

Matter Number 16-00681, In the Matter of the Clean Energy  
Fund Investment Plan

Clean Energy Fund Investment Plan:  
Market Characterization & Design  
Chapter

**Submitted by:**

**The New York State Energy Research and Development Authority**

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### 3 Market Characterization & Design

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The Market Characterization & Design Chapter (MCDC) presents NYSERDA's approach to market research and characterization to provide the necessary analytical information to identify and adequately understand target markets, including who the market players are and how they influence each other, barriers and leverage points, value added opportunities, pricing, baseline information, and other potential indicator metrics. As a part of this Chapter, a key focus will be on "Novel Solutions" where NYSERDA will identify and test the effectiveness of different novel intervention types and their potential to inform future investments in New York.

The MCDC Chapter has been modified to update the Intervention Pre-Development activities listed in Table 1. Some of the studies that were indicated in the initial April 16, 2016 filing have been removed as the insights and intelligence targeted have been collected through other methods (e.g. procurement of existing data and research). Table 1 has also been updated to reflect scoping changes to some of the remaining studies and reflect the market intelligence needs more accurately. The timing of the Market Fundamentals and Sector Building Stock work (in Tables 2 and 4 respectively) has also been updated to reflect more accurate timing based on initiative launch dates. The overall timeline laid out in Appendix A has also been updated to reflect these changes. The MCDC Chapter has also been modified to add additional funding for Novel Solutions activities. The additional funding will be leveraged to conduct market concept tests to validate effectiveness and impact potential of a concept, prior to filing a full-scale initiative.. This activity will accelerate the path for successful novel ideas and concepts that can be quickly proven to get to the market.

The objective of market research and characterization is to provide energy use and demographic/firmographic information; economics perspectives on costs and value of energy solutions; and insights on market, provider and customer trends relevant to accelerating the deployment of effective clean energy solutions. This work is designed to be available and useful to all actors engaged in advancing the objectives of the Clean Energy Fund (CEF), including but not limited to utilities, customers, and emergent service providers, and Reforming the Energy Vision (REV) project developers seeking to develop new business opportunity in emerging markets. This work will provide ongoing information to market participants as REV changes the regulatory environment for energy services and as the CEF and utility activities help to advance the market for clean energy services.

Accordingly, the approach recognizes the value of the learning to be extracted in a timely manner from CEF interventions and from the REV demonstration projects, as well from the activities of other parties engaged in relevant and instructive work. The approach commits NYSERDA to effective sharing of insights, resulting both from studies and learnings derived from interventions. Importantly, this market research and characterization approach will also support predevelopment work required to identify, prioritize, and design the future market development interventions for NYSERDA.

This chapter identifies known market characterization and design data needs, which NYSERDA expects will evolve along with the CEF portfolio. As new interventions are planned and introduced,

NYSERDA will revisit needs and update this chapter, at least annually, to reflect material changes.

This Market Characterization & Design Chapter is organized into the following sections:

- Market Characterization & Design Activities
- Information Dissemination
- Additional Resources
- Budgets & Expenditures

### 3.1 Market Characterization & Design Activities

The MCDC identifies five distinct categories of market characterization and design work required to initiate, accelerate, and evaluate interventions under the CEF. Furthermore, this work is expected to have broad applicability and value to other clean energy activities such as utility Energy Efficiency Transition Implementation Plans (ETIPs), REV Demos and other activities.

- **Intervention Pre-Development (Sector Level)** – Improved quantitative/qualitative understanding of energy efficiency decision making, economics, value proposition, segmentation, market trends and opportunities to aid in planning or modifying investments.
- **Novel Solutions** – Research and analysis to identify and measure the effectiveness of novel interventions to inform new investments, including behaviorally-based and performance based interventions, and other pre-investment in-market concept tests appropriate for validation of effectiveness and impact potential, prior to filing a full-scale initiative or launching a larger-scale initiative.
- **Market Fundamentals** – For energy efficiency and renewable/distributed energy resources, NYSERDA requires data on: energy use in various areas of the market; demographic/firmographic information; economic perspectives on costs and value of energy solutions; and insights on market/technology, provider and customer trends relevant to accelerating the deployment of effective clean energy solutions and evaluating the effects of interventions in the market. Work in this area will fulfill such information needs, typically informing multiple NYSERDA interventions.
- **Market Baselines, Potentials and Progress** – This area encompasses: high-level market characterization information needs that are important to optimizing NYSERDA's strategy in the market on an ongoing basis and to measuring overall market progress across strategies; ongoing updates to energy efficiency potentials by major end use sector to aid in planning; and overarching, ongoing information needs pertaining to buildings, energy equipment and impact of program activities on energy consumption by sector.
- **Macro-Level Analyses** – NYSERDA will explore the viability and utility of conducting top-down econometric, macro-consumption studies to provide a more complete understanding of overall end-use energy reduction outcomes, including those associated with all clean energy strategies in the State. NYSERDA is also exploring the potential use and development of energy intensity indicators.

Although this chapter is organized by these five areas, NYSERDA will optimize its data gathering efforts (e.g., using the same data sets, same primary data collection vehicles, etc.) to meet needs in multiple areas. NYSERDA has competitively selected multiple pools of qualified consultants to perform the market and evaluative research identified herein in order to inform program strategies and assess the effectiveness of strategy results. NYSERDA's evaluation and market research capabilities are transitioning to become increasingly nimble and flexible to meet short turnaround requests and provide actionable insights while supporting accountability goals. The results of this work will allow NYSERDA to improve impact and innovation in deploying clean energy projects and strategies.

In order to achieve these objectives cost-effectively and efficiently, work will be assigned for individual, discrete activities with firm timelines and approaches and tools (including, but not limited to, longitudinal surveys and analysis of secondary data) will be used in conducting analyses, non-traditional research methods such as ethnography, social media and community platforms to offer real-time and continuous feedback on concepts and strategies will also be explored.

### 3.1.1 Interventions Pre-Development (Sector Level)

NYSERDA will leverage a wide range of intelligence gathering and research techniques to hone investment opportunities, identifying and applying actionable insights to interventions to increase their likelihood of success in the market. Activities will largely focus on market discovery methods designed to understand (1) customer and partner attitudes and perceptions, (2) customer decision-making, drivers and barriers affecting market growth, and (3) partner, service provider and end-user economics and business models to ensure the design of interventions and approaches will be economically compelling. Voice of customer and concept testing, in addition to other research methodologies will confirm that strategies and market approaches resonate with target audiences. Activities may also include continuous monitoring of the social, economic, demographic and financial conditions which impact NYSERDA's efforts. Table 1 provides more detail on specific work that is planned.

**Table 1. Interventions Pre-Development Work**

	2016	2017	2018	2019
Energy Efficiency - Commercial			Analysis of small/medium facilities (consideration of employee size of less than 100 = small, 100-500 = medium as proxies; will also consider square footage); assess remote audits and other analytics service options, intelligence for commercial office space and leasing process, including energy efficiency clauses and “rentalization” concept.	Applicability of energy service companies (ESCOs) to smaller facilities; Segment colleges, universities/k-12 for depth of sustainability activity and map values/drivers for faculty, staff and donor engagement.
Energy Efficiency - Industrial			Current state of industrial operations among small to medium facilities (Small = 500kw and below; Medium = 500kw to 1MW).	Evaluate and test tools for measuring productivity of data centers; assess emerging technologies for potential application in industrial process; analysis around small on-site data centers facilities; explore energy information management systems (EMIS) applicability for data centers.
Energy Efficiency - Multifamily			Analysis of building management and investment structures, financing mechanisms and barriers, and tenant preferences including buildings with 4-49 units. Analysis of service provider market, focus on non-NYSERDA service provider participants.	

	2016	2017	2018	2019
Energy Efficiency - Residential		Analysis of realtors, appraisers, lenders markets to integrate efficiency at point of home sale, and validity of home scoring systems.	Assess solutions gaining traction in other jurisdictions to feed pipeline for future NY strategies and investments- including combined EE/PV offering, analyzing pay for performance models in residential sector; business models for heating, ventilation, and air conditioning (HVAC) and other contractors serving the retail market; Identify MLS' including who utilizes energy efficiency information in their listings; Assess viability for a centralized on-line consumer resource to support residential energy systems, performance information, and service offerings	
Energy Efficiency - Products and Digital Solutions			Home energy management systems and advanced roof top units (ARTU) market analyses.	Analyze long-term energy as a service business models potentially using cloud computing to store and use energy data to optimize performance.
Low - to-Moderate Income (LMI) - Energy Efficiency and Distributed Generation (DG)	Inventory of LMI homes previously served and assessment of unmet needs of market.		Analysis on affordable housing builders and developers for potential to build to higher standards.  Analysis on landlords and property owners to understand their investment and capital improvement decisions.	Feasibility study and analyses on potential for scaling market for zero net energy modular homes to increase affordability for LMI residents.
Distributed Energy Resources (DER) - Storage				Opportunities for storage as an integrated service offering with non-utility partners such as energy service providers.

	2016	2017	2018	2019
DER- Renewable Heating and Cooling		Customer analysis on decision making, priority segments and value propositions; analysis of contractor business models and potential models for financing.		
Clean Transportation				Assess critical segments (i.e., car dealers, employers, municipalities, etc.) for economics, decision making and value propositions around electric vehicles (EVs). Engage the EV dealer network: understand and evaluate dealer approaches to selling EVs and how potential customers are responding and what barriers are they seeing to purchasing EVs.
Innovation in Renewables Value Improvement and Connectivity			Support market research/analysis that will provide critical input to develop Innovation strategies around renewable value improvement, connected buildings, and smart mobility.	
Workforce Development	Research to isolate the energy impacts and non-energy benefits for buildings.	Analysis of operations and maintenance skills gaps and training needs		

	2016	2017	2018	2019
Financing Solutions			Analysis of potential barriers related to financing that are preventing the acceleration of cost-effective deployment of energy efficiency and renewable energy technologies in the State. Activities are envisioned to include, but not be limited to, sponsoring/ funding studies, pilots and interventions as well as working with market participants and other stakeholders.	
Large Scale Renewables – On Site			Assessment of attitudes and perceptions surrounding large scale solar and land based wind, including issues on siting and transmission development.  Analysis of bottlenecks in citing review process of major electric generating facilities (Article 10 process).	
New Construction				An analysis of demographic/cultural trends that can shape the New Construction market 5-10 years out for future investment planning; analysis/trends in construction practices including BIM (3-D modeling tool), design build and production build.



### 3.1.2 Novel Solutions

NYSERDA will identify and test the effectiveness of different novel intervention types and their potential to inform future investments in New York. Research activities will initially focus on identifying and testing the effectiveness and market impact of interventions supporting: 1) behavior integrated clean energy design and 2) performance-based solutions.

#### ***Behavior Integrated Clean Energy Design***

NYSERDA will evaluate and test integrated behavioral approaches for specific CEF strategies where a behavioral intervention is expected to result in high impact outcomes. Behavioral approaches use insights from social psychology and the decision sciences, like social norms that predict most people will adjust their behavior to be consistent with what is perceived to be the norm or common behavior. Integrated behavior design with a program or strategy could range from minimal to more extensive with in-market field testing using quasi-experimental design and/or random controlled trials. Successful outcomes for this behavioral science research could lead to broad intervention application and investment.

NYSERDA will also work outside of NYSERDA collaboratively with market partners to integrate effective behavioral principles into clean energy design, delivery and market animation activities to test efficacy and impact for potential to scale.

#### ***Performance-Based Solutions***

NYSERDA will identify and evaluate a variety of performance-based solutions and other novel financial mechanisms that have the potential to achieve greater clean energy adoption. Manufacturer warranties, pay as you go (examples include EVs, shared solar, van pools), lease to own (solar, EVs), crowd funding, carbon credits, and collaborative purchasing, hold a largely untapped potential for clean energy in New York State. This work is separate from and will complement the larger scale activities conducted by the New York Green Bank by focusing on new ways to drive projects forward and leverage financial markets without direct use of ratepayer funding.

As part of this work, NYSERDA will establish forums for knowledge sharing among technical and subject area experts to convene and discuss research analyses and other market insights to hone in on areas of opportunity and focus, and provide direction for future investments and intervention/pilot design. Activities and results from this work can also be disseminated through the Clean Energy Advisory Council (CEAC).

#### ***In-Market Testing for Novel Ideas and Concepts***

NYSERDA will develop a mechanism to implement small-scale in-market tests of novel ideas, including behavior and performance based solutions, as well as other concepts that are promising, but in need of further real world market validation prior to proceeding to a full initiative or

investment plan pilot.<sup>1</sup> The in-market testing will accelerate the path to market for successful novel ideas and concepts that can be quickly proven.

The tests are anticipated to last no longer than 18 months to two years, including implementation and evaluation. NYSERDA will allocate \$8,000,000 in total over three years to fund approximately five in-market concept tests per year (up to \$500,000 per in-market test). It is expected that market-driven projects would be solicited through an open enrollment procurement, and via solicitations for targeted NYSERDA driven tests. Market-driven solicitations may be phased to enable NYSERDA to recruit and select the best projects for testing each year. Novel ideas may include but are not limited to the following examples:

Multifamily Comparables Database: Affordable housing agencies are eager to underwrite to projected operational cost savings from energy performance improvements, as part of their first/unsubsidized mortgage lending process. This would allow for larger first mortgages and reduce the amount of subsidized capital needed for each property, which could then be allocated elsewhere. NY State Homes and Community Renewal (HCR) and Housing Preservation and Development (HPD) underwriters currently refer to Management and Operations Standards (“Standards”) when projecting buildings’ operating costs, yet energy models and audits regularly project energy cost numbers that are significantly below the per-unit energy costs prescribed by these Standards. While the will is there to underwrite lower operating costs from energy performance improvements, underwriters and regulators are uncomfortable deviating from these Standards based solely on energy models and audits. Based on meetings with HCR and interviews with underwriters, “comparables” comprised of post-retrofit energy consumption and costs information could serve as reference resources to corroborate energy model projections and allow underwriting to those savings. NYSERDA could develop a database of comparables—using NYSERDA multifamily program data and HCR financial reports for buildings that have received NYSERDA incentives for retrofits—to serve this role for affordable housing underwriters and test this idea on a small- scale to determine its potential impact.

Testing Products, Tools, and Approaches to Improve Energy Affordability and Access to Clean Energy Solutions for LMI Customers and Affordable Housing: Working with the utilities, product manufacturers, developers and CBOs, NYSERDA could help to demonstrate new products, tools, and services that can improve an LMI customer’s ability to better manage their energy consumption and reduce their energy costs. Demonstrations would include understanding barriers to adoption, as well as testing for user acceptance, and affordability impacts. In addition, NYSERDA can explore the development of new approaches for delivering clean energy services for LMI customers, such as testing effective models for integrating energy efficiency and on-site generation for LMI customers or affordable buildings, or piloting alternate models of procuring no-cost energy efficiency services to reduce the overall cost of delivering those services.

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<sup>1</sup> The novel solutions work here differs from the Novel Business Models and Offerings (NBMO) initiative which is more narrowly focused on supporting companies in scaling up novel service offerings.

### 3.1.3 Market Fundamentals

In all areas of energy efficiency and renewable/distributed energy resources, NYSERDA requires data on energy use in various areas of the market; firmographic/demographic information; economic perspectives on costs and value of energy solutions; and insights on market/technology, provider and customer trends relevant to accelerating the deployment of effective clean energy solutions. This data is imperative to understanding current market activity and future changes related to clean energy interventions.

NYSERDA's initiatives define the current market situation, theory of change (including market barriers addressed and outcomes sought) and expected impact of each strategy. Market Evaluation data needs associated with measuring the effectiveness of each specific strategy, over time, are also outlined in the individual initiatives. In conjunction with and in addition to these strategy-specific market evaluation needs, there are several higher-level market characterization data needs that are important to optimizing NYSERDA's strategy in the market on an ongoing basis and to measuring overall market progress across strategies. This layered approach including investment-specific and high-level market data is an important foundational element of NYSERDA's approach to measuring market change and validating program effectiveness.

This section describes higher-level data needs and plans for fulfilling them in each major end use sector. Table 2 provides more detail on specific work that is planned. The original timing for some activities, including the Home Energy Management System Market Assessment and the LMI Key Housing/Energy Assessments and LMI Integration of Key Cross-Agency Information Sets, have shifted to future years due to a change in study timing priority. New to Table 2 is a Large-Scale Wind Balance of System (BOS) Cost Study that will commence in 2018 and will be designed to quantify elements of BOS cost in NYS as a baseline for future progress and to compare BOS cost to other states and regions.

The CEF order called for specific attention to LMI households, ordering both a specific LMI Chapter and a minimum commitment of CEF funds of no less than \$234.5M during the years 2016-2018. In recognition of the need to assure that CEF programs effectively deliver clean energy solutions to these households, NYSERDA has developed approaches to improve its understanding of LMI customers and guide CEF investments. Research has and will include critical and relevant demographic, housing and energy information such as detail on housing tenure, occupancy by building type and configuration (single family, multifamily, public housing), household composition, energy end use characteristics, energy cost, energy burden, and geography. NYSERDA also will coordinate information gathering and integration of data with agencies that maintain relevant data, including the Office of Temporary and Disability Assistance, Department of Environmental Conservation, Department of Health, Department of Public Service, and Homes and Community Renewal. The data collected could then be processed and presented in multiple ways, including in geospatial information system (GIS) mapping to identify trends, gaps, and opportunities that will guide CEF investments.

**Table 2. Market Fundamentals Work<sup>2</sup>**

	2016	2017	2018	2019-2021
Energy Efficiency - Commercial	Key Technology/Market Area Assessments including: HVAC; energy management systems (EMS)/Building management systems (BMS); Energy Service Market; Customer Decisions	Net Zero Energy Commercial Building Market Assessment		Update to Key Technology/Market Area Assessments including: HVAC; EMS/BMS; Energy Service Market; Customer Decisions
Energy Efficiency - Multifamily		Net Zero Energy Multifamily Building Market Assessment		
Energy Efficiency - Residential	Net Zero Energy Homes Market Assessment; Home Energy Management Systems Market Assessment	HVAC Market Assessment	Update to Home Energy Management Systems Market Assessment; Update to Net Zero Energy Homes Market Assessment	Investigate Standardized Approaches to energy efficiency
Low-to-Moderate Income	Key Housing/Energy Assessments;		Key Housing/Energy Assessments; Integration of Key Cross-Agency Information Sets	
DER – Renewable Heating and Cooling	Air Source Ductless Mini- Split Market Assessment			Update to Air Source Ductless Mini-Split Market Assessment
DER - Renewables	Photovoltaic (PV) Balance of System Cost Study		Large-Scale Wind Balance of System Cost Study	Update to PV Balance of System Cost Study

<sup>2</sup> Several studies in Table 2 are supported by legacy Energy Efficiency Portfolio Standard (EEPS) and Technology & Market Development (T&MD) funds. These studies are shown here as part of the longitudinal data collection plan envisioned within the MCDC and because NYSERDA plans to use CEF funds to support updates to the studies as spending for legacy-funded evaluation activity will end February 29, 2020. Also, where NYSERDA programs or interventions are using non-ratepayer funds, market evaluation budgets will also be supplemented with non-ratepayer funds where comprehensive studies are planned.

	2016	2017	2018	2019-2021
Transportation	Transportation Market Assessment			Update to Transportation Market Assessment
Multi-Sector	Impact Study on NYSERDA Technology Innovation Demonstration Projects		Impact Study on NYSERDA Technology Innovation Demonstration Projects	

### 3.1.4 Market Baselines, Potentials and Progress<sup>3</sup>

To support CEF program design and evaluation, as well as assessment of overall progress toward the State Energy Plan and future Clean Energy Standard (CES) goals, NYSERDA will conduct a number of overarching, time series studies on building stock and energy consumption in NY State. These studies are described below.

#### ***Sector Building Stock Data***

Comprehensive sector building stock data will be gathered statewide on existing and new construction buildings across a broad range of customer segments and energy measures. The overall objective of this data collection effort is to understand the current condition of the building stock (residential, multifamily, commercial space) and associated energy use, including the saturations of energy consuming equipment (electric, natural gas, and other fuels) and the penetrations of energy efficient equipment, building characteristics and energy management practices. The studies will also collect demographic and firmographic information along with behavioral and operational information which will be correlated with the energy usage features.

The information gathered from building stock studies is necessary to support intervention design and evaluation, including a critical use in understanding market transformation. Based on the aggregation of data collected through the building stock studies, NYSERDA will be better equipped to design interventions that strategically target high opportunity segments, measures, or behaviors within the different NYS buildings markets. For example, the Residential Statewide Baseline study completed in

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<sup>3</sup> The *Plan for EEPS Statewide Research Studies and Joint Evaluations*, prepared by the Evaluation Advisory Group in February 2012 and updated August 2012, included two rounds of the Statewide Residential/Multifamily Baseline/Potential Study and two rounds of the Statewide Commercial Baseline/Potential Study. The first round of the Residential/Multifamily study was completed in 2015 and the first round of the Commercial study is currently underway; both have been funded with EEPS funds. The next round of the Residential study is included in this plan and will also be allocated EEPS II funds rather than CEF funds. This work activity is important to the CEF and will ultimately be allocated CEF funding for future rounds as NYSERDA updates this Chapter. As spending for legacy-funded evaluation activity ceases on February 29, 2020, the next round of the Commercial study and a new, separate Multifamily study will be funded entirely by CEF. The EEPS Statewide Study Plan can be found at:  
[https://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/766a83dce56eca35852576da006d79a7/\\$FILE/2012-08-10\\_Feb\\_2012\\_Statewide\\_Study\\_Plan.pdf](https://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/766a83dce56eca35852576da006d79a7/$FILE/2012-08-10_Feb_2012_Statewide_Study_Plan.pdf).

2014 identified that just over one-third of NYS homes do not receive an annual tune/service call for their HVAC systems, indicating a significant intervention opportunity around annual HVAC servicing. Further analysis of the data from these studies can be used to establish the condition of specific building types or segments at a point in time to serve as a standard practice baseline against which evaluation work can more precisely measure the impact of specific interventions. For example, the Residential Statewide Baseline study indicates that roughly a quarter of existing homes use heating oil as their primary heating fuel; this baseline will be used to understand the impact of NYSERDA programs that encourage heat pump technologies and develop fuel-neutral initiatives. Furthermore, these studies will provide valuable data to triangulate with other sources in order to arrive at estimates of the indirect, market transformative effects of NYSERDA and other interventions in the market in terms of key indicators, e.g., market penetration of high efficiency HVAC or other measures. In addition to measuring market transformation effects, the publicized results from these building stock studies will also inform the private market to better understand energy efficiency and renewable energy investment opportunities (see Information Dissemination section for more details).

The process for conducting building stock studies and regularly maintaining the key construction market attributes will require NYSERDA to assess which research elements may be established and/or supplemented by existing data (public or purchased) and which elements will require primary data collection. Furthermore, the elements requiring primary data collection will be organized by the level of effort. For example, some data can be reliably collected through phone or web-based surveys while other data requires on-site verification, based on complexity and level of rigor desired. To date, this assessment work has identified sources like HARDI data from D&R International to be a reliable source to track the penetration of energy efficiency HVAC equipment sales. This data can be purchased on an annual basis to keep building stock information current in the interim years between studies. Where data like the estimated level of private investment in energy efficiency within a construction market would likely require primary data collection, it may be annually updated through web-based surveys. Lastly, data elements like efficiency levels of equipment installed requires on-site verification approximately every five years.

This process and specific data collection plan for each construction market will be identified during the first task of each building stock study.

Research by major end use and operations and behavior elements vary by construction market and are identified in Table 3 below. The building stock studies are designed to collect key characteristics on buildings and equipment including, fuel type, vintage, equipment type, nameplate data, and measure counts. Building stock studies will generally include secondary data aggregation to support primary data collection. Primary data collection may include telephone and web-based surveys for less granular data points (e.g., heating equipment type) and on-site visits to validate phone and web-based data or collect additional granular data (e.g., Furnace annual fuel utilization efficiency (AFUE)) that may not be easily or accurately self-reported by the respondent.

**Table 3. Sector Building Stock Study Elements**

Elements of Research	Residential	Multifamily	Commercial
<b>Major End Uses</b>			
Lighting	X	X	X
Heating and Cooling	X	X	X
Ventilation	X	X	X
Space heating	X	X	X
Process heating/cooling		X	X
Water heating	X	X	X
Motors, fans and pumps		X	X
Compressed air		X	X
Refrigeration		X	X
Plug load/Computing/data/electronics	X	X	X
Segment-specific end-uses	X	X	X
Building shell (insulation and air sealing)	X	X	X
Appliances (e.g., dishwasher, clothes dryer, clothes washer)	X	X	
<b>Operations and Behavior</b>			
Operation days-of-week		X	X
Space hours-of-use		X	X
Equipment hours-of-use	X	X	X
Maintenance and Replacement practices	X	X	X
Awareness of energy efficiency technologies and practices	X	X	X
Control strategy (e.g., lighting: manual, EMS, occ. sensors, dimmers, daylighting, etc.; HVAC: thermostat, EMS, etc.)		X	X
Settings/set points (e.g., thermostat settings, hot water temps; use of energy-saving settings)	X	X	X
Common space attributes		X	X

From a longitudinal perspective, the comprehensive picture of the construction markets at different points in time can be used to understand the trend line within a construction market. These studies require regular updates, currently projected to be conducted every five years with specific elements collected annually through secondary data purchases and targeted primary data collection as described above. In addition, more frequent data collection may be conducted to ensure metrics on key indicators are current. Table 4 below is the schedule for building stock studies.

**Table 4. Timing of Sector Building Stock Studies**

	2016	2017	2018	2019	2020
Residential		Design & Implement Update Study	Measurement Year	Report Out	
Multifamily				Design & Implement	Baseline Year
Commercial	Design & Implement	Design & Implement	Baseline Year	Report Out	

### ***Future Potential***

The building stock studies and associated data will directly feed into NYSERDA's short-term potential studies. NYSERDA will maintain energy efficiency potential models for each of the construction markets that estimate technical, economic and achievable energy efficiency opportunities in NYS over the next three and five years. The models will be maintained through both bottom-up (measure-level) data from building stock studies and top-down (end-use or sector-level) data from secondary or other sources, e.g., technology cost forecasts. The potential studies will also include consideration of the influence of code changes. The potential studies will assist with the identification of energy-related opportunities and, when possible, recommend intervention action or adjustments to pursue opportunities found to be cost-effective. The potential studies will inform intervention targets and the development of strategic initiatives that best align with the State Energy Plan, CEF and REV goals.

NYSERDA will employ a strategy for keeping the potential studies up to date in the interim years between major primary data collection efforts. Inputs envisioned to be updated more frequently, potentially on an annual basis, are avoided costs, market penetration values gathered from secondary data and data purchases, and other such inputs.

#### **3.1.5 Macro Level Analyses<sup>4</sup>**

NYSERDA will explore the viability and utility of conducting top-down analysis, including potentially basic approaches to more sophisticated econometric, macro-consumption studies, to provide a more complete understanding of overall end-use and energy reduction outcomes, including those associated with all clean energy strategies in the State. Macro level analysis is useful to corroborate and correlate observed building and equipment changes with actual changes in energy use, controlling for factors such as energy prices, overall economic health, weather and business cycles. Should the approach prove feasible and effective in New York, wider scale implementation of macro-level analysis every 2-3 years can provide comprehensive information directly related to assessing the State Energy Plan energy, environmental and economic goals. Reduced energy consumption by sector can be translated into energy cost savings and emission reductions.

NYSERDA is also exploring the potential use and development of energy intensity indicators. Energy intensity is measured by the quantity of energy required per unit output or activity and may include energy use per unit of Gross State Product or energy use per square foot of building space in the residential sector, for example. Energy intensity indicators can be used to consistently track changes in energy intensity over time, for the State as a whole as well as for specific end-use sectors.

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<sup>4</sup> The *Plan for EEPS Statewide Research Studies and Joint Evaluations*, prepared by the Evaluation Advisory Group in February 2012 and updated August 2012, included Top-Down Energy Indicator/Econometric Study work consisting of identifying methods and conducting pilot assessments, as well as a full Statewide effort. Thus, the initial work identified in this MCDC will utilize EEPSII Evaluation funds. Future work planned for later years of the CEF will utilize CEF Evaluation funds, following appropriate updates to this MCDC to gain authorization.



## 3.2 Information Dissemination

The approach outlined in this Chapter allows for effective sharing of insights, resulting both from studies and the like and from learnings derived from interventions.

As studies are completed on the time lines identified within this Chapter, NYSERDA will share the data and information gained through this work with the public by publishing studies on its website and in the Department of Public Service's Document and Matter Management (DMM) system<sup>5</sup>, posting data on Open NY and in the context of later filed initiatives that will rely on this information. NYSERDA will also provide an update on information gained through the work outlined in this Chapter, and how the information has influenced activities, in the annual investment plan and progress reports. In addition, NYSERDA will seek out other ways to ensure NY Program Administrators have access to, and can benefit from, this information.

At this time, a nominal amount of funding associated with information dissemination is included within the budgets for activities identified elsewhere in this Chapter. If in the future NYSERDA identifies a more significant need for funding specific to information dissemination, this request will be made in the form of updates to this Chapter. However, NYSERDA is developing a suite of tools to support systematic and ongoing knowledge sharing by engaging with the market on data and information gained through its work, and to collect viewpoints and reactions to concepts during the strategic development process. For example, NYSERDA may leverage its Salesforce CRM platform to create "communities" that enable NYSERDA to opt-in market stakeholders for intelligence seeking or sharing of insights.

## 3.3 Additional Resources

### 3.3.1 Technical Assistance for Reform of the Electric Distribution System and Markets

NYSERDA will competitively select a pool of contractors qualified to assist NYSERDA staff in conducting objective economic and technical analysis and analytical modeling to inform the modernization of the electric distribution system in New York State; this work will complement and enhance the impact of CEF activities and further the objectives outlined in the 2015 New York State Energy Plan. The 2015 Energy Plan coordinates across State policies, agencies, and authorities that touch energy to advance the State's comprehensive energy policy initiative, REV. Central to the REV agenda are initiatives to reform regulatory policy, create new markets, and catalyze technological innovation to integrate clean DER into the core of the State's electric system.<sup>64</sup>

This contractor pool will make available specialized expertise and technical assistance across multiple support areas that reflect NYSERDA's current and anticipated work to advance reform of the State's electric distribution system and markets. Access to the contractor pool will augment

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<sup>5</sup> Final CEF evaluation plans and studies will be posted to DMM under Matter #16-02180.

<sup>6</sup> DER is comprised of a variety of resources, principally located on customer premises, including energy efficiency, demand response and energy management controls that increase demand elasticity, distributed storage, microgrids, and roof-top solar, combined heat and power, and other on-site power generation.

NYSERDA staff capabilities when called upon to undertake distinct, time-sensitive projects. Consistent with NYSERDA's leadership role in developing the State Energy Plan, NYSERDA will continue to provide research and analytic work to inform ongoing deliberations on relevant policy and regulatory proposals. NYSERDA also will use these technical assistance services in developing complementary CEF initiatives, which both account for anticipated regulatory reforms and help to accelerate technology and business model innovations that will make possible greater investment in and integration of clean DER.

### 3.3.2 Data Sets

To aid in securing timely information, NYSERDA will expand on its procurement of secondary data resources for intelligence gathering and analysis across NYSERDA's efforts. Databases will be purchased for both quicker and more qualitative findings, and also to support more foundational, quantitative work. The secondary research will be used both as a precursor to a primary research (i.e., to help clarify what is to be learned) and to answer specific, targeted research questions. In some cases, studies cannot definitively answer the research question but, nonetheless, can contribute to an understanding of the issue.

Data sources that NYSERDA plans or has procured include, but are not limited to the following:

- CoStar: CoStar provides access to research and data on commercial real estate properties throughout New York State, including building stock characteristics, lease turnover, and average tenant space square footage. This provides NYSERDA with key market intelligence to inform program design and continually up-to-date learnings about the market. This will be leveraged to support initiatives targeting commercial real estate tenants and multifamily buildings.

Info Group (formerly Info USA): Both the business and consumer datasets contain confirmed contact information for New York State businesses and individuals that can be used for marketing, program outreach, and sample development for evaluation and market insights. The datasets also contain both verified and modelled data points on firmographics and demographics, information like sales revenue or employee counts that will enable NYSERDA to track market growth related to new interventions. The datasets also include geo-coding for these entities which will be used to develop maps that enable geographic targeting.

- McGraw-Hill (including market sizing, relationship, and Dodge products): Market sizing function uses historic data from the Dodge data to construct forecasts the growth/contraction of construction by major Commercial building type, model is usually within five percent of reality. Relationship and Dodge data provide maps of key market actors relationships, market channels, and key specifications on any new commercial construction occurring in NYS (e.g., sq. ft., building type, value, etc.). This suite of data would provide a comprehensive picture of the commercial construction market that will enable more accurate evaluation, better segment-design program interventions, and a strategic understanding of the market's evolution.

- D&R International: Collects heating and cooling equipment sales by fuel, efficiency, and equipment type from surveys with Heating, Air-conditioning, and Refrigeration Distributors International (HARDI) members. This type of data enables program planning, marketing, and evaluation of the HVAC market in NYS through understanding market size, penetration and saturation of specific HVAC equipment, and identifies areas for potential growth/impact. NYSERDA's 2015 Residential Baseline Study identified and validated the HARDI data by comparing it to two other data sets, and NYSERDA plans to use the HARDI data set to potentially offset the need for more costly primary data collection in the future.
- Navigant: Provides research and analytical support on a variety of topics, including energy storage, residential energy innovations, and distributed generation. This information will provide key market intelligence to inform program design, and continually provide up to date learnings about the market.
- Green Tech Media: Provides research and analytical support on a variety of topics, including solar and grid-tied technologies. Information includes market forecasts, technology hard vs. soft cost breakdowns, and granular data and insights into global grid vendor deployments and projects. This information will provide key market intelligence to inform program design, and continually provide up to date learnings about the market.
- E-Source: A research library and data sets subscription service that provides access to market analysis tools and advisory services for more effective program planning, including knowledge of the best technologies. This work will provide insights to inform investments in the Products area.
- NYSERDA will investigate a data set that captures renovation/gut-rehab information, including the quantification of square foot of renovation activity, amount of energy savings potential (and/or energy efficiency activity), and systems break-out (envelopes, systems, etc.). This insight and data will inform New Construction and Codes strategy and investments.

In addition to the above data sets and resources, NYSERDA will also leverage and procure data from other sources, as appropriate, to support its efforts on an ongoing basis. Some of the initial purchases of data sets will utilize existing EEPS and T&MD funds.

### 3.3.3 Utility Data

The Market Characterization & Design work described herein will require access to utility customer and system data. This Chapter recognizes that the approach for providing this data has not yet been resolved and requires consideration of the value of and usefulness of the data, as well as of feasibility and of privacy and proprietary concerns that arise. The Chapter notes that there is an existing New York State Public Service Commission REV proceeding that includes the consideration of issues related to utility data.<sup>7</sup>

Data needed includes customer-level but anonymized data on certain defined segments/sectors of

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<sup>7</sup> Case 14-M-0101, In the Matter of Reforming the Energy Vision.

customers, including variables such as annual energy use, segmentation by NAICs code, location, and utility program participation, is needed to define the population and to develop sampling plans for sector building stock studies. Similar data is also needed for macro-consumption analysis.

Contact information is needed for a subset of customers selected for sampling within the sector building stock or other studies. These customers will be contacted for agreement to participate in such studies and will be asked to provide authorization for more detailed information, such as their individual energy consumption data, to be released to NYSERDA for use within the study.

### 3.3.4 Professional and Expert Engagement

The CEF will take advantage of national, state and regional entities whose mission is to advance and improve markets for clean energy to collaborate, further inform research, aggregate information from thought leaders and experts, and pool resources across multiple jurisdictions. Support for such organizations allows for the collection of best practices for program formation, as well as ‘next generation’ or innovations in program approaches and market designs that may help with New York’s REV strategy as well as the CEF implementation. Memberships provide forums for NYSERDA to engage with experts in various topic areas, as well as platforms that both inform policy and program directions for New York, and promote New York’s approaches to clean energy market development. Such engagements can also have the effect of eliciting interest in New York’s clean energy market, providing greater opportunities for products and services as well as increasing the level of expertise among stakeholders to foster greater information exchange in public proceedings. Finally, such institutions often provide focused research and/or market data (particularly in regional markets) that help to ensure that CEF strategies can be best structured to have impact in target market audiences.

NYSERDA has found value in membership of national, regional, state organizations in the past. As NYSERDA evolves its focus and activities under the CEF, it will continue to assess which organizations/activities provide the greatest value for engagement in furtherance of the CEF objectives. NYSERDA will engage where the organization furthers its market characterization and design activities, as well as provides market intelligence, information, pooled resources from multiple sources such as various states, or expertise that can inform future initiatives that would not be achieved otherwise.

## 3.4 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 5. The annual expenditure projection is included in Table 6. Budgets and expenditures do not include Administration or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. For transparency, NYSERDA has included in this budget activities planned for the years indicated. It is expected that activities will be added, especially for the later years in these tables, as this Chapter is updated and refiled in the future.

As noted earlier in this Chapter, some activities previously planned to be undertaken within EEPS or T&MD will be supported by NYSERDA’s EEPS or T&MD funding initially. Descriptions of these activities are included in this Chapter nonetheless as they are a critical part of NYSERDA’s CEF

evaluation approach and are planned to be included in future updates to this Chapter requesting allocation of CEF funding for later work. The budget and expenditure schedule below includes only CEF funds needing authorization at this time and is not indicative of the level of future CEF budget/spending that is envisioned for the work described. Furthermore, the budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

**Table 5. Evaluation Annual Budget – Based on Expected Schedule of Commitments**

<b>Budget - Commitment Basis</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>Total</b>	
Market Development Market Research	<i>Market Characterization &amp; Design Activities</i>									
	Intervention Pre-Development	\$50,000	\$625,000	\$2,400,000	\$725,000	-	-	-	-	\$3,800,000
	Novel Solutions	-	\$50,000	\$3,300,000	\$3,300,000	\$2,600,000	-	-	-	\$9,250,000
	<i>Additional Resources</i>									
	Technical Assistance	\$150,000	\$1,750,000	\$1,350,000	\$1,250,000	\$500,000	-	-	-	\$5,000,000
	Data Sets	\$150,000	\$150,000	\$150,000	\$150,000	-	-	-	-	\$600,000
	Professional and Expert Engagement	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	-	-	-	\$2,500,000
<i>Sub-Total</i>	<i>\$850,000</i>	<i>\$3,075,000</i>	<i>\$7,700,000</i>	<i>\$5,925,000</i>	<i>\$3,600,000</i>	-	-	-	<i>\$21,150,000</i>	
Innovation & Research Market Research	<i>Market Characterization &amp; Design Activities</i>									
	Intervention Pre-Development	-	-	-	\$250,000	-	-	-	-	\$250,000
	<i>Sub-Total</i>	-	-	-	<i>\$250,000</i>	-	-	-	-	<i>\$250,000</i>
Evaluation	<i>Market Characterization &amp; Design Activities</i>									
	Market Fundamentals	-	\$977,500	\$690,000	\$4,864,500	\$632,500	\$552,000	-	-	\$7,716,500
	<i>Additional Resources</i>									
	Data Sets	-	-	-	\$100,000	\$125,000	\$25,000	\$25,000	\$25,000	\$300,000
<i>Sub-Total</i>	-	<i>\$977,500</i>	<i>\$690,000</i>	<i>\$4,964,500</i>	<i>\$757,500</i>	<i>\$577,000</i>	<i>\$25,000</i>	<i>\$25,000</i>	<i>\$8,016,500</i>	
<b>Total</b>	<b>\$850,000</b>	<b>\$4,052,500</b>	<b>\$8,390,000</b>	<b>\$11,139,500</b>	<b>\$4,357,500</b>	<b>\$577,000</b>	<b>\$25,000</b>	<b>\$25,000</b>	<b>\$29,416,500</b>	

**Table 6. Annual Expenditures Projection**

<b>Expenditures</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>Total</b>
Market Development Market Research	5%	20%	27%	24%	18%	6%			100%
Innovation & Research Market Research	-	-	-	100%	-	-			100%
Evaluation	-	12%	9%	62%	9%	7%	0.3%	0.3%	100%

## Appendix A – Timeline

Year	Sector	Activity	Status
2016	Commercial	Market Assessments for Commercial: HVAC; EMS/BMS; Energy Service Market; Customer Decisions	In process. Preliminary findings will be complete by early 2018; final deliverables will be informed by and align with the completion of the Commercial Building Stock Study.
		Design and Implement Commercial Building Stock Study	In process. Final deliverables expected 2019.
	Industrial	Current state of industrial operations among small to medium facilities	Shifted activities to 2018.
	Single Family	Investigate Standardized Approaches to energy efficiency in the residential sector	Moved to 2019 due to priority shifts
		Net Zero Energy Homes Market Assessment	Complete. Final study will be posted to NYSERDA's website.
		Assess solutions gaining traction in the residential sector, including delivery mechanisms and key factors for contractor selection	Shifted activities to 2018.
		Analysis of business models for residential HVAC and other contractors	Shifted activities to 2018.
	Multifamily	Analysis of building management and investment structures, financing mechanisms and barriers, and tenant preferences; Analysis of multifamily service provider market	Shifted activities to 2018.
	LMI	Inventory of LMI homes previously served and assessment of unmet needs of market	Completed. through Apprise Market Characterization Study. Final study to be posted on NYSERDA website.
		LMI Key Housing/Energy Assessments	Complete. Final study posted <a href="#">here</a> . <sup>1</sup>
		Integration of Key Cross-Agency Information Sets for LMI	Ongoing activity.
	Products	Home Energy Management Systems Market Assessment	Complete. Final study posted <a href="#">here</a> .
		Air Source Ductless Mini-Split Market Assessment	Complete. Final study will be posted to NYSERDA's website.
		Home energy management systems and ARTU market analyses	Shifted activities to 2018.
	Workforce Development	Analysis of operations and maintenance skills gaps and training needs; research to isolate the energy impacts and non-energy benefits for buildings	In progress. To be completed Q4 2017.
	Transportation	Transportation Market Assessment	Complete. Final study posted <a href="#">here</a> . <sup>2</sup>
On-Site Power	Evaluate market approaches to attract luxury condo/coops and hotels segments to CHP	Activities cancelled due to priority.	
Solar PV	PV Balance of System Cost Study	Complete. Final study posted <a href="#">here</a>	

Year	Sector	Activity	Status
	Cross Sector	Impact Study on NYSERDA Technology Demonstration Projects	Complete. Final study posted <a href="#">here</a> .
		Behavior Research	Ongoing activity.
		Performance Based Solutions Research	Ongoing activity.
		Explore macro consumption modeling and energy intensity indicators	Ongoing activity.
		Information dissemination	Ongoing activity.
2017	Commercial	Analysis of smaller commercial buildings, including applicability of ESCOs	Scoping of project underway. Complete study in 2018.
		Assess remote audits	Activities shifted to 2018.
		Intelligence for commercial office space and leasing process	Scoping of project underway. Complete study in 2018.
		Segment colleges/universities and K-12 for depth of sustainability activity	Activities shifted to 2019.
		Map values/drivers for college faculty, staff and donor engagement.	Activities shifted to 2019
		Net Zero Energy Commercial Building Market Assessment	Study scoping in process.
		Assess baseline year for Commercial Building Stock Study	Move to 2018 given current progress of the study.
	Industrial	Evaluate and test mentoring and internship approaches in the industrial sector	Activities conducted in house,.
		Inventory of current industrial M&V protocols	Activities conducted in house
		Testing uptake for new approaches to energy efficiency in the industrial sector	Activities shifted to 2019.
	Single Family	Analysis of realtors, appraisers, lenders and markets to integrate efficiency at point of home sale	Project underway. To be completed in 2017.
		Update to Home Energy Management Systems Market Assessment	Moved to 2018 due to priority shifts.
		HVAC Market Assessment	Study scoping in process.
		Design and implement Residential Building Stock Study	Study scoping in process.
		Assess viability for a centralized on-line consumer resource to support residential energy systems, performance information, and service offerings	New study added to MCDC as part of November 1, 2017 filing.
	Multifamily	Analysis of multifamily building management and investment structures, financing mechanisms, and tenant preferences	Activities shifted to 2018
		Net Zero Energy Multifamily Building Market Assessment	Study scoping in process.
	LMI	Analysis on affordable housing builders and developers for potential to build to higher standards	Scoping of project underway. Complete study in 2018.
		LMI Key Housing/Energy Assessments	Cancelled due to priority and recent completion date of 2016 study.
		Integration of Key Cross-Agency Information Sets for LMI	Ongoing activity.

Year	Sector	Activity	Status
	Energy Storage	Assess best fit sectors for energy storage	Activities conducted in house
		Assess opportunities for storage as an integrated ESCO service offering	Study areas revised. Activities shifted to 2019.
		Assess viability of alternative ownership models for energy storage (shared savings, PPA, etc.)	Study areas revised. Activities shifted to 2019.
	Renewable Heating and Cooling	Customer analysis on decision making and value propositions	Project underway. To be completed in 2018.
		Analysis of contractor business models	Project underway. To be completed in 2018.
	Workforce Development	Analysis of operations and maintenance skills gaps and training needs	New study added to MCDC as part of November 1, 2017 filing.
	Transportation	Assess critical clean transportation segments (i.e. car dealers, employers, municipalities, etc.) for economics, decision making and value propositions around EVs	Activities shifted to 2018.
	On-Site Power	Assess opportunities to increase uptake of small CHP (<50Kw) for restaurants and low rise Multifamily (25 units)	Activities cancelled due to priority.
	Cross Sector	Behavior Research	Ongoing activity.
		Performance Based Solutions Research	Ongoing activity. Project scoping for phase 1 research underway.
Information dissemination		Ongoing activity.	
2018	Commercial	Update to Key Commercial Market Assessments including: HVAC; EMS/BMS; Energy Service Market; Customer Decisions	Study moved to 2019 given planned completion date of 2016 study.
		Report out from Commercial Building Stock Study	Report out moved to 2019 given current progress of the study.
	Industrial	Evaluate and test tools for measuring productivity of data centers	Activities shifted to 2019.
		Assess emerging technologies for potential application in industrial process	Activities shifted to 2019.
	Single Family	Update to Net Zero Energy Homes Market Assessment	No change to original plans.
		Assess baseline year for Residential Building Stock study	No change to original plans.
		Assess solutions in other jurisdictions for potential in New York	New study added to MCDC as part of November, 1, 2017 filing
	LMI	LMI Key Housing/Energy Assessments	No change to original plans.
		Integration of Key Cross-Agency Information Sets for LMI	No change to original plans.
		Analysis of landlords and property owners capital improvements decision making	New study added to MCDC as part of November 1, 2017 filing
	Products	Update to Air Source Ductless Mini-Split Market Assessment	Study moved to 2020 due to priority shifts.



Year	Sector	Activity	Status
	Transportation	Update to Transportation Market Assessment	Study moved to 2020 to align with annual study timing not disaggregated in original filing.
	Solar PV	Update to PV Balance of System Cost Study	Study moved to 2019 to align with annual study timing not disaggregated in original filing.
	Large-Scale Renewables	Large-Scale Wind Balance of System Cost Study	New study added to MCDC as part of November 1, 2017 filing.
		Assessment of attitudes and perceptions surrounding large-scale solar and land-based wind, including issues on siting and transmission development	New study added to MCDC as part of November 1, 2017 filing.
		Analysis of bottlenecks in citing review process of major electric generating facilities (Article 10 process)	New study added to MCDC as part of November 1, 2017 filing.
	Financing Solutions	Understanding of potential barriers and obstacles to accelerate the cost-effective deployment of energy efficiency and renewable energy technologies in the State	New study added to MCDC as part of November 1, 2017 filing.
	Renewables Value improvement and Connectivity	Analysis surrounding the development of innovations for renewables value improvement, connected buildings and smart mobility	New study added to MCDC as part of November 1, 2017 filing.
	Cross Sector	Impact Study on NYSERDA Technology Demonstration Projects	No change to original plans.
		Behavior Research	Ongoing activity
		Performance Based Solutions Research	Ongoing activity
		Information dissemination	Ongoing activity.
		Novel Solutions In Market Testing	New study added to MCDC as part of November 1, 2017 filing.
	2019	Single Family	Report out from Residential Building Stock Study
LMI		Feasibility study and analyses on potential for scaling market for zero net energy modular homes to increase affordability for LMI residents.	New study added to MCDC as part of November 1, 2017 filing.
Multifamily		Design and implement Multifamily Building Stock Study	No change to original plans.
New Construction		Analysis of demo/cultural trends shaping new construction 5-10 years out	New study added to MCDC as part of November 1, 2017 filing.
Notes:			
<ol style="list-style-type: none"> <li>Additional volumes of this study, including the Executive Summary, Special Topic Reports, Methodology Reports, Acronyms and Glossary can be found <a href="#">here</a> under the Low- To Moderate-Income Market Characterization Study heading.</li> <li>Additional volumes of this study, including the Executive Summary, Electric Vehicles and Transportation Demand Management Market Characterization and Baseline Assessments and report appendices can be found here under the Clean Transportation Market Characterization Study heading.</li> </ol>			