

Regulatory and Financial Engineering for Microgrids

Microgrid 2.0
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Goals for a Microgrid

- Achieve resilience for a campus or a community
 - What are your critical loads and what is their shape?
- Thermal and electric efficiencies, reduced carbon
 - Cogeneration, electric and thermal storage
- Arbitrage energy markets
- Sell energy, services to the grid or your neighbors
- Save money and make money in the process
- Structure effective financing
- Take advantage of legal avenues

Legal and Financial Engineering

- Legal structures that permit intended operations and support financing
 - Tax credits are only available to taxable tax owners
- Financing that meets owner objectives, takes advantage of available savings, revenues and subsidies, and meet lender criteria for credit quality
 - Lender's credit analysis is called underwriting
 - Applies equally to debt and equity investments
 - Even where projects are internally financed by the owner the owner needs to establish the case for allocation of internal funds

Underwriting

- The borrower must be legally enabled to engage in the transaction and must operate in compliance with law.
- The borrower must be financially sustainable—the borrower's revenues after expenses must be adequate to comfortably repay the loan.
- If the borrower is providing collateral to secure its repayment obligation, the value of the collateral must support the amount of the loan (or in any event must have the value that the lender assumes in its overall credit analysis).

State Regulatory Barriers

- Is the DER a utility? Franchise required?
 - Can relate to ownership of generation, or wires, or can be based on sales of electricity.
- Self Generation is usually permitted
 - Most states allow a third party supplier on site
 - Virtual net metering
- Self distribution behind meter often permitted
- Some states exempt multiple local customers
 - New York Qualified Facility exemption
 - Not “holding oneself out to serve the public”
 - California – adjoining properties

Options for Load Aggregation

- Municipal Utilities, Electric Co-operatives
 - Broad powers to empower customers
 - Limited ability to export (tax-exempt finance)
 - Restrictions on formation
- Community Choice Aggregation
 - Act as a load serving entity with opt out only
- Co-operative Load Serving Entity
 - In states with retail choice
- Landlord exceptions - price constraints
- Homeowners association

Partnerships Structures

Parties and project entities vary by:

- Capabilities
 - Legal purposes
 - Core competency
- Constraints
 - Legal regulation
- Credit
 - Legal capacity
 - Sustainability
 - Collateral

Partnerships

- Public/Private
- Profit/Non-profit
- Utility/Private

Allow the legally or financially empowered partner to take action that the other could not

Other Structural Options

- Aggregation
 - Multiple small projects, standardization
 - Pooled procurement
 - Pooled financing
- Risk allocation and ownership can be separate
 - Who is allowed to optimize?
 - Is a partner acting as an agent or a principal?
 - Financing usually follows ownership of the assets financed.
- Performance measurement and guarantees
 - Energy measurement and verification – the costs of information are coming down
 - Performance covenants and guarantees

RTO Wholesale Markets

- Federal Energy Regulatory Commission allows wholesale services from behind the meter in RTOs
 - Order 745 - Demand response
 - Order 755 - Regulation
 - Order 784 - Storage
 - Order 819 - Frequency
- EPSA v. FERC has given FERC clear authority
 - Wholesale market not an intrusion on retail price
- Hughes v. Talen Energy Marketing
 - States have broad power
 - Can't interfere with wholesale market

Federal Uncertainties

- Role of demand response (most microgrids) in markets
 - What is the baseline for a microgrid?
 - Status of aggregation, and hybrid generation
 - Can microgrids be net exporters?
 - What is the “participation model?”
- Capacity markets
 - PJM – Restricting market access for demand response resources with “actionable subsidies” – RECs and ZECs – while exempting waste-to-energy and cogeneration
 - ISO-NE – Limit on subsidized resources
- Ancillary services outside RTO’s

Distribution Grid Services

- Need fair, disaggregated pricing for services to and from the grid – a slow move to markets
 - Public Utility Regulatory Policies Act (PURPA)
 - States have subsidy programs, not purchase programs
 - “Value of solar” and “net metering” – integrated retail tariffs obscure actual value of services, jurisdiction
- Utility – Private partnerships
 - California non-wires alternatives
 - Utility procurement and voluntary proposals
 - Long term contracts
 - Hybrid microgrids

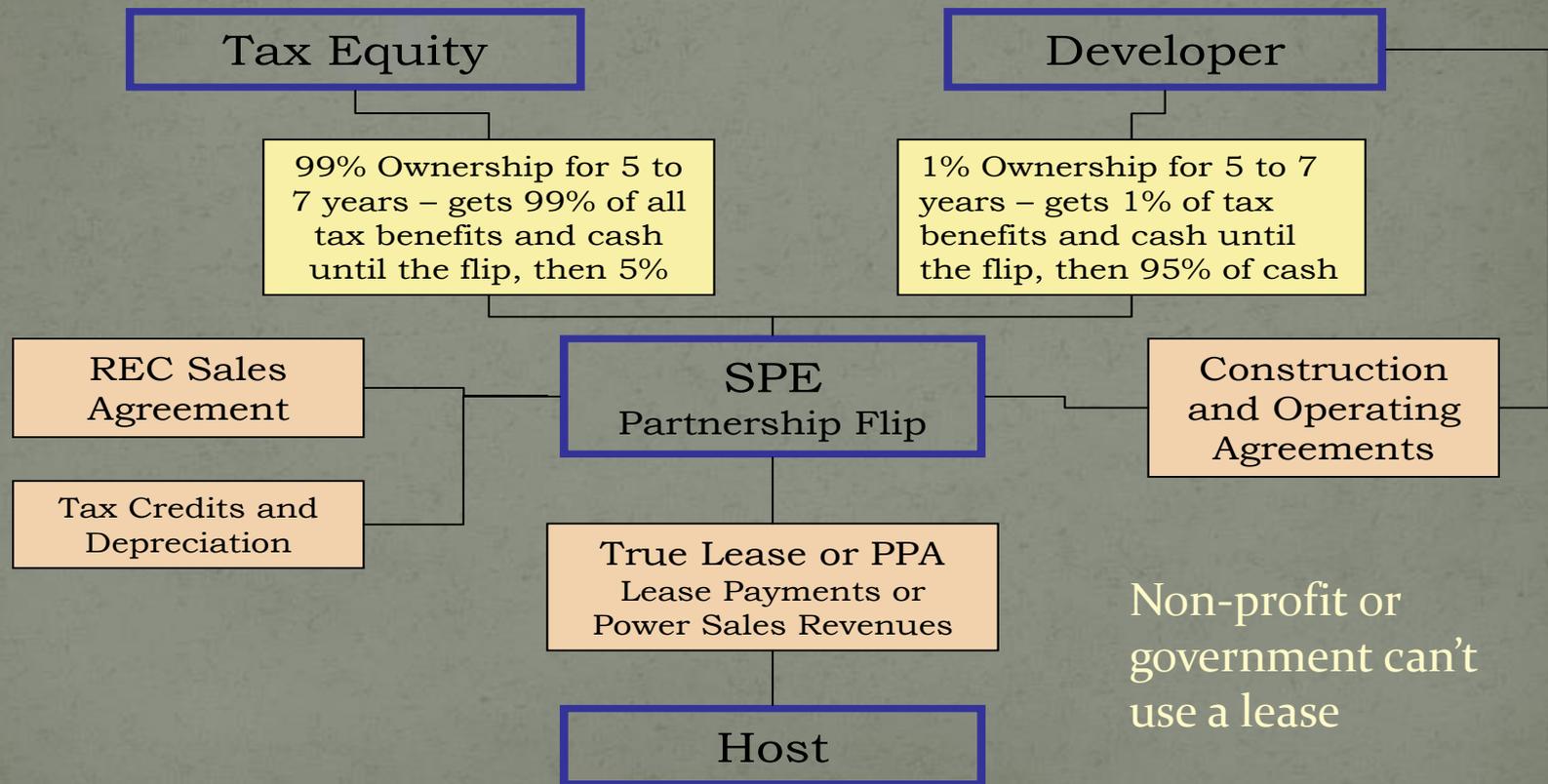
Financing Enhancements

- Tax credits for generation
 - Renewables
 - Cogeneration
 - Fuel cells and microturbines
- State Renewable Energy Credits
 - Under FERC attack
- State planning grants for microgrids
- Utility energy efficiency rebates
 - Includes load management controls
- Resilience Credits?

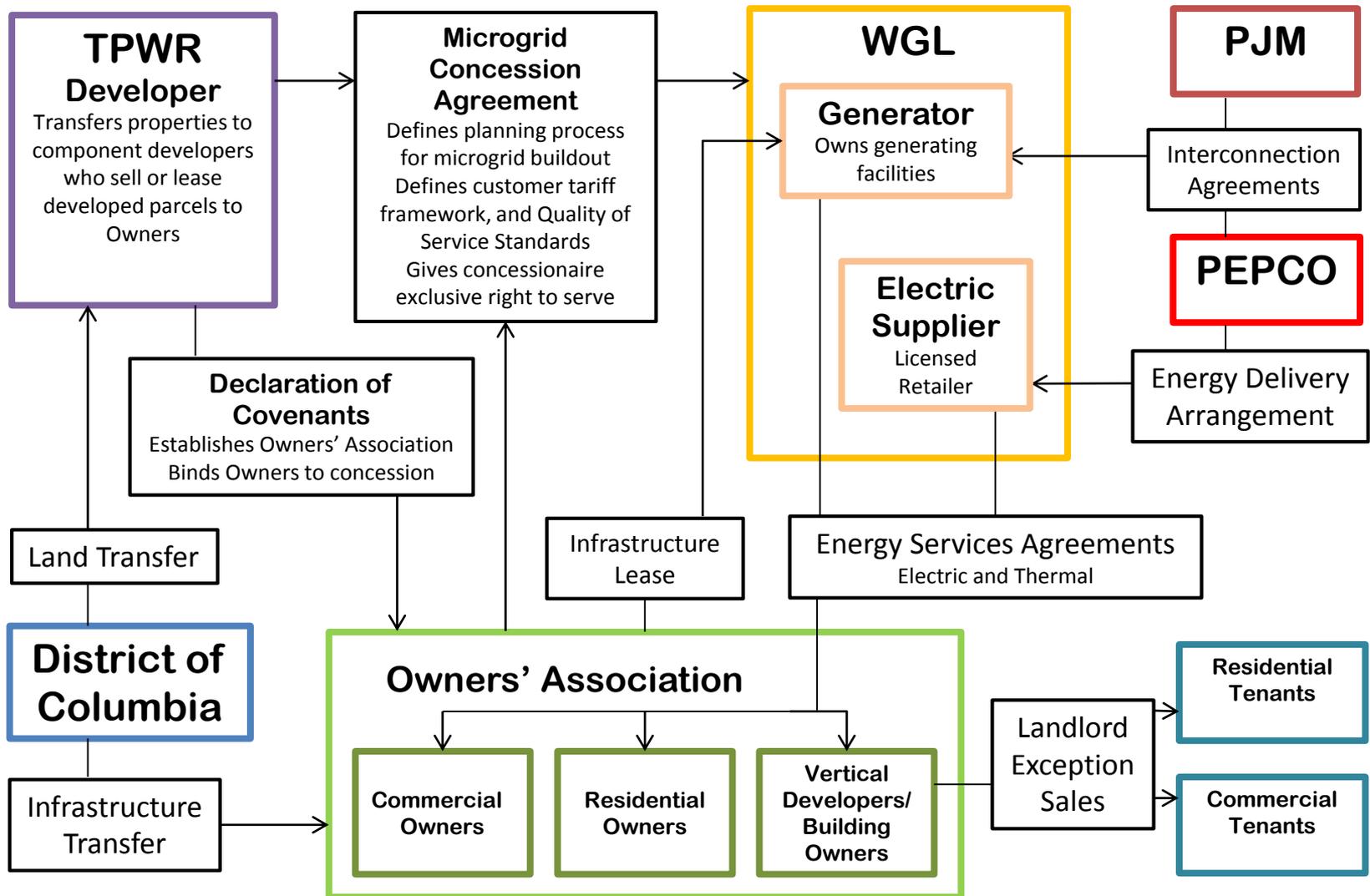
Microgrid Finance

- Owner financed microgrids look like energy retrofits
 - Controls, HVAC equipment, storage are typical for energy retrofits
 - Ancillary services revenues don't come with long term contracts
 - Energy savings aren't a "revenue stream" to pledge
 - Generation is mostly used on site
- The techniques that work for energy retrofits work for microgrids
- If there is a significant generation component, it may make sense to do a companion financing

Typical Solar Structure



The Parks at Walter Reed – Microgrid Structure



Utility 2.0

- Several State PUCs are reviewing utility regulation
 - Looking at new utility business models
 - Considering the effect of widespread adoption of DERs
- New York – Renewing the Energy Vision (REV)
 - Utilities serve as distributed service platforms (DSPs)
- California PUC DER Planning Process
 - Map Distribution System for DER contributions
 - Conduct Requests for Proposals for DER solutions
- Hawai'i – Decoupling and incentive ratemaking
 - Specifically empower microgrids

The Grid of the Future

- A self-healing grid in emergencies
 - The grid can separate into self-supporting microgrid islands
 - Each island is its own semiautonomous control area
 - Each supplied by Distributed Energy Resources
 - The islands can support one another
- Microgrids provide grid support services when not in emergency mode
- DER are mostly clean energy resources
- The grid operators conduct the concert

Questions

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