

ECONOMIC IMPACTS FROM NYSERDA'S INNOVATION & RESEARCH PORTFOLIO

Final

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STUDY OBJECTIVE

New York State Energy Research and Development Authority (NYSERDA)'s Innovation and Research (I&R) portfolio supports clean energy technological innovation to accelerate new business ventures in New York State (NYS). By supporting the development, commercialization, and integration of new clean energy technologies, the I&R portfolio helps NYS become a leader in clean energy technological innovation, and generates a range of benefits to businesses, entrepreneurs, consumers, ratepayers, and society at large. This study evaluated three of NYSEDA's six Clean Energy Fund program areas under the I&R portfolio: Building Innovation, Clean Transportation, and Grid Modernization.

Figure 1: Innovation and Research Portfolio Breakdown

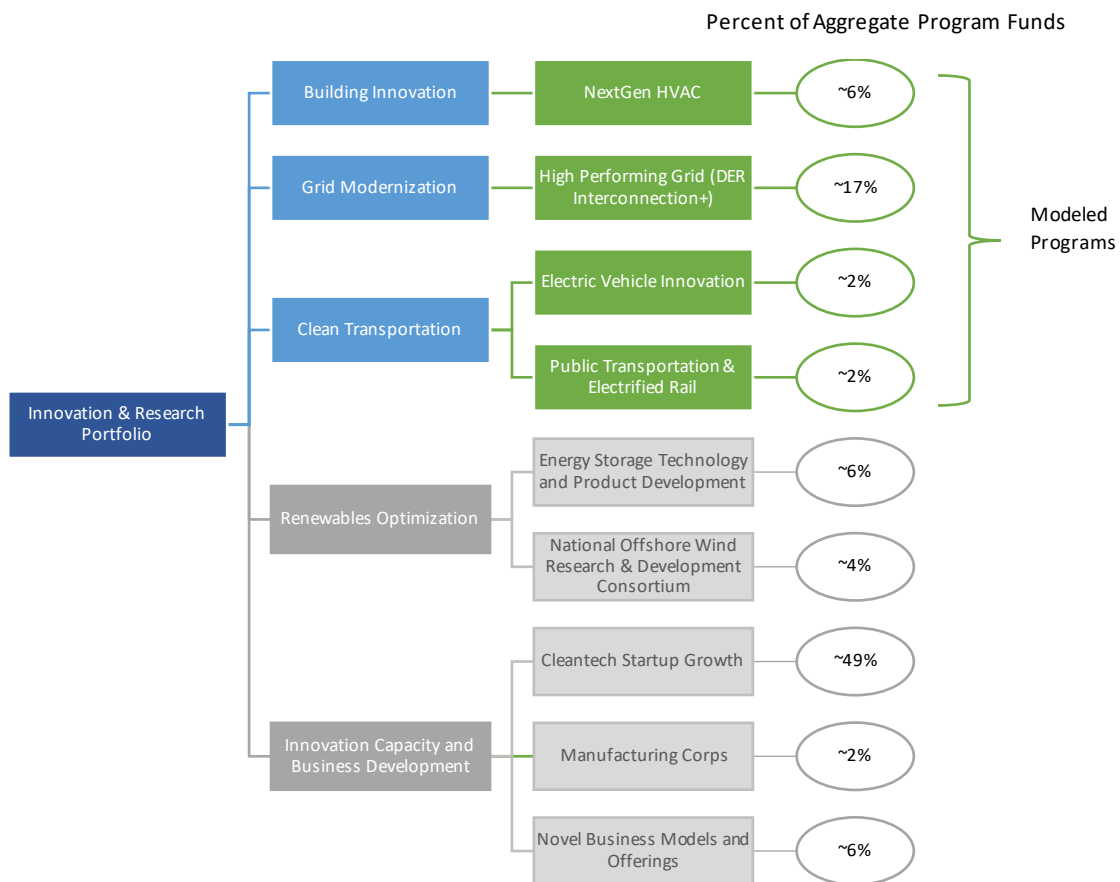


Figure 1 above shows the components of the I&R portfolio, highlighting those that were modeled in this study and the relative size of those program areas. ¹ Table 1 below shows the actual total funding allocated for the different I&R components, broken down by the State allocation, termed NYSERDA Funds, and the projections for the leveraged Private Funds. ²

Table 1: NYSERDA, Private, and Total Funding for I&R Programs, \$M

I&R Chapter	Program	NYSERDA Funds	Private Funds	Total Funds
Building Innovation	NextGen HVAC	\$30.0	\$151.9	\$181.9
Grid Modernization	High Performing Grid	\$116.8	\$420.7	\$537.5
Clean Transportation	EV Innovation	\$19.9	\$49.1	\$69.0
	Transit Innovation	\$18.5	\$43.9	\$62.4
Renewables Optimization	Energy Storage	\$33.0	\$172.3	\$205.3
	OSW R&D	\$22.5	\$112.9	\$135.3
Innovation Capacity and Business Development	Cleantech Startup	\$97.7	\$1,476.0	\$1,574.0
	Manufacturing Corps	\$12.0	\$64.3	\$76.3
	Novel Business Models	\$16.1	\$168.6	\$184.7

MODELING METHODOLOGY

REMI PI+ Model

The economic analysis of the I&R programs was conducted using a customized version of the REMI Policy Insight Plus model, a widely used industry model.

REMI’s PI+ model is a structural economic forecasting and policy analysis model that integrates several analytic techniques including input-output (I-O), computable general equilibrium (CGE), econometric, and economic geography methodologies. REMI is a dynamic model, with forecasts and simulations to include behavioral responses to wage, price, and other economic factors.

The REMI model projects the total economic effects of policy initiatives, as defined by changes in key policy variables such as change in output or prices (e.g., sales of new products, changes in electricity or natural gas production and prices), investments (e.g., in energy efficiency or battery storage capacity), and changes in production costs, among other variables.

Modeling Assumptions

The modeling used a variety of data sources but primarily relied on historical and projected NYSERDA I&R Program data, as shown in Table 1 above. Throughout the modeling effort many assumptions were made to develop model inputs, but a few key conservative assumptions were made that likely lead to results representing a low estimate of economic impacts. Some of those key assumptions or conservative data estimates are:

¹ The sixth program area, not shown in Figure 1 is Energy-Related Environmental Research, designed to increase the understanding and awareness of the environmental impacts of energy choices and emerging energy options through scientific and technical research. Since this program area is not expected to create significant jobs, it was excluded from this analysis.

² Macroeconomic modeling for these types of research programs present different challenges because of the unique characteristics of each program area. This study only focused on modeling three of the six programs because of data limitations and resource constraints.

- Macroeconomic results in the study likely do not include all the benefits these programs provide. The I&R program may well lead to lagged benefits that are difficult to fully account for in a standard macroeconomic modeling exercise. Benefit metrics included and modeled in this analysis, while estimated largely based on the extrapolation of available data and other defensible techniques, would likely not capture all significant economic benefits.
- A key driver of the economic impacts are product sales from successful NYSERDA investments under each program. The amount of product sales, and how long they last, were estimated from available historical I&R program data. This results in a conservative estimate of product sales particularly for newer programs, as well as for investments made in recent years that may not yet have products on the market or are expected to have product sales in future years.
- Modeling does not account for potential groundbreaking technological advancements that alter the technological landscape (i.e., “home runs”) and are associated with low probability, yet highly impactful investments.
- The timeframe of funding varies across programs. Since the CEF was progressively built, the NYSERDA programs did not all begin at the same time and many have different durations of planned/approved funding currently. For this analysis, funding was assumed to continue through 2030. However, if funding continues past this timeframe, further economic impacts will result. Additionally, modeling components with lifetime impacts, such as energy savings and product sales, were conservatively assumed to last up to 2040.
- Results only include impacts from select I&R programs, and therefore exclude impacts from the Innovation Capacity and Business Development and Renewables Optimization programs. As a result, a significant portion of I&R portfolio spending is not included in the study. These programs could potentially be analyzed in a subsequent phase of this work.

INNOVATION & RESEARCH PORTFOLIO PROGRAMS

Brief summaries of the modeled I&R programs are outlined below:

- **Building Innovation**
 - **NextGen HVAC:** Initiative focused on developing, demonstrating, commercializing, and de-risking solutions to deliver better performance and cost reductions to building heating, cooling, and ventilation (HVAC).
- **Grid Modernization:** Program aimed at lowering the carbon intensity of energy usage and increasing customer engagement in energy markets.
 - **High Performing Grid (Grid Innovation):** Initiative investing in digitally enhanced and dynamically managed electric grid innovation.
- **Clean Transportation:** Program aimed at reducing greenhouse gas emissions from the transportation sector and gaining market share for these products.
 - **Electric Vehicle Innovation (EV Innovation):** Initiative focused on expanding market adoption of Electric Vehicles (EVs).
 - **Public Transportation & Electrified Rail (Transit Innovation):** Initiative aimed at investing in energy-efficient products and operating strategies for NYS’s public transportation system.

MODELING RESULTS

Table 2 below presents the cumulative employment in job-years³ by component across the four I&R programs modeled. Components include various pathways of economic impacts, both that lead to positive and negative impacts, so as to provide a holistic picture of the overall impacts. Positive impacts could include the money that is invested in the New York economy, product sales over time and bill savings from these clean energy products and services, as well as other unique benefits such as grid reliability benefits for the Grid Modernization program. Negative impacts could include opportunity costs of these investments, lost revenues for utilities, mostly for electric utilities but also for gas consumption decreases in some cases, and the estimated costs of the program to ratepayers. And although these contribute to negative employment impacts, these are outweighed by increased employment from program investments, positive grid reliability impacts, bill savings, and increased product sales, for the overall positive impact on the New York economy.

Table 2: Total Employment Impact by Component and I&R Program, Job-years (2017-2040)

Component	Building Innovation	Clean Transportation	Grid Modernization	
	NextGen HVAC	EV Innovation	Transit Innovation	High Performing Grid
Total Investment	666	268	146	1,773
Private Investment Opportunity Cost	(1,412)*	(703)	(614)	(3,601)
Grid Reliability Impacts	-	-	-	5,592
Oil Consumption	-	(13)	-	(9)
Electricity	-	15	-	-
Bill Savings	255	592	151	12
Lost Utility Revenues	(168)	-	(114)	-
Product Sales	4,841	4,204	3,780	1,519
Program Cost to Ratepayers	(269)	(179)	(163)	(1,023)
Total	3,913	4,184	3,186	4,263

**Parentheses in Table 2 represent a decrease in job-years, i.e., job losses related to certain cost increases or revenue losses.*

Table 3 below provides an overview of the average annual jobs and cumulative economic impacts of the NextGen HVAC, EV Innovation, Transit Innovation, and High Performing Grid I&R programs in the State. Each program is expected to generate between 133 and 180 average annual jobs, between 3,186 and 4,263 cumulative job-years and a minimum of \$495 million and \$228 million in Gross State Product (GSP) and Disposable Personal Income (DPI), respectively. The Grid Modernization program is estimated to generate the most annual jobs and job-years, at almost 180 jobs on average and 4,263 job-years cumulatively, as well as result in the greatest impact to GSP and DPI, at \$776 million and \$473 million, respectively.

³ A job-year is the amount of work that can be done by one person in a year. A job-year is also commonly referred to as a full-time equivalent (FTE).

Table 3: Average Annual and Cumulative NYS Economic Impacts of Select I&R Programs

I&R Chapter	Program	Avg. Annual Jobs	Total Job-Years	GSP, 2022\$M	DPI, 2022\$M
Building Innovation	NextGen HVAC	163	3,913	\$603	\$244
Clean Transportation	EV Innovation	174	4,184	\$650	\$307
	Transit Innovation	133	3,186	\$495	\$228
Grid Modernization	High Performing Grid	178	4,263	\$776	\$473
Total		664	15,546	\$2,524	\$1,253

Table 4 shows peak annual economic impacts⁴ across the selected I&R programs. NextGen HVAC, EV Innovation, and High Performing Grid all reach around 740 peak annual jobs and around \$120 million to \$130 million peak GSP. While Building Innovation and EV Innovation generate approximately \$100 million in increased DPI, High Performing Grid generates almost \$130 million. Transit Innovation generates the lowest peak impacts of the four modeled programs, at 529 peak annual jobs, \$85 million GSP, and \$71 million DPI.

Table 4: Peak Annual NYS Economic Impacts of Select I&R Programs

I&R Chapter	Program	Peak Annual Jobs	Peak GSP, 2022\$M	Peak DPI, 2022\$M
Building Innovation	NextGen HVAC	744	\$132	\$101
Clean Transportation	EV Innovation	740	\$119	\$99
	Transit Innovation	529	\$85	\$71
Grid Modernization	High Performing Grid	739	\$132	\$128

⁴ Because the modeling was conducted in annual increments, peak annual impact represents the largest annual impacts for jobs, GSP, or DPI, across the entire program lifetime.