Solar PV + Storage

A NEW ECONOMIC REALITY IN CALIFORNIA



Net Energy Metering Policy

Simon Baker Deputy Director, Energy Division California Public Utilities Commission

September 10, 2019

Current Net Energy Metering (NEM) Program Design



<u>Eligible Technologies</u>: Customer-sited renewable generation facilities sized to meet average annual energy usage, no cap on total system size. NEM 1.0 had a 1 MW system size cap.

Program Cap: None

<u>Bill Credits</u>: Customers receive bill credits for generation exported to the grid equivalent to the full retail rate minus non-bypassable charges (approx. 2.5-3.5 cents/kWh).

<u>Annual True-Up</u>: Credits can be rolled over on a month-to-month basis for up to a year. At the end of the year, any excess generation is paid out at the net surplus compensation rate (approx. 3 cents/kWh).

<u>NEM Transition Decision</u>: Customers may remain on their NEM tariffs for 20 years from the date of interconnection, and then they must transfer to the currently offered tariff.

Key Features of "NEM 2.0"

NEM 2.0 retained the existing NEM structure with three important modifications:

- 1) <u>Time-of-use rates</u>: Customers must take service on a time-of-use rate.
- 2) <u>Non-bypassable charges</u>: Customers must pay non-bypassable charges on energy consumed from the grid.
- 3) <u>Interconnection</u>: Customers with systems <u>1 MW</u> <u>and under must pay a small interconnection</u> fee, and customers with systems <u>larger than 1</u> <u>MW</u> must pay an interconnection fee and all distribution/transmission upgrade costs.





SGIP Incentive Storage Requirements (Starting April 2020)

Residential Requirements

- Must have a Single Cycle Round Trip Efficiency of at least 85%.
- Enrollment in a TOU rate with peak period starting at 4 pm or later and summer peak to off-peak price differential of 1.69 or more is required (except CARE customers).

Non-Residential Requirements

- A 5-minute real time GHG signal will be made available to help non-residential projects meet the program's GHG reduction requirements.
- 50% of incentive upfront / 50% over 5 years based on performance.



Example TOU Rate (SCE TOU-D 4-9PM)





NEM Export Rate equal to rate at time of export minus ~\$0.02/kWh in nonbypassable charges

Growth in Customer-Sited Solar PV Capacity Continues in Investor-Owned Utility Service Territories





Factors Driving the Value of Storage in California

Scott Murtishaw Senior Advisor September 10, 2019



Four Key Factors Drive Storage Payback

- Installed Cost of Storage Systems
- Availability of Incentives
- Rate Structures
- Compensation for Grid Services

Storage Incentives

- Investment tax credit when paired with solar
 - Steps down from 30% to 10% in 2022
- Self-Generation Incentive Program
 - Incentives range from \$0.25/Wh to \$0.50/Wh depending on utility and customer class
 - CPUC considering proposal to increase to \$0.65 to \$0.85/Wh for vulnerable customers in high fire threat areas
 - CPUC will next consider SB 700 implementation, which provides up to \$830 million of additional funds for SGIP over next five years

Rate Trends Affecting Storage Payback

- Later peak periods in time-varying rates reduce value of stand-alone solar
- Creation of storage-specific rates
- Reduction in non-coincident demand charges
- Reduced value of exports under NEM
- In the future: real-time pricing?

Storage vs Standard Rates



Demand Charge Reform

- CPUC disfavoring non-coincident (maximum) demand charges
- Revenue collection moving to peak demand charges &/or energy charges
- Recent PG&E decision created Option S storage rate with
 - Very low maximum demand charges (which don't apply from 9 am 2 pm)
 - Daily peak demand charges

Grid Services from Customer-Sited Storage

- Demand response
- Local resource adequacy
- Distribution capacity
- Wholesale energy arbitrage
- Other ancillary services may be available in the future
 - Frequency regulation
 - Voltage support
 - Spinning reserve

Evolution of Net Energy Metering (NEM): SCE's Case Study on NEM Subsidy

Ray Liang | Advisor, Modeling, Forecasting & Economic Analysis A New Reality for Solar + Storage Systems in California | Sept. 10, 2019

Note: The views and opinions expressed in this presentation are for discussion purposes only and do not necessarily reflect official SCE positions in any proceeding.



History / Background

1996 – Birth of NEM 1.0

• Legislation introduced requiring utilities to offer "net energy metering" to customers with behind-the-meter renewable technologies

Jan. 2016 – NEM 2.0 adopted; Reform of residential rates begins

- Default time-varying rates for residential customers (~Q4 2020)
- Resolution of fixed charges for residential customers (~Mid 2019)

Jul. 2017 – NEM 2.0 launched in SCE's service territory

• Key changes include *mandatory* time-varying rates, some additional non-bypassable charge recovery, and new \$75 interconnection fee

Oct. 2018 – Commission authorized \$2 million to review NEM 2.0

• Energy Division to hire an independent consultant managed by SDG&E (In Progress)

Dec. 2018 – Commission indicated* new Distributed Generation Successor Tariff Rulemaking to begin by Q3 2019

• To investigate the best path forward for NEM, and the consideration of the development and adoption of successor tariffs



Evolution of the NEM Subsidy

SCE's Residential Distributed Generation Cost-Shift Over Time



----Cumulative Annual NEM Impact (\$) Assuming NEM 1.0 and 5-Tiered Rate

NEM Subsidy Continues to be Borne by Lower Income Customers



Million \$

Customers adopting rooftop solar *generally* have higher incomes than non-adopters

Current annual **NEM subsidy (~\$450M)** provided to ~300k NEM participants now **exceeds** annual income-qualified **CARE subsidy (~\$375M)** provided to ~1.2 million customers



Cost-to-Serve Impacts Due to Various Rate Structure Modifications





CUSTOMERS FIRST

LADWP Solar + Storage Efforts

US Green Building Council of Los Angeles September 10, 2019

2019 Extreme Weather Events

Emmanuel Macron 🥏

Our house is burning. Literally. The Amazon rain forest - the lungs which produces 20% of our planet's oxygen - is on fire. It is an international crisis. Members of the G7 Summit, let's discuss this emergency first order in two days! #ActForTheAmazon



O 162K 12:15 PM - Aug 22, 2019

O 90.9K people are talking about this



1 nr 7 min ago

Here are the conditions we expect in each city



EUROPEAN HEAT WAVE

BLAST FURNACE Paris to hit hottest temperature in history at 42C tomorrow as Europe sizzles in new heatwave

Netherlands 38°C London 36°C Belgium 39°C Paris 42°C Luxembourg 39°C Castelo Branco 32°C Rome 36°C Madrid 36°C Rhodes 32°C



Power outages jump to at least 221,000 in three states

AN SECOND European heatwave brought temperatures in to the 40Cs.

An all-time record was set in France a few weeks ago, sparking wildfires across the continent in a week of searing temperatures which set record highs.



Wildhie spreads across parts of the Amazon rainforest, near the Porto Velho region, 24 August 2019, Credit: 2094 Press, Inc. / Alarmy Stack Photo.

People bathe in the Trocadero Fountain near the Eiffel Tower in Paris during Friday's heatwave Credit: AFP or licensons

Why are we moving towards renewable energy?

- Mitigate emissions of greenhouse gases that contribute to climate change
- Clean sources of energy and a much lower environmental impact than conventional energy technologies
- Renewable energy will not run out
- Energy Security

Sources: Department of Energy, National Renewable Energy Laboratory, and Renewable Energy World





Recent Efforts to Achieve Renewable Goals

Los Angeles seeks record setting solar power price under 2¢/kWh

BUSINESS ENERGY STORAGE UTILITY-SCALE PV CALIFORNIA UNITED STATES

The city's municipal utility is readying a 25-year power purchase agreement for 400 MWac of solar power at 1.997¢/kWh along with 200 MW / 800 MWh of energy storage at 1.3¢/kWh.

JUNE 28, 2019 JOHN WEAVER



8minutenergy - 328 MW-DC Mount Signal Solar Farm in Calexico, California









ladwp.com

Recent Efforts to Achieve Renewable Goals

Fire Station 28



- Lithium Ion Battery
- 12 kW size, 3 hour
- Demand Response
- Emergency Backup
- On 3/22/18, due to heavy rain, power outage exceeded 7 hours, batteries were sufficient to provide 43 hours of backup power

La Kretz Innovation Center



- Lithium Ion Battery
- 60 kW size, 2 hour
- Demonstration of solar, EVs , and battery integration

LAX Thermal Energy Storage



Preliminary architectural rendering of the new Central Utility Plant with the FAA air traffic control tower and Theme Building in th background.

- Stored energy to cool
 1.6m gallon water at
 night for next day
 cooling use
- 1.25 MW size
- Total Thermal Storage Portfolio 10.4 MW size in other facilities such as USC and UCLA



ladwp.com

Efforts on Solar + Storage Programs and Projects

- Net Energy Metering and Solar Incentive Program
 - 41,616 total customers with behind the meter solar
 - 313.6 MW of behind the meter solar
- Feed-in Tariff (FiT) Program
 - 96 projects in service with a total capacity of 66.2 MW
 - 121 projects under development with a total capacity of 80.9 MW
- Community Solar Programs
 - Share Rooftops Program 1-10 kilowatts (kW) each, on single family rooftops
 - Completed 23 projects at 72 kW
 - Shared Solar Program Multifamily residents to fix a portion of electric bill
 - Enrolled 97 customers, 6 applications in progress

Utility Built Solar Pilot Projects (Planning)





LADWP Solar Programs



Includes Largest Feed-in Tariff Program of any US City

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LADWP achieved 30% RPS integration in 2017



Source: California Energy Commission (CEC) Power Content Label filings



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LADWP Mission Statement

The Los Angeles Department of Water and Power provides our customers and the communities we serve **safe**, **reliable**, and **costeffective** water and power in a **customer-focused** and **environmentally responsible** manner.

| How L.A. Water & F | DETITIVE Ka Power Residential Bills | Compare to Oth | er California | Cities" |
|--------------------|---|----------------|---------------|---------|
| Burbank | \$124.88 | | | |
| Pasadena | \$126.61 | | | |
| LADWP | \$130.88 | | | |
| Santa Monica | \$130.91 | | | |
| Long Beach | \$142.59 | 5 | | |
| Glendale | \$143.60 | | | |
| Arcadia | | \$155.65 | | |
| San Francisco | | \$187.81 | | |
| | | | 4000 14 | |

Source: LADWP Strategic Plan, Priorities, and Vision, December 2017



Thank you



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- Locally owned & operated for 15 years
- One of Southern CA's top developer of residential storage solutions
- Over 80 million watts installed across 8,500+ systems
- Inc. Fastest-Growing for 8 consecutive years
- OC Register's and San Diego Union-Tribune's Best Solar Company



ACCREDITE

Ilivan Solar Power





Net metering 1.0 grandfathering

- Net metering 1.0
 - Protections for residential & commercial distributed generation clients who got PTO prior to the deadlines
 - SDG&E's NEM cap was hit 6/29/2016
 - Edison's statutory deadline was 6/30/2017
 - Protections:
 - Can stay on tired rates up for to 20 years from PTO, as long as they are available
 - No non-bypassable charges
 - Cannot incur a charge a non-solar customer doesn't incur
 - No fee for net metering application



How to Boil a Frog A timeline of utilities turning up the heat

AB 327 = Pandora's Box

- Gave CPUC authority to craft a new electric rate structure
- Introduction of net metering 2.0

CPUC Decision 16-01-044

- Adoption of successor net metering tariff
- Forced all net metering 2.0 customers to time-of-use

CA IOU time-of-use rate filings

- September 1, 2016 SCE required moving commercial peak windows to 4-9 p.m.
- SCE Phase 2 of 2018 General Rate Case proposes 4-9 p.m. for residential
- December 1, 2017 SDG&E's 4-9 p.m. on peak went into effect
- March 1,2019 SCE's 4-9 p.m. on peak went into effect (had pilot program in 2018)



Net metering 2.0 grandfathering

- Net metering 2.0
 - Forced onto a time-of-use rate

Protections:

- Due to SDG&E's delay with rate case about moving on peak windows, two grandfatherings were given to solar customers
 - 1. Tiered grandfathering
 - Residential solar clients who got PTO between 6/29/16 3/1/2017 can stay on tiered rate for up to 5 years
 - 2. TOU window grandfathering
 - Residential solar clients who got PTO by 11/30/17 and go on a time-ofuse rate, locked in the 11 a.m.-6 p.m. on peak window which moved to 4-9 p.m. on 12/1/17. SDG&E pushed clients to this, then flattened the rates which eliminated the need to use energy storage.
 - Edison solar customers who switched to a grandfathered TOU rate by 2/28/19 were grandfathered for up to 5 years onto the 2-8 p.m. on peak window, which has moved to 4-9 p.m. or 5-8 p.m. depending on the rate.
- Protections:
 - 20 years of NEM 2.0

Understanding Time Of Use Rates (SCE)

TOU-D-4-9PM

TOU-D-PRIME



AFTER SOLAR ON CURRENT TOU RATES

WHAT EDISON'S METER SEES



SOLAR WITH BATTERY ON NEW TOU RATES

WHAT EDISON'S METER SEES



What Does It Look Like?



Self-Generation Incentive Program

- Rebate for batteries from the state of California
- SCE is in Step 5 of funding
- Funds based on kWh, currently around \$1,888 for a 10 kWh battery

- Luxury for users grandfathered into tiered rates
- Recommended for solar customers today
- Request for commercial funds under review

Battery Economics

Installed Cost of PV + Storage (6kW-AC)

- Gross Cost = \$32,973
- SGIP Rebate = \$1,888
- 30% Tax Credit = \$9,325
- Net Cost = \$21,760

Thank You!





A New Reality for Solar + Storage Systems in California

Green NRG / USGBC LA Sep 10, 2019



Energy Toolbase

SaaS platform for modeling & proposing the economics of solar + storage projects.





Accurate, objective, transparent: 'utility rate' & 'avoided cost' analysis.

⊙ ENERGY TOOLBASE[™]

Our customers



6 Thoughts on residential ESS market in CA

- 1. Demand is strong & growing rapidly
- 2. CA has best TOU rates for Resi ESS in the country
- 3. PV-only beats PV+ESS economics
- 4. Primary motivation for homeowners is not financial
- 5. Adding ESS adds complexity to the sale
- 6. NEM 3.0 will change everything



⊙ ENERGY TOOLBASE[™]

#1) Demand is strong and projected to grow rapidly

 Smart Electric Power Alliance: <u>"2019 Energy Storage Market</u> <u>Snapshot" report</u>

 Wood Mackenzie: "<u>Q2 2019 U.S.</u> <u>Energy Storage Monitor" report</u>

• <u>SGIP incentive tracker data</u>



C ENERGY TOOLBASE™

#2) California has the best TOU rates for residential Energy Storage economics in the country

- Wide TOU price differentials
- Later evening "on-peaks" (4p 9p)
- New solar customers required to go onto TOU rates





#3) Solar-only project economics still beat solar-plusstorage project economics

- SolarPowerWorld article: <u>Case study</u> <u>When solar+storage operating in time-</u> <u>of-use arbitrage mode beats the</u> <u>economics of standalone solar</u>
- Best rate vs best rate analysis
 - PV-only best rate
 - PV+ESS best rate
- PV-only offers such a strong value prop, it's hard for PV+ESS to compete



● FNFRGY TOOL BASE[™]

#4) Primary motivation for homeowners adding storage today is not financial

- Back-up power
- Energy Independence
- Future-proofing
- Early adopter / cool factor





#5) Adding energy storage adds complexity to the sale

- selling PV-only in CA is quick, easy & repeatable for good firms
- Adding ESS lengthens the sales cycle
- Depends on the customer's motivation





#6) NEM 3.0 will change everything

- Value of exported solar production to the grid will get reduced
- Residential PV systems export a lot of production to grid
- Est Timeline (per CALSSA):
 - 2020 (early): formal proposals solicited
 - 2020 (late): possible to get a PD
 - 2021: implementation?





<u>Q & A:</u>

A New Reality for Solar + Storage Systems in California

Special offer: Extended free trial > mention this event



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