Purchase Power Agreements Under Regulated and Competitive Markets in Texas

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Overview

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I - Regulatory Framework Applicable to PPAs

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Regulatory Framework within which PPAs were Created

- In 1995, the Texas Legislature deregulated the wholesale market. Independent Power Producers entered the Texas market.
- Vertically integrated utilities were discouraged from building power plants and encouraged to turn to PPA's for their current and future power needs.
- Utility companies had to submit a Resource Plan to the Commission for approval.

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Regulatory Requirements for Acquisition of Resources

A utility company seeking to acquire resources was required to submit to the Commission:

1. A description of the Resource Solicitation Process, including milestones.
2. A copy of the proposed RFP and model contract.
3. A description of the resource selection criteria and weights to be used in the evaluation of bids.
4. A description of how the company took into account the definition of "lowest reasonable system cost", the values and preferences of its customers, the characteristics of the resource need, and any statewide goal.

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Lowest Reasonable System Cost

In addition to direct costs, the following issues were to be considered in determining lowest reasonable system cost:

1. The effects on the rates and bills of customers.
2. Minimization of the risks of future fuel costs and regulations.
3. The appropriateness and reliability of the mix of resources.
4. The cost of compliance with environmental and other laws.

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Diversified Resource Portfolio

- A diversified resource portfolio was expected to:
  - Include a mix of technologies that use different fuels.
  - Rely on both short-term and long-term fuel contracts.
  - Include non-fuel technologies (such as renewable energy and demand-side resources.)

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Commission Review

- The Commission reviewed the solicitation process and decided:
  - whether the procedure encouraged broad participation by potential suppliers of demand-side and supply-side resources.
  - Whether the criteria used to evaluate resources were reasonable and did not favor affiliates.
  - Whether the solicitation process was conducive to the development of a competitive wholesale market in Texas
  - Whether it produced the best bid reflecting the "lowest reasonable system cost" for the customers

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Recovery of PPA costs

- Commission certification of a power contract was necessary to pass through purchased power costs into rates

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Rate Structure to Recover Purchased Power Costs

- The tariff structure should recover capacity costs from peak users. This provides an incentive for large users to install peak shaving technology, including installing small generators.
- There are several ways to encourage peak shaving:
  - the energy charge is set lower, the higher the load factor, or
  - the monthly billing demand is ratcheted based on the customer Non-Coincident Peak demand during the summer months.

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Example of Rate Structure 1 – Residential

Customer Charge	$ 15.00 per month
Demand Charge	None
Energy Charge	$ 0.097 per MWh
PP Charge	Flow through according to formula

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Example of Rate Structure 2 – Large Commercial

Customer Charge	$ 75.00 per month
Demand Charge	$ 3.80 per kW
Energy Charge – level 1	$ 0.88 per kWh
Energy Charge – level 2	$ 0.77 per kWh
Energy Charge – level 3	$ 0.68 per kWh
Fuel Charge	Flow through according to formula

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Energy Charge as a Function of Load Factor for Large Customers

- Level 1 >>> customers under 30% load factor
- Level 2 >>> customers under 60% load factor
- Level 3 >>> customers above 60% load factor

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Rate Structure: Ratcheted Demand

- Some companies use a Ratchet for billing demand to encourage peak shaving.
- For example, 80% of the customer Non-coincident Peak Demand during the peak months of June through September establishes the customer's minimum monthly peak for the year for billing purposes.

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II - Procurement

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Procurement Process

Assume a distribution company with a need to acquire 250 MW to meet its load obligation.

1. The company conducts scenario analysis and risk assessment, finds that there is uncertainty about future fuel prices and future load growth.
2. The company issues a request for proposals (RFP) in which it describes its objectives and invites bidders to propose any and all realistic strategies by which the company could achieve these objectives.
3. The company will consider both cost and risk management strategies when it evaluates the proposals.

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Exploring Alternatives

- The contract can be served by existing single resource, existing diverse resource mix, or a generating unit constructed to serve the load.
- In the latter case, a long term contract can be a guarantee that the newly constructed resource will receive a stream of payments.
- This guarantee in turn can facilitate access to financing and lower financing costs for the construction of the plant.

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Diversifying the Mix of Resources

- A diversified portfolio offers the best guarantee of low system cost, reliability, and flexibility.
  - Should include different fuel sources.
  - Should include different technologies that complement each other.
  - Should include short term, medium term, and long term contracts.

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Diversifying the Mix of Resources: Example

Assuming base and intermediate load of 200 MW and peaking load of 30-50 MW:

- Resource #1: short term contract to serve 50 MW peak load (5 years).
- Resource #2: Mid-term contract to serve 100 MW intermediate load (10 years).
- Resource #3: Long term contract to serve 100 MW base load (15, 20, or 25 years).
- Resource #4: Demand-side measures to serve 2 MW peak load.

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Demand-side Options

- The company may solicit demand proposals for the reduction of energy usage or peak demand
  - through end-use efficiency, or
  - through shifting demand from on-peak to off-peak periods, or
  - through peak shaving.
- Demand proposals may be submitted by the company's customers or by a third party.

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Considerations for Future Coverage

- The company may invite proposals to serve future load growth.
- In the case of a single dedicated resource, the company may also consider options for contract renewals up to the life of the resource.

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Performance Guarantees

- The winning bidder
  - may be asked to provide a performance bond.
  - must be ready to demonstrate that it is financially capable.
  - must have proven experience.
  - must be able to commit to a delivery date or bear financial consequences.
  - bears the responsibility for the cost of compliance with environmental and other laws.

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Addressing Risk

Start-up risks

- Penalties for non-performance should be specified,
  - Posting of bonds, letters of credit, etc

Operations risks:

- Seller should be asked to bear risk of procuring replacement power if it cannot meet its obligation,
  - May be financial or physical replacement.

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Items to be Addressed in Contract

1. Termination of contract, buy-out provisions.
2. Project maintenance and operations (will it be the Seller's responsibility?)
3. Control of dispatch.
4. Payments – specify circumstances under which payments may be discounted or no payments made.

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Items to be Addressed in Contract

5. Buyer will keep records of power and energy delivered and Seller will keep metering records.
6. Ability of each party to inspect and audit other party's records.
7. Bill payments, correction to bills, interest on bills not paid when due, etc.
8. Regulatory approval of the contract – Buyer must have right to terminate the agreement if such approval is not obtained or if it is later overturned.

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Issues to be Addressed in Contract

9. Possible change of ownership of the Project.
10. Outages – Buyer must have right to decide when to schedule outages, in accordance with Good Utility Practice.
11. Notices of forced outages must be provided by Seller.
12. Force majeure – carefully defined, excuses non-performance if reasonable diligence has been exercised – each party should keep records of its efforts.

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III – Technology Considerations

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Technology Choice

The most reliable and lowest long term cost portfolio will have a mix of technologies that complement each other because they use different fuels and provide different degrees of flexibility.

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1 - Combustion Turbines

- Quick start CTs offer flexibility, can run on gas or oil. Small scale. Best to serve short peak periods.
  - Trade off: short construction time and low construction costs, flexibility, but high running costs.

Presents advantages and disadvantages for Nicaragua.

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2 – Combined Cycle Combustion Turbines

- CCCT's offer high efficiency in burning gas, are more efficient if run continuously but can be re-started daily if necessary. Medium to large scale. Best to serve intermediate load.
  - Trade offs: compared to coal plants, shorter construction time, cheaper to build, more flexibility in utilization, but higher running cost. Not economical if re-started daily.

The advantages of CCCT's don't seem suited for Nicaragua at this time. Better suited for regional project.

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3 - Coal

- Coal plants provide low cost energy. Must run continuously, cannot be easily re-started. Large scale: best to serve large base load. Cannot be efficiently built in small units.
  - Trade off: low running costs but long construction time and high construction costs. No flexibility. Dirty fuel, environmental pollution.

Does not seem suited for Nicaragua at this time. Better suited for regional project.

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4a – Wind

- *No fuel costs!*
- Very quick construction time, construction costs have been coming down.
- Best in high and consistent wind areas.
- Best if combined with units that can be quickly backed down or started up such as CTs.

Advantage for Nicaragua: could help reduce its use of high cost oil and lower overall electricity costs.

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4b – Wind

Wind Major drawbacks:

- Not dispatchable, may require expanded Ancillary Services, which would increase operation costs.
- Does not provide frequency response, regulation or short term reserves.
- If new transmission construction is required because of remote location, may become very costly.

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5 – Hydro

- Hydro – Excellent complement to any electric system. Low operating costs. Immediate response to sudden frequency changes. Allows for storage, lots of flexibility, adds to reliability. May be small, medium, or large projects.
- Trade off:
  - May require relocation of population, politically sensitive.
  - depends on water availability, which can vary greatly from one year to the next.
  - Construction cost and time.

Many advantages for Nicaragua if part of a diversified mix.

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6 – Other Renewable Resources

- Geothermal – Ideal in volcanic country like Nicaragua. Small to medium scale.
- Biomass – Flexible and low cost operation. Small scale. Limited by availability and seasonality of combustible.
- Solar panels –High cost, very small scale. Ideal in remote areas where needs are small and don't justify building transmission lines. In Texas rural areas, water pumps are powered with solar. In Mexico, has been used for electrification of isolated villages.

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IV - Ancillary Services: Regulatory Considerations after Wholesale Deregulation in ERCOT

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Regulations Applicable to the Provision of A/S

The following regulations applied to electric utility companies in ERCOT after the competitive wholesale market opened:

- Obligation to provide A/S on a non-discriminatory and comparable basis to all transmission customers.
- Obligation to file a tariff for such service and to take such services for its own operations in accordance with the terms of its tariff for A/S.

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Regulations Applicable to the Provision of A/S

A PPA could include provisions for any A/S, including:

- Dynamic scheduling service: provides remote load regulation (i.e. uses a dynamic power signal to control generation to match load.)
- Load following service: provides hour to hour changes in generation output to match changes in load.
- Load regulation service: provides intra-hour changes in generation to match load changes

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Regulations Applicable to the Provision of A/S

- A/S had to be discretely priced and separately provided to all market participants who contracted for transmission.
- Any generator could provide A/S to the transmission customers of any utility.

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Regulated Charges for A/S

- A utility could negotiate rates with the customer, subject to a price floor and price ceiling, and subject to the non-discrimination requirement.
- The price ceiling was based on the utility's average embedded cost of generating capacity.

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V - Ancillary Services and Demand-side Resources Today

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Ancillary Services

- A/S are services necessary to support the transmission of energy from resources to loads while maintaining reliable operation of the transmission system.
- A/S can be provided by Seller if part of contract, or from competing source.
- Some technologies cannot provide A/S (wind) or are limited in how much they can provide if they tend to run at full output for efficiency reasons (coal, nuclear).

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Ancillary Services in the Deregulated Market in ERCOT

- Regulation, Responsive (spinning) Reserves, Non-spinning Reserves, Replacement Reserves, are contracted in the day ahead by the Independent System Operator (ISO).
- The first three can be self-arranged by individual market participants, or procured through an auction process by the ISO.
- Balancing Energy is contracted in real time by the ISO.

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Regulation Service

- RGS is used to control the power output of Resources in response to frequency fluctuations so as to maintain the target system frequency.
- Must be capable of delivering the full amount of contracted capacity within ten (10) minutes.
- A provider of RGS must provide communication equipment to receive telemetered control deployments from the ISO.
- Must be able to provide a feedback signal to the ISO.

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Responsive Reserve Service

- RRS are daily operating reserves that restore the frequency of the system within a few minutes of a significant frequency event.
- RRS is provided by on-line Resources capable of ramping to the contracted output level within 10 minutes.
- May be provided by Load capable of interrupting within 10 minutes.
- Seller must provide communication equipment to receive telemetered control deployments from the ISO.

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Non-Spinning Reserve Service

- NSRS must be provided within 30 minutes from unloaded, on-line resources or from off-line resources.
- Must be able to run at output level specified in contract for at least one hour.
- Like RRS, may be provided by Loads.

RGs, RRS, and NSRS are subject to qualification tests by the ISO.

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Frequency Response

- FR is the response of a Resource to a deviation in frequency from scheduled frequency within a few seconds.
- FR is usually an obligation for all generators, but sometimes it is also a paid service (e.g. New Zealand).
- FR is most important in a small country or island to maintain reliability.
- A PPA may include requirements for the provision of FR. Note that a resource operating at full output can only provide a response in the down direction.
- Some technologies cannot provide FR (wind), others can provide excellent FR (Hydro).

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VI - Load as Resource Providing Ancillary Service

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Responsive Reserves Provided by Load

- Customers can participate in the RRS market by offering to interrupt their load when frequency dips. They can also provide Non-spin Reserves and Replacement Reserves.
- In Texas, half of RRs, or 1150 MW, can be from Loads acting as Resource (LaaRs).
- When frequency dips below 59.7 Hz, LaaRs are automatically tripped through under frequency relays.
- Advanced metering and real time telemetry are required.

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Responsive Reserves Provided by Load (cont'd)

- LaaRs can also be instructed to interrupt manually when there is a sudden loss of a large generator.
- In ERCOT, LaaRs have been deployed three to four times a year in recent years.
- Over 1800 MW of LaaRs are qualified and registered to provide Responsive Reserves in ERCOT.

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Contracting with Load for Emergency Service

- ERCOT runs a quarterly auction to procure Load Resources for severe power emergency situations.
- The contracted Load can be interrupted after all other resources have been deployed and before firm load interruption.
- It is expected that Emergency Load would be deployed no more often than once every 7 to 10 years.

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Performance Guarantees for Loads providing Reserve Services

- ERCOT conducts an initial qualification test with actual interruption to test the Load's ability to respond.
- If a LaaR is unable to respond twice in one year, it is disqualified and must re-apply. In addition, penalties may be imposed by the Commission.
- If an Emergency Load fails to interrupt upon instruction, payment is withheld and the Load is disqualified. The Commission may impose penalties.

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How is Balancing of Market Achieved

Before ERCOT became one control area, each control area was responsible for performing the instantaneous balancing of generation and load.

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How is Balancing of Market Achieved

Today, ERCOT is one control area.

- The ERCOT ISO administers a Balancing Energy Auction market. Market participants submit bids and ERCOT procures balancing energy hourly.
- Market Participants are required to submit mandatory Balancing Energy Down bids.

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VII - Lessons Learned in Texas

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Attracting Investments

- A major concern when opening the market to competition was for the regulatory authorities to make it attractive to invest in our state by:
  - Not allowing established utility companies to continue to build power plants
  - Making sure established utility companies did not favor their affiliates when purchasing power contracts

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Attracting Investments

- Ensuring non-discriminatory access to transmission
- Facilitating Interconnections
- Not requiring lengthy approval process for new entrants
- Acknowledging the need for regulatory certainty
- Striving to establish rules that allow for fair recovery of investment costs for efficient producers -- but do not protect inefficient investments

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Facilitating Competition

- In a de-regulated market, competition is the best customer protection and the best insurance against unduly high prices. To facilitate competition:
  - Eliminate barriers to entry so that many suppliers enter the market;
  - No supplier should be so large that the market cannot clear without its power;
  - If a large supplier is able to influence prices, impose price mitigation on this supplier only;
  - If a price mitigation tool is applied to all suppliers, such as a price cap, make sure it is high enough to not interfere with the need for scarcity pricing.

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