PURPA Resurgence and Avoided Costs

PRESENTED TO
EUCI Symposium

PRESENTED BY
Metin Celebi

September 9, 2019

THE Brattle GROUP

EUCI

Agenda

PURPA Evolution

Changing Mix of Qualifying Facilities

New Challenges in Avoided Cost Calculation

QF Contracting and Competitive Procurement

Background – The Basics

- PURPA enacted in 1978 to encourage conservation and small generation facilities
- Goal to achieve level playing field with QF sales at incremental cost of alternatives
- "Unique federalism" calls for state implementation under FERC guidelines
- Rationing by price, not quantity

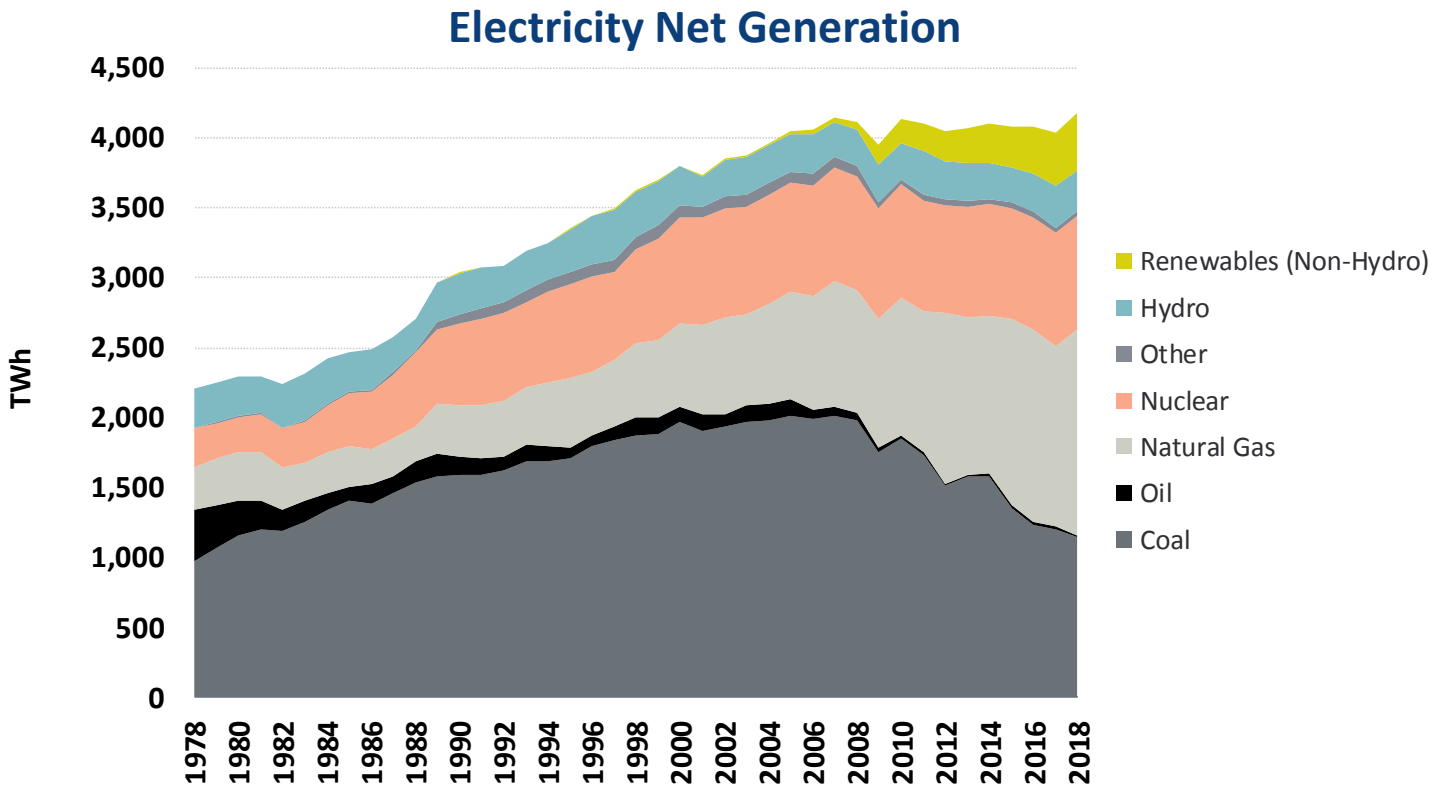
- Has required recurring "but-for" analysis of Avoided Costs, including:
  - Next planned (proxy) unit
  - Marginal CT capacity and energy
  - Comparative system-wide costs
  - Fuel Index Rates

  With alternative of Auction/ RFP process

- Plus eligibility/ contract issues:
  - Effective scale thresholds
  - Contract length/ price structure
  - Environmental attributes
  - Integration costs
  - Dispatchability
  - Risk sharing

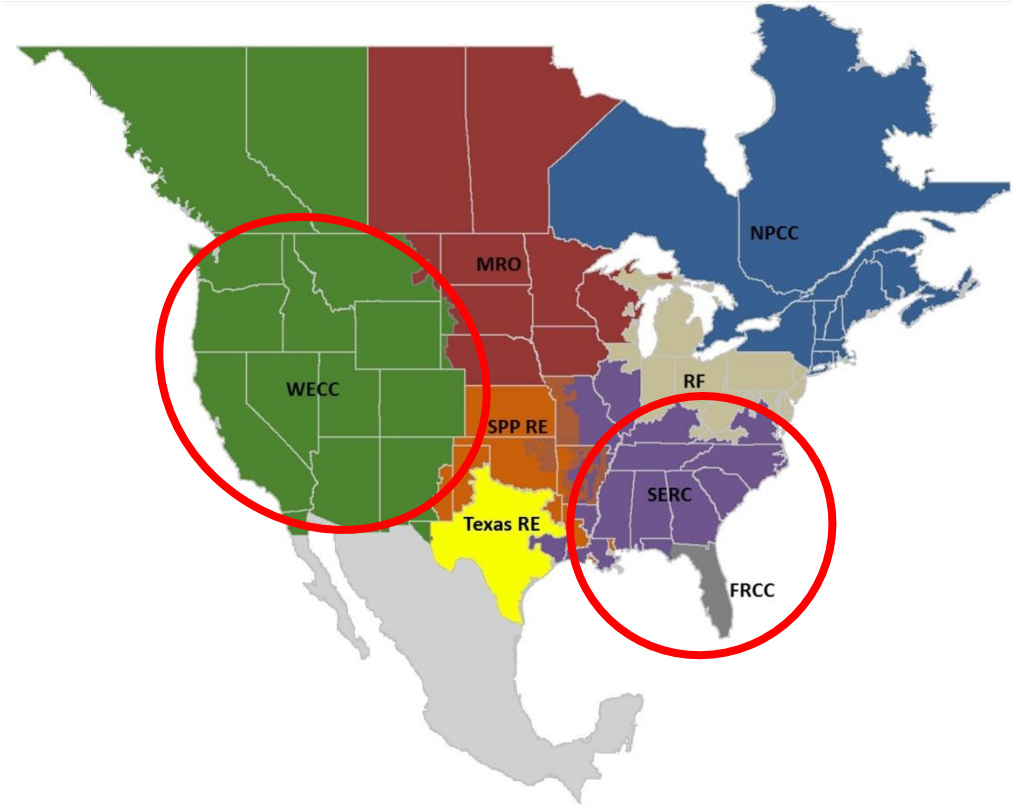
Changing Fundamentals and Policy Goals

1978…		and Now
Conservation imperative	→	Climate change imperative
Strong electricity demand	→	Weak load growth
Utility dominance	→	Extensive generation deregulation



EPAct of 2005

- EPAct in 2005 modified the "must purchase" obligation for QFs
- This applied to QFs with non-discriminatory access to competitive markets
- FERC created a rebuttable presumption to this effect for QFs larger than 20 MW in:
  - PJM
  - Midwest ISO
  - ISO-NE
  - NYISO
  - ERCOT
- The full PURPA mandatary purchase continues in the non-RTO West and Southeast



New Technologies, But Old Issues

1. ***Administratively set avoided costs***
   - Administratively set long-term avoided costs have diverged from actual fuel and capital costs, load growth and technology originally expected to offset
   - In practice, actual costs have continually dropped below long-term estimates
2. ***Rationing QF procurement by price***
   - QFs customarily "rationed" based on price, not on quantity
   - This often led to over-subscription (example of Standard Offer 4 in the 1980s)
   - Now renewables are price competitive, while load growth stalls
3. ***Equitable risk sharing under PPAs***
   - FERC supports "reasonable opportunities to attract capital", but does not define
   - In the early implementation of PURPA, that could mean life-of-asset PPAs
   - In changed circumstances, long-term PPAs may no longer be equitable

Push-Back From Some States

States in non-RTO regions:

West	Southeast
Arizona	Alabama
Colorado	Florida
Idaho	Georgia
Montana	Kentucky
Nevada	North Carolina
New Mexico	South Carolina
Oregon	
Utah	
Washington	
Wyoming	

- Individual states are on the front line, since PURPA leaves them much latitude.
- In July 2017, HB 589 codified a PURPA alternative in North Carolina.
- Colorado has effectively folded PURPA obligations into state IRP process.
- Idaho introduced 2-yr limit to QF contracting.
- Regulators in Utah and Montana, and utilities in Arizona have sought shorter QF PPAs.

Recent Federal Actions

- FERC held a technical conference to reexamine PURPA in 2016
- As a result of the conference, FERC invited comments on:
  - Minimum standards for PURPA purchase contracts and
  - Potential gaming of the "one-mile" rule.
- Numerous utilities and IPPs have weighed in, as well as the NARUC.
- Comments remain under consideration by FERC.

- The House Energy and Commerce Committee held PURPA hearings:
  - September 2017, January 2018
- H.R. 4476, the PURPA Modernization Act of 2017, calls for:
  - Limiting mandatory purchase obligation if
    - Competitive procurement
    - No need for capacity
    - QFs larger than 2.5 MW
  - Tightening one-mile rule.
- H.R. 1502 in 2019 calls for similar amendments

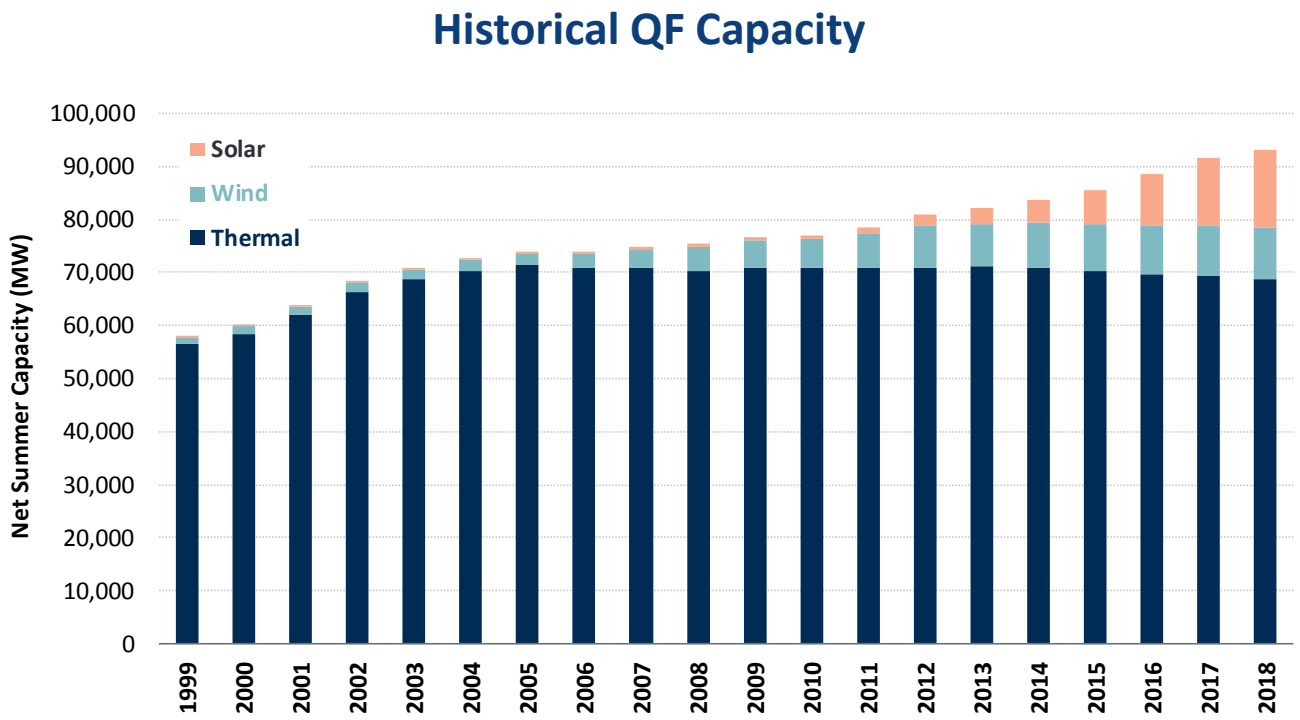
Key Issues Going Forward

Estimating Avoided Cost Has More Moving Parts	– Forecasting avoided cost drivers has always been difficult – Complicated by effects of renewables penetration – *NC and MI partially sidestepped via competitive procurement* – But avoided cost still needed to establish ceiling prices
Workable Targets for QF Supply More Critical	– Load growth has stalled since PURPA inception – QFs may form excess capacity, not just displace new-build – *NC targets fixed amount of procurement* – Still need to reconcile negotiation and system needs
Risk Sharing Parameters are Changing	– PPA terms interactive with avoided costs and QF economics – QF cost advantages may in some cases warrant shorter PPAs – *NC and MI addresses indirectly, through competitive bidding* – A different issue where long-term avoided costs remain

Changing Mix of Qualifying Facilities

Recent Dominance of Renewables

- PURPA has a new role as vehicle for renewables (at least for now)
- Growth in QF facilities over the last 10 + years has come entirely from renewables

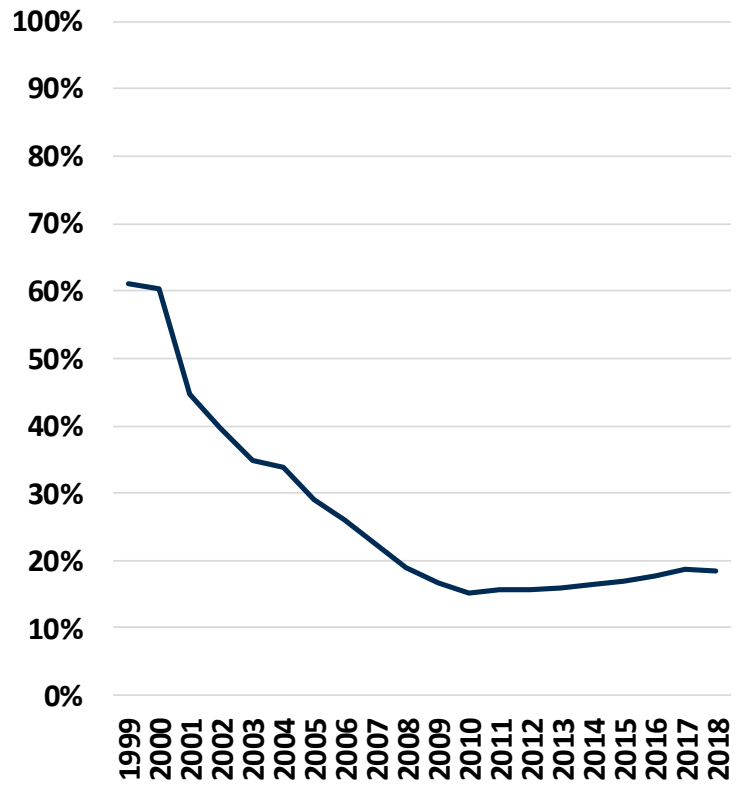


Source: Velocity Suite, ABB Inc. (2019)

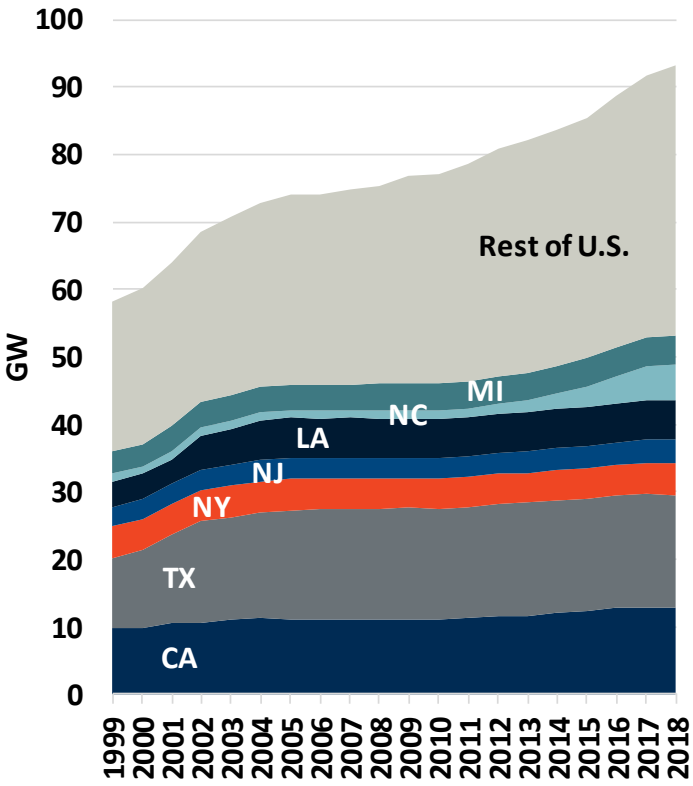
QFs Have Contributed Importantly to Historic Renewables Development

But form a much smaller part of overall renewables development today…

QF Share of Total U.S. Renewable Capacity



Cumulative QF Capacity

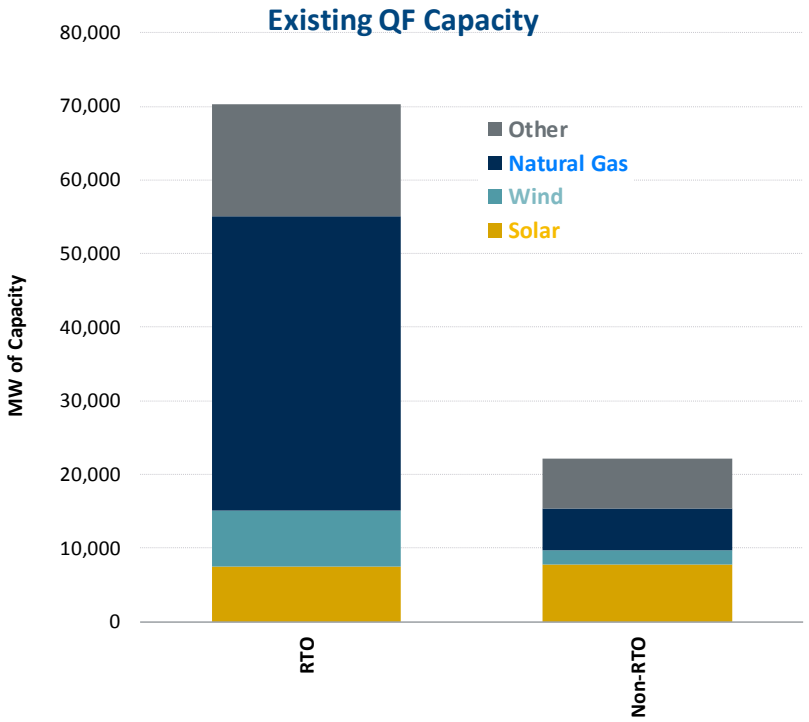


Source: Velocity Suite, ABB Inc. (2019)

Current QF Demographics

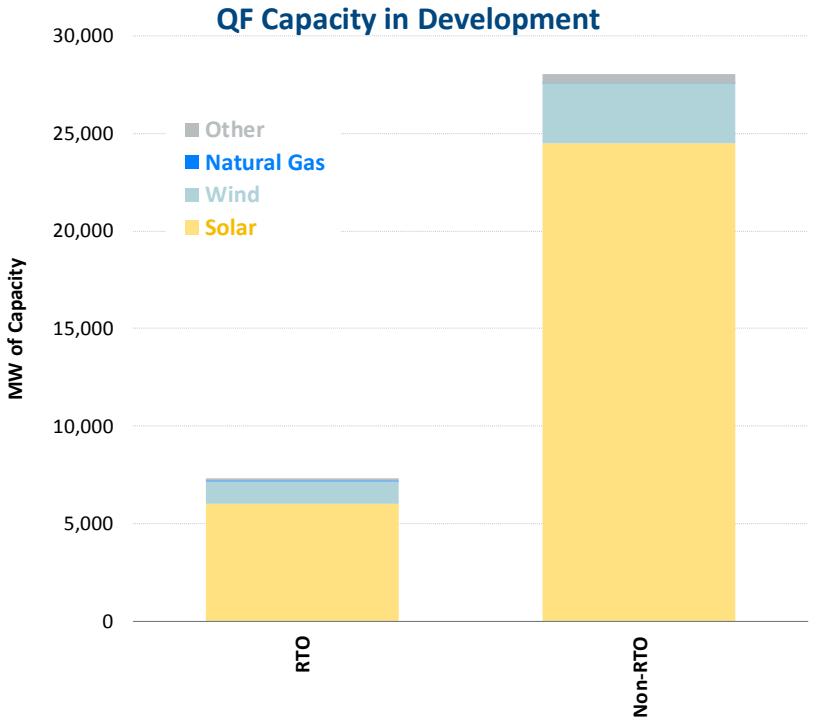
Operating inventory of 90,000 MW:

- Remain mostly thermal (gas, biomass, etc.)
- Mostly in RTO regions (much pre-1990s)
- Most renewables came online in last ten years



24,000 MW under development:

- Dominated by renewables (mostly solar PV)
- Mostly in non-RTO regions



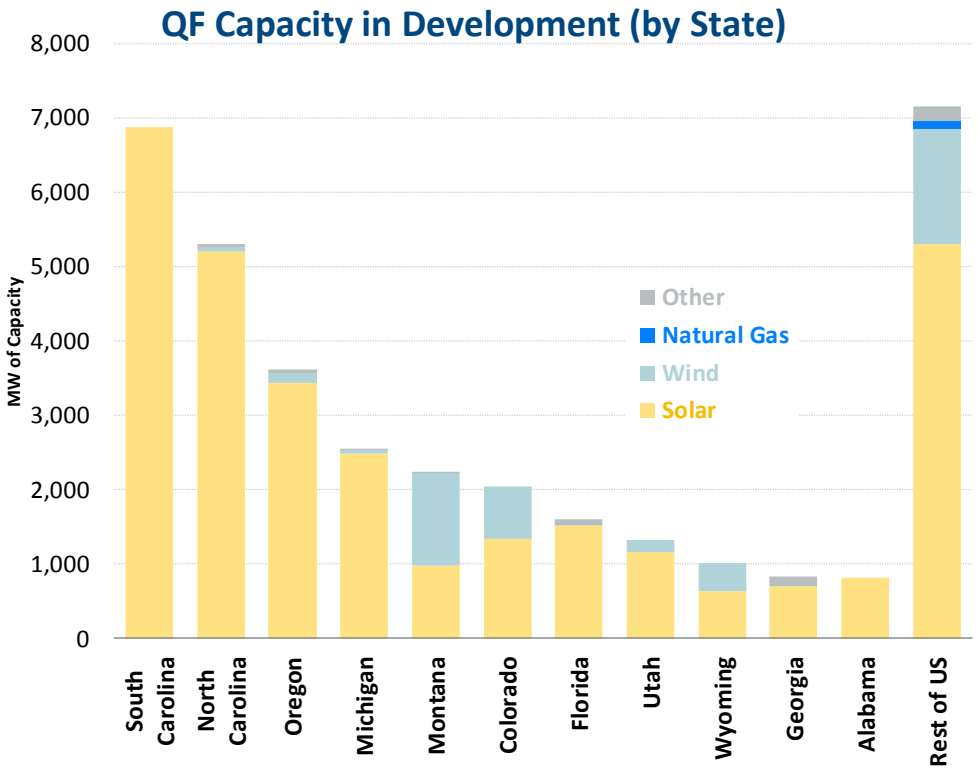
Source: Velocity Suite, ABB Inc. (2019)

Current QF Demographics (cont'd)

QFs under development are geographically concentrated:

- South Carolina 6.9 GW
- North Carolina 5.3 GW
- Oregon 3.6 GW
- Michigan 2.5 GW
- Montana 2.2 GW
- Colorado 2.1 GW
- Florida 1.6 GW

Solar projects make up the majority of QF capacity under development



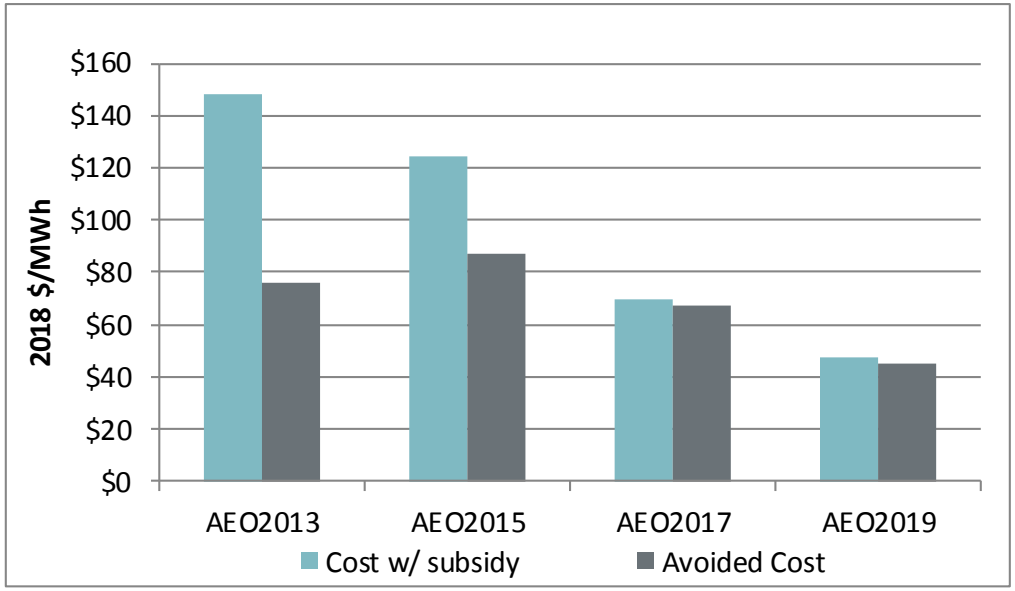
Source: Velocity Suite, ABB Inc. (2019)

- High insolation, largely non-RTO states
- Mix of RPS requirements and potentially reinforcing local incentives

Changes in Solar PV Cost and Avoided Cost
National Average

- EIA estimates solar PV levelized cost (LCOE) at parity with avoided costs on average.
- The U.S. average levelized cost of new solar PV units approached reported avoided costs of $45/MWh in 2021.

Estimates for New Solar PV Costs vs. Avoided Costs

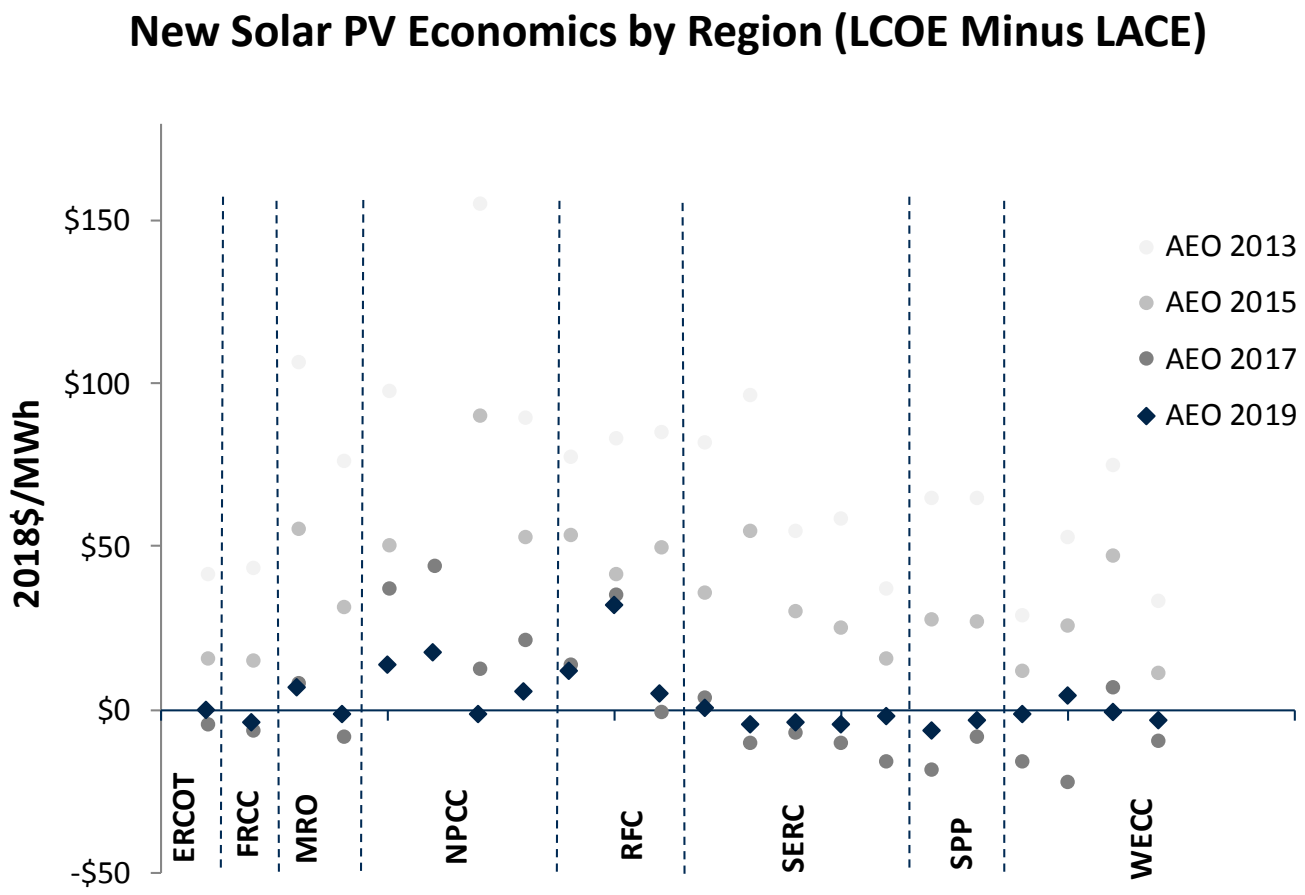


Source: EIA (https://www.eia.gov/outlooks/aeo/electricity_generation.php).

- Recent solar PPAs as low as $20/MWh.

Changes in Solar PV Cost and Avoided Cost
Regional

- Solar PV LCOE is *lower* than levelized avoided cost in some (high-insolation) regions
- Substantial overlap with non-RTO regions



Source: EIA.

New Challenges in Avoided Cost Calculation

Determining Avoided Cost Historically An Administrative Process

- Theoretic controversy over methods, *ex ante* and *ex post.*
- Practical outcomes:
  - Over-abundance of offered QF supply in some regions.
  - Departure from actual costs.
  - Associated operating and planning problems.

Pros and Cons of "but-for" Analyses

Method	Pros	Cons
– Next planned unit	No modeling	Scale/ timing mismatch
– Marginal capacity and energy ("peaker")	Captures marginal cost	May require modeling
– Comparative system-wide costs	Comprehensive	Requires extensive modeling
– Fuel index rates	Transparency	Doesn't capture capacity value

Some Hazards in Avoided Cost Estimates

Long-term forecasting of avoided costs typically suffer from:

- Difficulties in estimating the impact of increasing and uncertain amount of renewable QF penetration in the region on avoided costs, which may result in:
  - Overstated avoided energy costs
  - Inaccurate estimate for the timing of capacity needs in the future
- (in)ability to deduct renewable integration costs for increasing amounts of "must-take" renewable QF power
- Failure to consider avoidable power purchases that could be cheaper than running utility generation

Past Events of Over Supply

- Early California experience a harbinger of today's challenges.
- Standard Offer 4 (SO4) in the 1980s:
  - Fixed energy payments for 10 years and capacity payments for up to 30.
  - Oil and natural gas prices were high and forecast to grow.
  - No cap on potentially eligible QF capacity.
- After fostering a huge amount of QF capacity, SO4 was suspended in 1985.
- This was repeated elsewhere in the country.
- LBNL reported capacity offered by QFs 10-20 times required amounts.

QF Contracting and Competitive Procurement

Key Drivers of Solar QF Development

Cost of new solar PV lower than avoided cost of energy and capacity

- E.g., Carolinas, Oregon, Utah, Colorado, Montana, Florida, Virginia and California

State/utility policies on QF contracting (duration, pricing, size restrictions, etc.)

- Relatively high avoided cost estimates and long contract lengths have attracted developers to these states
- Almost all of these states are in non-RTO regions

State policies for new renewables (RPS/carve-out, tax incentives, permitting process)

- Most of these states have renewable portfolio standards/goals along with other policies aimed at incentivizing utility-scale solar development

States with High Solar QF Development

Standard Contract

State	Planned QF Solar Capacity (MW)	Avoided Cost Rates ($/MWh)	Max Contract Term (years)	Max Contract Capacity (MW)	Emerging QF Policies	RPS Policy	Solar Carve-Out	Other Relevant State Incentives & Policies
South Carolina	6,874	On: $34-$88 Off: $32-$41	10	0.1 - 2	Energy Freedom Act signed into law in May 2019; directs utilities to offer minimum contract length of 10 years	2% by 2021	—	—
North Carolina	5,201	On: $44-$53 Off: $25-$34	10	1	2017 legislation reduced standard offer terms to 10 years while also applying a capacity limit of 1 MW (up to a total capacity of 100 MW). It created a competitive process to solicit up to 2.7 GW from larger projects (> 1 MW) under a 20-year term.	12.5% by 2021	0.2% by 2018	35% state ITC (expired in 2015); 80% of value exempt from property taxes
Oregon	3,436	On: $37-$63 (Solar) Off: $28-$49 (Solar)	15-20	3-10	The Oregon PUC has shifted from adjudicatory procedures to rulemaking as the means to implement PURPA	50% by 2040	2.0x REC multiplier	$5/MWh add'l payment (up to 150 MW)

❖ Avoided cost rates in the table are averaged over the maximum term. The range reflects differences across utilities and contract options.

States with High Solar QF Development

Standard Contract

State	Planned QF Solar Capacity (MW)	Avoided Cost Rates ($/MWh)	Max Contract Term (years)	Max Contract Capacity (MW)	Emerging QF Policies	RPS Policy	Solar Carve-Out	Other Relevant State Incentives & Policies
Michigan	2,489	Based on highest priced proposal from competitive solicitation	10-15 or what is offered in competitive solicitation	0.1 - 2	Consumers Energy IRP approved in June 2019 • Annual competitive bidding for capacity, including 1,200 MW of new solar from 2019-2021. Consumers can own up to half of the capacity; any capacity not filled by solicitation will be available to QFs • Consumers is authorized to earn an FCM (financial compensation mechanism) equal to the product of PPA payments in that year multiplied by the WACC In a separate proceeding, Consumers Energy agreed in August 2019 to contract with QFs for 170 MW of energy and capacity at "full avoided cost." In addition, Consumers Energy will enter into contracts with QFs for 414 MW of energy and capacity at the "energy plus MISO PRA" rate	15% by 2021	2.0x multiplier prior to 2017	
Montana	986	On: $41 (Solar) Off: $32 (Solar)	15-25	3	Montana state court ruled against PSC in April 2019, reverting contract length back to 25 years and requiring inclusion of carbon adder in avoided cost New LEO standard no longer requires QFs to have signed interconnection and signed PPA	15% by 2015	—	50% property tax abatement (for new renewables)

❖ Avoided cost rates in the table are averaged over the maximum term. The range reflects differences across utilities and contract options.

Bilateral QF Contracts

QFs with capacities above the limits allowed for standard contracts have signed long-term contracts through bilateral negotiations with the utilities.

	Standard Contract		Bilateral Contract			
State	**Max Contract Term (years)**	**Max Contract Capacity (MW)**	**Range of Contract Term (years)**	**Range of Contract Capacity (MW)**	**# of Solar QF Contracts (count)**	**Total Existing Capacity (MW)**
South Carolina	10	0.1 – 2	—	1-20	30	229
North Carolina	10	1	10-25	1-80	563	4,016
Oregon	15-20	3 – 10	25	1-15	37	262
Michigan	Other	0.1 – 2	25	1-11	3	20
Montana	15-25	3	—	3	5	15

Source: Calculated based on data compiled by ABB Inc. 2019.

Advantages of Competitive Procurement

Competitive bidding under PURPA has been a natural consideration to:

- Replace administrative methods with market process.
- Limit the amount of QF capacity to utility capacity needs.
- Rank QF operating and other characteristics.

FERC weighed in with "Bidding NOPR" in 1988 (RM88-5)

- Suggested that bidding could:
  - Eliminate debates over avoided cost.
  - Achieve lowest cost.
  - Not necessarily conflict with PURPA.
- Proposed guidance to states:
  - All sources—QFs, self-supply, and wholesale purchases.
  - No portion of capacity needs reserved for non-QFs.
  - Evaluate fuel diversity, dispatchability and reliability.
  - Certify process.

The "Bidding NOPR" was not implemented, but conveyed the signal that state bidding mechanisms had potential to be used.

States Have Experimented With Competitive Procurement

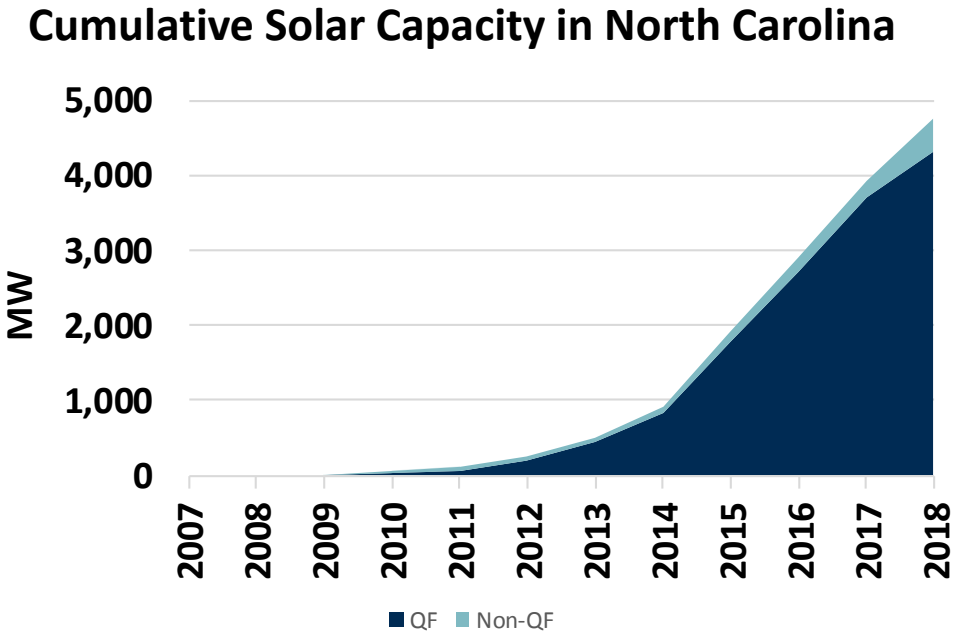
- In the late 1980s, some states replaced or augmented administrative processes with RFPs or bidding mechanisms.
- By the 1990s, approximately 10 states had some type of bidding mechanism.
- QFs were ranked in terms of price and other criteria.
- Bidding systems varied among states and utilities.
  - Transparent “self-scoring” systems (ultimately verified).
  - Non-public evaluation processes.
- State bidding programs appear to have been generally consistent with FERC proposed criteria, except for legal/regulatory challenges on:
  - Compliance with the all-source bidding requirement
  - Requirement to bid & win at the RFP process for QF contract
- Recent Consumers Energy settlement to use competitive procurement for new QF contracts (with utility owning up to 50%, and incentives for PPAs)

Montana Experience

- 2014 - Montana controversy drew FERC Declaratory Order:
  - Since 1992 the "Montana Rule" had required competitive bidding.
    - LEOs effectively contingent on winning RFP.
    - For QFs > 10 MW after 2007.
  - FERC order ruled the Montana Rule posed "Unreasonable Obstacles":
    - Exclusive path to LEO.
    - MT solicitations not regularly held.
    - Bidding NOPR never adopted.
    - But MT rules not specified in any case.
- 2016 – FERC repeated concerns raised in MT in Windham Solar LLC and Allco Finance Ltd., 156 FERC ¶ 61,042

Solar QFs in North Carolina

- Explosive growth over last 5 years
- Dominated by QFs
- Spurred also by 35% state tax credit
  - Cumulative upon Federal ITC
  - Expired after 2015



Source: Velocity Suite, ABB Inc. (2019)

HB 589 in North Carolina

- In July 2017, Competitive Energy Solutions for North Carolina Act ("HB 589") became law after extensive negotiation
- An alternative to PURPA-based implementation to reflect current market realities:
  - Mandates competitive procurement
  - A fixed amount of renewable capacity (2,660 MW)
  - 45 month procurement
  - Long-term PPAs
  - 30% limit on utility-owned assets
  - Managed by Independent Administrator

An example for other regions?

Michigan Experience

Recent Consumers Energy settlement (Mar 2019) uses competitive procurement for new QFs

- Annual RFPs to procure new capacity based on the needs identified in the most recent IRP
- Any remaining capacity needs can be met by QFs at avoided cost rates set by the highest accepted bid in the RFP
  - Impact on incentives to participate in the RFP??
- Utility can own up to 50% of the new capacity procured through RFP
- Utility earns an incentive for new PPAs (including QF contracts) procured through RFP
- Small QFs (< 150 kW) receive standard offer PPA based on full avoided cost rate, regardless of capacity need; larger QFs (< 2 MW) either participate in RFP or receive MISO capacity rate plus forecasted/actual LMPs

 an example for other regions?

Presenter Information

METIN CELEBI
Principal | Boston, MA
Metin.Celebi@brattle.com
+1.617.864.7900

Dr. Celebi provides expertise in electricity markets and analysis of environmental and climate policy. He has consulted primarily in the areas of electricity spot pricing and market design, and has experience in developing and analyzing climate policies, resource planning, power plant valuation, cost/benefit analyses for joining RTOs, LMP modeling, and merger analysis.

Dr. Celebi received his Ph.D. degree in Economics at Boston College, M.A. degree in Economics at Bilkent University, Turkey, and B.Sc. Degree in Industrial Engineering at METU, Turkey.

About Brattle

The Brattle Group provides consulting and expert testimony in economics, finance, and regulation to corporations, law firms, and governments around the world. We aim for the highest level of client service and quality in our industry.

OUR SERVICES

Research and Consulting

Litigation Support

Expert Testimony

OUR PEOPLE

Renowned Experts

Global Teams

Intellectual Rigor

OUR INSIGHTS

Thoughtful Analysis

Exceptional Quality

Clear Communication

Our Practices and Industries

ENERGY & UTILITIES

- Competition & Market Manipulation
- Distributed Energy Resources
- Electric Transmission
- Electricity Market Modeling & Resource Planning
- Electrification & Growth Opportunities
- Energy Litigation
- Energy Storage
- Environmental Policy, Planning and Compliance
- Finance and Ratemaking
- Gas/Electric Coordination
- Market Design
- Natural Gas & Petroleum
- Nuclear
- Renewable & Alternative Energy

LITIGATION

- Accounting
- Analysis of Market Manipulation
- Antitrust/Competition
- Bankruptcy & Restructuring
- Big Data & Document Analytics
- Commercial Damages
- Environmental Litigation & Regulation
- Intellectual Property
- International Arbitration
- International Trade
- Labor & Employment
- Mergers & Acquisitions Litigation
- Product Liability
- Securities & Finance
- Tax Controversy & Transfer Pricing
- Valuation
- White Collar Investigations & Litigation

INDUSTRIES

- Electric Power
- Financial Institutions
- Infrastructure
- Natural Gas & Petroleum
- Pharmaceuticals & Medical Devices
- Telecommunications, Internet, and Media
- Transportation
- Water

Our Offices

BOSTON

BRUSSELS

LONDON

MADRID

NEW YORK

ROME

SAN FRANCISCO

SYDNEY

TORONTO

WASHINGTON

THE POWER OF **ECONOMICS**

brattle.com

THE Brattle GROUP