



An Energy-Efficiency Workshop and Exposition

Orlando, Florida

Energy Utilization & Strategic Planning

Load Management
Terms and Techniques



Introduction (Who am I?)



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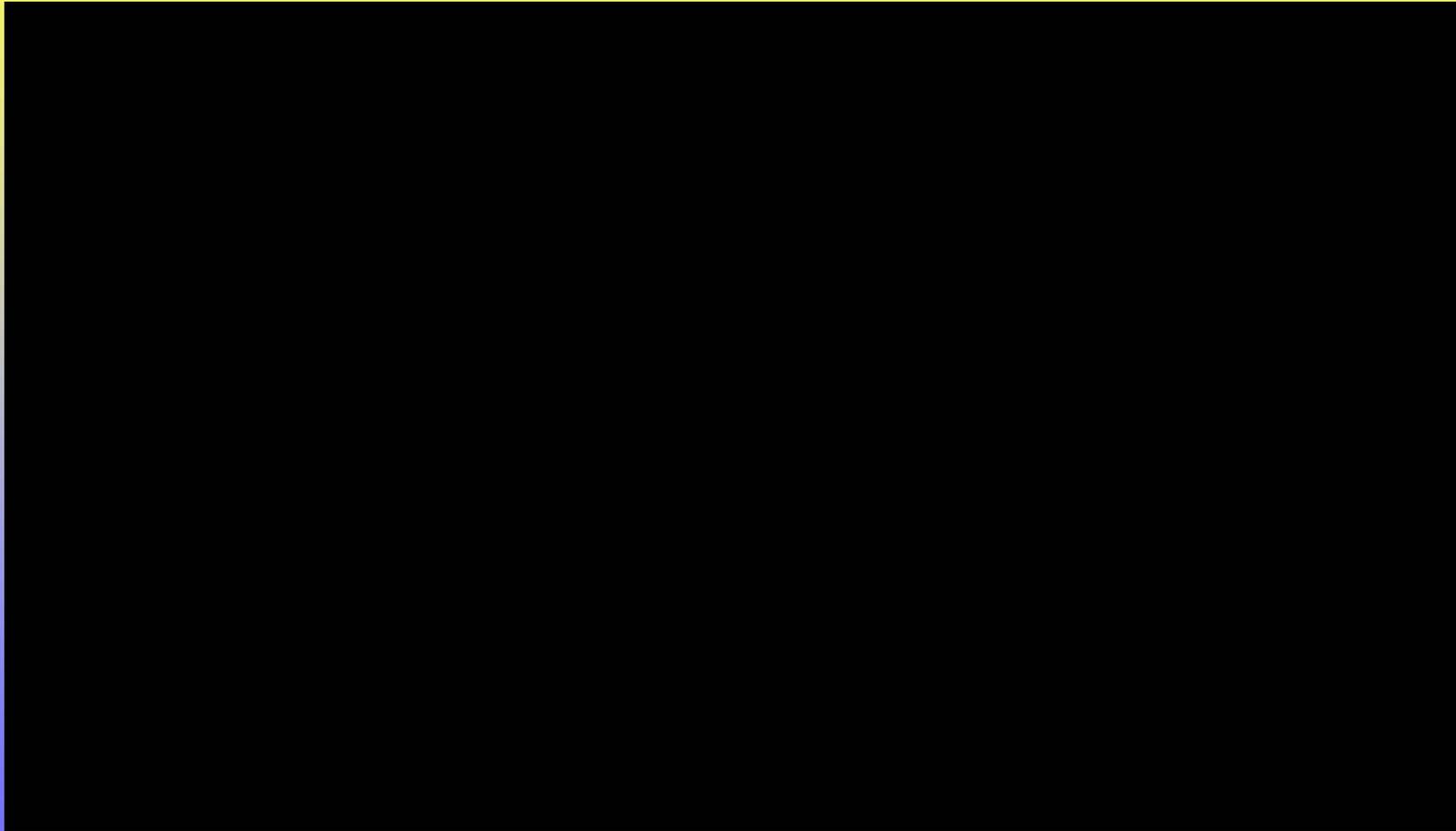


Introduction (Who am I?)

- **Over 13 Years of Energy Industry Experience (Efficiency Audits, Technology Evaluation, DSM and Load Management)** 
- **Engineer, MBA** 
- **Certified Energy Manager** 



Current Status (New York, Detroit, Cleveland...)





What is Load Management?

- **In the simplest terms...**
 - Performing deliberate activities to influence the characteristics of the utilization of energy (from the perspective of the electricity end-user)**
 - **Activities typically limit or modify the instantaneous or typical pattern of electricity utilization**
 - **Characteristics include the rate of electricity consumption (demand - kW) and the total amount of electricity consumed (energy - kWh)**



Note

We will discuss making changes that will impact the actual consumption of electricity... these may or may not have an impact on the electricity bill...

- **“Billed” Energy Consumption - Determined using rates, tariffs or other contractual mechanism**
- **“Actual” Energy Consumption – Measured consumption or performance**





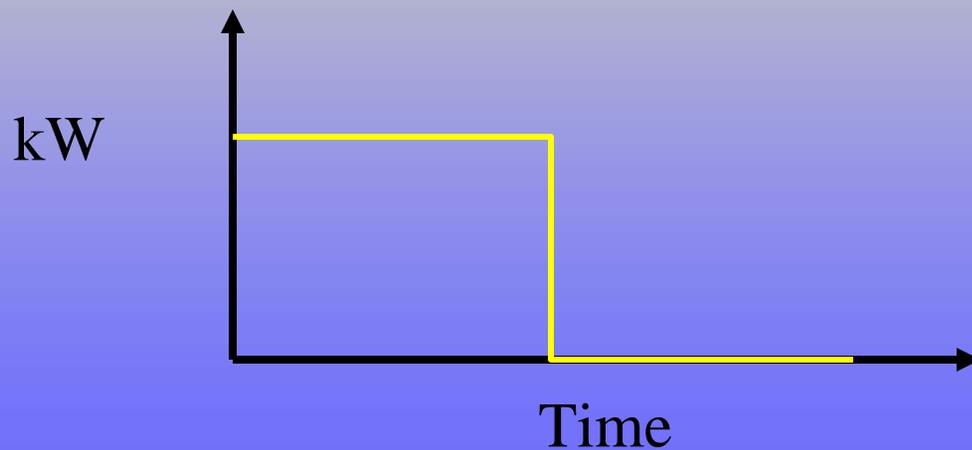
Common Terms

- **Interruptible Load**
- **Load Curtailment**
- **Load Leveling**
- **Load Shifting**
- **Peak Limiting**



Interruptible Load

- Energy loads that can be shut off or disconnected at the supplier's discretion
- Or as determined by a contractual agreement between the supplier and the customer.





Examples of Interruptible Load

- Decorative Lighting
- Non-Critical Processes
- Water Fountains
- Elevator Banks
- Other “Substantial” Loads





Global Natural Gas Reserves

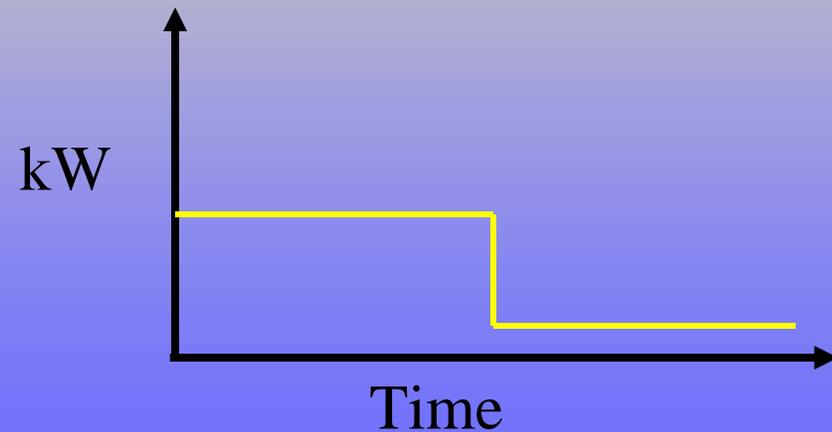
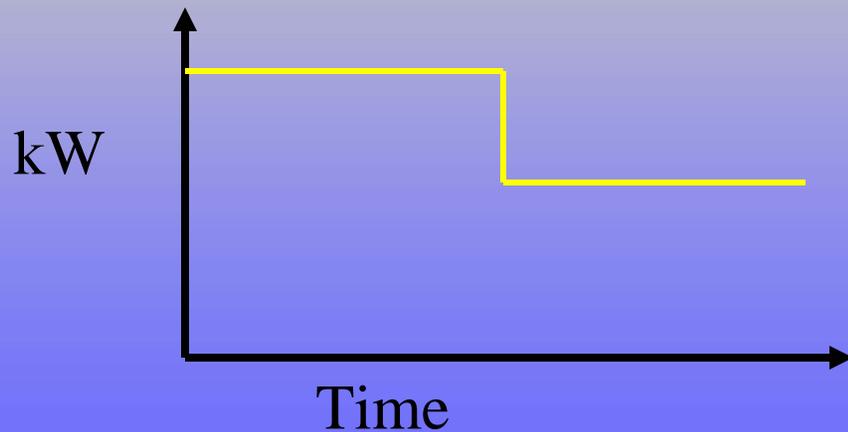
Load Curtailment

- The temporary reduction in electricity consumption, typically at the discretion of the customer
- The amount and duration of reduction, types of equipment and strategy involved, and participation in the program are typically at the discretion of the customer
- A.k.a. – Load Shedding



Typical Curtailment Concepts

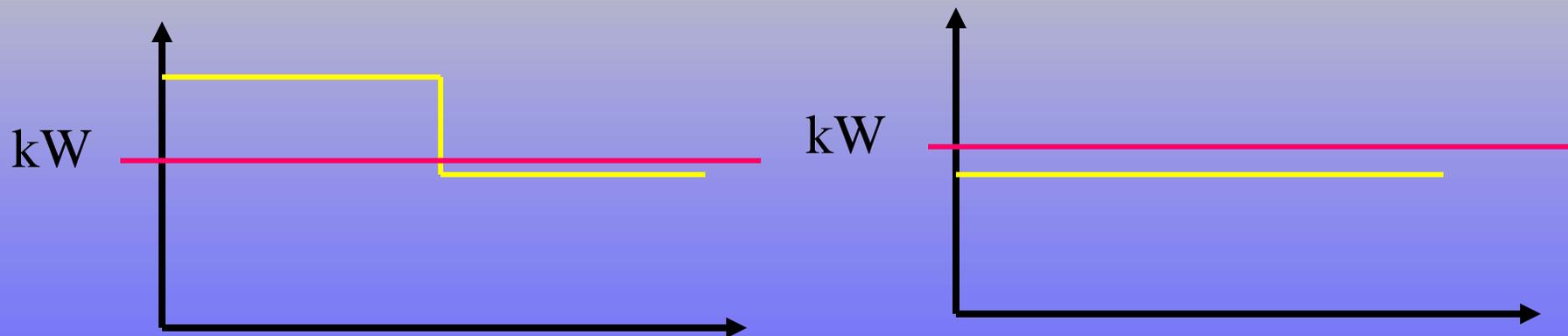
- Firm Load Reduction – No matter what your actual consumption, you will reduce your load by a pre-determined amount





Typical Curtailment Concepts

- Firm Maximum Load – No matter what your actual consumption, you agree not to consume more than a pre-determined amount





Typical Curtailment Concepts

- Buy-Through Options – For a pre-determined price, you may purchase electricity as opposed to reducing overall load (may not be available)
- Voluntary Load Reduction – No matter what your actual consumption, you will reduce your load by a variable amount and are compensated accordingly



Examples of Curtailable Load

- Dimming lighting systems
- Increasing temperature set points in occupied spaces
- Increasing set point of supplied chilled water (“reset”)



Problems with Curtailable Load

- You cannot measure something that does not exist 
- Must estimate what the load “would have been” absent any load management activities
- The “gird” does not care where you would have been.... But where you ARE



Why Have Interruptible and Curtailment Programs?

- “Physical” Generation Restraints – actual consumption exceeds actual generation capacity
 - Not enough generation to meet demand
 - Generation station “trip” or failure
 - Fixed generation capacity (can’t make more)



Why Have Interruptible and Curtailment Programs?

- “Physical” Transmission Restraints – actual consumption exceeds available transmission capacity (may have adequate generation capacity)
 - Transmission line physical size at capacity
 - Failure of transmission line
 - May “overload” for short periods



Why Have Interruptible and Curtailment Programs?

- “Physical” Distribution Restraints – actual consumption exceeds individual substation, transformer, or feeder capacity
 - Distribution equipment physical size capacity
 - Failure of distribution equipment
 - May “overload” for short periods



Why Have Interruptible and Curtailment Programs?

- “Physical” Restraints
 - Real problems... in real-time
 - Installation of additional equipment takes time
 - Equipment in field has “fixed” capacity
 - Long or short-term occurrence
 - The more “local” the source the “quicker” the fix...
distribution easier than transmission easier than
generation



Why Have Interruptible and Curtailment Programs?

- “Physical” Restraints
 - Natural causes (storm), man-made causes (car hits utility pole), Canadian causes (it was lightning... um... fire... um... who knows but it was on your side of the border)
 - Reduce some power voluntarily or lose all power intentionally (rolling black-outs) 



Why Have Interruptible and Curtailment Programs?

- “Economic” Restraints – Market value of consumption or transmission exceedingly high
 - Adequate capacity may be available (buy-through)
 - Large spike in market value (market \$2/kWh and tariff “sells” at \$0.05/kWh) 



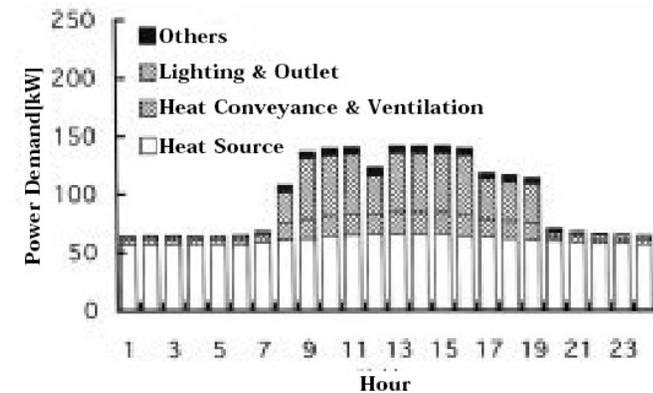
Load Leveling

- The deferment of certain loads to limit electrical power demand (curtailment)
- The production of energy during off-peak periods for storage and use during peak demand periods
- Using the same amount energy, just changing the time of use (objective is to reduce demand)

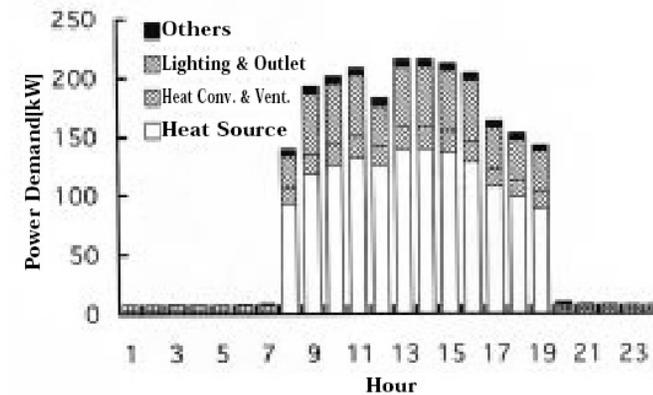


Examples of Load Leveling

- Ice Storage Systems
- Staggered breaks, start and stop times
- Interlock equipment operations to prohibit simultaneous operations



(a) With Ice Storage



(b) Without Ice Storage



Load Shifting

- Moves loads from on-peak periods to off-peak periods
- Objective is not to reduce peak, rather to shift peak to another time



Examples of Load Shifting

- “Off-peak” production – manufacturing third shift
- Melting steel at midnight and processing it the morning
- Running laundry at night



Peak Limiting

- Limiting the maximum demand to a pre-determined level
- A.k.a. Peak Shaving
- Accomplished either by reducing load or “shifting” process to alternative drive mechanism



Examples of Peak Limiting

- Natural gas (propane) prime mover
- Utilizing building control system to de-energize equipment
- Interlocks on cyclic equipment



Putting it All Together

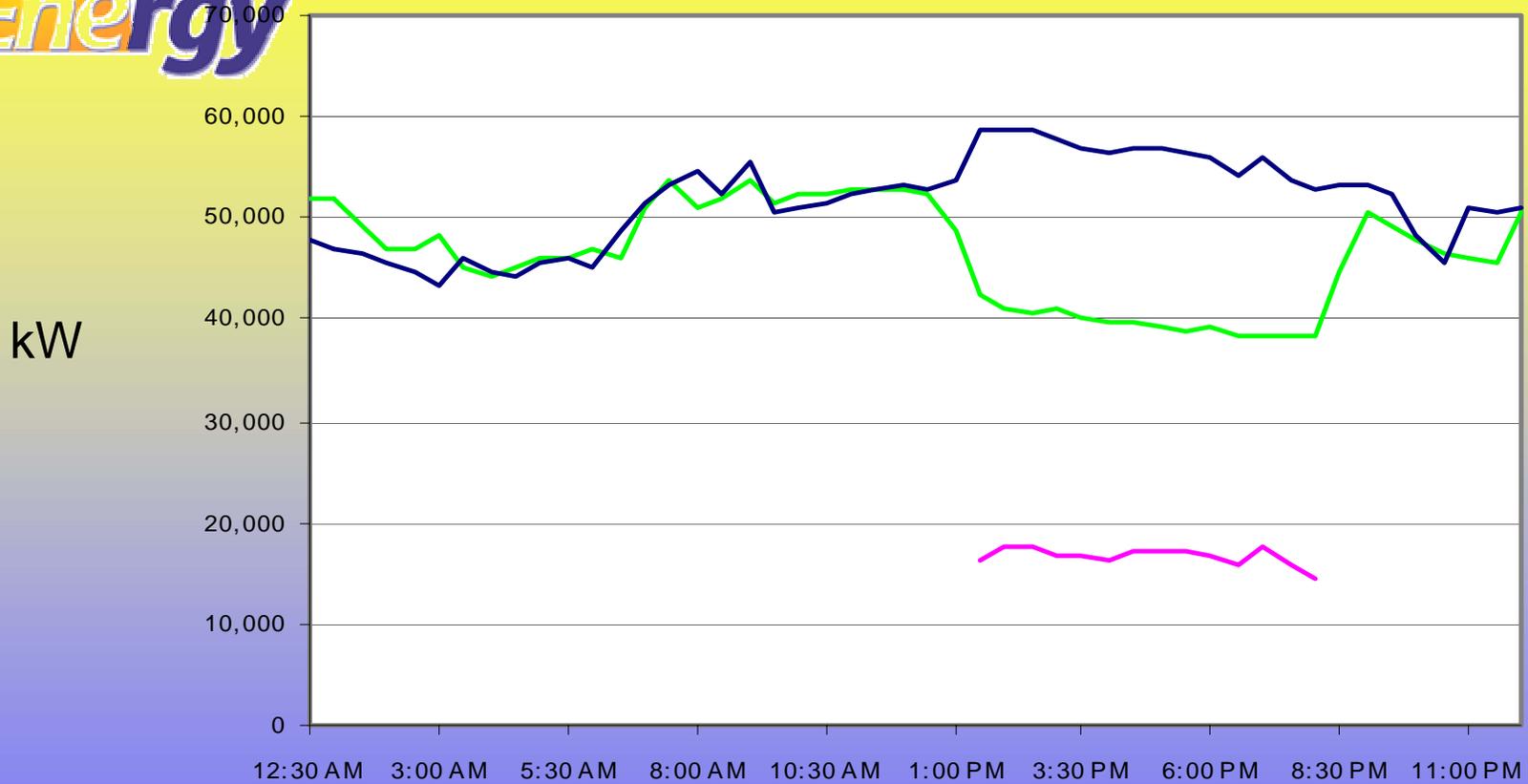


Load Management Programs typically:

- **Consider load leveling in initial design to limit equipment energy consumption and up-front costs**
- **Use peak limiting concepts to control overall facility energy costs (demand charges)**
- **Combine both interruptible and curtailable loads to take advantage of utility programs or when necessary due to system conditions**



Community Energy Cooperative Curtailment Event



— August 8th — August 7th — Curtailment Amount



Questions

It's over....

“How did it get so late so soon?

It's night before it's afternoon.

December is here before it's June.

My goodness how the time has flown.

How did it get so late so soon?”

Dr. Suess