September 27, 2019

Via Electronic Mail

Commissioner Judith Judson
Department of Energy Resources
100 Cambridge St., Suite 1020
Boston, MA 02114

Re: Department of Energy Resources SMART Program Formal Review

Commissioner Judson:

Sunrun Inc. ("Sunrun") requests that the Department of Energy Resources ("Department") support certain changes to the SMART program recommended herein in the Department's formal SMART program review. As discussed further below, we specifically urge the Department to (1) allow customers to utilize a customer-owned revenue grade meter ("RGM") in lieu of a utility-owned production meter to track SMART system production, (2) adopt a resiliency adder for customers who install solar paired with energy storage systems; (3) implement the option to allow customers to meet the cycling requirement or participate in a program that provides grid benefits; and (4) modify the congestion subtractor to provide a congestion relief adder to incentivize projects that expand the hosting capacity of congested area.

Finally, we urge the Department to exercise its authority pursuant to 225 C.M.R. Section 20.00 et seq. to direct SMART program administration. While the Department of Public Utilities must approve tariff modifications, the Department should have greater oversight of program administration to, among other matters, ensure that administrative issues are addressed in a timely and efficient manner on a rolling basis. As such, certain matters, such as metering, may be better addressed in program guidelines rather than in the program regulations.

I. The Department Should Require Utilities to Accept Customer-Owned Revenue Grade Metering Data To Track SMART System Production.

a. *Metering from customer-owned Revenue Grade Metering should be enabled for both solar plus storage and solar-only behind-the-meter systems.*

Requiring the Electric Distribution Companies ("EDCs") to accept RGM readings from customer-owned devices is clearly the way to unblock the market and help drive innovation. We were pleased to see the straw proposal allow this for AC-coupled energy storage systems. We believe that DC-coupled energy storage systems were inadvertently left out of this revision and we urge the Department to clarify that DC-coupled systems will also be able to meter from customer-owned RGM.

Moreover, residential solar installations have faced significant interconnections delays even when not paired with storage. This is due to onerous, expensive, and time-consuming processes around meter socket installation, which can require multiple utility and developer truck rolls. We recommend that where a customer's system has certified RGM, the RGM may be used instead of utility-owned meters, regardless of whether the solar is paired with storage or not.

In Docket 17-140, National Grid and Unitil filed for approval of a metering solution for residential DC-coupled solar and storage, which includes having utility-owned production meters on both AC lines coming out of the inverter which are then summed together for the SMART payment values. This solution is necessary as we transition to more efficient, accurate, and less expensive customer-owned RGM. However, it is not a long-term metering solution due to cost and inability to adapt to innovative configurations. Allowing customer-owned RGM reporting for both AC- and DC-coupled systems would unlock energy storage use cases and would allow for full participation in the SMART program. Additionally, extending this protocol to solar not paired with storage will also increase deployment, decrease costs and improve the solar customer experience.

The current utility metering requirements for DC-coupled SMART systems require the installation of an additional production meter and associated equipment for measuring system output.[1] The additional meter, wiring and installation costs are borne by the customer and are redundant to existing customer-owned RGM capabilities. The requirement for a production meter and the added costs for complying with utility metering solutions adds substantial costs to system installation. For instance, compliance with one of the utility proposals for a DC-coupled residential solar plus storage system could cost up to $1,700 per residential customer. Compliance with another could cost up to $780 per year per customer. This significantly reduces the SMART incentive funds available for offsetting the costs of the solar and storage systems -- costs that are ultimately borne by ratepayers through the SMART incentive. The SMART storage adder was intended to bridge the gap between the cost of storage and the market revenues for which storage is currently eligible. Ratepayer funds for SMART were not intended to go toward redundant utility metering costs. Ultimately, this leads to less and much more expensive storage deployment under SMART.

Additionally, current utility-owned metering requirements for solar systems, without storage, also create undue costs and delays. This is due to unclear utility protocols, requiring revisions and multiple truck rolls. This results in higher than necessary solar costs, requiring a higher level of SMART funding.

Allocating such substantial portions of the SMART incentive to metering compliance creates significant hurdles for SMART system deployment, particularly for residential behind-the-meter ("BTM") customers. Indeed, current utility SMART system metering has prevented certain systems, such as certain DC-coupled batteries, from being deployed altogether, or from receiving all

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[1] *See* Department of Energy Resources, SMART Metering Requirements (Feb. 28, 2019) *available at* https://www.mass.gov/files/documents/2019/03/06/SMART%20Metering%20Requirements%2022819.pdf.

SMART compensation due under the tariff, given that all production cannot be metered by a single production meter without additional, redundant, and expensive equipment that can make residential projects uneconomic.

To put a finer point on this issue, the ConnectedSolutions Bring-Your-Own-Device ("BYOD") programs that are part of the utilities' approved energy efficiency plans have suffered from low enrollment due to the financial burden of the additional metering requirements. The BYOD-based energy efficiency programs are a cost-effective energy efficiency resource that will reduce ratepayer costs; however, if energy storage deployment remains hindered by high metering costs, these benefits will not be realized and there may even be a net cost for the program.

Importantly, while we highlight this issue as it relates to residential applications, other developers installing other battery technologies in other market segments are similarly impacted by the current metering requirements.

b. *Revenue Grade Metering Standards*

Utility-owned metering is not necessary in all deployments. In many cases, customer owned RGM is more accurate than utility metering. While not all customer systems will have integrated RGM and those systems may still need utility-owned production meters, where a customer has upgraded to RGM such metering should not only be allowed, but considered a preferred option. Indeed, customer system RGM is certified to 0.5% accuracy according to American National Standards Institute ("ANSI") C12 standards.[2]

Historically, customer-sited clean energy systems relied only on non-standardized data from inverter controls for metering and did not use certified RGM. The utilities in the Commonwealth have used this outdated understanding to obstruct the move to customer-owned meters. In 2010, the

[2] ANSI was founded in 1918 to provide standards for industry in the United States and collaborates with other international standards organizations to insure consistency of world wide standards.

ANSI published the ANSI C12.20 standard which provides both requirements and test methods for high accuracy RGM - for both customer and utility meters.

This standard is not just the standard for customer-owned meters, but is used by all of the major smart meter vendors that supply to utilities in the U.S. This utility standard is the same standard used by all of the major solar and storage inverter manufacturers to provide an option for metering that will comply with state-based standards for accuracy in metering, since in many cases, homeowners are billed or compensated based on this data (such as for ConnectedSolutions). The ANSI C12.20 standard requires meters to be accurate to no worse than +/- 0.5% at full load to be certified revenue grade. Meter manufacturers, whether of utility meters or customer-sited devices, such as an inverter,[3] are required to comply with rigid test criteria to meet the standard during certification: "[t]he meter performance under the test conditions [. . .] shall be as close as practical to zero error and in no case shall exceed 0.2% error for accuracy class 0.5%".[4]

Because the same standard used by utility smart meters is also used by customer device manufacturers, such as inverter companies, there is no technical reason to believe that data from either source is more or less accurate. However, data from an inverter RGM has the added advantage that there is no additional equipment cost since it is part of factory assembly of the inverter. Additionally, utilizinginverter metering cuts down on install times and other soft costs, including utility delays in installing utility-owned production meters. This reduces the overall ratepayer costs of the SMART program.

Through legislative and executive leadership, the Commonwealth is a leading state in driving clean energy innovation. However, backward-looking metering protocols hinder innovation.

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[3] *See, e.g.*, SolarEdge, Single Phase Inverter with HD Wave Technology Datasheet *available at* https://www.solaredge.com/sites/default/files/se-hd-wave-single-phase-inverter-with-setapp-datasheet-na.pdf.

[4] ANSI C12.20-2015 American National Standard for Electricity Meters—0.1, 0.2 and 0.5 Accuracy Classes.

For example, only allowing inverter-based RGM would exclude RGM based in other system equipment, such as RGM in a smart main electrical panel or similar device. In other words, the protocol for metering should not be device/location-based, but whether the meter is revenue grade tested and certified according to ANSI C12 and whether it can measure all production for SMART.

c. *Other states and market operators use customer-owned RGM.*

Using customer-owned RGM data for SMART systems is consistent with how production data is tracked and reported for multiple utility programs in other states and would allow the ratepayer funds in the SMART program to contribute to the cost of deploying solar and storage, rather than the cost of utility metering. Indeed, as outlined in the table below, ISO-NE, the U.S. Department of Treasury, and numerous other states currently authorize the use of inverter data in lieu of a production meter.

Table 1: Examples of Programs that Utilize Inverter Data for System Production Information

State	Program	Description
California	Self-Generation Incentive Program ("SGIP")[5]	For storage systems of 30 kW or less, performance audit monitoring and verification may use data from metering systems built into the storage device. This is used to verify operation of the system in accordance with program requirements (*e.g.*, annual cycling requirements).
New York	NY-SUN Incentive Program[6]	Participant solar systems must have monitoring equipment, which at the contractor's election may include a production meter, online monitoring system, inverter display recorded production, or another method.

[5] Self Generation Incentive Program Handbook, Section 5.5 (Dec. 18, 2017) *available at* https://www.selfgenca.com/documents/handbook/2017.

[6] NY-SUN Upstate and Long Island Program Manual at 30 (Apr. 2019) *available at* https://www.nyserda.ny.gov/-/media/NYSun/files/Contractor-Resources/upstate-program-manual.pdf (note: this citation references the upstate and Long Island regional program segment but the rules are the same for the downstate New York segment).

Pennsylvania	Alternative Energy Portfolio Standard - SREC Generation[7]	All solar generation installed after May 18, 2017 require production metering for SREC generation. Inverter readings qualify as metered data for this purpose.
Illinois	Adjustable Block Solar Incentive Program ("ABP")[8]	The ABP, a long-term SREC contract program, allows systems of 10 kW or less with inverters certified to +/- 5% accuracy with either web-based or digital output displays to qualify for production measurement. Inverters with integrated ANSI C.12 compliance qualify.
Vermont	Green Mountain Power (GMP) BYOD Program[9]; GMP Resilient Home Pilot[10]	Under GMP's BYOD program, GMP dispatches and monitors the performance of battery storage systems enrolled in the program remotely, including using the SolarEdge Monitoring Platform. Separate battery metering is not required for program participation. Participants in the BYOD program can also enroll in GMP's Resilient Home pilot program through which customer sited batteries provide whole-home backup power and act as the meter for the home; avoiding the need for traditional meters to measure power usage.
New Hampshire	Liberty Utilities Residential Storage Pilot[11]	Liberty's initial utility-owned storage version of this program uses Tesla Powerwalls and the accompanying GridLogic platform for remote dispatch and monitoring. Separate battery metering is not required for program participation.

[7] Pennsylvania Pub. Utils Comm'n, L-2014-2404361, Second Amended Final Rulemaking Order at p. 111 (Oct. 17, 2016), *available at* http://www.puc.pa.gov/pcdocs/1483199.doc.

[8] Illinois Power Agency, Adjustable Block Program Guidebook at 38 (May 31, 2019) *available at* http://illinoisabp.com/wp-content/uploads/2019/05/Program-Guidebook-2019_05_31.pdf.

[9] Green Mountain, Power Bring-Your-Own-Device "BYOD" Access & Service Agreement (Mar. 2019) *available at* https://greenmountainpower.com/wp-content/uploads/2019/03/BYOD-Terms-and-Conditions-3-11-19.pdf.

[10] *See* Green Mountain Power, News, GMP Pioneers Patent-Pending System Using Energy Storage to Make Meters Obsolete, https://greenmountainpower.com/news/gmp-pioneers-patent-pending-system/.

[11] New Hampshire Pub. Utils Comm'n, Docket No. 17-189, Supplemental Testimony of Heather Tebbetts at 19 (Feb. 9, 2018) *available at* http://www.puc.state.nh.us/Regulatory/Docketbk/2017/17-189/MOTIONS-OBJECTIONS/17-189_2018-02-09_GSEC_STESTIMONY_TEBBETTS.PDF.

Federal	Treasury 1603 Grant Program[12]	The 1603 Grant Program requires annual production reporting for five years by grant recipients. Recipients may use inverter readings if the inverter has a display showing total production to date.
ISO-NE	On-Peak and Seasonal Peak Demand Resources[13]	Solar resources enrolled as this type of resource are subject to minimum measurement requirements and providers must submit plans specifying how these requirements will be met. The requirements are technology agnostic and governed by accuracy and certification parameters. Providers may submit alternative plans that are consistent with these generalized parameters for ISO-NE approval. Thus, separate revenue grade metering is not required if the minimum requirements can be met through other equally reliable means.

As energy storage and other DERs are integrated into grid operations through traditional programs such as SMART and new programs, such as BYOD, Clean Peak Standard, and other pay-for-performance programs, it is essential to have system measurement solutions that do not require customers to purchase and install costly and redundant production meters. Indeed, Edison Electric Institute President Tom Kuhn lauded the progress of Green Mountain Power's innovative Resilient Home Pilot Program in bringing inverter-based metering solutions to customers and entirely eliminating and replacing utility meters:

> It is great to see how much progress is being made by EEI's member companies to innovate and transform to deliver a clean energy future for customers. Green Mountain Power is part of revolutionizing the business, and is proving that out-of-the-box thinking is not only critical for achieving clean energy goals, but also

[12] U.S. Dept. of Treasury, Treasury1603: Recommendations for Annual Report Production Documentation *available at* https://www.treasury.gov/initiatives/recovery/Documents/Recomendations for annual production - 2013 Feb.pdf.

[13] ISO New England Manual for Measurement and Verification of On-Peak Demand Resources and Seasonal Peak Demand Resources (Effective Oct. 2018) *available at* https://www.iso-ne.com/static-assets/documents/2018/10/manual_mvdr_measurement_and_verification_of_onpeak_and_seasonal_peak_demand_resources_rev07_20181004.pdf.

> possible. This innovation is a huge jump forward into the resilient, distributed energy grid we need as we move to provide more renewable energy for customers, and it also shows that electric companies are a key part of that solution.[14]

Utilizing customer-owned RGM technology is a viable and cost-effective means to track and deliver SMART system production data and is not without precedent in Massachusetts. The Department currently utilizes customer-owned RGM data to track cycling requirements for the SMART storage adder and utilities similarly utilize customer-owned RGM data for storage systems under BYOD programs. SMART and BYOD programs provide ratepayer funds for eligible systems and are approved by the Department of Public Utilities. The current utility production metering requirements insert metering redundancies and substantial inefficiencies in the use of program funds -- and currently are completely blocking deployment of some systems.

These inefficiencies should be corrected to ensure that ratepayer funds are utilized to maximize resource deployment and not siphoned off to comply with out-moded utility metering practices. The current use of customer-owned inverter data by the Department and utilities in Massachusetts further underscores that the use of customer-owned RGM data is a simple, viable and cost-effective solution to the current costly and redundant requirement for customers to install additional production meters. As discussed above, this requirement is cost-prohibitive and an inefficient use of ratepayer funds.

We urge the Department to revise the SMART program rules to require utilities to immediately begin accepting inverter data as an alternative to the current requirement that customers install utility-owned production meters. As an initial step, we recommend the Department require utilities to institute billing protocols and functionalities necessary to facilitate inverter data intake through monthly data batching in a Comma Separated Value (.csv) file format

[14] *See* Green Mountain Power, News, GMP Pioneers Patent-Pending System Using Energy Storage to Make Meters Obsolete, https://greenmountainpower.com/news/gmp-pioneers-patent-pending-system/.

for immediate implementation. As a permanent solution, we recommend the Department require utilities to institute such billing upgrades and other functionalities necessary to facilitate application programming interface ("API") connection with the utility. Many leading utilities around the country have modernized their systems to unlock innovation and integrate grid edge devices that can reduce system costs. As utilities move toward a platform model, modernized API connections and billing systems are a necessary step.

Instituting these revisions will ensure uniformity in the measurement of system production for SMART program implementation, align Massachusetts with ISO-NE policies and other states, and reduce costs for program participants to ensure that SMART incentive funds are maximized for system deployment.

II. The Department Should Adopt An Adder For SMART Systems That Provide Resiliency Benefits.

The concept of resiliency in electrical system planning has gained significant attention in recent years in the context of electrical infrastructure and the provision of essential services in the wake of extreme weather events.[15] Following Hurricane Irene in 2011 and Superstorm Sandy in 2012, both of which caused substantial damage and left thousands without power in Massachusetts and along the East Coast, federal and state government agencies gave close attention to incorporating resiliency into the electric system.[16] The incorporation of DERs, particularly solar and

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[15] *See, e.g.,* J. Van Nostrand, *Keeping the Lights on During Superstorm Sandy: Climate Change Adaptation and Resiliency Benefits of Distributed Generation*, 23 NYU Envtl. L. Journal 92, 112-14 (2015) ("Van Nostrand") (discussing various federal and state agency reports and utility proceedings assessing resiliency value and incorporating concepts of resiliency into electric system planning and operation).

[16] *See, e.g.*, Executive Office of the President, *Economic Benefits of Increasing Electric Grid Resilience to Weather Outages* (2013) ("Executive Office of the President") *available at* https://www.energy.gov/sites/prod/files/2013/08/f2/Grid%20Resiliency%20Report_FINAL.pdf; New York Pub. Serv. Comm'n, Case No. 13-E-0030, *Order Approving Electric, Gas and Steam Rate Plans in Accord with Joint Proposal* (Feb. 21, 2014) *available at* http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={1714A09D-088F-

energy storage, were given particular attention as these resources have the unique advantage of being located closer to load centers and have the ability to maintain key loads to contribute to system and host customer resilience.[17]

Indeed, the Department included the possibility of integrating a resiliency multiplier in the Department's recently released Clean Peak Standard Straw Proposal[18] and we commend the Department's proposal. While we urge the Department to continue exploring the possibility of incorporating a resiliency multiplier as part of the Clean Peak Standard, we further urge the Department to adopt a resiliency adder under the SMART program for broader applicability.

Resiliency is a critical climate change adaptation strategy in the face of increased frequency of extreme weather events. Including a resiliency adder under the SMART program would enhance the financeability of resiliency technologies, particularly energy storage systems. Adding a backup function to a home or business can significantly increase costs to the installation and operation of certain resources. A resiliency adder would provide an additional value stream to incentivize greater adoption of solar and energy storage resources to provide customer and system resilience.

Sunrun recommends for the Department's consideration in developing a SMART program resiliency adder recent reports on the economic benefits of customer and grid resiliency, and studies conducted to estimate the value of resiliency on a more granular level. On a broad scale, the U.S. Department of Energy and the President's Council of Economic Advisors examined the economic benefits of grid resiliency in a 2013 report. That report found the annual cost of weather-related outages ranged from $18 billion to $33 billion, with much higher costs in years with major storms.[19] According to the report, grid outages resulted in significant economic losses, including "lost output

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4343-BF91-8DEA3685A614}.

17 *See, e.g.,* Van Nostrand at 113-114.

18 Clean Peak Straw Proposal at Slide 24.

19 Executive Office of the President at 23.

and wages, spoiled inventory, delayed production, inconvenience, and damage to the electric grid."[20]

Other studies have taken broad economic impact data such as that discussed above and developed methodologies to quantify more granular monetary valuations of reliability and resiliency benefits, or termed another way, the benefit of uninterrupted power supplies. For instance, a recent report titled "Energy Storage: the New Efficiency" includes a white paper from the Applied Economics Clinic ("AEC") providing valuation estimates of the cost per kWh of power outages as a "value of lost load" ("VoLL"). VoLL estimates the costs of supply interruptions for energy customers in the reliability and resilience context.[21] Among other things, the AEC white paper estimated the non-energy benefits of storage in Massachusetts using Lawrence Berkeley National Laboratory's VoLL estimates for residential customers. A summary table from the AEC white paper estimating costs to customers from lost power is reproduced below.

Table 5: Estimated cost per event, average kW and unserved kWh, residential (2018$)[22]

	Momentary	**30 Minutes**	**1 Hour**	**4 hours**	**8 Hours**	**16 Hours**
Cost Per Event	$4.19	$4.83	$5.47	$10.20	$18.46	$34.77
Cost per Average kW	$2.49	$3.11	$3.54	$6.65	$12.13	$22.75

[20] *Id.* at 24.

[21] *See* Clean Energy Group, *Energy Storage: The New Efficiency, How States can use Energy Efficiency Funds to Support Battery Storage and Flatten Costly Demand Peaks*, Appendix 3, Applied Economics Clinic, Massachusetts Non-Energy Benefits of Battery Storage White Paper (Apr. 2019) ("AEC White Paper") *available at* https://www.cleanegroup.org/wp-content/uploads/energy-storage-the-new-efficiency.pdf.

[22] AEC White Paper at 15.

Cost per Unserved kWh	$33.16	$6.33	$3.54	$1.72	$1.50	$1.40

It is also important to note the AEC white paper's findings regarding health and safety related benefits of resiliency. The paper highlights that more resilient power supplies enable providers of safety and health services—like hospitals or community health centers—to continue to provide services that are highly valuable to society during outages associated with natural disasters, and noted this as "a distinct non-energy benefit that may not be adequately accounted for in VoLL."[23]

The AEC white paper also noted the "additional value of avoided power outages for customers who are elderly, disabled or have serious health conditions and rely on electronic devices are more vulnerable to power outages than the average customer."[24] The paper cited research finding that "in the United States—among the 175 million people covered by employer-sponsored health insurance—approximately 218 per 100,000 people are 'electricity dependent residing at home.'"[25]

Further emphasizing the non-energy health benefits of improved resilience, the AEC white paper cited Massachusetts investor-owned utilities' obligation "to maintain lists of health critical customers (called 'life support customers' in Massachusetts) who cannot have their power shut off, and are prioritized in power restoration efforts, because they are reliant on electrical medical devices, and to be without power would be harmful or life threatening."[26] The adoption of resilient

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23 *Id.* at 14.
24 *Id*.
25 *Id.*
26 AEC White Paper at 14.

technologies by vulnerable populations would provide critical electricity service during power outages, and potentially life-saving benefits.

We urge the Department to adopt a resiliency adder in the forthcoming SMART program revisions and respectfully submit that the AEC white paper, and other resources cited in that paper, could provide a useful guide for the Department's development of such an adder.

III. Other Topics

a. *Cycling Requirement*

The straw proposal notes the Department's intent to encourage solar plus storage projects to participate in demand response programs and provides the option to (a) discharge at least 52 times per year, or (b) participate in a demand response program.[27] Replacing the cycling requirement with participation in a program, such as demand response, ensures that the project provides grid value and we support this modification to 225 CMR 20.06(1)(e)4. Moreover, we commend the Department for structuring SMART to bridge the revenue gap between grid service programs and the cost of deploying storage. It has been successful in not only inducing market entry but also in positioning developers so they must maximize participation in performance programs to stack value. This reduces the cost of storage to customers, reduces the cost of SMART, and reduces grid costs; thereby saving money for all Massachusetts ratepayers.

b. *Congestion Adder*

Sunrun supports exploring an adder mechanism to incentivize solar and storage deployment in locations that could support and/or benefit from additional solar or storage[28]; however, we urge the Department to modify the "subtractor" element for projects interconnected to locations

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[27] Dept. of Energy Resources, *SMART 400 MW Review* at Slide 22 (Sept. 5, 2019) ("SMART 400 MW Review").

[28] *Id.* at Slide 24.

identified as too congested.[29] Instead of discouraging customers from siting solar at currently congested areas, providing an adder to site resources that relieve congestion will further Massachusetts renewable energy and energy storage deployment goals and mitigate costly system upgrade costs that would otherwise be required to allow for higher renewable penetration levels. Solar plus storage projects, particularly BTM projects, have numerous capabilities that include the ability to defer capital intensive system upgrades to increase the hosting capacity for additional solar resources and support beneficial electrification and other beneficial load growth.

IV. Conclusion

Sunrun appreciates the opportunity to submit the foregoing comments on the Department's formal review of the SMART program. We urge the Department to institute SMART program revisions consistent with the recommendations herein to (1) allow customers to utilize customer-owned RGM in lieu of a production meter to track SMART system production, (2) adopt a resiliency adder for customers who install solar paired with energy storage systems; (3) retain the option to allow customers to meet the cycling requirement or participate in a program that provides grid benefits; and (4) modify the congestion subtractor to provide a congestion relief adder to incentivize projects that can expand the hosting capacity of congested area.

Respectfully submitted,

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[29] *Id*.