Smart DG Hub

Value of Resiliency Survey Results

Summary results of extensive interviews conducted by Sustainable CUNY of the City University of New York in the Spring and Summer of 2017

Insurance

Banking

Public Policy

INTRODUCTION

IN THE AFTERMATH OF HURRICANE SANDY New York City and its partners determined that while the solar arrays on NYC rooftops at that time sustained little or no damage during the storm, they were unable to supply critically needed power during the subsequent outage. While integrated solar + storage (S+S) system installation, a.k.a. "resilient PV", are capable of supplying perpetual emergency power in the event of outages, in order to tap into this resource on a broad scale, key issues such as system design, costs, technology integration, incentive structure, codes and regulations need to be addressed.

SUSTAINABLE CUNY OF THE CITY UNIVERSITY OF NEW YORK formed the Smart Distributed Generation Hub (Smart DG Hub) to develop a strategic pathway to a more resilient distributed energy system, and won Federal and State support for the Resilient Solar Project and State support for Reducing Distributed Energy Storage Soft Costs.

BILLIONS OF DOLLARS are lost each year due to business interruption and damage to physical buildings and equipment from power outages. These costs are typically borne by the building owner, by a building's or enterprise's insurers, and/or the local, state, or federal government. Such losses cumulatively threaten to erode the value of a building or even the entire business enterprise, leaving the facility's lenders with vast exposure. When properly planned and sized, S+S systems can decrease a building's exposure to the risk of losses. As such, building owners, insurers, governments, and lenders have an incentive to minimize their exposure to losses incurred as a result of outages.

THE SOLAR+STORAGE MARKET has stepped closer to the tipping point since the inception of the Resilient Solar Project; however, the remaining critical task is to establish tangible price signals in the marketplace that will recognize the many values of resilient PV systems.

THE SMART DG HUB has now formed a "Value of Resiliency" (VoR) Strategy Team to engage subject matter experts in three key stakeholder communities to develop actionable industry and policy guidelines to recognize the value of resiliency offered by S+S system installation:

(i) Insurance
(ii) Government policy
(iii) Banking

By bringing together leaders across these stakeholder communities, the VoR Strategy Team aims to develop the strategies and tools for stacking the value offerings of resilient PV systems.

Contents

Executive Summary

Resiliency planning is rapidly becoming a focus among public and private real estate developers, facilities managers, and energy procurement specialists. While the cost of resilient PV systems has been dropping, such systems are often still deemed too expensive. However, these systems benefit a facility's insurers, mortgagees, and the public at large by reducing the facility's exposure to power outage-related losses. As such, real estate owners of all types are beginning to demand that their insurers, banks, and governments help make resilient PV systems more affordable. The ultimate goal of the VoR project is to create an easily understood value stream that improves the economic performance of S+S for building owners and facilities managers based on such systems' capacity to mitigate losses that are currently borne by a mix of: (i) the facilities owners themselves; (ii) business interruption, property, and other insurers; (iii) mortgage lenders; and (iv) the general public.

In the Spring and Summer of 2017 Sustainable CUNY's Smart DG Hub conducted in-depth interviews with experts in the fields of **insurance**, **banking** and **public policy** with a view towards developing a VoR Scope of Work that is fully informed by the industries capable of creating a tangible price signal for energy resiliency. Key findings and recommendations are summarized below and provided in each section, followed by the survey and responses.

Insurance

- Determine the magnitude of insurers' exposure to losses caused by power outages
- Convince insurers to offer more robust coverage for business interruption losses for a wider range of "triggers"
- Demonstrate the risk-reducing capabilities of S+S systems
- Build demand for insurance incentives within and among large policyholders

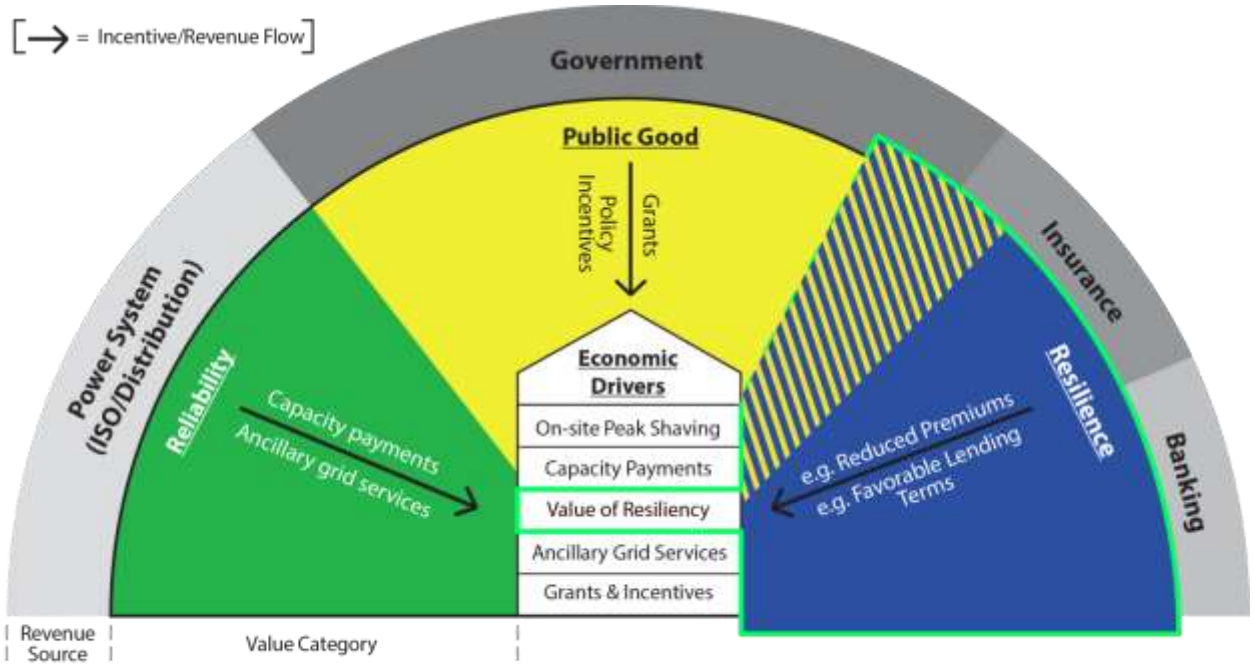
Banking

- Demonstrate how S+S installations put the building owner/borrower in a better cash flow position
- Find a way of appraising the increase in value of buildings with S+S
- Adjust actuarial tables to reflect the reduced risk profile of buildings with S+S
- Build demand for banking incentives within and among large real estate organizations

Policy

- Determine the total stack of externalities caused by power outages
- Build a coalition of groups from across the ideological spectrum to all "buy into" the VoR project
- Create a compelling narrative around S+S systems keeping the community powered
- Identify policy makers' different motivations for increasing energy resilience

Monetizing the Value of Resiliency Visual



Monetizing the Value of Resiliency

Survey Methodology and Principle Framing

Sustainable CUNY's Smart DG Hub commenced the VoR project on the basis of a straightforward hypothesis that an energy resilient building is less likely to experience insurance losses and that the insurance industry should therefore be an active participant in the S+S development market by incentivizing its policyholders to become energy resilient; the purpose of the work to date, including conducting the instant surveys, has been to refine that hypothesis. The Smart DG Hub has sought to develop a better understanding of the challenges and opportunities of engaging the insurance industry to first convince the industry of the risk mitigating capabilities of S+S systems, and then to offer incentives to policyholders that install such systems.

As this hypothesis began to take a clearer shape, the Smart DG Hub observed that there are additional stakeholder groups who are negatively impacted when a facility does not proactively plan for energy resiliency. Facilities that are entirely dependent on the traditional coal and natural gas powered utility grid are vulnerable to interruptions to their cash flow and a diminution in the value of their buildings when outages occur, and they are more likely to drain public resources following an outage event. Therefore, the hypothesis grew to encompass the banking industry (especially mortgage lending and trading in mortgage linked securities) and public policy makers, both of which have a vested interest in their clients' and constituents' energy resiliency.

The team spent several months reviewing the existing academic and trade literature and speaking with professionals working in each of these three stakeholder groups to determine whether any efforts were already underway to place a clear price signal on energy resiliency, and if not, what would be required to undertake such an effort.

Through those early efforts, the Smart DG Hub made several key early assumptions. The first was that to the extent any clear price signal could be put on the value of energy resiliency, such a value would operate as a tertiary revenue source to the system purchaser. The primary economic driver behind installing an S+S system is the value of "peak shaving," which, for present purposes, can be defined as the ability to reduce energy operational costs by using the energy stored on site during a period of peak demand on the grid. Secondarily, utilities across the country are starting to offer payments to building owners to release their stored energy onto the grid in a variety of ways. Thus, the previous graphic situates the value of energy resiliency in the overall scheme of economic drivers that might motivate a building owner to install S+S at their facility.

Next, the Smart DG Hub recognized that there is precedent in each of the three stakeholder groups to draw on in the framing of the VoR project. Where flood risks are concerned, the real estate community has long been joined by the insurance and banking industries as well as public policy makers in recognizing the importance of risk management. Homeowners or business owners who invest in concrete, sandbags,

plastic sheeting, and plywood to build a barrier when a storm is coming keep their property from flooding. Neighbors on the same street who do not build a barrier get flooded and push their losses onto their insurers, lenders, or the emergency management and disaster response agencies charged with restoration. Though these neighbors may in the short term be made whole, their insurers have suffered a loss and have likely raised the premium rate, their assessed property value has likely diminished and tenants may have withheld rent until they were able to move back in, and they have drained taxpayer funds from the public.

In turn, the Smart DG Hub assumed that S+S systems have the potential to disrupt this dynamic in a variety of ways. In the property or flood policy context described above, it is possible for a homeowner or business owner to power its sump pump with S+S, while those neighbors without such systems experience an outage, and possibly flooding. Perhaps even more importantly, from a business interruption vs. business continuity perspective, the power made perpetually available by an S+S installation can be routed to a facility's most important power loads so that all or part of the business operations being conducted at the facility remain active even when the grid goes down. As we saw during Superstorm Sandy, the losses associated with the interruption of operations, whether borne by the building owner, its insurers, its lenders, or the public at large, can mount quickly and aggregate substantially the longer the grid is down.

Given this value proposition, made a final key assumption: that if the VoR project team could demonstrate to insurers, lenders, and public officials that power outages cost each of them a substantial amount of money and that S+S systems significantly reduce the risk of financial loss, each stakeholder group could be convinced to incentivize building owners to install S+S. If that could be achieved, the value of energy resiliency as a tertiary revenue stream could significantly collapse the payback window of installing S+S systems, and there would be a substantial increase in the market uptake of S+S systems.

The survey questions and their responses discussed below were intended to refine each of these assumptions and gather expert opinions about the viability of the Smart DG Hub's central hypothesis that S+S systems are worthy of insurance, banking, and public policy incentives because they reduce the risk profile and increase the value of facilities. The surveys were conducted in the weeks and months leading up to Sustainable CUNY's 11th Annual Solar (+Storage) Summit, held in New York City on June 21, 2017.

Insurance Survey

Key Findings and Noteworthy Observations

Prior to the surveys, Sustainable CUNY's Smart DG Hub conducted preliminary research in order to inform the process and speculated that "**Insurance savings**" were likely to come in one of three forms:

1. **Lowered premium:** Insurers could stimulate investment in S+S systems by offering their policyholders reduced premium rates. To the extent that the VoR Strategy Team can demonstrate, insurance companies would likely want to see, to a degree of certainty acceptable to insurance underwriters: (a) the escalating risk of loss associated with power outages due to aging infrastructure, cyber threats to the grid, and climate change; and (b) that the installation of S+S systems mitigates such risk,
2. **Changed policy provisions:** The insurance policy provisions might be amended to encourage policyholders to install S+S systems. For example, policies might include a shifting deductible concept (i.e., if the policyholder installs an S+S system, any claims made under the policy are subject to a lower deductible); policies might include an exclusion based on the policyholder's failure to take proactive risk mitigation measures such as installing S+S within a defined period of time; or other changes to policy provisions.
3. **Return of excess premium deposit:** When a policyholder installs an S+S system to reduce their risk profile during the pendency of an existing policy period, they may qualify for a refund to reflect the delta between their premium without the system installed and with the system installed.

After conducting the surveys, consensus emerged that the most viable pathway to incentive creation in the insurance stakeholder group would be a discount on premiums. This would require changes in underwriting, actuarial, and catastrophe modeling practices, as well as the right market conditions (i.e., insurers feeling pressure to offer such incentives in order to retain existing business or attract new policyholders). As to the feasibility of changes to the provisions of the policies or a return of excess premium deposits, survey respondents gave somewhat contradictory responses and no clear consensus emerged at this time.

Key Recommendations

- ✓ Determine the magnitude of insurers' exposure to losses caused by power outages
- ✓ Convince insurers to offer more robust coverage for business interruption losses for a wider range of "triggers"
- ✓ Demonstrate the risk-reducing capabilities of S+S systems
- ✓ Build demand for insurance incentives within and among large policyholders

Insurance Questions and Responses

1. Do you primarily work in commercial or residential/individual lines of insurance? Other?

1.1. Of the fifteen (15) insurance survey respondents, fourteen (14) stated that their work is focused on commercial insurance, in various capacities. In some instances, respondents stated that there was no clear distinction between the two lines of insurance in their work, but that their thinking was more oriented towards commercial insurance.

1.2. There was representation from a variety of insurance market participants, including actuarial consultants, catastrophe modelers, risk specialists within insurance carriers, non-profit strategic consultants, insurance coverage attorneys, and more.

1.3. A majority of the respondents believed that the VoR project is more likely to succeed by focusing on commercial lines of insurance, rather than homeowner's policies.

2. Is the majority of your work in urban, suburban or rural risk environments?

2.1. The responses to this question were disparate in that many respondents stated that their approach towards understanding risk and insurance products was not easily categorized by geographic considerations.

2.2. Anecdotally, several respondents believed that the VoR effort should focus on urban environments first because of the increased density and magnitude of business interruptions risks.

2.3. Whether to focus on urban, suburban, or rural environments will depend on the peril at issue, i.e., terrorism and cyber-terrorism, different natural catastrophes, or aging infrastructure.

3. What types of insurance policies are best suited for the creation of insurance incentives for resilient PV systems?

3.1. At a high level, there was consensus among the respondents that business interruption was the type of insurance best suited to creating VoR incentives.

3.2. Within the realm of business interruption policies, there were several noteworthy observations:

3.2.1. There is unlikely to be any monolithic response among insurers, as any conversation regarding which policies are best

suited to incentive creation is complicated by factors such as competitiveness in insurance markets, internal underwriting policies and processes, and various institutional pressure points that will manifest differently according to each insurer's individual organizational drive.

3.2.2. Not all traditional business interruption policies provide coverage for losses caused by power outages. Those that do, tend to require that the power loss has been caused at the facility itself, i.e., a disruption in power stemming from a utility failure would not be covered.

3.2.3. There is more likely to be coverage under what is known as "contingent business interruption" policies, which provide coverage for business interruption losses cause by a third party, such as a disruption in supply chain, utility power outages, or damaged infrastructure impacting access to a policyholder's place of business.

3.2.4. At least one respondent noted that at the moment, because (i) there has been no attempt, at the loss adjustment and claims handling stage, to quantify precisely how much business interruption loss is directly attributable to power outages; (ii) there are no standards for energy resiliency in the insurance industry; (iii) business interruption insurance is typically written as a rider to commercial property policies; and (iv) a business interruption premium is priced according to the value of a policyholder's economic activity (and the insurer's matched exposure) rather than on the actual risk of loss. Because the existing market for business interruption (including contingent business interruption) is too rigid and opaque to innovate solutions related to VoR price signals, there is no way for insurers to get comfortable with certifying the risk mitigation capabilities of S+S. In order to change the market, it is therefore exceedingly important to (a) change loss adjustment practices to granularly understand the extent to which power outages cause business interruption losses; and (b) work to develop industry-accepted standards and certifications around both the magnitude of losses and how S+S is capable of performing to reduce that risk.

3.2.5. Traditional business interruption policies are not written very widely especially compared to policies such as homeowners or

commercial property; contingent business interruption is an even narrower market.

3.2.6. Given that business interruption policies are typically written as riders to larger property policies, they often require the same "trigger" (the causal event). For example, if there were to be a fire at the property, a business interruption policyholder would typically be covered and compensated for the direct property damages (i.e., the cost to build back the facility to its pre-"trigger" state) as well as the revenue lost during the period of time in which the facility is being restored. Therefore, the insurer, having paid out for the loss, wants its policyholder to get back up and running as soon as possible in order to mitigate the business interruption losses.

3.2.7. Traditionally, what was considered a covered "trigger" for business interruption claims was very narrow, but there is now a trend, under pressure from brokers, to broaden the scope of "triggers" for business interruption loss to include cyber, political, and **climate change risks**. The VoR project is therefore well-timed to capitalize on this trend; efforts to get insurers to understand the magnitude and ways to deal with power outage related loss fit within the broader business interruption market context.

3.2.8. Thus, a helpful pathway for the VoR Strategy Team to focus on is the expansion of coverage under traditional business interruption policies to include power outages of any cause, and/or to broaden the market for contingent business interruption by encouraging policyholders to seek this coverage from their insurers vis-à-vis brokers.

3.3. Most respondents agreed that property policies could offer another attachment point if underwriters can be convinced that S+S systems could sufficiently power equipment that prevents physical damage, such as sump pumps. While the connection between property loss concerns and S+S installations is more attenuated, at least one respondent noted that it might be a good place to focus early efforts because the property insurance market is better developed with more sophisticated loss adjustment practices, which would make it easier to isolate the risk mitigating capabilities of S+S.

3.3.1. Some respondents raised concerns, however, that S+S installations could increase the risk profile of a facility from a property policy perspective because they come with attendant fire and wind liability concerns.

3.3.2. Additionally, the installations might increase the assessed property value, increasing a property insurer's exposure to property claims.

3.4. Other types of policies to come up as worth exploring included flood, contents, equipment breakdown, utility service interruption, life, and health insurance policies. However, these are less obviously connected to power loss concerns and should not be the focus of the VoR project until business and interruption and property policies have been addressed.

4. How can insurers be encouraged to think beyond the usual framework of a 1 – 3 year policy period horizon so that their underwriting reflects a steady global increase in the risk of loss caused by power loss?

4.1. There was nearly unanimous feedback from the respondents that this is not a concern at all; insurers can simply re-price policies during each policy period to better reflect the known risks at that time.

5. To what extent does power loss (whether caused by extreme weather, cyber interruption, aging infrastructure or other) factor into the underwriting of the relevant insurance policies?

5.1. Generally, it appears that underwriters at most large insurance companies do not granularly price business interruption policies based on risk assessment factors as they would for liability or property policies; rather, pricing is almost completely a function of the economic output of the policyholder, which is understood as a proxy for exposure to losses per unit of time in which business is interrupted. Thus, the extent to which business interruption underwriters factor power outage concerns into the pricing of business interruption policies is largely unknown or non-existent.

5.2. The catastrophe modelers stated that the catastrophe models, which capture wind and flood concerns, set a local baseline for the underwriting of business interruption policies that are then adjusted based on individualized concerns. The catastrophe models should be updated to reflect power outage concerns, but this requires the right entities with access to the right information to feed data into the models, such as reinsurers, utilities, loss adjusters, and facilities managers.

5.3. With reference to the distinctions made in the response to Question No. 3, one of the reasons for the dearth of data and lack of motivation to deal with losses caused by power outages is that insurers don't view themselves as exposed to these losses except in a narrow range of circumstances.

5.3.1. Insurers don't like writing power outage cover, in part because of aggregation of risk in a given geography. This is harder to think about in the context of climate change related events, and easier to conceptualize in the reinsurance context and particularly in the context of pure blackouts. Do the reinsurers have the appetite to underwrite aggregated power outage related losses?

5.4. Considerations:

5.4.1. The landlord-tenant contractual obligations are important in this context. The VoR Strategy Team should determine whether buildings in NYC are buying coverage for disruptions to rent roll caused by power outages; do tenants experiencing their own losses have their own exposure or does this pass through to the landlord's exposure; where does the insurer cut these items off conceptually to understand their exposure? It is important not to lose in the shuffle that landlords' (with the ability to purchase S + S systems to mitigate risk) concerns over power loss are distinct from the lost economic activity of their tenants.

6. Is it possible to isolate or disaggregate such risks from other confounding variables, such as flood damage, to evaluate the magnitude of risk mitigation offered by resilient PV?

6.1. Given the above responses, it would not be possible at this time to disaggregate power outage loss from other confounding variables, except in certain isolated cases involving more boutique, customized insurance products.

7. Are insurers receiving any pressure from large institutional policyholders or brokers as yet to create these incentives?

7.1. Most respondents were unaware of this kind of pressure being exerted, except in specialized circumstances often requiring more engineering-focused insurers.

7.2. One respondent noted that in a general sense, there's a lot of focus on how engineering for risk should be reflected in pricing of insurance. There is far too much capital chasing a limited amount of risk since the financial crisis of 2008, so insurers' margins are thinning, but the anticipated impact of Artificial Intelligence, Internet of Things, Cyber Attacks, etc., is that there will be opportunities and threats. Insurers thus want to stay ahead of the curve. Some of the insurers are asking profound questions about how they as a company

remain relevant - they're very conservative and behind their customers in terms of use of technologies like AI, and the products can feel clunky and slow; some millennials are starting to say, “Why am I bothering with this?” In other words, there is a lot of "disruption" in the world of “Insurtech” and VoR can ride this wave.

7.2.1. Insurers are no longer simply offering a product, they're offering a service – they can employ the same skills as they use to underwrite policies to advise a client how to mitigate their risk.

8. Is it possible to create a streamlined process akin to the lowered premium offered on auto policies for installing certain monitoring devices or making certain behavioral modifications such as taking defensive driving courses? Is this more akin to some homeowner’s policy, where insurers are starting to request monitoring devices such as Nest?

8.1. As long as there is a high level of standardization and certification, a model like the discount for behavioral modification in the auto policy context should be replicable with respect to incentives for S+S.

8.2. It is important to get more S+S actually installed and on the ground to develop robust data sets to support the justification of incentive creation.

8.3. Look to whether there are any individualized cases of policyholders receiving business interruption discounts for installing diesel or gas powered generators as a good precedent.

8.4. Smarter insurers are starting to innovate in this space: they are using technology as a prophylaxis against risk, and have developed many points of contact with the policyholder and the risk itself. It is important to turn these concepts into solid images in consumers' minds to motivate them to install risk-mitigating technologies. All of these concepts are proxies for likeliness and severity of covered losses, but with Internet of Things, you're getting closer to actual, current risk in real time - dynamic risk assessment but also dynamic risk mitigation.

9. Is there industry data available as to the overall magnitude of all losses attributable to power outages paid by all insurers over the last 20 or 30 years?

9.1. No respondents were sure how to answer this.

9.2. There was some sense that some of the organizations responsible for claims handling and data tracking in the insurance industry, such as the Insurance

Services Office (ISO), might have some or all of this data, but not necessarily organized in a comprehensible way.

10. Is it possible for you to provide that information in whole or in part?

10.1. Uncertain. See response to Question No. 9.

11. Is it directly tied to power loss or subsumed within larger loss causation such as Superstorm Sandy?

11.1. Uncertain. See response to Question No. 9.

11.2. One respondent added that the VoR Strategy Team should check with the Cambridge Center for Risk Studies: they did a report for Lloyd's two years ago modeling a blackout that took out the whole grid, and in drafting that report, they might have come across some good real world figures. Swiss Re also has an arm called Sigma (the bible for catastrophe losses) and they might have a good figure for this, as well as the insurance response.

12. Is it possible to disaggregate this information?

12.1. Uncertain. See response to Question No. 9.

13. Are there trend lines as to the increasing exposure to such losses?

13.1. Uncertain. See response to Question No. 9.

14. What is the order of magnitude of premium paid for business interruption policies ranging from small business to heavy industrial or high revenue office space? Property Policies? Blended?

14.1. The respondents were unable to give clear answers to this question, as premium pricing is treated as proprietary information and business interruption policies are highly individualized, but some indicated that business interruption premium price is tied to the potential amount of loss, which is a function of the size of the commercial operation, number of employees, etc. (all of which are proxies for the “economic activity” or “economic output” of the policyholder).

15. Assuming well-established data indicating substantial risk mitigation offered by resilient PV systems, what is a realistic percentage reduction in premium insurers would be willing to entertain?

15.1. Answers to this query were varied.

15.2. Some respondents believed that, assuming sophisticated modeling that meets industry standards for certification, any incentives offered for installing S+S systems should be roughly proportional to the expected loss reduction.

15.3. Other respondents raised ideas about analogies to auto or homeowners policies: for instance, at least one auto insurer offers a 5-10% discount for hybrid vehicles, though the justification for this is unclear, and certain homeowners insurers offer (for a fee) Rebuild to Green endorsements whereby if the homeowner suffers a total loss, it can rebuild to LEED certification or Energy Star, etc.

16. What is a covered vs. non-covered loss under a business interruption policy?

16.1. Most respondents believed a utility-caused power outage would be a covered loss, but some raised caveats, described in the response to Question No. 3.

16.2. The individual components that cause the downtime for the business aren't necessarily distinct and the concern tends to be about overall downtime. ("Hours clauses" in flood policies tend to mean there's only so much time they will cover).

17. What is the nature and role of emerging concepts and products like resiliency or catastrophe bonds in servicing the needs of individual policyholders to diminish the net cost of installing resilient PV systems?

17.1. Most respondents agreed that it is premature to be thinking about these concepts in the context of the VoR project, but that if the project successfully establishes that S+S installations reduce the risk profile and increase the value of facilities, these findings can impact the shape and pricing of more exotic insurance instruments.

18. Thoughts on developing a resiliency rating model (similar to LEED) to be used by insurers to evaluate risk profile and exposure to power outage induced loss? See, e.g. https://www.resilient.property/

18.1. Respondents tended to fall into one of two camps on this question: those who believed LEED is little more than a marketing ploy and could be a distraction from the larger VoR effort, and those who believed that so long as the certification or rating model was concrete and specifically geared towards valuing energy resiliency, it would serve the effort well.

18.2. With any rating scheme, it would be important to find some way of measuring an individual corporate entity's (the policyholder) risk profile, using catastrophe models and any additional tools already being used by underwriters to understand the nature and magnitude of power loss risks to business interruption.

18.3. There is some indication that LEED buildings are appraised higher by investors and command a premium, which would be especially helpful in making the case to the Banking Working Group.

18.4. Catastrophe modelers consider and build into their models when a building was constructed, which often correlates with a measure of the building's vulnerability if the building was constructed after a specific regulation was put in place. For example: in 1996, the state of California enacted significant changes to building code because of the Northridge earthquake. If you could code into the model that a building is rated to a specific resiliency rating, it would impact the modeling, which impacts the pricing the insurer will consider.

19. Is a shifting deductible concept feasible? What about an exclusion for failure to self-help?

19.1. Deductibles in the context of business interruption policies are often based on "hours clauses" measuring the duration of downtime before coverage kicks in as opposed to a dollar threshold.

19.2. Generally, respondents felt that while both of these concepts are possible anchors for the VoR project; neither is likely to have the same impact as focusing on getting discounts on premium.

19.3. Ultimately, this will be an individualized decision for each insurer, depending on their marketing stance and underwriting guidelines.

20. How do concerns over wind and fire safety inherent within solar or solar + storage systems undermine this effort? Is there potential for the increase in loss exposure resulting from these concerns to unwind the loss mitigation capabilities of resilient PV systems in the calculation of premium?

20.1. In sum, the consensus answer was "it depends" on the quality of the installation and the extent to which the VoR Strategy Team can demonstrate, through its own modeling and by drawing on existing studies and evidence, that S+S systems are safe.

20.2. A checklist may need to be developed for use by underwriters to ensure that the system has been installed to the highest degree of safety.

20.3. Whether or not these concerns would outweigh the gains in energy resilience (which no one knows yet), it's a perfectly valid question to be mindful of in executing the VoR project. In addition, the team will want to be mindful that installing S+S will increase the asset value of the insured facility, and if they break, it might result in a property claim (e.g., damage to the panels themselves). All this is worthy of further investigation.

21. Do you believe Insurance, Government Policy and Tax Incentives, and Banking Working Groups properly identify the areas of value creation that are most likely to result in a tangible value of resiliency?

21.1. For the most part, yes.

21.2. In addition, it is important to include business and consumer advocacy groups who understand the concerns driving purchasing decisions and larger power companies; focus on changes in rate structures and take a look at how insurance companies interact with major power companies like utilities to see if there is any precedent for insurance incentive concepts.

Banking Survey

Key Findings and Noteworthy Observations

Sustainable CUNY's Smart DG Hub recognized that as the risk of outages increase, mortgage lenders with equity in their real estate portfolios would seek to minimize the chance of either (i) the building owner terminating mortgage payments because the building is no longer worth the outstanding loan principle; or (ii) the appraised value of the building being significantly diminished, which might result from exposure to outages in a variety of ways.

Initial research led to the finding that the mortgage lending industry's exposure to losses caused by outages described above could aggregate across entire mortgage portfolios and thereby impact the market for trading in mortgage backed securities. Therefore, the Smart DG Hub's initial hypothesis was that lenders could be interested in offering borrowers who installed S+S incentives, such as a mortgage interest rate discount, on the basis of the systems' ability to preserve the value of buildings. With respect to mortgage backed securities, the financial services industry may have an incentive to stimulate investment in resilient PV systems. Hypothetically, a reduced calculated risk, as part of a suite of bundled resilient assets would be entitled to a better credit rating. By investing more in these safer assets, banks would be freed to take advantage of other riskier opportunities in the market.

After surveying thought leaders in the lending industry, the findings outlined above was largely verified, with some additional nuanced considerations. However, perhaps the most important takeaway was that the impact of an S+S system on a borrower's cash flow is even more important to a lender than the system's capacity to preserve the value of the mortgaged property. The most important consideration when underwriting a mortgage is the borrower's cash flow because it is a proxy for the borrower's ability to repay the loan; thus, to the extent that the VoR project can demonstrate to the banking industry that because of the primary (peak shaving) and secondary (utility payments) economic drivers behind S+S installations, borrowers are more likely to be able to repay their mortgage, thus lenders will be more likely to offer incentives for S+S installations.

Key Recommendations

- ✓ Demonstrate how S+S installations put the building owner/borrower in a better cash flow position
- ✓ Find a way of appraising the increase in value of buildings with S+S
- ✓ Adjust actuarial tables to reflect the reduced risk profile of buildings with S+S
- ✓ Build demand for banking incentives within and among large real estate organizations

Banking Questions and Responses

1. Is the majority of your work or expertise in residential or commercial lending? Mortgage backed securities? Community banking (CFDA)? Other?

1.1. Respondents to the banking survey represented a mix of backgrounds, including commercial mortgage experts from non-profits specializing in multifamily residential construction, project finance consultants, and experts in mortgage underwriting processes.

1.2. Between them, the respondents were familiar with the implications of the VoR project on commercial, multifamily residential, universities, hospitals, military bases, and mortgage linked securities.

2. What data must be established regarding the cost savings and risk mitigation capabilities of resilient PV systems before mortgage banks would consider creating more favorable lending terms for properties with resilient PV systems installed?

2.1. Most essential to the success of the VoR project is establishing the link between S+S systems and a reduction in buildings' operational expenses, as this will drive changes to the loan underwriting practices within lending institutions.

2.1.1. As reflected in the primary (peak shaving) and secondary (utility) economic drivers behind installing S+S.

2.2. One respondent answered this question by noting the VoR project is much more likely to succeed in the commercial mortgage context than in the residential context, and stated the following:

2.2.1. Lending terms depend on the ability of the borrower to pay back the loan. This ability depends on their free cash flow. The property itself is a "last resort" in case the free cash flow is no longer available. The value of the property is not determined in great granularity. The determining factor is whether it is worth more than 1.5 (this number can vary) times the loan.

2.2.2. Does S+S sufficiently increase the value of the collateral (the building) so there is more built-in cushion concerning the "loan-to-value ratio"?

2.2.3. A building with S+S increases the value of the building and the probability that the building is available for sale in case the free cash flow of the debtor or any insurance payment is

unavailable. The improvement from the banks in the residential market can be reflected by the following formula:

- (Probability of debtor losing his free cash flow) x
- (Probability of catastrophic event) x
- (Probability of insurance not covering loss of property) x
- (Increased value of property due to S+S)

The result of this formula is probably close to zero for residential mortgages.

2.2.4. A different scenario would apply in the commercial loan context where the free cash flow is directly related to the property. In this case the only mitigation available for the bank is a business interruption insurance policy. This scenario reduces the formula above as follows:

- (Probability of catastrophic event) x
- (Decreased probability of business interruption due to S+S) x
- (Free business cash flow)

2.2.5. In terms of data that must be established:

- Probability of relevant catastrophic event
- Decrease of probability of business interruption due to S+S
- Cash flow at stake in case of business interruption

2.3. A recognized expert must demonstrate to a high degree of certainty that S+S has can power X percentage of a facility's critical load for Y number of days.

2.3.1. This level of standardization will build currency within the industry that makes it "plug and play." The stamp of approval from a nationally recognized expert gives clear metrics to an underwriter or loan officer who needs to be comfortable with the forecasted performance of the system. Underwriters do not want to be thinking too much outside box, and the case for S+S needs to be made obvious to them.

2.4. The other thing that would be helpful is to determine if the owners of buildings rent commercial spaces at higher lease rates where there is resiliency.

2.5. According to one respondent, the greater concern right now is in the financing of the S+S systems themselves, and this is what is creating barriers to VoR.

2.5.1. This is leading to regulatory barriers and a lack of clarity among project financiers, which in turn leads to fewer real world examples from which the VoR project can draw data.

2.6. In terms of data, there is a need to know how to guarantee the production of the system so that it affects cash flow. In solar, with a Power Purchase Agreement

(PPA), the underwriter gathers information about the off-takers' creditworthiness to assess likelihood of payment.

2.6.1. The VoR project would need an equivalent to the PPA's guaranteed production. It would need to stress test the value of the equipment and what the returns are. As of today, no one is really looking at power concerns in the real estate lending world. It's not currently part of the training or thinking, but there might be some internal thinking about the value of the assets.

2.6.2. "Asset perspective" - need to educate the market as to how this value is different from other more static assets like generators. Banking Officials have considered this but it is not yet informing underwriter's discretionary loan approval parameters.

2.7. It would be important to determine what precedent exists for thinking like this; how and why have other incentives been offered?

2.7.1. Determine if there is any credit given for diesel generators. In the commercial setting, the "capitalization rate" asks what one would pay for earnings for a building. A 5% cap rate means you'd pay $20 to get a dollar of earnings on the building, so **every dollar you add to that company's operating income increases the value of the building by $20, so every $10,000 in reduced energy expenses makes the building worth $200,000 more.** A building with better cash flow even with the same rent roll is worth more, and you can get a better rate if it's a lower loan-to-value ratio. If there is a better collateral ratio, the building is a safer loan; if the VoR Strategy Team can demonstrate this, it can fit within the existing programmatic structure of banks. On top of that, the protection of the value of collateral is important. If you can keep sump pumps on, the building is worth more.

2.8. It is important to know how long the power source can be islanded, how much power will be available, and for what systems within the building. Concerns over distribution of power should be addressed too - how is the lifecycle of the energy system spread both within the building and across buildings? Will it power critical medical devices, communications, HVAC, etc. or what? What is this replacing? How long will it last? How is it governed?

3. How does the mortgage banking industry currently value or recognize as a value stream other energy related upgrades, such as energy efficiency improvements or LEED certification?

3.1. The leading precedent for setting VoR incentives is some of the work being doing on energy efficiency, specifically recent programs with the backing of Fannie Mae and Freddie Mac where energy efficiency can be used to underwrite costs savings and are rewarded with a mortgage rate reduction.

3.1.1. The VoR project should be careful to avoid running into issues of “split incentives” that often cause trouble in the energy efficiency space.

3.2. Generally, banks currently only look at the market value of the property and the potential value decrease or increase over time. The market value is affected by LEED or other certifications because potential tenants pay more rent because of lower operating expenses. The vacancy rate of these buildings is lower, which increases the value.

3.2.1. However, the stamp of LEED is less important than performance metrics. The focus is on cash flow and there is nothing directly linking LEED to this. Banks will look at a pro forma and if energy efficiency positively affects cash flow, they will offer a loan reflective of that improved cash circumstance.

3.3. Fannie and Freddie recently created the Green Refinance Plus Program, including a physical needs assessment and modules, one of which has to do with valuing energy efficiency (High Performance Building Module).

4. What types of energy or non-energy facility upgrades to existing buildings or features in new buildings significantly affect lending terms (if any do) and what is the justification for their impact?

4.1. Generally, see the responses to Question No. 2 above, as respondents tended to view these two queries as interrelated.

4.2. In general, the two most important factors impacting a mortgage interest rate are cash flow and/or project pro forma and Treasury rates, and then comes value of collateral.

4.2.1. Any framing around these three factors is what will motivate the banking industry to reflect VoR price signals in their underwriting.

4.3. Lenders commonly have numerous requirements around immediate repairs and replacements - meeting safety and code requirements - and there's potential to wedge energy concerns into this domain. It is important to know the format that this information needs to be supplied in, like a Capital Replacement Schedule as part of a Physical Needs Assessment. There's value to tucking energy resiliency concerns into the list of repairs rather than treating them as

standalone concerns requiring additional documentation. There's been an evolution in the last few years away from a standardized replacement value concern (Capital Needs Assessment) towards a greener one. Integrated Physical Needs Assessment is also starting to become more robust with respect to concerns over energy and resilience; a holistic approach is best and lenders are starting to realize this.

5. Can this thinking be extended into energy resiliency?

5.1. The most persuasive argument in this regard relates to the perceived risk of loss or impairment in value that might come from a power interruption - if it threatens the borrower's bottom line it might influence the lender's decision to finance upgrades or offer incentives.

5.2. Lenders are most likely to be concerned with avoiding the costs of non-resiliency.

5.2.1. Therefore, tallying all the bad things that can happen to the borrower's building including a non-functioning sump pump, tenants withholding their rent, etc. is going to be key.

6. What are the critical factors that would go into the development of an algorithm underpinning a banking incentive? For instance, is it type of use, location, size, time without power, and utility connection type? Other?

6.1. Generally, all of the above-listed factors would be important to consider.

6.2. There is an interrelationship in this respect with the insurance stakeholder groups portion of the VoR project, as lenders will want to understand where they are exposed because insurance will not cover the losses.

6.2.1. The industry would be less concerned with building the matrix itself: the question is whether the lender is going to be able to get its loan repaid, and the most important proxy for answering this question is cash flow - will it help to service the debt for instance by lowering insurance premiums? First banks will wants to know if insurance is in place to collect collateral of the building, but if that gets really expensive (and it is starting to) they might start thinking about putting money into resiliency directly.

6.3. Once the "matrix" is built, it would be helpful to have an "R" (resiliency) score that is as standardized and well understood in the industry at a FICO score, as loan officers and underwriters do not want to spend any additional time learning new concepts or programs.

6.4. With respect to the last response to Question No. 4, these criteria need to tie back to the Capital Needs Assessment: on a scale of 1-10, how important is it to help ongoing operations of the property? How is the system going to securely and reliably help repayment of the loan?

6.4.1. These concerns need to be stress tested.

6.4.2. Determine valuation of the equipment that will be saved against the size of the loan.

7. Is there data available as to the overall magnitude of all losses attributable to power outages that have diminished the value of mortgage portfolios over the last 20 or 30 years?

7.1. None of the respondents believed this information was available or consolidated in any helpful format, and suggested speaking with utilities and possibly ESCO's for this information.

8. Is there data available that is directly tied to power loss or subsumed within larger loss causation such as Superstorm Sandy? Is it possible to disaggregate this information? Are there trend lines as to the increasing exposure to such losses?

8.1. Uncertain. See response to Question No. 7.

9. Assuming well-established data indicating substantial risk mitigation offered by resilient PV systems, what is a realistic order of magnitude for a banking incentive?

9.1. Most respondents were unable to estimate the potential magnitude of an incentive.

9.2. One respondent noted that the best comparison is to the difference between a good and an excellent credit rating. However, the expected impact on the offered rate would be diminished because credit ratings affect the borrower's everyday ability to pay the mortgage while the resilience is a much less frequent event, though of a much greater potential magnitude.

9.3. Not sure what this boils down to in basis point terms.

10. Would the development of a resiliency rating model (similar to LEED) be helpful to the mortgage banking industry to evaluate risk profile and exposure to power outage induced loss? See, e.g. https://www.resilient.property/

10.1. There was similar divergence on this Question as in the insurance context.

10.2. In sum, some type of resiliency rating tool would be useful as currency in the underwriting community, but only to the extent it is seen to impact a pro forma.

11. Do you believe Insurance, Government Policy and Tax Incentives, and Banking Working Groups properly identify the areas of value creation that are most likely to result in a tangible value of resiliency?

11.1. In addition, within the overall structure of the Working Groups, include:

- Tenants' advocacy groups
- Ratings agencies
- Equity Investors
- Grid resiliency experts
- Corporate sustainability experts

Public Policy Survey

Key Findings and Noteworthy Observations

As a complement to the insurance and banking engagements, Sustainable CUNY's Smart DG Hub recognized that many of the costs associated with power outages are borne by the general public in the form of externalities absorbed by local, state, and federal taxpayers and managed by emergency response agencies.

Through its work, Sustainable CUNY was aware that legislators, regulators, consultants, and other stakeholders at all levels of government have been thinking about the value of energy resiliency to the public **at a macroeconomic scale**; considerably less attention has been focused on how to reduce the installation cost of S+S systems **for the individual system owner**. After conducting the public policy surveys, it is clear that this remains true as of the Fall of 2017.

While it is true that governments and utilities already offer incentives to purchasers of S+S systems, such incentives tend to be based on broader public policy goals such as greenhouse gas emissions reductions and climate change readiness. More needs to be done to create incentives based specifically in energy resiliency.

It is clear that there are other approaches that might motivate legislators or regulators that energy resilience specific incentives is justified, ranging from budgetary concerns to human health to lost economic development. It will be necessary to demonstrate that S+S installations benefit the public on each of these fronts and then identify the audiences most likely to be persuaded by the various justifications for an S+S incentive.

The most urgently needed work for the VoR Strategy Team will be to build a robust economic model that accurately captures the entirety of the externalities caused by widespread power outages. By stacking the direct costs such as emergency management personnel and equipment onto the indirect costs such as lost tax revenue, governments will be better positioned to understand how much they are saving by incentivizing building owners to become energy resilient.

Key Recommendations

- ✓ Determine the total stack of externalities caused by power outages
- ✓ Build a coalition of groups from across the ideological spectrum to all "buy into" the VoR project
- ✓ Create a compelling narrative around S+S systems keeping the community powered
- ✓ Identify policy makers' different motivations for increasing energy resilience

Policy Questions and Responses

1. *In what capacity are you involved in public policy? Experience with resilience or renewables generally?*

1.1. Respondents to the public policy survey included representatives from New York City government, tax consultants, lobbyists, and public policy advocacy groups.

1.2. Respondents' level of familiarity with resiliency varied significantly from dealing with resiliency planning on behalf of New York City to only incidentally dealing with resiliency in the context of processing energy efficiency or renewable energy related tax deductions.

- 1.2.1. The topic of how to value energy resiliency has been emerging as a focus for many organizations, and often relies on input from FEMA.
- 1.2.2. All respondents agreed that the future of the U.S. grid was going to be much more distributed and less centralized, therefore increasing the stakes of getting greater market uptake of S+S on a more accelerated basis.
- 1.2.3. S+S installations unlock the potential for resiliency across a number of other important domains, such as access to water, food supply, fuel, etc.

1.3. There was divergence among the respondents as to whether more progress towards resiliency would be made by relying on large utility-driven infrastructure projects or on smaller Distributed Energy Resource projects.

- 1.3.1. Within this conversation, several respondents noted that in the past utilities, were rewarded based on how much money they spent, and this should be changed to reward them for how well they serve customers, including with respect to increasing resiliency.

2. *What data must be established regarding the cost savings and risk mitigation capabilities of resilient PV systems before legislators would consider drafting policies creating a favorable regulatory and legislative environment to stimulate increased investment in resilient PV?*

2.1. Generally, all respondents agreed that this question can be distilled down to a consideration of what is the cost of the status quo vs. the value of increasing energy resiliency.

2.1.1. What is the cost that exists without resiliency measures?
2.1.2. What is the timeframe of the payback period for S+S installations?
2.1.3. When the next widespread outage occurs, what is the specific likelihood of a power outage in a particular area, and how does the installation of S+S mitigate the outage?

2.2. From an engineering and architectural perspective, on a building by building basis, how vulnerable are building's systems to power outage and flooding?
2.3. FEMA assesses that $1 spent on resiliency is worth $7 in cost mitigation.
2.4. If VoR public policy incentive creation is framed as cost avoided factored by the probability of an outage event that will cost the municipal government, it is more likely to pass muster within budget offices and the legislature.
2.4.1. It is important to recognize up-front that not every building needs to have backup power; some buildings can be without power for an extended period of time without imposing externalities onto the public.
2.4.2. S+S is really competing with traditional backup generation. Therefore, the argument in favor of increased S+S market uptake must expand from an economic perspective to reflect that having a longer term energy resilient supply would be good.
2.4.3. Sit down with utilities to figure out their costs to manage getting power restored.
2.5. Look to Sandy programs such as NY Rising and FEMA's handling of claims:
2.5.1. When people came in to report their losses, FEMA or NY State were able to quantify the amount of loss - how did they do this quantification, flowing from individual owners up through a larger municipal scale? Then, how much of this loss is certifiably mitigated by the installation of S+S? Authorities have adhered to non-transparent reactionary formulas for allocating disaster relief funds. Perhaps emergency planners could make these formulas transparent and factor in the value of preventive measures to develop properly sized incentives.
2.6. To develop a metric for resilience, we need to know how quickly it can respond to an outage situation, however caused. When electricity shuts off from the grid, how many milliseconds for S+S to come on, how long does it stay on, what percentage of load will it power? How quickly does it revert from a connection to the grid to the system?
2.7. In developing a resiliency project in New York City, one respondent described their rough methodology for valuing energy resiliency as follows:

2.7.1. To begin, the project team relied on blunt instruments like CAIDI and SAIFI. They looked at different intervals of outages to determine potential economic losses (especially at a food distribution center), looked at inventory losses, wage losses, etc. They modeled 12-72 hour losses of power. Engineering consultants and economic analysis consultants did this modeling.

3. *What types of policies changes available to governments are best suited to incentivizing property owners to install resilient PV systems?*

3.1. There was consensus among the respondents that the single best policy tool to incentivize S+S installation would be a straightforward cash grant, followed by tax credits, then tax deductions or abatements.
3.2. Process streamlining and mainstreaming can be helpful, similar to what the Smart DG Hub has already been involved in.
3.3. PACE financing is worth looking into.
3.4. On the issue of whether tax policy and law or energy policy and law is a better avenue for incentive creation, respondents seemed to generally agree that straightforward policy and legal changes requiring uptake of S+S systems for resiliency might be more effective, particularly where the government helps end users understand things like the all-in cost of interconnection.
    3.4.1. FEMA and its counterparts can make their reimbursement payments contingent upon building back to resiliency standards.
3.5. Leveraging existing programs such as the Green Bank and Clean Energy Fund to finance resiliency installations is a good place to start.
    3.5.1. Look to the NJ Resilience Bank as an example.
3.6. Municipal bonds can be priced at least in part on resilience metrics.
3.7. Regulators can incentivize utilities by allowing them to have a rate of return on the installation of resilient equipment.

4. *What is the process by which such policies can be created?*

4.1. When it comes to various municipal and state agencies, each comes up with capital plans for what upgrades they're going to do, so they'd be interested in knowing how they can spend money more effectively.
    4.1.1. Speed is important - a pilot program would be helpful. Determine who the biggest consumers are and get them pushing for it.

4.2. Generally, when it comes to the creation of new laws or policies, it is important to appeal to both the business community and the environmental community.
4.3. In NYC:
    4.3.1. There's already enabling state legislation for a PACE program; the City needs to pass local legislation and can then engage in the process of design and administrative set-up.
    4.3.2. A local tax incentive requires joint bills in state assembly and senate.
    4.3.3. Green Bank and NYCEEC (quasi-governmental) are just accessible as standing programs.
4.4. Generally, state PSC's are the best conduit for creating new energy policies, but it is hard to get state legislatures to get into the weeds on the creation of legislation.
    4.4.1. RPS's are legislated in some states; in others it's administrative and programmatic. Where they are legislative, they are much harder to unwind.
4.5. Tax policy requires legislative efforts and therefore lobbying in most cases, with some exceptions at the municipal level.

5. What types of arguments and motivations are most likely to result in the creation of new legislation, regulations, and the like?

5.1. Cost-benefit analysis similar to the FEMA ratio of $1 on resiliency = $7 cost avoidance is central to all arguments.
5.2. Finding a coalition of interests is key: combination of environmental appeal, including resilience and public good, with hard-nosed business sensibility. When talking to the commercial side, the argument needs to make sense economically. S+S systems themselves are the best drivers because of the primary and secondary revenue sources they offer, so treat VoR as “layering the cake” of the overall economic performance.
5.3. In NYC, arguments related to increasing the availability of quality affordable housing are likely to have a lot of sway.
5.4. If the goal of the VoR project is to mitigate risk to communities, policy makers should be made to understand that S+S installations are about risk mitigation to allow communities to return to social order if and when something devastating happens, so it's a "harm to the citizenry" argument.
5.5. Distributed resources like S+S still don't have a great story about their benefits above and beyond energy production; need that story to connect with people. The VoR Strategy Team needs to convince both energy end users and

policymakers that when one person or community or hospital, etc. installs S+S, it ends up saving everybody money.

5.5.1. Everyone should want to be the proverbial (energy) “beacon” on the hill.

5.5.2. With S+S installed, all those citizens and consumers in the utility's footprint don't have to buy the most expensive electricity of the year - so it goes beyond simply saving money for the S+S system owner and helps society in general.

6. How does the creation of a tax incentives factor into this overall analysis?

6.1. Some respondents felt that this was a key driver to moving the market, while others believed the focus should be on moving towards a market based system with a credit trading scheme or using energy law to create mandates.

6.2. All respondents agreed that a cash grant is preferable to a tax incentive.

7. Focusing on tax policy, what are the advantages and disadvantages of a tax credit vs. a tax deduction vs. a tax abatement in this respect?

7.1. All things being equal, a credit is preferred.

8. Are you familiar with EPAct 179D?

8.1. Responses were evenly split on this question.

8.2. Where respondents were not familiar with this law, the Smart DG Hub explained that it is a per-square-footage based tax deduction for energy efficiency.

9. Using the energy efficiency tax deduction creation by the Energy Policy Act of 2005 (EPAct) § 179D as an example, should a resiliency based tax incentive be driven off the square footage of a given facility or some other metric?

9.1. Respondents generally felt that while the size of a given facility is a relevant consideration in the articulation and scope of a VoR incentive, ultimately, the incentive will need to be weighed against the “criticality” of the given facility to the functioning of municipal affairs.

9.1.1. Additionally, should consider the facility’s load profile.

9.2. Try to avoid the incentive being pegged to price, because if it is, as the cost of systems comes down, the incentive gets reduced and this weakens the desired behavioral modification purpose of the incentive.

10. Is the process by which the EPAct § 179D tax deduction was lobbied for and created replicable in the context of energy resiliency?

10.1. At least one respondent was intimately familiar with the work that went into the passage of the legislation, and made several key points about replicating that process in the context of a VoR public incentive.

10.2. NRDC, representing the environmental community, knew that energy efficient lighting, HVAC, and building envelope products were available but being underutilized; the market wasn't embracing them quickly enough pre-2005 (EPAct).

10.3. The idea behind the passage of the incentive was at least in part to familiarize the buildings industry (engineers, architects, and so on) with the emergent technologies, first by offering the incentive to the design community for projects done on non-taxable public buildings, and then giving commercial taxpayers the ability to take the same tax deduction.

10.4. This process was intended to push a quantum leap rather than incremental improvements.

10.5. NRDC worked with NEMA and GE, both representatives of the manufacturing industries, and there was representation from both Democrats and Republicans in this way. It was a petri dish to go at public buildings first (schools and such, using technologies never used before) and then extend that into the commercial setting.

10.6. The people that joined together with NEMA were the lighting industry and HVAC industry because they wanted to sell more, and then the architecture and engineering community - the business friendly side met with the NRDC side for the environmental push.

10.7. The concept of a VoR project steering committee or some version thereof came up several times: use top-level people to set objectives and then cull the data from membership in the Working Groups.

10.8. To the extent a federal tax law would be passable, it couldn’t come from the environmental community, it would need to come from looking at a previously passed energy bill and trying to get this through as an amendment.

10.9. Would want to have it gain traction in the Senate Energy and Finance Committees (same for the House); would want it to be bipartisan and attached to something else rather than its own bill.

11. What was the motivation for creating such a tax benefit?

11.1. See the responses to Question No. 10.

11.2. The menu of motivations that apply differently depending on who the VoR Strategy Team is talking to include:
    - 11.2.1. Social good-Social good is important but when talking to the business community, it can't be the lead rationale, especially because you don't know if it's the facilities manager or the sustainability lead or the financial department or perhaps the energy manager, etc. who has the most bandwidth to make the ultimate decision. On average though, consider the common denominator.
    - 11.2.2. Rescuing Operating Costs for Citizenry
    - 11.2.3. Save taxpayer funds prophylactically
    - 11.2.4. Changing consumer behavior- This motivation in particular requires a sustained effort at educating the marketplace, and packaging the incentives helps with this.
    - 11.2.5. Resource consumption reduction
    - 11.2.6. Work in the buildings trades - Get union support.
    - 11.2.7. Price signal for externalities
    - 11.2.8. Innovating new technologies
    - 11.2.9. GHG emissions reductions
    - 11.2.10. Human health

11.3. While the VoR Strategy Team should craft a different message for each politician they engage by determining who needs to hear what from whom, messages should never contradict so as not to be caught in a bind.
    - 11.3.1. Establish who needs to be influenced and then map who and what will influence them.

12. What are the critical factors that would go into the development of an algorithm underpinning a tax incentive that saves taxpayers money and contributes to the benefit of the public at large? Type of use/Location/Size/Time without power/Utility connection type/Other:

12.1. All of the above, but especially ‘use’, which can be thought of as “criticality” to the community.
    - 12.1.1. One factor is whether it's designated as a critical facility, which the municipality defines one way, but private industry might define differently.
    - 12.1.2. When it comes to type of use, it might mean critical facilities where loss of power is going to cost a lot of money or there might be the most externalities.

12.1.3. Check with utilities about their hierarchy of getting power turned back on after widespread outages.

13. What are the direct costs to the public (particularly government agencies tasked with emergency management) of non-resiliency?

13.1. Respondents offered the following menu of direct costs:

13.1.1. Personnel costs for emergency services: employees getting overtime costs, including police, firefighters, emergency managers, utility workers, etc.

13.1.2. The cost of running generators, which was millions of dollars of fuel spent during Sandy.

13.1.3. Construction/repair costs: labor and materials.

13.1.4. Operating cooling centers and shelters.

13.1.5. Increased potential for additional disasters like fires.

13.1.6. Clean-up of roadways and infrastructure.

14. What are the indirect costs and externalities to the public of non-resiliency?

14.1. Respondents generally struggled to think about non-obvious, more attenuated costs borne by the public in the event of outages, and agreed that a substantial portion of the VoR project effort should be dedicated to parsing these costs and constructing an economic model reflective of these externalities.

14.2. Some ideas included:

14.2.1. Increased emergency room visits.

14.2.2. Loss of running water.

14.2.3. Disruptions to transportation systems.

14.2.4. Lost tax revenue and wages due to lost business operations.

14.2.5. Opportunity cost to spreading personnel too thin and not being able to service the most important damages.

15. Is there data available as to the overall magnitude of all losses attributable to power outages paid by FEMA (or its state and local counterparts) over the last 20 or 30 years?

15.1. No respondents were able to answer this question confidently.

16. Is there data directly tied to power loss or subsumed within larger loss causation such as Superstorm Sandy?

16.1. Uncertain. See response to Question No. 15.

17. Is it possible to disaggregate this information?

17.1. Uncertain. See response to Question No. 15.

18. Are there trend lines as to the increasing exposure to such losses?

18.1. Uncertain. See response to Question No. 15.

19. Assuming well-established data indicating substantial risk mitigation offered by resilient PV systems, what is a realistic order of magnitude for a tax incentive?

19.1. At least within NYC, there is likely to be a fixed aggregate limit as to how much the City would be willing to forego in lost tax revenue, and a larger per unit incentive would be more palatable if there were some upper limitation on applicability.

19.1.1. Inverse relationship between the depth and breadth of an incentive.

19.2. Outside New York City, it would be premature to respond to this Question.

20. ***Would the development of a resiliency rating model (similar to LEED) be helpful to government to evaluate risk profile and exposure to power outage induced loss? See, e.g.*** https://www.resilient.property/

20.1. As with the insurance and banking survey respondents, some respondents believed LEED is little more than a marketing tool to try to get building owners to modify their behavior in ways that do not necessarily make economic sense on their own terms, while the VoR concepts are justified purely by the economics.

20.2. Other respondents believe no harm comes from LEED, and it gives projects a recognizable brand name that would be helpful in the VoR context.

21. Do you believe Insurance, Government Policy and Tax Incentives, and Banking Working Groups properly identify the areas of value creation that are most likely to result in a tangible value of resiliency?

21.1. Yes, and in addition, should include utilities, economic development agencies and non-profits, and affordable housing advocates.

Survey Participants

INSURANCE

The Smart DG Hub conducted one on one interviews for the Value of Resiliency Insurance survey with Senior Management, Vice Presidents, CEO's, Executive Directors, Partners and Principals from the New York offices of eight leading national and international Insurance Companies. Additionally, Directors of several public agencies and non-profit agencies were surveyed as well as Catastrophe Modeling Analysts, and Scientists.

BANKING

The Smart DG Hub conducted one on one interviews for the Value of Resiliency Banking survey with Managers, Senior Program Officers, Senior Program Directors, Managing Directors, CEO's, Managing Partners, Principal Consultants, and Principals from ten leading organizations in the fields of financing, banking, and consulting.

PUBLIC POLICY

The Smart DG Hub conducted one on one interviews for the Value of Resiliency Public Policy survey with Managers, Senior Policy Advisors, Senior Analysts, Managing Partners, Presidents, Partners, CEO's, Principals and Founders from ten leading public and government organizations.

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