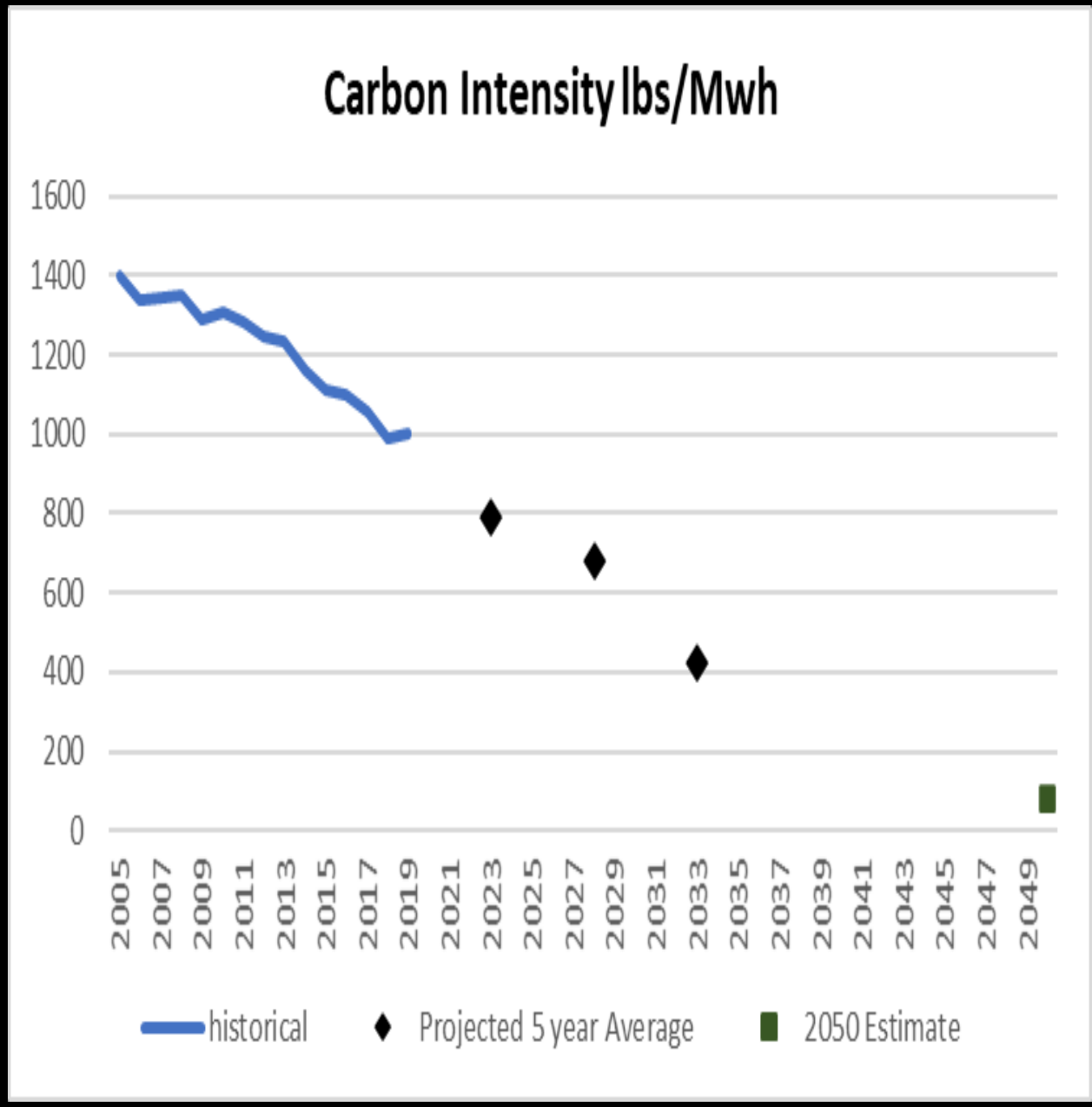
-Population

-Energy efficiency

-Electric vehicle adoption rate

-Continued positive business environment and new energy intensive industry


Carbon Emissions (Metric Tons)
50,000,000
45,000,000
40,000,000
35,000,000
30,000,000
25,000,000
20,000,000
15,000,000
10,000,000
5,000,000
0
2005 2007 2009 2011 2013 2015 2017 2019 2021 2023 2025 2027 2029 2031 2033 2035 2037 2039 2041 2043 2045 2047 2049
historical
Projected 5 Year Average
2050 Goal


Carbon Intensity lbs/Mwh
1600
1400
1200
1000
800
600
400
200
0
2005 2007 2009 2011 2013 2015 2017 2019 2021 2023 2025 2027 2029 2031 2033 2035 2037 2039 2041 2043 2045 2047 2049
historical
Projected 5 year Average
2050 Estimate

Long-term implications of utility plans

- In 2030 absolute carbon emissions are expected to be 34.4% lower than 2005, and carbon intensity is expected to be 53.6% lower.
- In 2035 absolute carbon emissions of CO_2 are expected to be 62.2% lower than in 2005, and carbon intensity 75.8% lower.
- In 2050 absolute carbon emissions are expected to be 89.3% lower than 2005 and carbon intensity 94.3% lower.