Moving and Measuring Market Transformation of a Decarbonizing Economy

Christine Lee, Industrial Economics, Inc. (IEc), San Francisco Bay Area, CA
Cynthia Manson, IEc, Cambridge, MA
Daniel Kaufman, IEc, Cambridge, MA
Angela Vitulli, IEc, Cambridge, MA

ABSTRACT

NYSERDA's Innovation and Research (I&R) portfolio invests in technologies and companies with the potential to transform key markets and accelerate New York State's decarbonization. A challenge in measuring the success of a program that is designed to reduce the barriers to innovation and spur market transformation is identifying and tracking progress of the broader markets that the program operates and targets. To meet this challenge, evaluators developed a portfolio of 12 market-level metrics designed to collectively provide information on: the direction in which target cleantech markets are moving and how quickly market-level changes are occurring. This information can serve as early indicators of whether (and/or how) I&R's longer-term program outcomes are starting to appear in the market, whether there is an indication that I&R investments may be playing a catalytic role in moving the market, and/or whether it may be helpful for NYSERDA staff to consider a change in investment strategy.

Evaluators first identified and assessed available programmatic and public data and methodologies to measure incremental and transformational change. Potentially applicable metrics were identified and ranked. For a smaller subset of selected metrics, evaluators identified and collected data for metrics development and conducted analyses to test the ability of potential metrics to operate under real-world conditions. In consultation with NYSERDA, the evaluators selected a suite of metrics and developed user-friendly Excel-based tools that NYSERDA could use on a going forward basis to inform program design and align investments based on an understanding of economy-wide progress and trends by sector.

Introduction

Over the past decade, New York State has established itself as one of the most dynamic energy economies in the U.S., and globally. With its Reforming the Energy Vision (REV), Clean Energy Fund (CEF), and the Climate Leadership and Community Protection Act of 2019 (CLCPA), the state aims to transform not only energy supply markets but the entire state economy into one that accurately values clean energy, energy efficiency, and resilience while encouraging competition and innovation to deliver value to consumers. In this context, the New York State Energy Research and Development Authority (NYSERDA) funds the Innovation and Research (I&R) Portfolio to invest in technologies and companies that have the potential to transform key markets including Advanced Buildings, Renewable Energy/Distributed Energy Resources, Smart Grid, Transportation, and Business Assistance.

A critical challenge in measuring the success of a program that is designed to reduce the barriers to innovation and spur market transformation is identifying and tracking progress of the broader markets that the program operates and targets. The foundation for this project starts with I&R's overarching investment strategy. I&R plays a strategic role by investing in projects and companies that, if successful, will have broader and potentially larger impacts than just the direct benefits that might accrue to the specific companies or technologies that I&R invests. In the energy evaluation context, however, evaluators have been wary of overinclusion of "indirect" benefits, even in technology development programs whose long-term outcomes are, by definition, indirect. These longer-term, indirect benefits and outcomes are the focus of this project. Based on our research, the market level focus of this project is unique. Most clean

energy programs only periodically consider market-level information, for example, as part of a market characterization assessment or an impact evaluation. Even in those instances, the market assessment may be narrowly focused (e.g., focused on a single technology).

The goal of this project was to provide a set of market-level metrics and tools to I&R that would provide information on: (1) the direction in which flagship markets prioritized by I&R are moving and (2) how quickly market-level changes are occurring. This information can help I&R programs by serving as early indicators of whether/how I&R's longer-term program outcomes are starting to appear in the market, whether there is an indication that I&R investments may be playing a catalytic role in moving the market, and whether it may be helpful for NYSERDA I&R to consider a change in investment strategy."

Methodology

As a first step, the evaluators developed a logic model to identify and articulate the relationships between I&R activities, changes in behavior (intermediate outcomes), and most importantly – changes in condition or long-term outcomes in targeted clean energy markets. While most evaluation activities focus on near-term and sometimes intermediate outcomes, the explicit focus of this effort was on the long-term market outcomes captured in the last column of the logic model (Appendix 1).

Using the logic model as a guide, the evaluators developed a taxonomy of candidate metrics and methods to measure market-level changes in relevant cleantech sectors. The objective was to identify a portfolio of metrics that will enable NYSERDA to:

- Document the State's progress towards its broad goals of decarbonization in the sectors that are the focus of the I&R portfolio,
- Provide insights into the pace of market-level changes that can in turn inform I&R program design.
- Rely on data sources and methodologies that program staff can cost-effectively update on a regular basis.
- Complement existing NYSERDA-project and program-level metrics.

To develop this taxonomy of candidate metrics, the evaluators conducted an extensive review of the literature, including I&R program documents and grant data, state-level energy and investment plans, and reports and documents from peer organizations. We looked for existing metrics and data used by NYSERDA, other New York State agencies (e.g., DPS, NYISO, etc.), other State agencies and peer organizations, as well as Federal agencies. We also reviewed published literature for best practices for measuring innovation diffusion and market transformation. The literature review was supplemented with in-depth interviews with I&R staff and subject matter experts in each of the clean tech markets targeted by the I&R portfolio.

Metrics were organized into two broad groups:

- **Cross-sector** metrics include economy-wide or macroeconomic metrics that address more than one I&R sector. Generally, these metrics would be used to understand the State's progress toward decarbonizing the energy system and are also generally relevant to the portfolio-level objectives of the I&R portfolio.
- **Sector-specific** metrics include metrics that can be used to understand how well each sector (i.e., Transportation, Advanced Buildings, RE/DER, Smart Grid, and Business Assistance) is moving toward decarbonization.

Each metric was reviewed based on the following factors and considerations:

- A high-level assessment of the intersection and/or alignment between each metric and I&R priorities, investment strategies, and activities.
- Review of the data and methods needed to calculate each metric in terms of data availability and the feasibility of converting the methodology into a user-friendly calculator.
- Long-term reliability – that is, can NYSERDA reasonably rely on long-term access to the required data sources on an annual basis, and over multiple years.
- Data limitations, including assessing the sensitivity of datasets to recent or existing market conditions such as the pandemic or stock market volatility
- Metric type based on the type of effect that the metric seeks to measure: (a) output; (b) near-term outcome; (c) later outcome; and (4) program and/or policy goal. In general, the metrics considered for this study include a mix of near-term and later outcomes.
- Whether the metric can serve as a binary indicator of key decarbonization milestones. One example is the point in time when utilities are no longer including any new builds of natural gas units to meet grid reliability needs in their investment planning documents.

In consultation with market-level subject matter experts, the evaluators then reviewed and ranked the metrics to identify a subset that would meet NYSERDA's objectives. Criteria considered included:

- Ability of a metric to measure market-level changes;
- For cross-sector metrics, what sectors the metric or method captures;
- Degree to which external factors may complicate the interpretation of a metric or method in measuring market-level changes;
- Frequency with which a metric or method was identified during the literature review;
- Review of the availability of data to develop a metric and/or method; and
- Assessment of the feasibility of developing a tool that can be cost-effectively updated at regular intervals based on publicly available data from credible state and federal data sources, and/or data readily available to the program.

The team identified approximately 20-25 potential metrics for each sector, just over one hundred metrics across all five sectors. In the metrics taxonomy, the evaluators tracked the above factors and criteria for each metric, providing NYSERDA with an understanding of the team's analysis of each metric and ultimately, the rationale for pursuing or rejecting potential metrics identified.[1]

Data Processing and Tool Development

For the selected metrics, the evaluators collected, cleaned, and prepared data for analysis and eventually, development of updatable tools in Microsoft Excel. As part of data processing, the evaluators conducted sensitivity analyses to ensure the metrics performed as expected and could reliably operate

[1] Examples of reasons that metrics were 'rejected' included data availability, misalignment between the metric and I&R's investments or desired outcomes, metric tracks an output rather than an outcome, and the presence of another metric that better tracks the desired outcome.

under real-world conditions. For select metrics, this included testing the metrics using historical data. For example, to track the impact of I&R renewable energy and grid investments, the evaluators developed a tool that tracks the share of fossil fuels dispatched to meet electricity demand during summer peak periods. This metric relies on real-time (5-minute) fuel mix deployment data from the New York State Independent System Operator (NYISO). In developing this metric, the evaluators were able to test and refine the metric by processing historical data beginning in 2016, which showed that the share of fossil fuels dispatched during summer peak periods has been relatively flat at approximately 60 percent. To track the fossil fuel intensity associated with the residential building sector, the evaluators were able to gather data beginning in 2010. Using these data, the evaluators could already see some initial transformation in the residential buildings sector. This observed downward trajectory is consistent with NYSERDA's investment programs focusing on heat pumps, as well as the deep energy retrofits and ZNE buildings. As the share of electric space heating increases, the fossil fuel intensity in buildings is falling due to both reduced energy consumption, and from fuel switching.

Throughout data processing and tool development, the evaluators engaged in iterative design review meetings with I&R program and evaluation staff. These meetings allowed the metrics and data sources to be further stress tested to ensure that the metrics and tools developed would be useful and provide new insights to program staff. Through these meetings, further refinements were made to select tools in response to staff feedback.

Considerations

In implementing this study, the evaluators ran into two key challenges. The first challenge is the long-term nature of the outcomes of interest, which as a result means it will take time before program administrators can see substantive movement in markets targeted by their investments. This challenge became most evident when looking at the historical trajectories of each metric. For example, some markets are still at relatively early stages of development, and as a result, little progress is visible to date for the fossil fuel intensity of transportation or the dispatch of RE during periods of on-peak demand in the summer. The one exception is the business assistance indicators, in which progress occurs on a shorter timeframe and I&R's activities are more closely tied to the metrics developed. For example, the Clean Tech Economy tool shows that from 2016 to 2020, cleantech jobs were steady or declined in five of the ten New York State economic development regions but increased in Western NY and the Southern Tier – both areas that NYSERDA prioritized for investment during this timeframe. NYSERDA could use this information to confirm ongoing investments in Western NY and the Southern Tier, and to prioritize investment in regions that are lagging.

A second key challenge is attribution. While the recommended metrics are not intended to provide information on what portion of market-level changes are attributable to I&R, the metrics are designed to be complementary to existing program- and project-level metrics and importantly can serve as earlier indicators of whether the anticipated outcomes of I&R activities are appearing in the market. Such indicators may be helpful to program staff regarding *how* or *when* to revise program investment strategies. Finally, because these metrics are macroeconomic in nature and reflective of market-level changes, they are capturing the contribution of not only I&R, but also other NYSERDA and non-NYSERDA programming (both state and federal) that have the same decarbonation objectives. As such, these metrics could serve as helpful benchmarks for other NYSERDA programs beyond I&R.

Results

To meet NYSERDA's objectives, the team selected a portfolio of 12 metrics, including four 'existing' metrics already tracked by NYSERDA or other agencies, and eight 'new' metrics designed to

provide additional insights into the progress of transformation within cleantech sectors targeted by I&R. Collectively, the portfolio of metrics are designed to provide information on (1) the direction in which cleantech markets prioritized by I&R are moving and (2) how quickly market-level changes are occurring. This information in turn can be helpful to I&R programs by serving as early indicators of whether (and/or how) I&R's longer-term program outcomes are starting to appear in the market, whether there is an indication that I&R investments may be playing a catalytic role in moving the market, and/or whether it may be helpful for NYSERDA staff to consider a change in investment strategy. To further orient these metrics, the evaluators arrayed the selected metrics within the reduced form logic model to illustrate which outcomes the metrics reflect and the relationships between metrics (Appendix 1). The market-level metrics were designed to complement (not duplicate or replace) NYSERDA's program- and project-level metrics and can be viewed in tandem to provide a more complete picture.

Existing Metrics

Based on the literature review, the evaluators identified four existing metrics that are critical to track because they provide necessary context for assessing I&R's role in the market-level changes that are occurring within the state's electricity system. Specifically, these metrics provide the I&R program with: (1) a clear alignment with established and widely used economic measures, (2) critical information about the overall direction and magnitude of the state's efforts to decarbonize, and (3) important context for measuring and better understanding the relative success of I&R-specific efforts.

Table 1. Summary of Existing Market-Level Metrics

Data Source	Metric	Key Attributes
Clean Energy Dashboard	Electricity Peak Demand Reductions, Gross (MW)	Includes cumulative progress over time by end use sector and captures efforts across NYSERDA efforts.
	Fuel Savings, Gross Annual/Lifetime (MMBtu)	
EIA	Carbon Intensity of the Energy Supply (kg CO_2 per MMBtu)	Common metric measure used at state, national and international scales to track the progress of decarbonization at the economy-wide level
NYISO Gold Book	Total Installed Renewable Energy (MW)	Common metric used by multiple entities to understand progress in renewable energy integration

New Metrics

The focus of this study was to identify new metrics that would provide additional insights into the current status and progress within the clean tech markets that I&R targets. Table 2 identifies and describes each of the metrics identified by sector, including two metrics for Business Assistance, one metric each for Buildings and Transportation, and four metrics focused on Renewable Energy and Grid Modernization. Notably, the term 'metric' is used broadly and in some cases, the 'metric' is comprised of multiple related metrics, or the metric includes a breakdown of the metric by sector and/or geography. For example, in support of NYSERDA's Business Assistance investments, the 'Growth and Geographic Distribution of Innovation' examines temporal changes across multiple metrics, including the number of jobs, number of companies, sales, investment dollars, number of investment deals, and number of innovation centers.

Table 2. Summary of New Market-Level Metrics

Sector(s) • Metric Name	What Does the Market-Level Metric Reflect?	When Will Progress Be Evident?	Data Requirements
Innovation Business Assistance • Growth and geographic distribution of innovation	Tracks if/how NYS's cleantech innovation economy is growing, and whether growth is well-distributed across the state. Existing business-level metrics show the performance of NYSERDA-backed companies, whereas the market-level metrics show changes for the overall cleantech economy. The market-level metrics include: # of cleantech jobs, sales $, # of companies, investment $, investment deals, # of innovation centers (universities, incubators, accelerators, and public laboratories), and Gross Regional Product. For each metric, the tool addresses results and highlights growth across each of the State's ten economic development regions to show regional and statewide growth in innovation. The data can also be segmented by geography and I&R's flagship technology sectors, showing the state of the market for renewable electric power generation, grid modernization & energy storage, energy efficiency, renewable fuels, and transportation. For example, the tool can show whether jobs in each of the I&R flagship technology sectors or priority geographic areas are growing more quickly than jobs in other (non-I&R flagship) technology sectors or areas.	Immediate. Small annual changes reflecting I&R investments in business assistance programming.	Existing Program Data - NYSERDA's Clean Energy Industry Report (CEIR) report data.
• Workforce Investment	Tracks training (number of graduates from cleantech training programs, and the number of cleantech training programs offered) as a leading indicator of growth in cleantech markets (by flagship technology). It also shows how much the market is investing in workforce training as a prediction market for flagship technologies. An increase shows that the market is "betting on" growth in these areas. If the market is investing in workforce training programs in the flagship technology areas (beyond workforce programs directly supported by and/or partnering with NYSERDA's Workforce Development program), it signals market change.	Mid-range (3-5 yrs). Market-level effects may lag training by 1-5 yrs; between when investments in new technology areas and training programs are made and program graduation rates.	Existing Program Data – workforce, training, and jobs data
Advanced Buildings • Fossil Fuel intensity of buildings	Fossil fuel intensity of residential and commercial buildings will decline as there are increases in: deep energy retrofits and electrification, scale up of utility and on-site renewables, and peak demand is met without using natural gas peaker plants. Following the logic from the business-level metrics you can expect to see increased number of heat pumps sold annually, increase in fuel savings, and greater peak demand reductions.	Long-term (5-10 yrs). Building-level gains are immediate upon investment. Market-level effects depend on increased efficiency of existing building stock and contribution of renewable energy to the grid.	• AHS (Census) Housing Data • EIA Emission Data • EIA RECS survey data (subsector calculations only) • NYSERDA Potential Study Residential and Commercial Building Data (Including supplemental tables for subsector calculations only) • NYSERDA/NOAA CDD and HDD

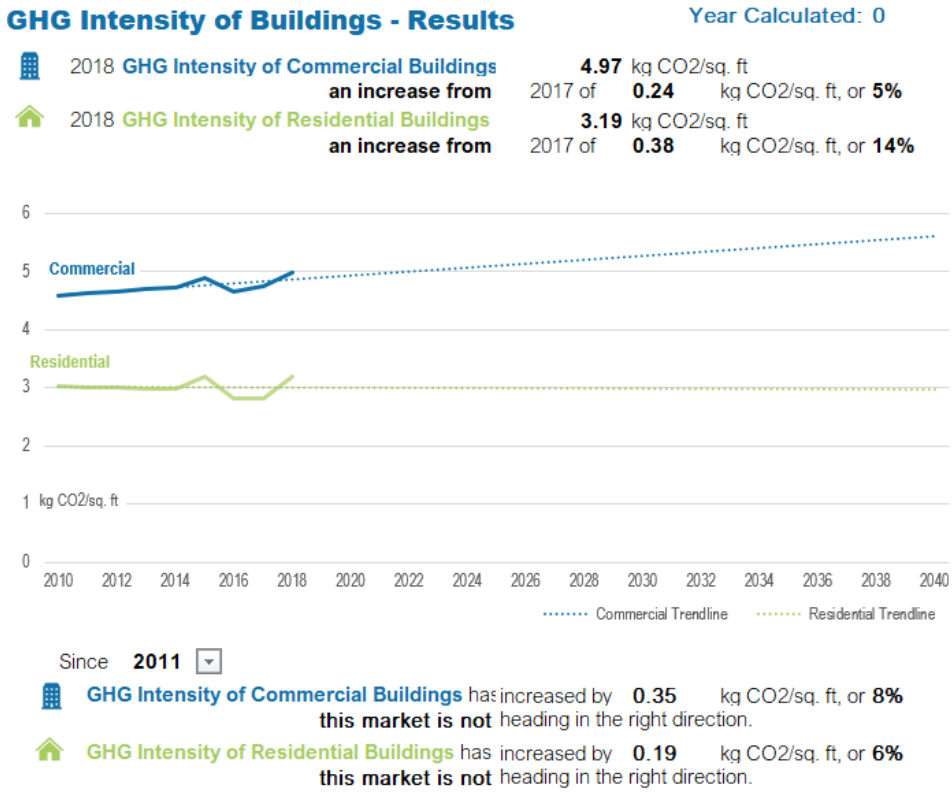
Sector(s) • Metric Name	What Does the Market-Level Metric Reflect?	When Will Progress Be Evident?	Data Requirements
Transportation Fossil fuel intensity of transportation	Decreases in fossil fuel intensity of transportation indicate progress toward statewide emissions reductions, reflects increases in EVs on the road, more electrified transit ridership, and greater vehicle fuel efficiency. This metric identifies changes in the total demand for gasoline/diesel, and as a function of economic activity.	Long-term (5-10 yrs). Market-level effects depend on the total EV market share.	FHWA data EValuateNY EV registration data NY Dept. of Environmental Conservation GHG emissions data APTA Transit data FRED GDP data NYS Dept. of Labor population data from Data.NY.gov
Renewable Energy Smart Grid Summer on-peak fuel mix Winter on-peak fuel mix	Tracks the change in the share of fossil fuels dispatched to meet electricity demand during peak periods of the year. This is different than existing business-level metrics because the metric focuses on the times of year when NYISO requires *flexible* resources that can quickly and cost-effectively ramp up or down to meet demand. Even with increasing amounts of installed RE, during periods of peak demand, natural gas may still be dispatched when RE production is not coincident with load. As the dispatch of fossil fuels decreases even during these high-load hours, this serves as an indication of the increasing availability (and usage) of a diverse mix of RE, including storage.	Long-term (5-10 yrs). Market-level efforts depend on large-scale wind (e.g., offshore wind) as well as performance of investments in other cleantech sectors (e.g., electrification and energy efficiency).	NYISO real-time fuel mix deployment data (updated every 5 minutes)
Planned natural gas units	Leading indicator of future need for natural gas capacity. Declining planned natural gas units serves as an indicator of the falling cost of renewable energy, increasing availability of energy storage, and/or advancements in smart grid technologies that allow system operators to effectively shift electricity consumption and balance out differences between supply and demand.	Long-term (5-10 yrs). NG planning depends on installed capacity and dispatch of ES as well as nuclear retirements.	EIA Form-860 and Form-860M generator data (updated annually)
Utility grid reliability indices	I&R investments in grid modernization are designed to ensure that the grid can effectively incorporate RE/DER without compromising grid reliability and/or resiliency. This metric, combined with RE investments, indicates the effectiveness of grid reliability investments. Investments are effective if grid reliability is stable or improving while the share of renewable energy increases. Conversely, if grid reliability is deteriorating as the share of renewable energy increases, this signals that additional investment in grid modernization may be needed.	Immediate. Utility-specific gains are immediate upon investment. Mid-range (3-5 yrs). Market-level effects require substantive grid investment by multiple utilities.	NYDPS Electric Service Grid Reliability Report (updated annually with 2-year lag)

Collectively, these metrics are intended to provide the program with an understanding of changes in growth and geographic distribution of its business assistance efforts. In support of renewable energy and grid modernization, the team developed two complementary metrics focused on looking at changes in the deployment of renewable energy during peak periods, one metric focused on summer peak periods and a second metric on winter peak periods. The team initially proposed this metric focused solely on summer peak periods, but in consultation with NYSERDA staff, the team developed a winter metric as well, based on the expectation that in the near future, the State expects a shift in peak periods from summer to winter due to increasing heating electrification.

Finally, in selecting metrics, the evaluators also considered how the metrics would interact with one another. The relationships between metrics are particularly important and reflect the team's intention to identify a set of metrics that when viewed collectively (as a portfolio) provide more information than each metric viewed individually. As an example, consider the relationship between grid reliability and renewable energy. When considering the State's objective to increase the deployment of renewable energy, a key question is whether grid reliability remains stable (or improving), or is grid reliability moving in the opposite direction of increasing renewable energy penetration. The former relationship could serve as an indicator of effective upgrades to the grid that are enabling higher penetrations of renewable energy and distributed energy resources without compromising grid reliability and/or resiliency. In contrast, an inverse relationship may indicate the need for increased investment in grid modernization. Another area of intersection may be between peak load and electrification and transportation, where increases in system peak load over time may serve as positive signals of increasing load due to building electrification and increased EV deployment.

For each of the new metrics, the evaluators developed stand alone, updatable tools in Microsoft Excel that NYSERDA staff can use on a going forward basis to help inform program design and align investments based on an understanding of economy-wide progress and trends by sector. Each Excel tool included a detailed user guide, data input tables, embedded metric calculations, and summary tabs designed with user friendly data visualization. Figure 1 shows an example output of the GHG intensity buildings metric. Below the graph, the output tab also includes contextual information to help users understand and interpret the data. This type of interpretative information was a key component of the effort in order to assist users to understand directional drivers of each metric.

Figure 1. Example Output: GHG Intensity of Buildings



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.nyserda.ny.gov/Researchers-and-Policymakers/Clean-Energy-Dashboard

As previously discussed, one important objective of the effort was to find a portfolio of metrics that collectively provide greater information than each metric individually. Towards that end, the team also developed a single tool that aggregates and arrays all the metrics to allow NYSERDA to view the metrics collectively. Figures 2 and 3 provide examples of the summary output in the aggregated Excel tool.

Figure 2. Example Output from the Summary Tool: Existing Metrics

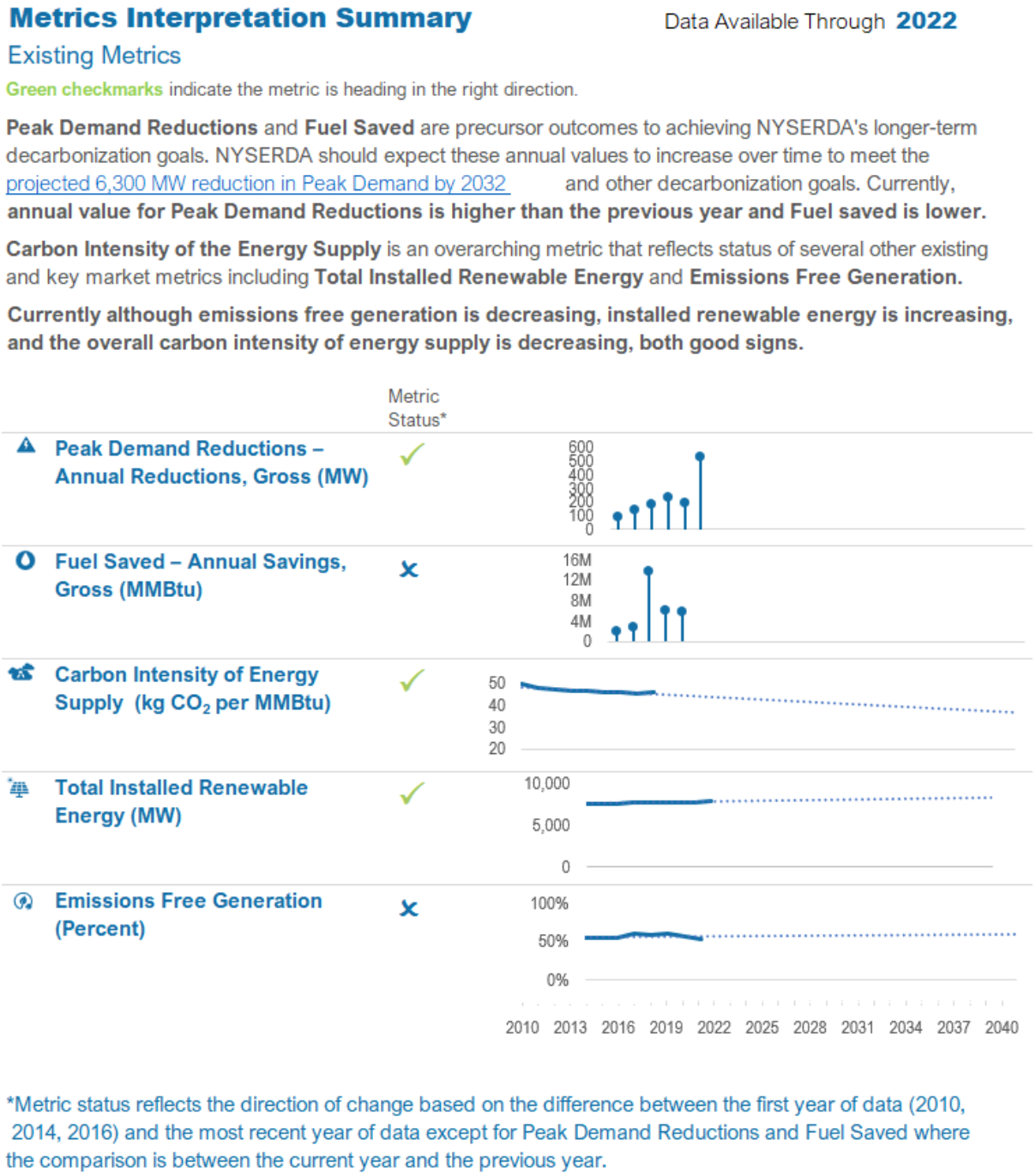


Figure 3. Example Output from the Summary Tool: Clean Tech Economy

Conclusions

The evaluators conducted research and analysis to develop macroeconomic indicators of market transformation for each sector in which NYSERDA invests: renewable energy and distributed energy resources (DERs), transportation, high performance buildings, smart grid, and cleantech startup development. In support of this effort, the evaluators conducted a review of the literature on key data

sources and best practices for measuring innovation diffusion and market transformation; reviewed key program documents (e.g., investment plans, annual reports, evaluation reports); conducted in-depth interviews with NYSERDA staff; and developed a theory of change to guide and organize the selection of market-level metrics into a coherent measurement framework. In consultation with NYSERDA, the evaluators selected a suite of metrics and developed user-friendly, updatable tools in Microsoft Excel that NYSERDA staff can use on a going forward basis to help inform program design and align investments based on an understanding of economy-wide progress and trends by sector.

One of the key challenges encountered in this study is the long-term nature of the outcomes of interest, which as a result means it will take time before substantive movement in targeted markets targeted are visible. This challenge became most evident when looking at the historical trajectories of metrics development. For example, some markets are still at relatively early stages of development, and as a result, little progress is visible to date (e.g., fossil fuel intensity of transportation or the dispatch of RE during peak demand periods in the summer). The one exception is the business assistance indicators, in which progress occurs on a shorter timeframe and I&R's activities are more closely tied to the metrics developed. For example, the Clean Tech Economy tool shows that from 2016 to 2020, cleantech jobs increased in Western NY and the Southern Tier – both areas that NYSERDA prioritized for investment during this timeframe.

Acknowledgements

The IEc team thanks NYSERDA and the I&R program staff for making this work possible. In particular, we thank Richard Bourgeois and Megan Bulman at NYSERDA for their guidance, direction, and support. We also express our appreciation for the collaboration and input from Michael Freeman at Emerald Energy Consulting, who served as the subject matter expert on renewable energy and grid integration. We also thank Phil Jordan from BW Research for his contributions as a subject matter expert for the business assistance sector.

We also want to thank several staff at IEc who provided valuable contributions and support for this multi-disciplinary effort including Greg Englehart and Emma Fox, and former IEc staff, Catherine Foley, Cole Kroninger, and Abhishek Anand.

References

NYSERDA. Innovation and Research Program. https://www.nyserda.ny.gov/All-Programs/Innovation-at-NYSERDA

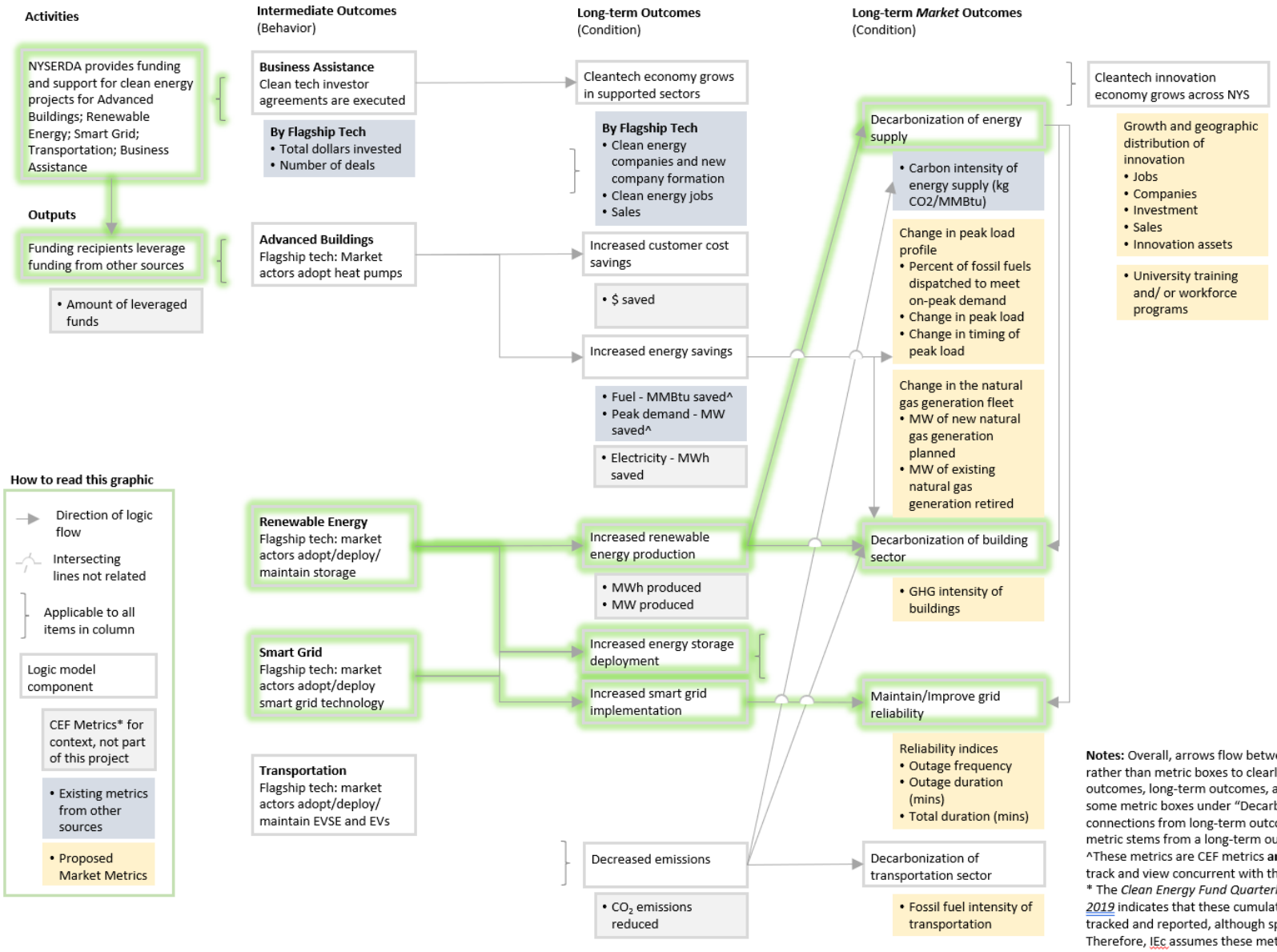
NYSERDA. Innovation and Research Portfolios. https://www.nyserda.ny.gov/All-Programs/Innovation-at-NYSERDA/Innovation-Project-Portfolios

NYSERDA. Clean Energy Dashboard Introduction. https://www.nyserda.ny.gov/About/Tracking-Progress/Clean-Energy-Dashboard

NYSERDA. Clean Energy Dashboard. https://www.nyserda.ny.gov/About/Tracking-Progress/Clean-Energy-Dashboard/View-the-Dashboard

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.

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

* 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.