

# Moving and Measuring Market Transformation of a Decarbonizing Economy

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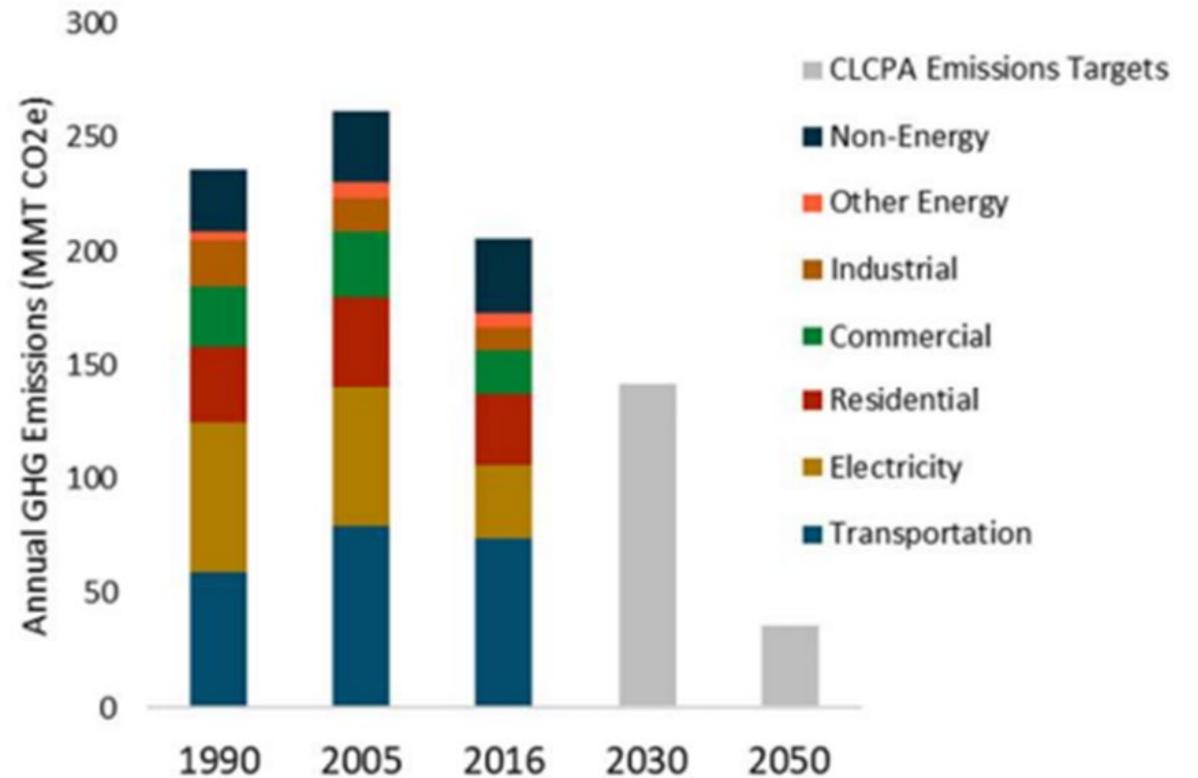
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# Project Background

- Economy-wide decarbonization requires ‘unprecedented transformation’ across sectors.
- NYSERDA I&R investments *when successful*, will have broader impacts than direct project impacts.
- Challenge: identifying these **longer-term, economy-wide, cross-program outcomes.**

Figure 3. NYS GHG Emissions by Sector: 1990, 2005, 2016, and CLCPA Emissions Targets: 2030 and 2050



# Project Goal

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A curated **set of market-level metrics** and tools that provide I&R:

- 1) Directionality of I&R sector/market movement
- 2) Speed of market-level changes

**Early indicators** of whether/how:

- Longer-term I&R investment outcomes are appearing,
- I&R investments are moving markets, and/or
- Changes in investment strategy are needed.

# Methodology: Key Design Parameters

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- Market-level changes:
  - What direction is the market moving?
  - How quickly are market-level changes occurring?
- Complement (not duplicate) existing NYSERDA project- and program-level metrics
- Suite of metrics that **when viewed collectively** provide *new* insights into I&R investments/activities
- Feasible:
  - Can be cost-effectively updated on a regular basis
  - Use available data from credible public state & federal sources

## TARGET SECTORS

- Business Assistance
- Advanced Buildings
- Renewable Energy and Distributed Energy Resources
- Smart Grid
- Transportation

# Methodology: Metric Identification

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## 1) In-depth literature review

- Program documents and grant data
- NYS energy and investment plans
- Metrics and data used by peer organizations
- Innovation diffusion and market transformation measurement

## 2) *Iterative* interviews with:

- Subject matter experts
- I&R Program staff
- NYSERDA Evaluation staff

# Methodology: Metric Identification

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## METRIC CRITERIA

- Ability to measure market-level changes
- Frequency metric/method/data appeared in the literature
- Data availability
- Feasibility of simple (Excel tool) updates
- Long-term reliability
- Minimize influence from external factors

## COMMON REASONS METRICS REJECTED

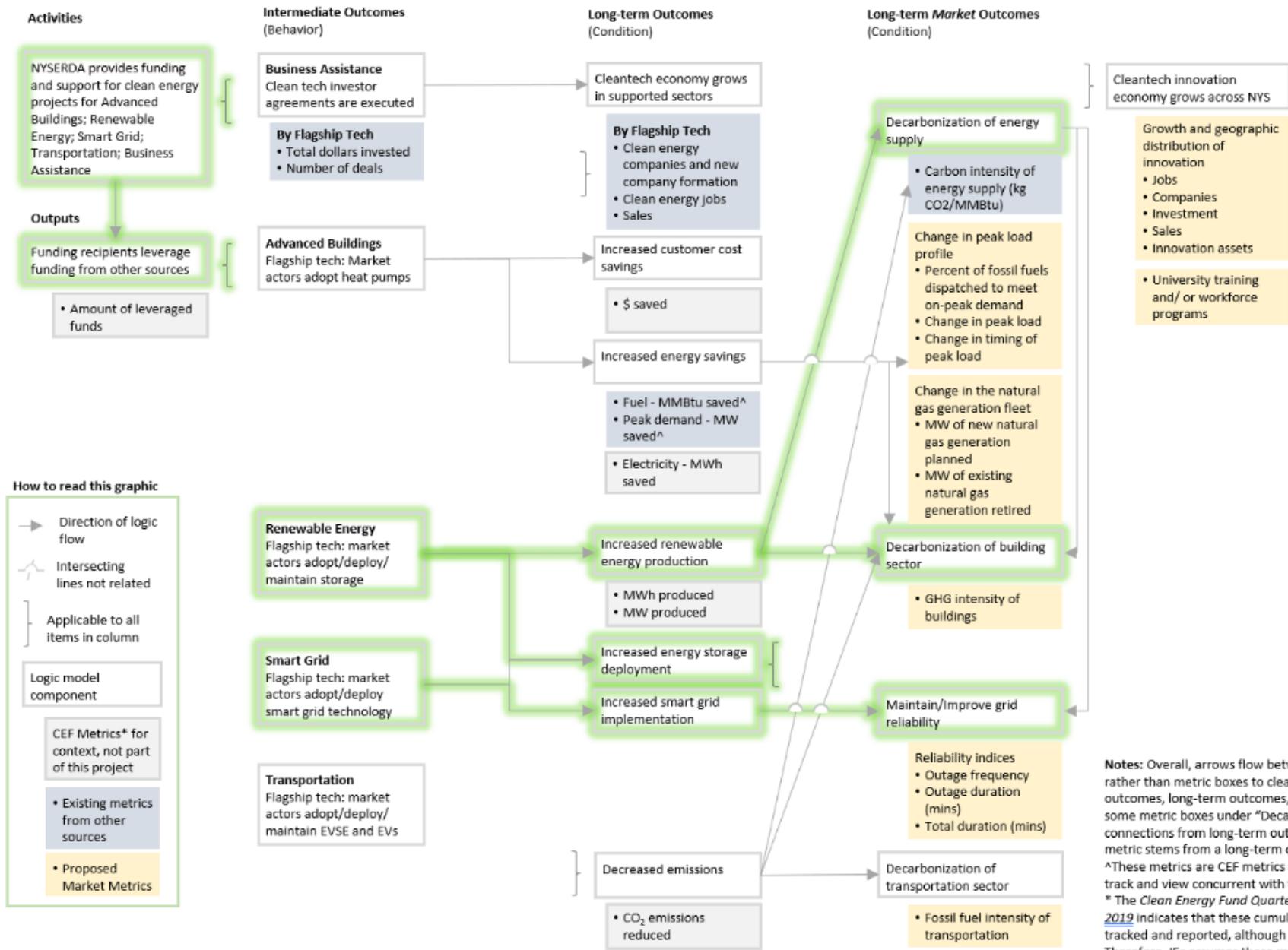
- Mis-alignment between metric and I&R investments/activities
- Metrics tracks an output rather than outcome
- Data availability
- Not feasible to develop an updatable tool
- Another metric (better) tracks the desired outcome

# Results

<b>NYS cleantech innovation economy grows</b>	<b>Energy supply decarbonized</b>	<b>Building sector decarbonized</b>	<b>Transportation decarbonized</b>	<b>Grid reliability improves</b>
1-3 years	Long-term (5-10 years)			All years, direct and backstop
Growth, distribution of jobs, companies	Percent fossil dispatched to meet peak seasonal demand	Fossil intensity of buildings	Fossil fuel use of transport per VMT, fleet	Utility Reliability indices
3-5 years	Backstop/ Tipping Point			
Workforce Investment	Change in the number of planned natural gas units			

# Appendix 1. Partial I&R Logic Model with Market-Level Metrics

The CEF Innovation and Research Portfolio is helping to build a clean energy economy in New York State, working with clean tech start ups, businesses, and universities to develop new-and-improved low-carbon solutions.



**Notes:** Overall, arrows flow between different logic model component boxes rather than metric boxes to clearly draw the connection between intermediate outcomes, long-term outcomes, and long-term market outcomes. However, for some metric boxes under "Decarbonization of energy supply," we draw connections from long-term outcomes to metric boxes where a specific market metric stems from a long-term outcome.

<sup>^</sup>These metrics are CEF metrics and existing metrics that we consider valuable to track and view concurrent with the proposed market metrics.

<sup>\*</sup>The Clean Energy Fund Quarterly Performance Report through September 20, 2019 indicates that these cumulative metrics for the I&R program are "to be tracked and reported, although specific planned benefit was not ordered."

Therefore, IEC assumes these metrics will be tracked outside of this current effort.

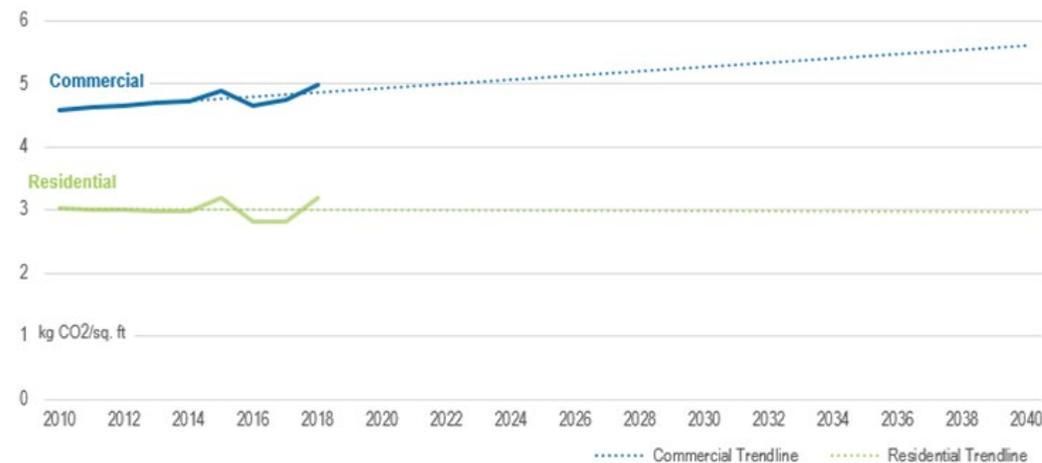
# Results: Excel Tools

- Stand alone, updatable tools in Microsoft Excel
- Detailed user guide
- Data input tables
- Embedded metric calculations
- Summary tabs with user friendly data visualization

## GHG Intensity of Buildings - Results

Year Calculated: 0

 2018 <b>GHG Intensity of Commercial Buildings</b> <b>4.97</b> kg CO <sub>2</sub> /sq. ft an increase from 2017 of <b>0.24</b> kg CO <sub>2</sub> /sq. ft, or <b>5%</b>	
 2018 <b>GHG Intensity of Residential Buildings</b> <b>3.19</b> kg CO <sub>2</sub> /sq. ft an increase from 2017 of <b>0.38</b> kg CO <sub>2</sub> /sq. ft, or <b>14%</b>	



Since **2011**

 <b>GHG Intensity of Commercial Buildings</b> has increased by <b>0.35</b> kg CO <sub>2</sub> /sq. ft, or <b>8%</b> <b>this market is not</b> heading in the right direction.	
 <b>GHG Intensity of Residential Buildings</b> has increased by <b>0.19</b> kg CO <sub>2</sub> /sq. ft, or <b>6%</b> <b>this market is not</b> heading in the right direction.	

This tool provides evidence of market level decarbonization trends. Several factors (including those listed below) may influence the GHG Intensity of buildings. To better understand why the market is moving in a particular direction, review the status of the contributing factors. The arrows indicate the desired direction of the metric.

-  Frequency of deep energy retrofits
-  Number of new ZNE buildings
-  Conversion to electric space heating
-  Increased grid integration of utility scale renewables
-  Increased use of on-site renewables
-  Reduced reliance on gas peaker plants

NYSERDA's Clean Energy Dashboard includes some information on the factors above.  
<https://www.nyserra.ny.gov/Researchers-and-Policymakers/Clean-Energy-Dashboard>

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## Clean Tech Economy Metrics

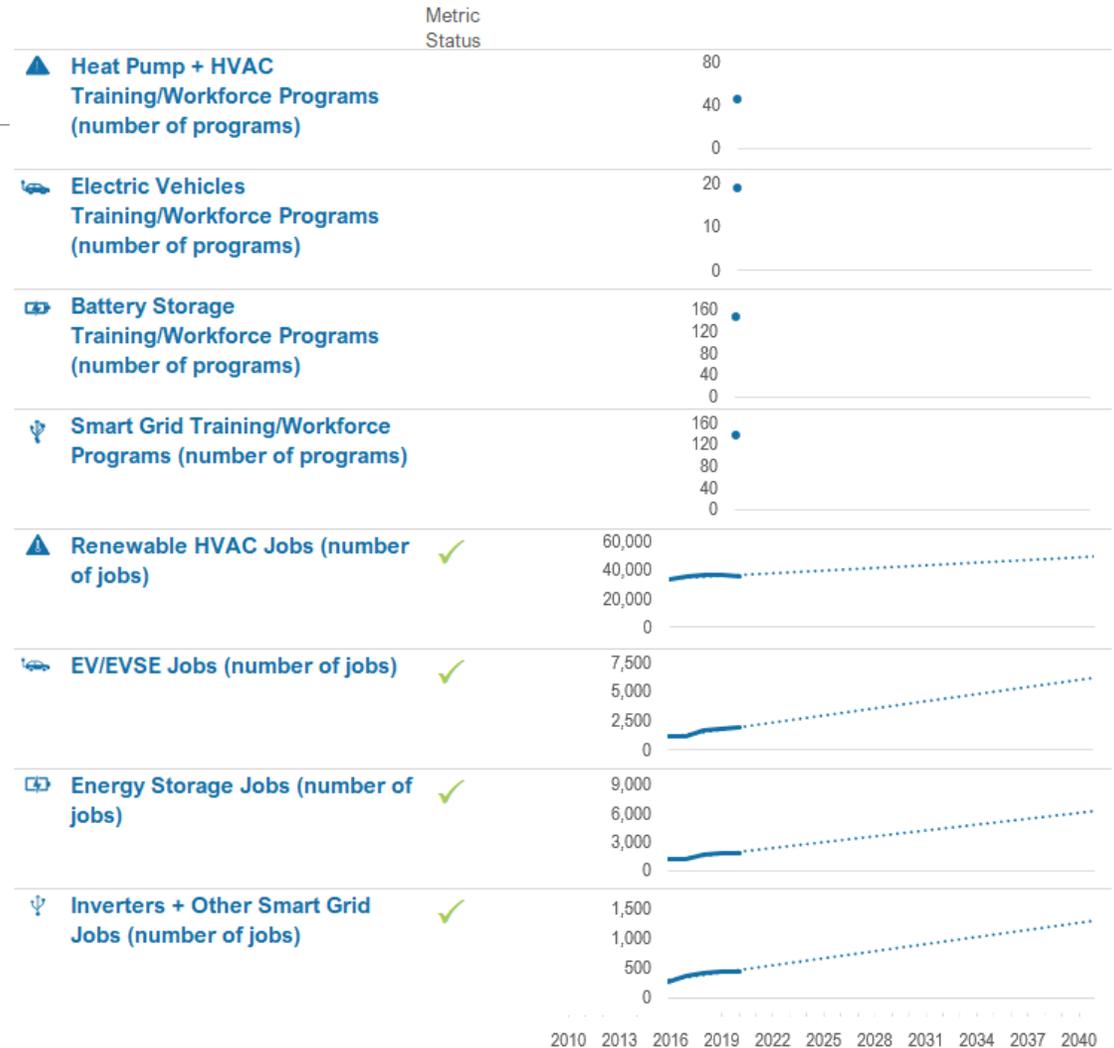
Data Available Through **2022**

Green checkmarks indicate the metric is heading in the right direction.

Note: Workforce training program data are only available starting in 2020, so no metric status is available for first year.

Trend data reflecting workforce programs is not yet available.

Four out of Four jobs metrics are increasing, a strong sign I&R investments are working.



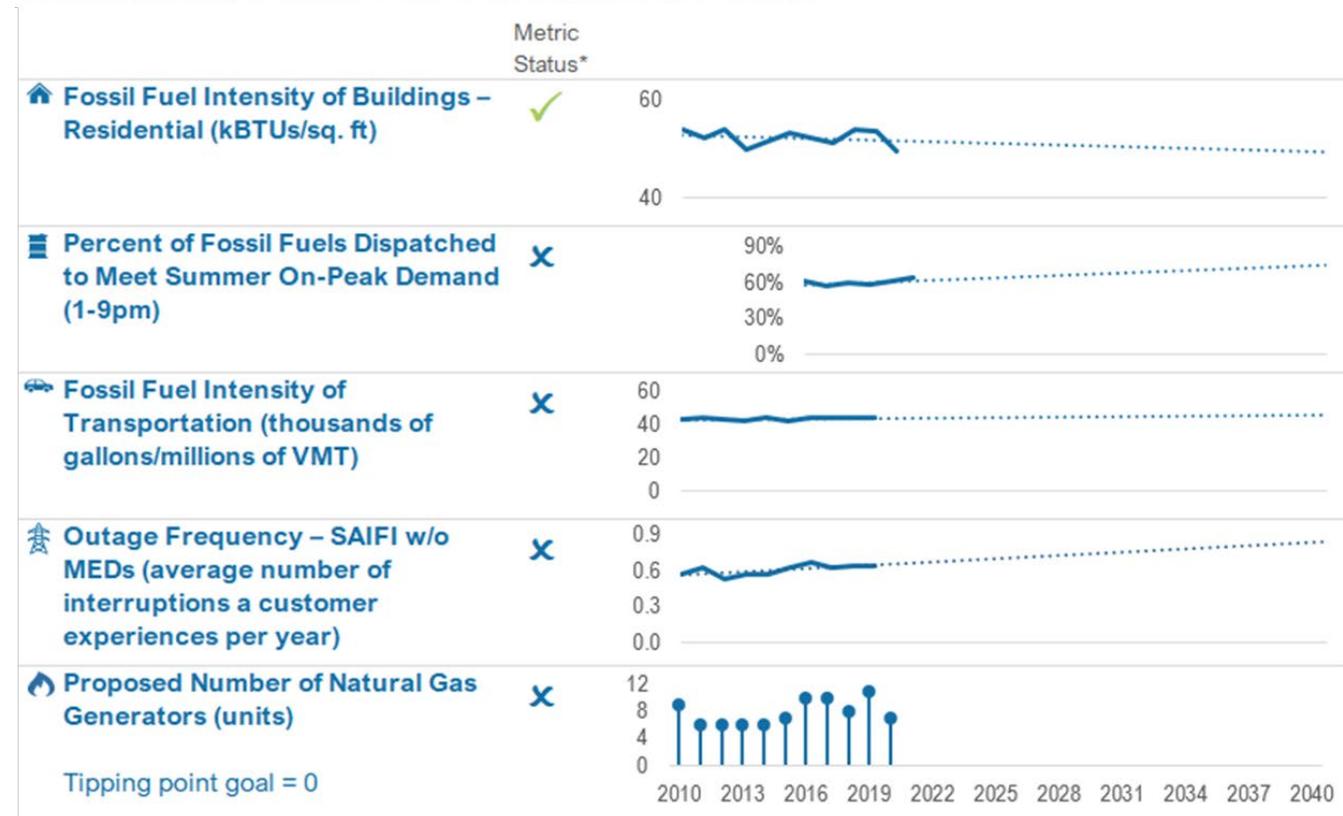
# Results: Excel Tools

Summary tool that aggregates and arrays all metrics together to allow program staff to view metrics collectively

## Key Market Metrics

Data Available Through **2021**

Green checkmarks indicate the metric is heading in the right direction.

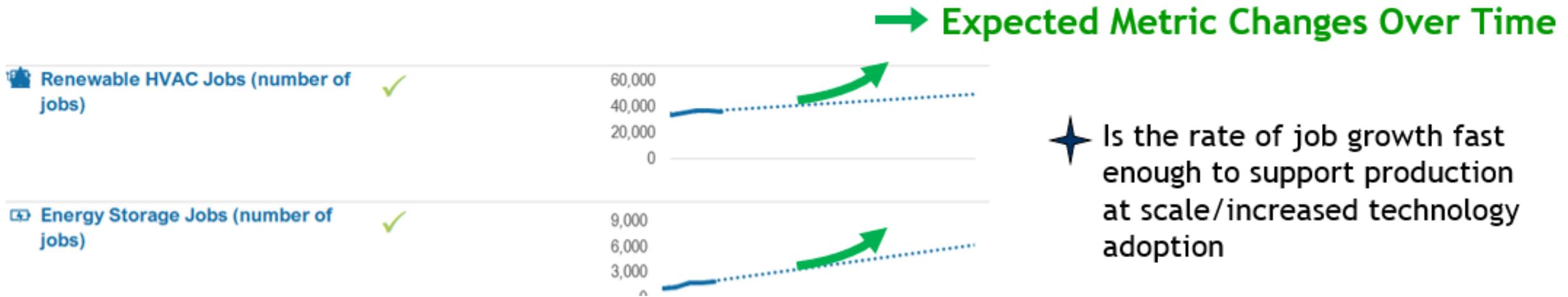


Long-term indicators (5-10 years)

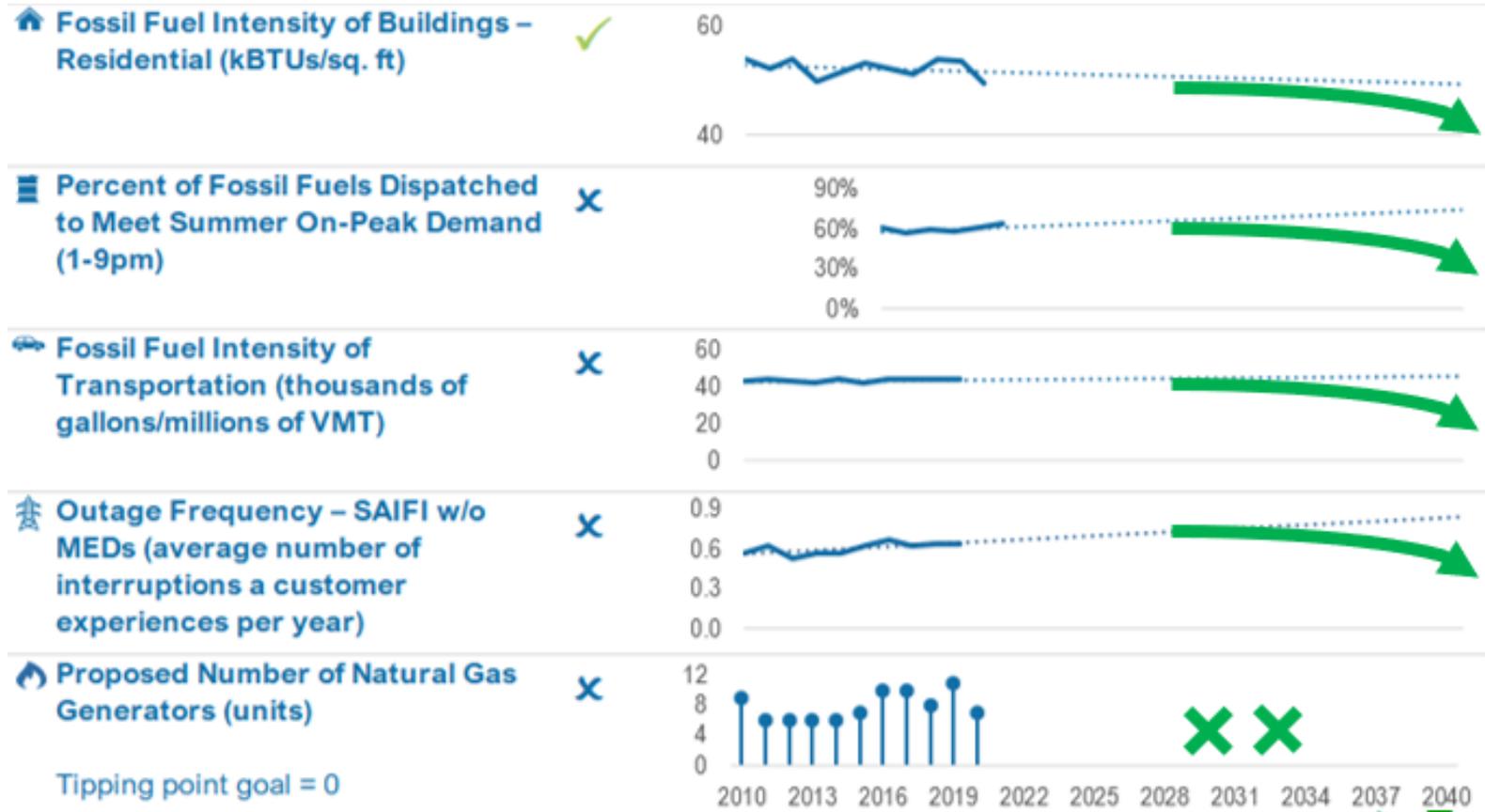
Mid-range indicator (3-5 years)

Long-term indicator (5-10 years)

# Results: Example Review Process



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- ✦ Captures the market effect of increases in heat pump installations
- ✦ As more wind and storage is installed, dispatch of fossil fuel during peak periods begins to fall
- ✦ Is the grid handling increased load from buildings, RE, and EVs? If not, more investment in the grid may be needed

→ Expected Metric Changes Over Time

# Results

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## KEY INSIGHTS

- Initial results track with anticipated performance
- Near-term successes, “jury still out” on longer-term metrics
- Metrics, data inform staff on investment strategies that might need to change

## KEY CHALLENGES

- Changes may not yet be visible in target markets
  - Some markets still in early stages of development (e.g., RE and storage)
- Attribution limited – market-level metrics may reflect impacts of other programs and external factors

# Conclusions and New Challenges

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- Current metrics: longitudinal starting point
  - Expect to see impacts of recent policy changes, data centers
    - Clear methods – no “black box”
    - Data sources, methods may need to adapt
- Additional metrics for sharper insights
  - “Force multiplier” role of I&R
  - Transitional efforts (e.g., alternative fuels)
  - Emerging technologies (VPP, plug-in solar)

# Thank you!

**Industrial Economics, Inc.**

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