Dinsmore & Shohl

Implementing Microgrids:

Or how I learned to stop worrying and love utility regulation

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The **Grid** is the Context

- Historically the **Grid** is a transportation system to get electricity from **generation** to **load** (consumers)
  - **Transmission** – superhighways
  - **Distribution** – roads, streets and alleys
  - **Safety Systems** – traffic management devices
- Now it is rapidly evolving
- The grid still provides the engineering, business and legal context for microgrids
- Energy regulation was developed to protect the consumer (and utilities), not to empower the end user

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The Grid is a **Control Area**

- An electric power system with **common automatic controls** that:
  - **Balances** power from generation and imports with load
  - Maintains scheduled **interchange** with other control areas
  - Maintains the **frequency** of the electric power system
  - Maintains **operating reserves**
- The original control areas were **integrated utilities**
  - They own and manage the grid and all generation in their **service territory**
  - They **dispatch** generation to meet load
- Some utilities formed **power pools** (PJM, NEPOOL)
  - They implemented **least cost dispatch** and **reserve sharing**
  - They became a common control area

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The **Microgrid** in Context

- A **microgrid** is
  - A microcosm of the Grid – integrates **generation** and **load**
  - It can **Island** from the grid
  - It can provide **services** to the grid
- To its owner/operator a microgrid is a micro control area
- To the grid it is both a load and a resource
- A microgrid can also integrate thermal load, energy storage and advanced contols – both internal and grid-facing – making it qualitatively different from other resources

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State Utility Regulation

- Utilities were viewed as "**natural monopolies**"
  - They received **franchises** for their **service territories**
  - They assumed an **obligation to serve** all customers
- State established **Public Utility Commissions (PUCs)** to assure that utility rates were **just and reasonable**
  - Utilities have a **revenue requirement** needed to meet operating costs and provide a **rate of return** to shareholders
  - They adopt **tariffs** – schedules of charges to classes of customers – that must be approved by the PUC in a **rate case**
  - Charges for energy are assessed by KWh
  - **Standby charges** may be fixed or based on peak demand
  - The tariff rates applied to the demand for all customers must equal the revenue requirement

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Misincentives and Cures

- To increase shareholder return utilities:
  - Inflate the **rate base**
  - Sell more KWh
- States and PUCs fight back
  - Certificates of **public convenience and necessity**
  - **Divesting generation**
  - **Retail deregulation**
  - **Decoupling**
  - **Incentive ratemaking**
- PUCs are no longer assuring adequate generation

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Federal Power Act (1935)

- Utilities circumvented state regulation through interstate **power purchase agreements** and **wheeling** arrangements
- **Federal Energy Regulatory Commission (FERC)** sets rates for
  - **Wholesale sales** of power (in interstate commerce)
  - Transmission (in interstate commerce)
- Rates must be just and reasonable, and **non-discriminatory**
- FERC initially set rates by approving individual contracts
- Now gives **market based rate authority** if no **market power**
- Extensive regulation of **jurisdictional** utilities

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Public Utility Regulatory Policies Act

- PURPA (1978) was environmental legislation
  - Encouraged renewable energy and efficient cogeneration (**qualified facilities or QFs**)
  - Required utilities to purchase power output of QFs at **avoided cost**
- It spawned a new industry of **independent power producers (IPPs)** largely exempt from federal utility regulation
- Utilities fought back with:
  - **Interconnection agreements**
  - Refusal to wheel power
  - **Auctions** to establish avoided cost
- Congress added **Exempt Wholesale Generators (EWGs)**

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Open Access Transmission and RTOs

- To end discrimination against IPPs, FERC required utilities to
  - Adopt an **open access transmission tariff (OATT)**
  - Create an **open access same-time information system (OASIS)**
- FERC orders
  - Encouraged use of **Independent System Operators (ISOs)**
  - Power pools become **regional transmission organizations (RTOs)**
- RTOs are control areas
  - They do **scheduling, transmission planning** and supervise **interconnection**
  - They eliminate **pancaked tariffs**
  - They do a **security constrained dispatch** to schedule transmission through **day-ahead and real-time energy markets** which price **congestion** using **locational marginal prices**
- Most power is not sold in these markets

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More RTO Markets

- RTOs realized they needed capacity, reserves and **ancillary services** to manage their control areas
  - They started markets for these services
  - Courts have blessed these markets under the FPA
- They moved to **forward capacity markets**
  - LMP markets don't incentivize new construction
  - They were worried about maintaining **reserve margins** and **reliability must run contracts** were a poor solution
  - Daily capacity markets can be gamed by the **last generator standing** because consumer demand is **inelastic**
  - They adopted administratively determined **"demand curves"**

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Demand Response

- The **Energy Policy Act of 2005 (EPACT)** encourages participation of **demand response (DR)** resources in RTO markets to
  - Reduce **peak load**
  - Reduce system costs
- Flat retail energy prices don't incentivize peak load reduction
- DR provides the same **balancing services** as generation and makes RTO markets more competetive
- DR comes from
  - Advanced controls and energy efficiency
  - **Behind-the-meter** generation
- Retail customers (such as microgrids) have been selling into RTO markets through **aggregators**

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Danger and Opportunity

- Climate Change
  - Institutional Goals
  - Increased stress on the grid from weather events
  - Increasing environmental regulation
- System Inefficiencies
- Improving distributed generation technologies and falling prices
- Evolving storage resources add elasticity and ancillary services
- DR is an increasing percentage of reserve margins
- IPPs are in the governance of RTOs and are pushing back at DR
- The utility business model is threatened by falling demand
- There is a capital shortfall

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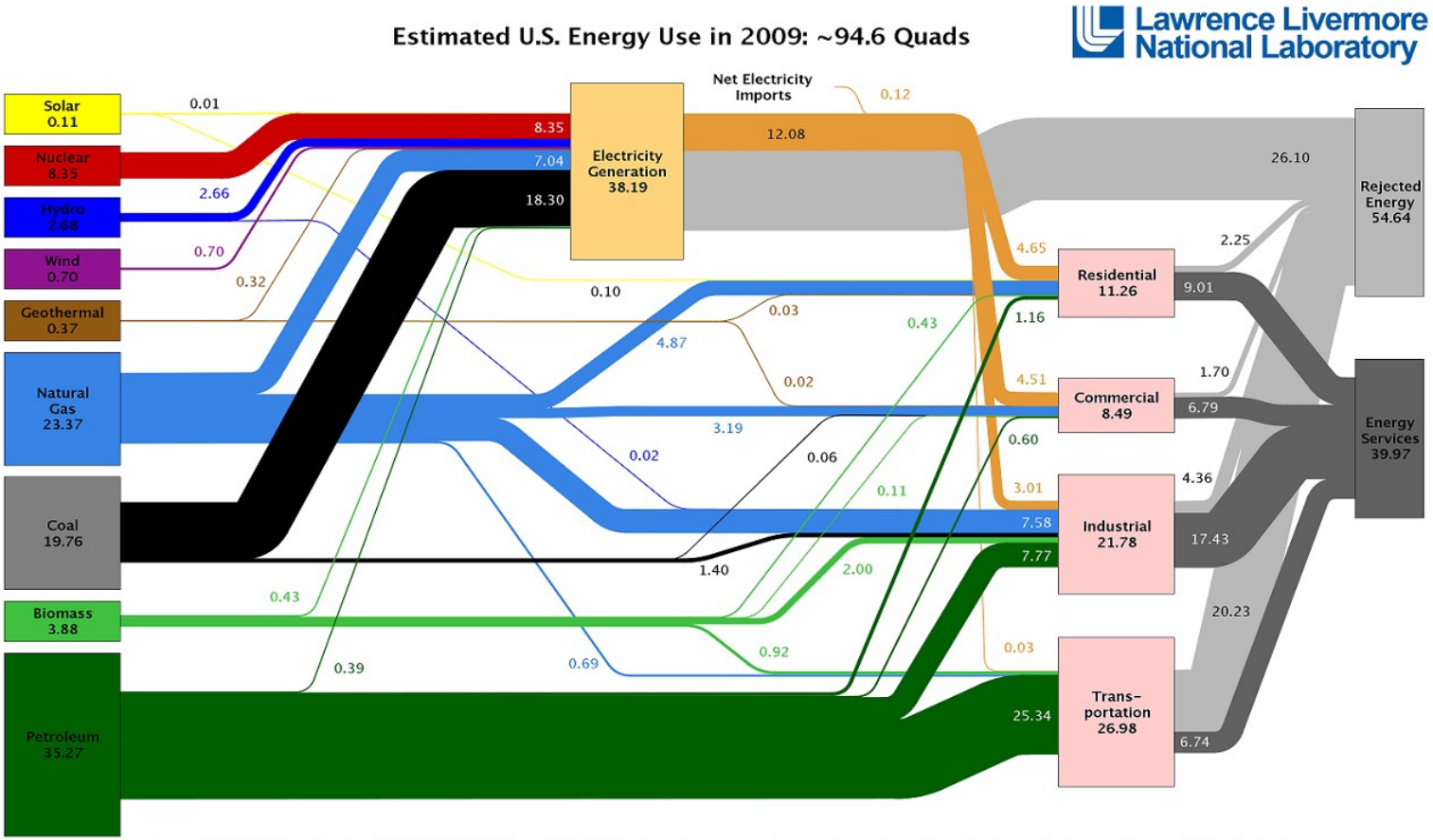
Wasting Energy



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The Trends Drive Microgrids

- Microgrids are resilient – backup generation fails frequently
- Microgrids are efficient – with balanced thermal load, over 90%
- Microgrids can improve integration of renewables
  - Provide internal balancing
- Microgrids can incorporate storage – permits **arbitrage**
- Microgrids can manage to the tariff – reduce standby charges
- Microgrids provide services to the grid
  - Demand response
  - **Regulation**
  - Reserves
  - Capacity
- Microgrids support the distribution system

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Fuzzy State Incentives

- State run DR programs have had little success
- **Renewable Energy Credits (RECs)**
  - Not tied to carbon outcomes (and badly defined)
  - Unreliable markets
  - Don't reflect demands on the grid
- **Net metering** doesn't reflect grid pricing and can't be shared
- **Social benefit charges** burden ratepayers not taxpayers
- Microgrid incentive programs use poor definitions to qualify
- No recognition of benefits to the distribution system

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Regulatory Hurdles for Single Owners

- State definitions of “utility” and “franchise” can
  - Prevent an owner from running wires across a street on its property
  - Prevent a third-party developer from selling power to owner from its own property
  - Only taxable owner can use federal tax benefits
- Interconnection difficulties
  - Complex microgrid functions can complicate study
  - Gives the utility more ways to stall
  - No recognition of system benefits
- Single owner with many meters can’t use **virtual net metering**
- Permitting processes (zoning, air permits) empower **NIMBYs**

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Multiparty Microgrids

- Common landlord
  - Some states allow landlord to **submeter** tenants
  - Facilities such as business parks, industrial parks, shopping malls
- Utility owned
  - Improve reliability on a **radial feed**
  - Install storage and islanding capability
  - Not suited to sophisticated controls or thermal integration
- **Utility / private partnerships**
  - Based on contractual arrangements
  - Utility owns wires and owns or allows islanding capability
  - Private developer operates generation, thermal supply, smart controls behind meter at **point of common coupling**

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Multiparty Microgrid Hurdles

- Utility and franchise definitions cause even bigger headaches
  - Private developer may be unable to make retail sales of power
  - Can form a local cooperative so that everyone is an owner
  - Can form a local load serving entity if there is retail competition
  - **Community choice aggregation** works in a few states
- Proposals for **"resiliency microgrids"** to serve critical facilities in a community require dedicated wires for emergencies, because islanding is not for contiguous facilities
  - Proposals in Connecticut, New York, New Jersey after Sandy
  - New Jersey considers a "**resiliency tariff**"

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RTO Markets

- FERC has been moving to support demand response
  - Order 719 – supports DR in all RTO markets
  - Order 745 – set an LMP price requirement for DR in the energy markets
  - Order 784 – sets rules for services from storage resources
  - RTO capacity markets generally incorporate DR
- Much remains to be done
  - RTO rules can prevent microgrids from performing multiple services
  - The rules aren't designed for microgrids
    - Microgrids have multiple sources of DR with different characteristics
    - PJM rules for **baselines** don't work well for microgrids

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EPSA v. FERC

- The DC Circuit Court strikes down Order 745
  - Challenge by IPP group trying to reduce competition from DR
  - Court takes a novel view of the FPA, says states regulate "retail markets" not "retail sales" so FERC can't set prices
  - States never regulated customer behavior behind the meter
- The Solicitor General has filed a petition for certiorari asking for Supreme Court review
- Utilities asked FERC to remove DR from capacity markets
- PJM has filed to remove DR from the supply side of the market
- The MRC doesn't believe EPSA requires this even if it survives
  - Suggests a "pass through market" with state regulated aggregators

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Utility 2.0

- Several PUCs are undertaking reviews of utility regulation
  - Looking at new utility business models
  - Considering effect of widespread adoption of distributed generation
- New York Public Service Commission **Renewing the Energy Vision (REV)** proceeding
  - Utilities serve as distributed service platforms (DSPs) for integrating widespread distributed energy resources (DERs)
  - DSPs will run markets for services from DERs analogous to RTOs
  - It isn't clear that such markets would be liquid or integrate with RTOs
  - DSPs both run markets and compete in them
  - They have yet to make proposals on ratemaking and compensation for DSPs

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More Utility 2.0

- California
  - AB 327 requires a new utility planning framework: “More than Smart”
  - Define optimal locations for DER deployment
  - Identify locational values for DER
  - New tariffs to support DER and removal of barriers
  - Envisions a “node friendly” **network system**
  - Done in the context of California climate change initiatives
  - Also revamping storage interconnection rules, and issued a white paper on microgrids
- Colorado
  - Low prices, no comprehensive reform
  - Frustration leading to municipalization efforts

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Utility 2.0 Tensions

- Where does the capital come from?
  - Utilities looking for rate base, but load is shrinking
  - Microgrids and DER bring private capital
  - Social justice issues
- Information issues
  - Who owns customer data? Privacy is being used as a weapon
  - Can utility use customer data to market to the customer?
- Visibility for the system operator
  - Current imprecision of load bids – can microgrids help?
  - Bi-directional dispatch from a set point
  - Seamless network of support without central dispatch?
- Optimizing the grid v. supporting customer choice

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A Few Policy Suggestions

- The most important project:
  - Determine what services microgrids provide to the grid
  - Determine what services the grid provides to microgrids
  - Price them both fairly
  - IPPs, utilities and ALEC seek repricing to fight renewables and DER
- Use decoupling and incentive ratemaking to
  - Compensate utilities fairly
  - Give them incentive to promote demand reduction through energy efficiency and distributed generation
- Don’t discriminate between owners, developers and unregulated utility affiliates
- Be skeptical of energy efficiency and DER in rate base
- Eliminate barriers to competition and customer choice

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Questions?

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