Wholesale Power 101

Maximizing Asset Value & Minimizing Risk

Facts

- Merchant Generators (In front of the meter) are generation facilities that sell electricity to the Wholesale Power Market, delivered through the “Grid” via centrally administered marketplaces, the Independent System Operator (ISO)
- Distributed Generators (Behind the meter) are generation facilities that sell electricity directly to an end user on-site to offset usage costs from the generation service provider
- In either case, power might be sold via a long term Power Purchase Agreement (PPA) that could require scheduling in an ISO administered system or on site metering

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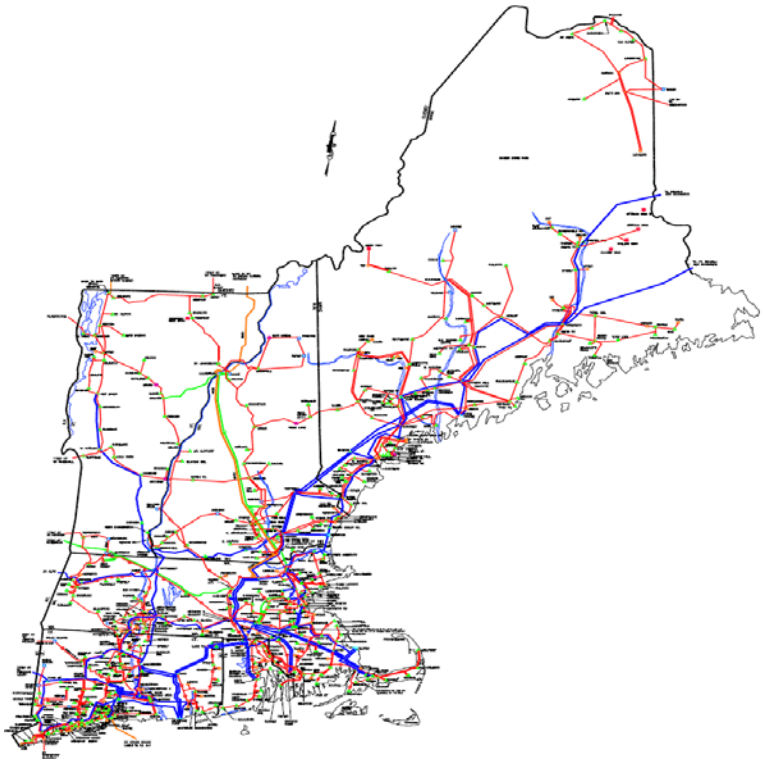
Example: ISO-NE

- ISO-NE is the revenue neutral Independent System Operator

- ISO-NE's task is to balance load and generation in real time across a wide geographic territory

- ISO-NE's main goal is Reliability



- All ISO-NE markets are designed to support the ISO's ability to forecast participant behavior

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How ISOs Support Reliability

- Physical Energy Markets
- Forward Capacity Markets
- Financial Transmission Rights (FTR) Auctions
- Ancillary Services Markets

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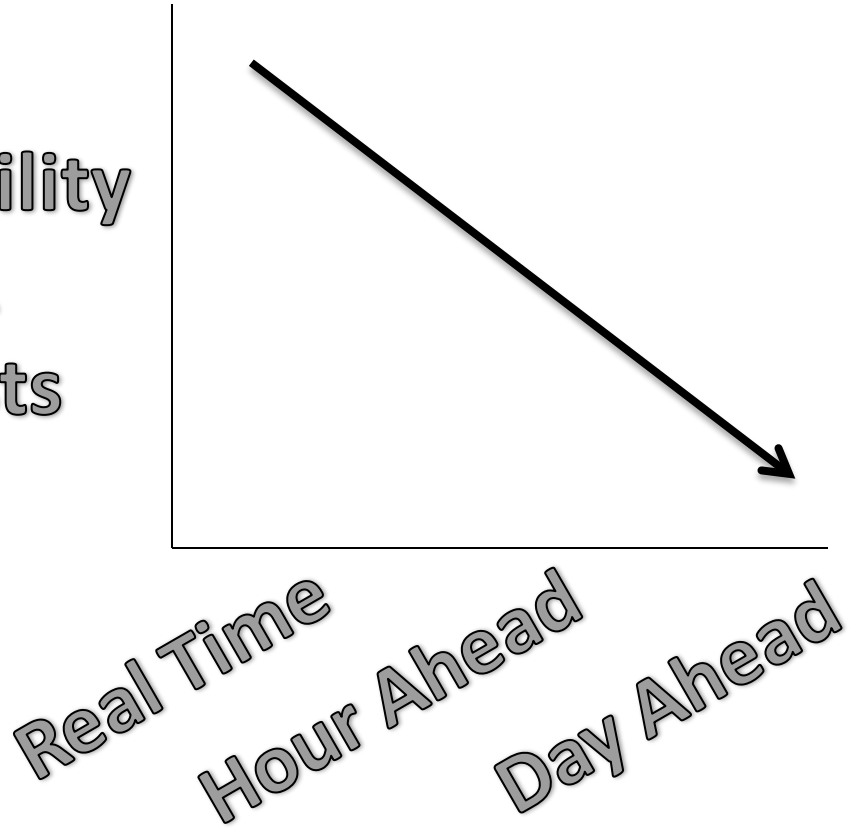
Physical Energy Markets

- Day Ahead
- Hour Ahead
- Real Time



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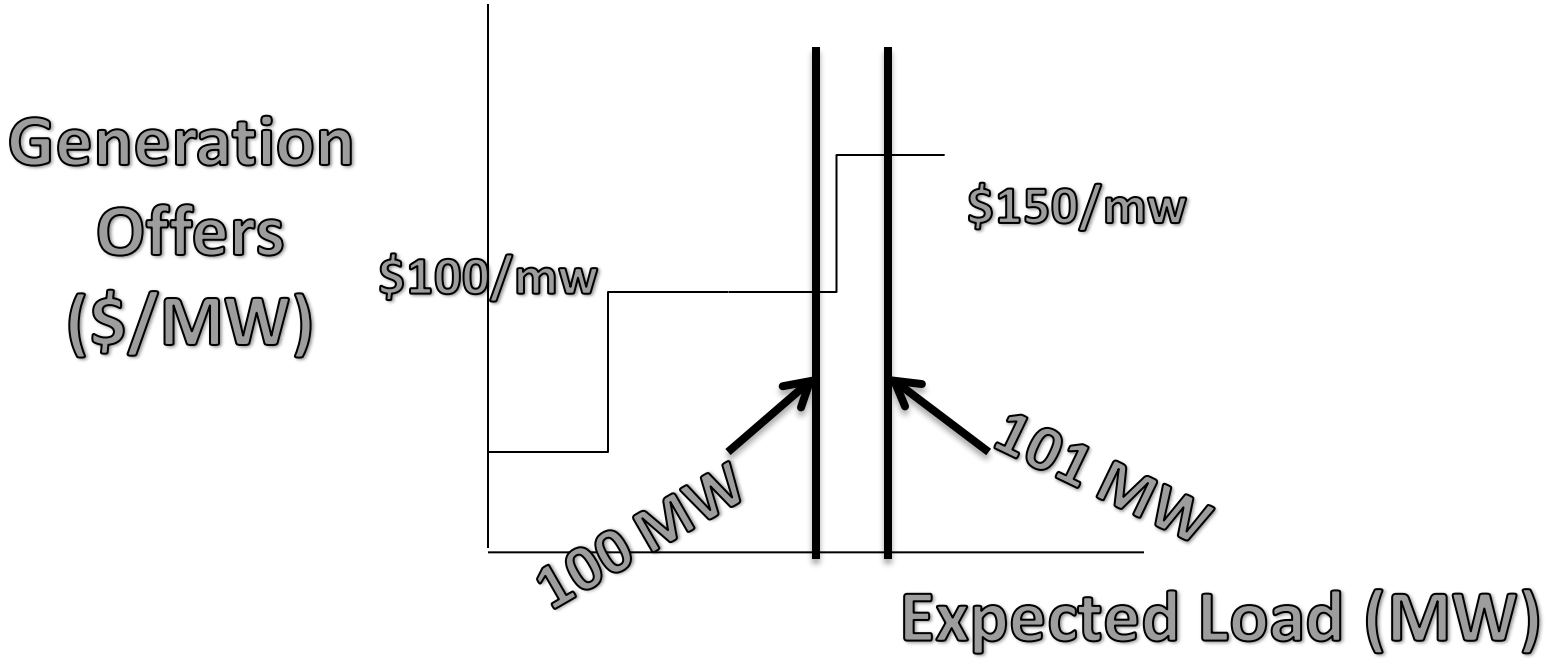
Locational Marginal Prices



- LMP's represent the cost to dispatch one more MW than is needed for load, here $150

Internal Bilateral Transactions

- Transactions between participants at any point on the grid
- Can be settled against the generator pricing node
- Can be settled against the load zone, such as CT Zone
- Schedule in the Day Ahead or Real Time markets
- Or some combination

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Forward Capacity Market

- ISO NE and PJM administer capacity auctions to provide generators additional revenue
- These auctions are Locational, higher payments go to generators in congested areas
- Capacity payments are available for intermittent resources
- A 10 mw solar generator in eastern PJM could have been entitled to nearly **$200,000** per year in additional revenue

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Financial Transmission Rights (FTR) Auction

- FTR auctions allow market participants to HEDGE or ADD basis risk
- Also known as “Congestion Revenue Rights” – These can only be used to hedge the portion of basis risk due to Congestion
- At times a limited amount or no volume may transact for particular transmission paths

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Ancillary Services

- An ISO's most direct way to maintain reliability, keeping generators ready to run
- Intermittent resources such as Solar, Wind, Run-of-River Hydro are ineligible to sell services into these markets
- Dispatch-able generation with reliable fuel sources such as landfill gas or pumped storage hydro can take advantage of these markets

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Over the Counter (OTC) Basis Markets

- Transact through brokers, direct-bilaterally, or exchange administered auctions
- These are typically swaps for the “All-In” price differentials between load zones settled in the Day Ahead Market
- New methods such as the “Nodal Exchange” are popping up for trading at the nodal level

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Power Purchase Agreements (PPA)

- Whether the generator is a Merchant facility or behind the meter, often a long term sale of power (PPA) is the prudent choice for management of risk in a power generation facility investment – otherwise an undue amount of risk is taken
- If Merchant, the facility must utilize the ISO administered markets to enact power sales, this usually implies the resource will be bid into ISO markets at a $0 price as compensation will come from the buyer, not the ISO
- If Behind the meter, the facility must utilize an on site meter to track output

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Power Purchase Agreements (PPA) Terms

- PPA's generally have an initial energy year price and an associated annual escalator
- Other terms can vary: the facility may pay the site owner a lease payment for the right to utilize land or a rooftop, or the site owner may even agree to free land use and even foot the bill for equipment insurance to sweeten the PPA
- No matter where on the spectrum the PPA terms are, renewable generation usually needs additional incentives to become financially viable, these come in the form of grants or commoditized Renewable Energy Credits (RECs)

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ISO Administered PPA Terms

- Day Ahead or Real Time IBT must be scheduled daily
- A Pricing mechanism must be chosen to settle against
- Power must be sold as Firm or Unit Contingent
- What are the risks?

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Risks Selling 100% Real Time, UC Power

- Basis Risk , the difference between the generator pricing point and the sale pricing point
- Physical Costs , these can compound when 100% of your position is settled in the RT market and will be subject to discrete real-time events
- In the Real Time Markets, options are limited – FTRs and OTC swaps are Day Ahead Settled
- Solution: Negotiate a Bilateral Transaction to hedge and transfer this physical and basis risk to someone else, for a price

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Risks of Selling 100% Firm, Day Ahead Power

- Require you to forecast your output
- Take on Delivery Risk
- Manage incremental Real Time Positions
- Solution: a combination of Day Ahead Schedules, Real Time Schedules, Firm delivery and UC delivery terms

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Wholesale Power Market Risk-End Users

- In most states, end users have Wholesale Market risk
- Since deregulation, the default service providers typically procure their power through Full Requirements load auctions held annually for a portion of their meters
- Participants in these auctions range from generation owners to energy trading companies speculating in the market
- Either way, auction pricing is market driven, and has historically accounted for anywhere from 40% to 70% of an end user's electricity costs– this should illustrate the value of a PPA to the buyer as much as the seller.

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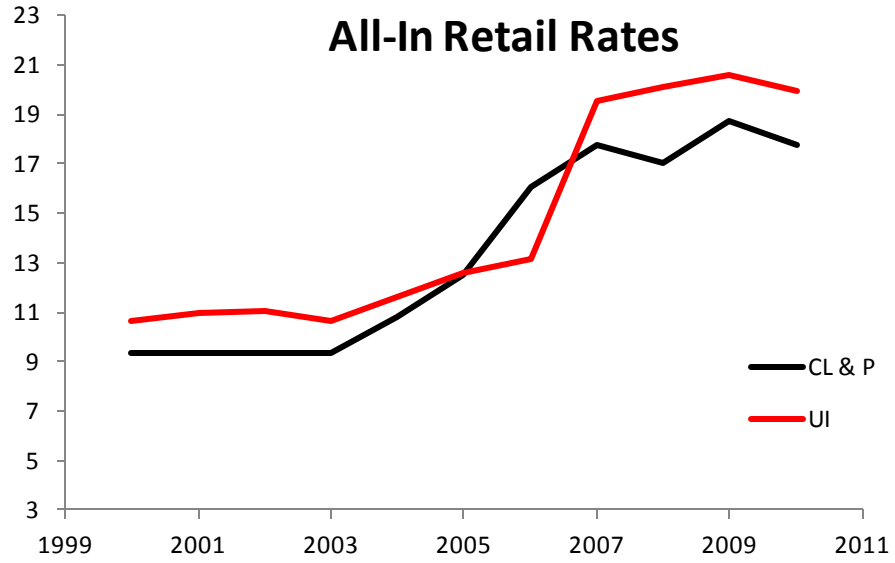
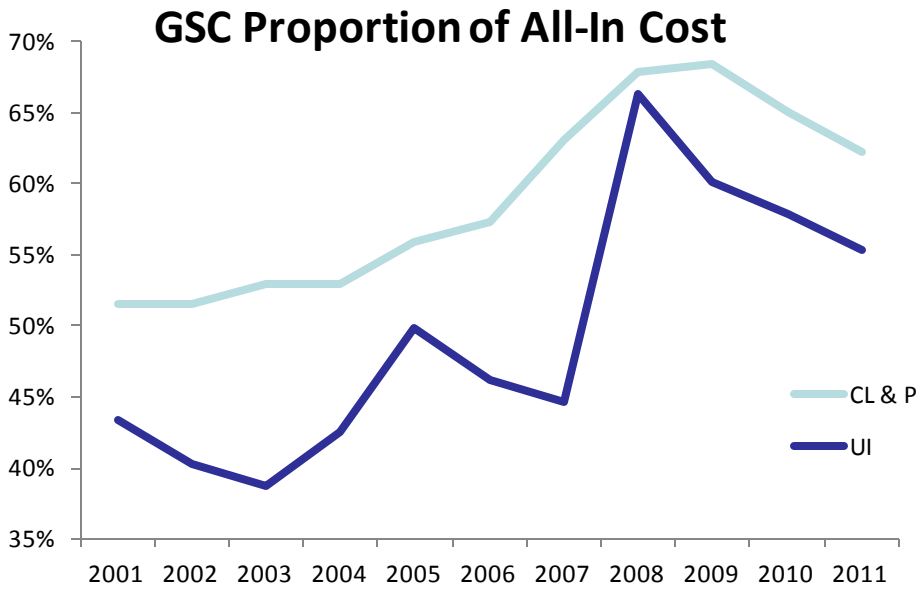
Wholesale Power Market Risk – CT Example





- Avg Annual % Increase in All-In prices from 2000 to 2010 have been slightly greater than 7% for both CLP & UI

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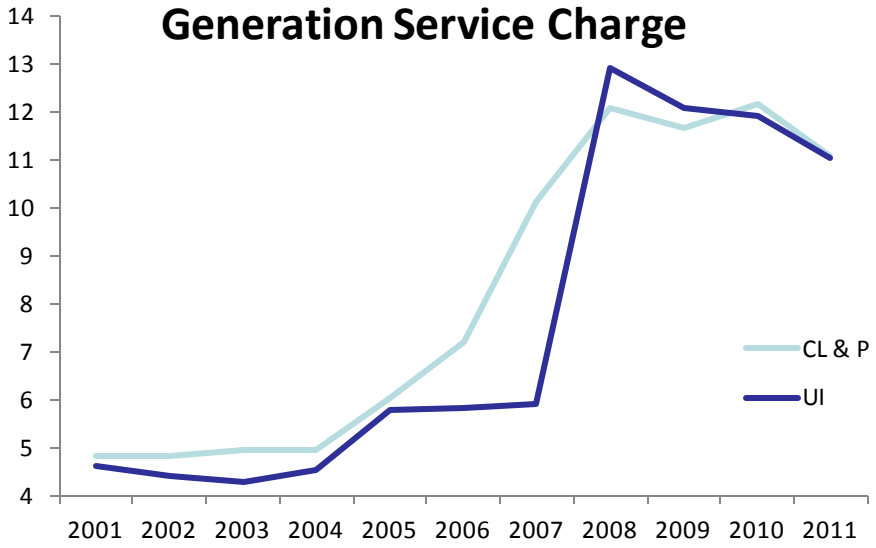
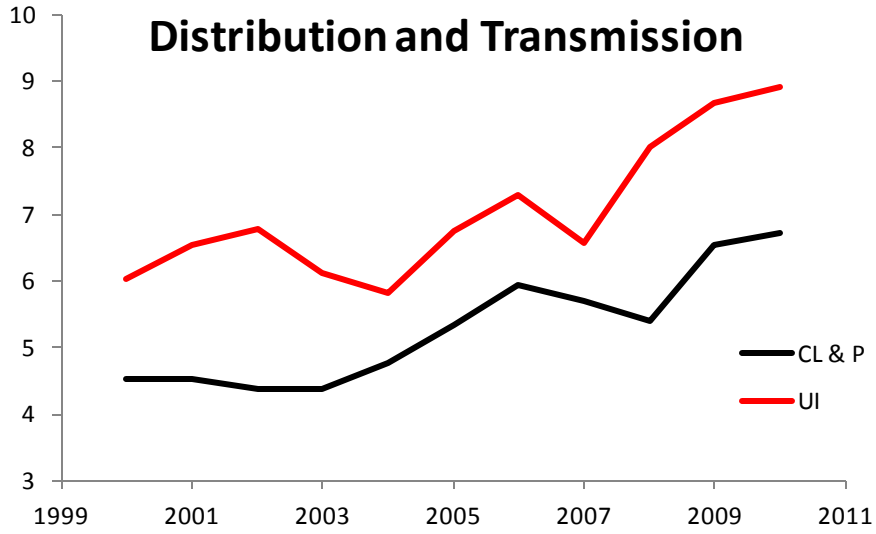
Retail Power Cost Breakdown





- Avg Annual % Increase in GSC has been 10% for UI and 13% for CLP;
- Avg Annual % Increase in D&T has been around 4% for both CLP & UI

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Recap

- There are many challenges facing Renewable Generation
- Many Renewable Generators are intermittent, such as Wind and Solar, but those that are not, can maximize their value in by optimizing the facility using the short term markets
- Renewable Generators do not simply produce electricity, they usually produce other commodities such as Renewable Energy Credits (RECs), Capacity or Reserves, all of which carry a host of risks that must be managed in order to maximize the return on investment

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Conclusion

- Every end user has risk to the wholesale power markets
- Long dated PPA's can be a valuable tool for both generators, end users and LSEs to manage their long term price risk
- There are ways to maximize asset value using the ISO administered markets, but with those come a variety of risks
- These risks come in different forms, with many methods for hedging them
- There is a price for every hedge out there, however it must be evaluated individually and with care to make the proper risk management decision

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Contact:

Utilize *GP Renewables & Trading's*

- Experience
- Relationships
- Analytical background
- To evaluate market opportunities, manage risks and maximize your asset value using the ISO marketplaces or behind the meter PPA's

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