Shift

SUNSHOT

MANIFEST | MIND

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ENOUGH
SOLAR ENERGY THAT IS AFFORDABLE FOR ALL

INITIATIVE

TRANSFORM HOW SOLAR IS GENERATED

FASTER, EASIER, AND AFFORDABLE TO CHOOSE SOLAR

Reduce the total installed cost (or the Levelized Cost of Energy, LCOE) for utility-scale solar-generated electricity to roughly 6 cents per kilowatt hour without subsidies

DRIVING

Rapid, large-scale adoption of solar electricity across the United States

INTEGRATION

STEADY COLLABORATION

ACCELERATING RESEARCH AND DEVELOPMENT

To achieve the goals of SunShot for the widespread availability of solar that is **economically-competitive (without subsidy) with nonrenewable forms of electricity by 2020**, the following system integration challenges must be achieved:

- Reduction in **the costs of power electronics and other system components**
- **Reduction of the risks** associated with innovative technologies by **improving bankability**
- Rapid development of **safe, reliable, and cost-effective processes for the integration of high-penetration solar** that adds value both to the system owner and the utility grid

Paradox

The traditional theory of **Economies of Scale** inherent in LCOE is useful when all other factors are equal so that increased scale will naturally create cost advantages

Yet, there is a paradoxical danger in employing LCOE as the key metric to measure progress towards the goal of widespread and affordable solar availability —

the costs of power delivery can quickly outweigh the economies of scale achieved by large-scale solar power generation projects

causing **diseconomies** of scale

LARGE-SCALE SOLAR SYSTEMS

DECREASE FIXED COSTS

INSTALLED, LIFETIME, AND PRODUCTION COSTS

DRIVEN BY TECHNOLOGY CHOICES

DISTRIBUTION AND TRANSMISSION INVESTMENTS

ESCALATING COSTS FOR DELIVERY

INCREASE IN UTILITY EXPENDITURES

LOSSES TO SHAREHOLDERS

RATE INCREASES TO CONSUMERS

LCOE

EXTERNAL

DISECONOMIES

For Immediate Release: January 30, 2015
11 a.m.

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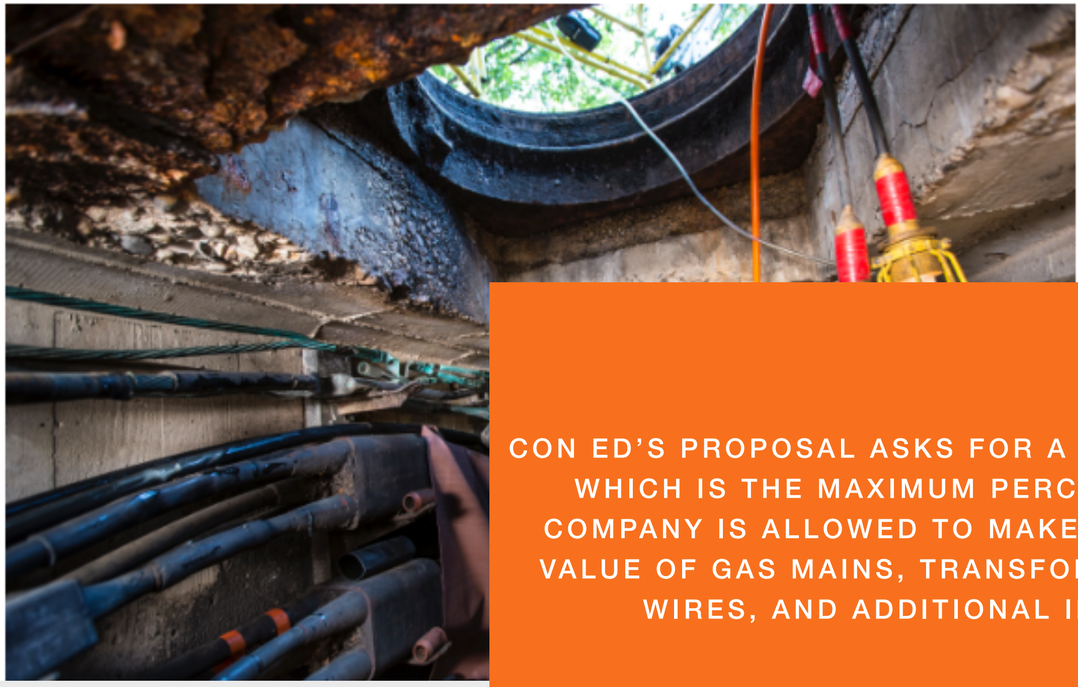
New York, NY– Consolidated Edison Company of New York, Inc. (Con Edison) announced an electric delivery service rate filing with the New York State Public Service Commission (PSC) today for new rates beginning January 1, 2016, which will support system reliability, storm hardening, better technology and online service enhancements. It would be the company's first rate increase since April 1, 2012.

The plan seeks a revenue increase of $368 million, resulting in an average bill hike of 3.2 percent (7.2 percent for delivery), for customers throughout the company's New York City and Westchester service area.

A typical bill for a New York City residential customer using 300 kWh per month would rise from $82.06 to $85.94, an increase of 4.7 percent (7.9 percent for delivery). A typical bill for a Westchester residential customer using



CON ED'S PROPOSAL ASKS FOR A 10% RETURN ON EQUITY, WHICH IS THE MAXIMUM PERCENTAGE RETURN THE COMPANY IS ALLOWED TO MAKE FROM THE ESTIMATED VALUE OF GAS MAINS, TRANSFORMERS, TRANSMISSION WIRES, AND ADDITIONAL INFRASTRUCTURE

INTELLIGENT DESIGN

LOW TOTAL LIFECYCLE COSTS

HIGH TOTAL LIFETIME ENERGY PRODUCTION

- Even if large-scale solar systems do achieve an LCOE on parity with non-renewables by 2020, external costs can easily undermine the economic benefits

- But, because of Economies of Scale, smaller-scale PV cannot achieve the desired LCOE, despite the benefits of targeted and selective deployment that avoids many external costs

The Key is to Reduce Transmission Grid Interconnection Costs

- Grid interconnection costs are related to inverters, transformers, switchgear, and MV substations. Interconnection advancements can drive down costs that undermine LCOE economics, including the costs of components, skilled labor, and the price of copper

- Critically, power transmission costs are reduced through scale economies, when intelligent system design and improved plant utilization is achieved. This is done through the use of technologies like solar tracking and the improved management of high-penetration solar impacts on the transmission system

MODELS

THE RIGHT DESIGN

Development and use of advanced simulation and modeling software to plan and operate solar interconnections, including data aggregation, predictive analytics, and functional integration into full-scale operations

RISKS

UNDERSTAND CONSTRAINTS

Careful calculation of costs, benefits, and risks in planning grid interconnections

PLANNING

USE THE MODEL

Improved technical planning of a grid interconnection that is coordinated at the very outset of project planning among economic, organizational, legal, and political stakeholders

APPROACH

CAPACITY AND FLEXIBILITY FOR VARIABLE GENERATION

SUPPORT AND ENHANCE

- Solving the bulk system issues that face utilities may be the key to reaching the goals of SunShot that will drive rapid, large-scale adoption of solar electricity

- Economies of Scale to reach the desired LCOE requires a centralized system of adequate scale, but these economic benefits can quickly diminish if not carefully managed within the broader context of the entire system from generation to the point of consumption

- The best system integration innovation brings a deep and significant understanding of the entire grid at spatial and temporal scales, and provides validated models that improve utility operations to accommodate and improve the integration of high-penetration solar on the grid without undermining existing and evolving transmission models

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