
Why is Demand Management So Important?

Ken Colburn

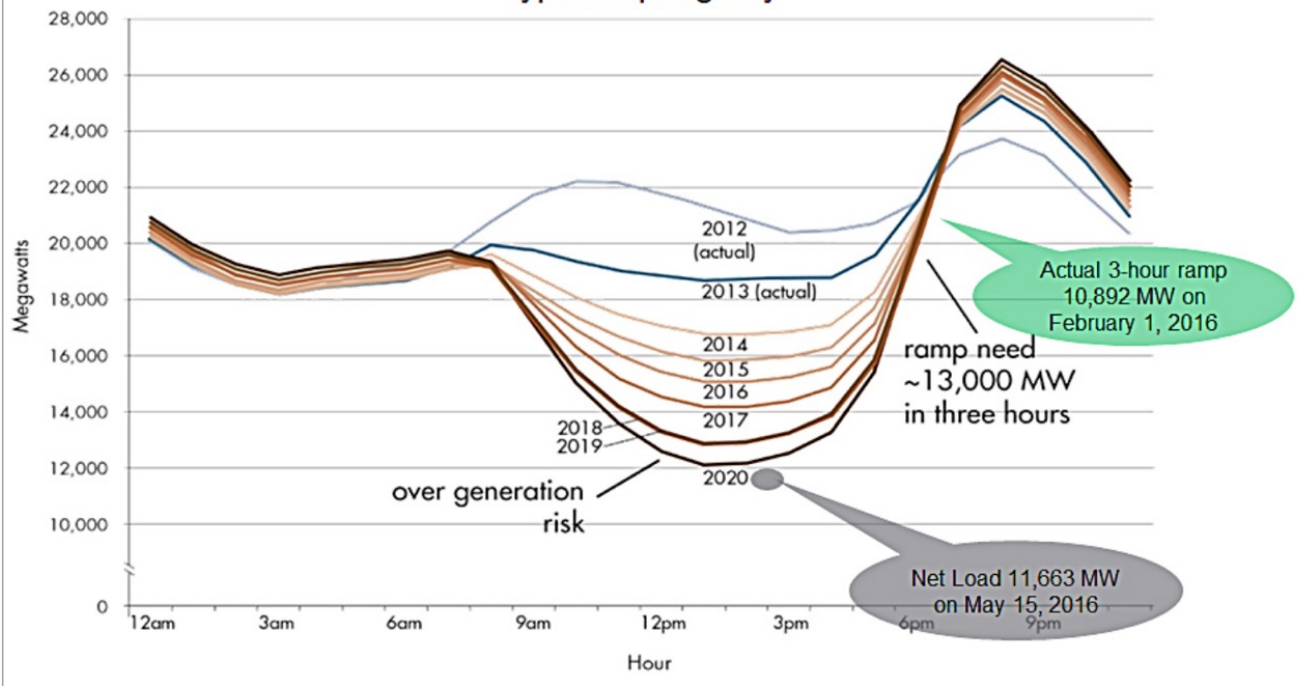
Co-Chair, MCC Energy Working Group

January 19, 2024

kcolburn@symbioticstrategies.com

The “Duck Curve” Showing Daily Net Load Over Time

Net Electricity Load on a
Typical Spring Day

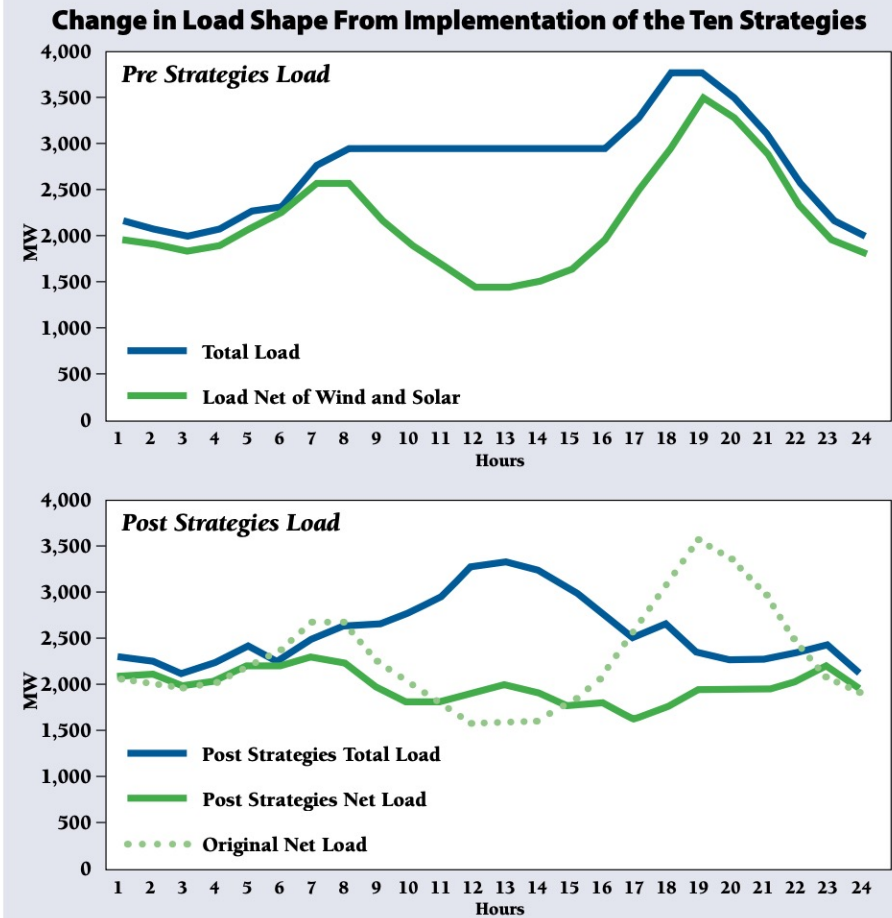


X-Axis reflects the 24 hours
in the day.

Y-Axis reflect electricity
demand.

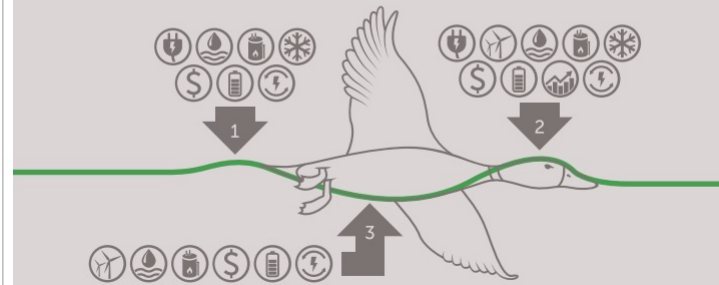
Source:
California ISO, *What the
duck curve tells us about
managing a green grid*,
2016, page 3

Figure 5



Teaching the "Duck" to Fly:

10 strategies to control generation, manage demand, & flatten the Duck Curve



Targeted Efficiency

Focus energy efficiency measures to provide savings in key hours of system stress. 📊 📈



Peak-Oriented Renewables

Add renewables with favorable hourly production. Modify the dispatch protocol for existing hydro with multi-hour "pondage." 📊 📈



Manage Water Pumping

Run pumps during periods of low load or high solar output, curtailing during ramping hours. 📊 📈



Control Electric Water Heaters

Increase usage during night & mid-day hours, & decrease during peak demand periods. 📊 📈



Ice Storage for Commercial AC

Convert commercial AC to ice or chilled-water storage operated during non-ramping hours. 📊 📈



Rate Design

Focus pricing on crucial hours. Replace flat rates & demand charge rate forms with time-of-use rates. Avoid high fixed charges. 📊 📈



Targeted Electric Storage

Deploy storage to reduce need for transmission & distribution, & to enable intermittent renewables. 📊 📈



Demand Response

Deploy demand response programs that shave load during critical hours on severe stress days. 📊 📈



Inter-Regional Power Exchange

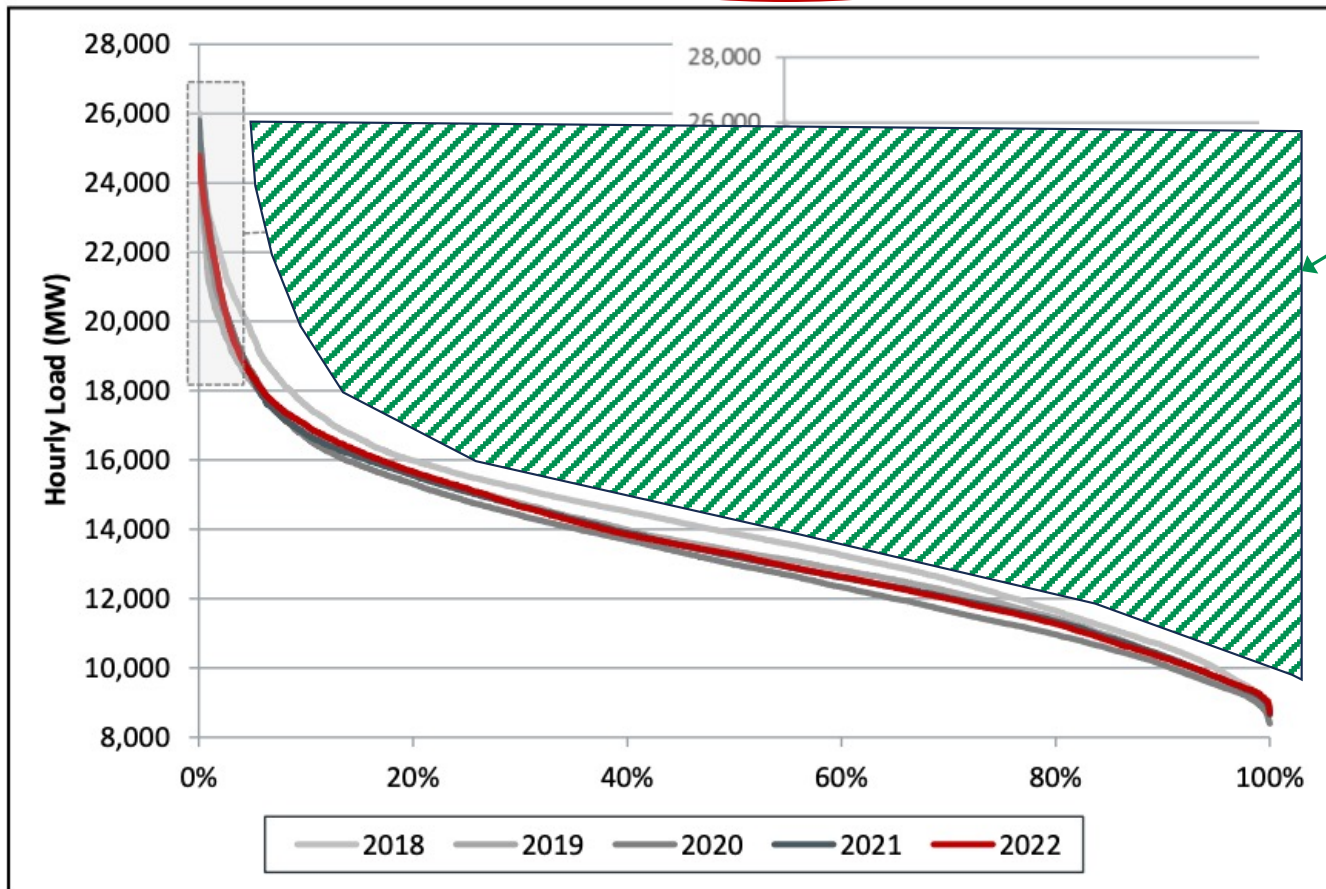
Import power from & export power to other regions with different peaking periods. 📊 📈



Retire Inflexible Generating Plants

Replace older fossil & nuclear plants with a mix of renewables, flexible resources, & storage. 📊 📈

Figure 1-13: Load Duration Curves



The number of peak hours is quite small, ~5%, but adds ~50%+ to the size grid we need!

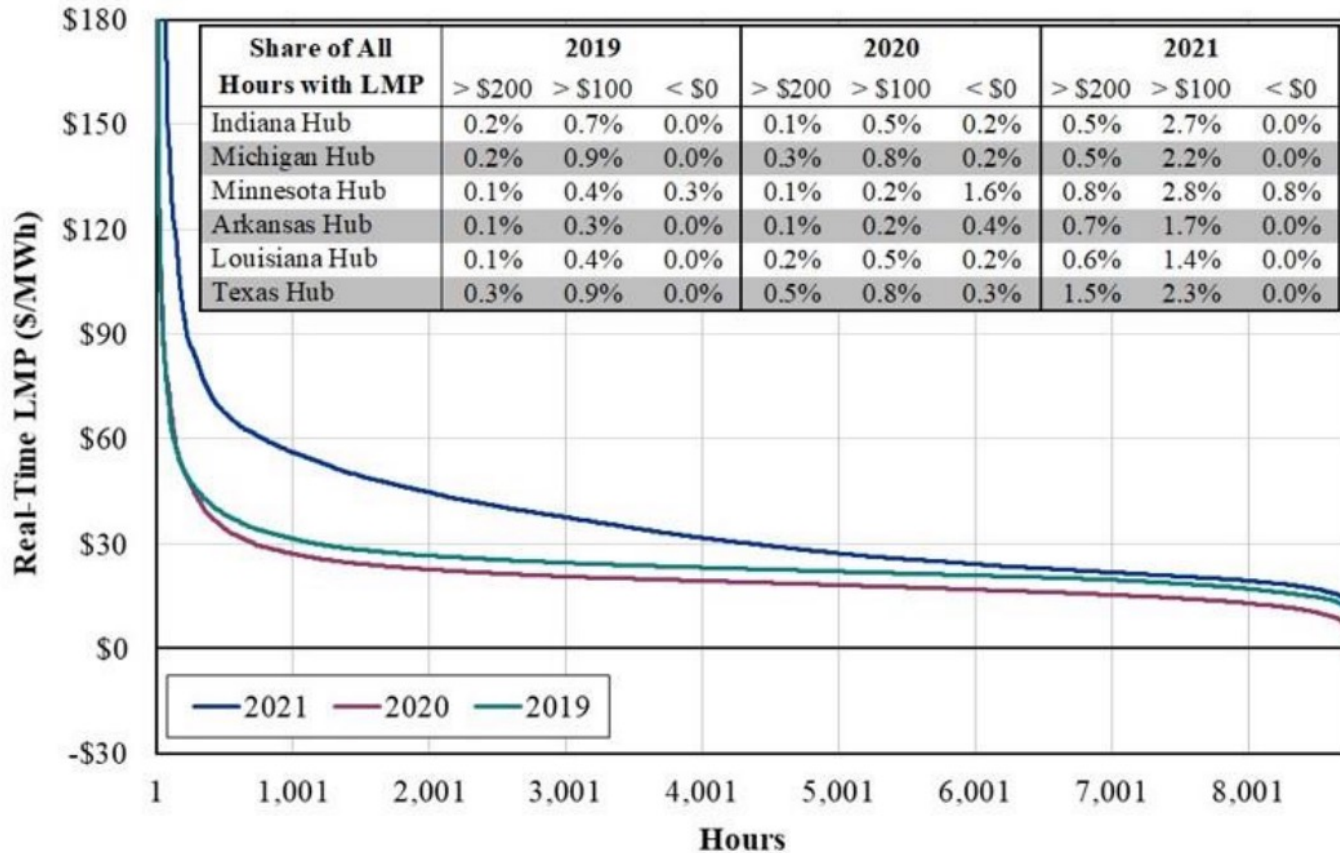
Today's grid could deliver nearly double the current demand – if managed well.

X-Axis reflects the 8760 hours in the year by declining load.

Y-Axis reflects electricity demand for each hour.

Source:
ISO-NE, *2022 Annual Markets Report*, page 37

Figure A3: Real-Time Energy Price-Duration Curve 2021



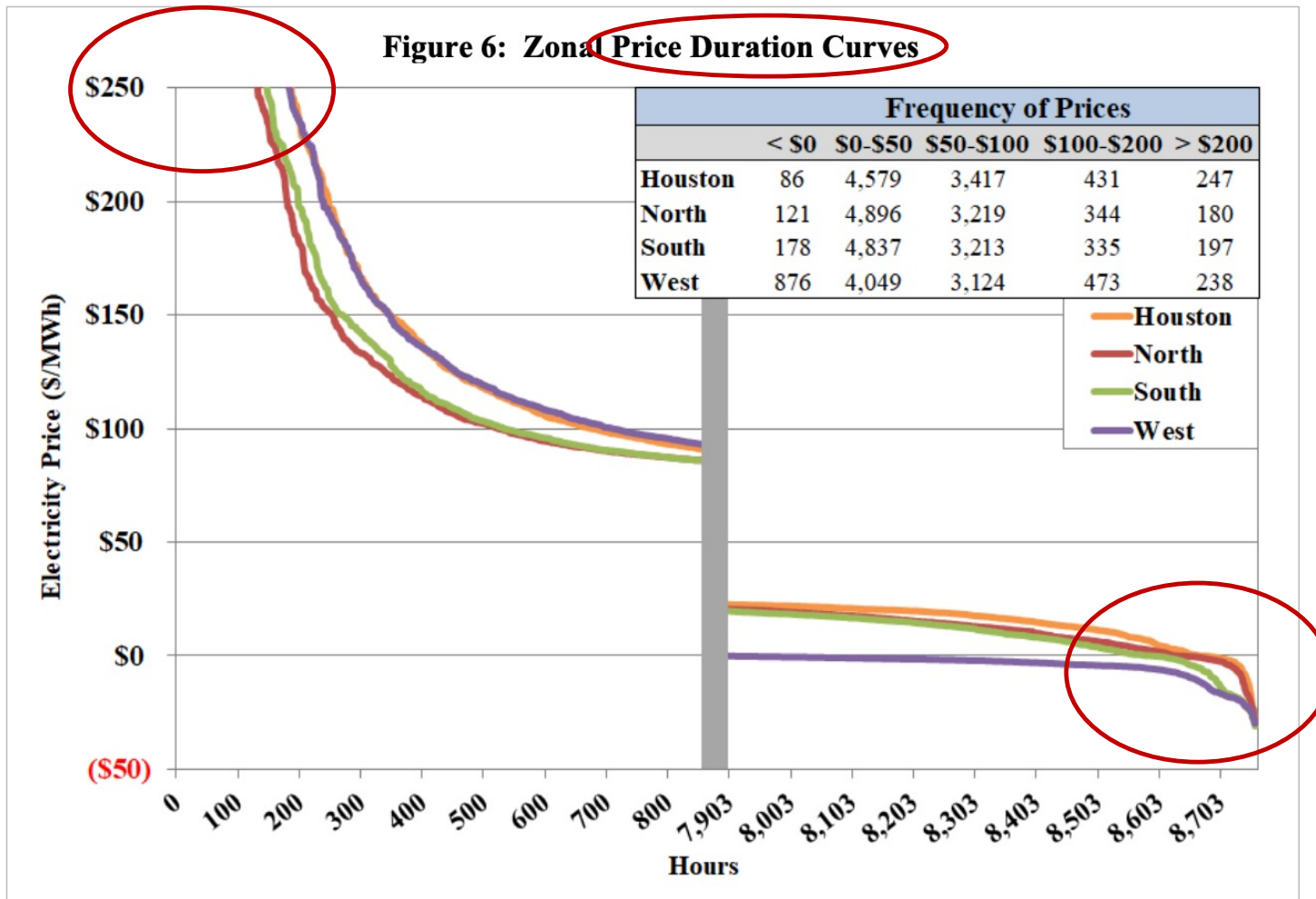
The highest price hours are few in number, <4%, but are 2-3 times the price!

X-Axis is the 8760 hours in the year, by declining price.

Y-Axis is the electricity price for each hour.

Source:
 2021 State of the Market Report for the MISO Electricity Market, page 5.

Figure 6: Zonal Price Duration Curves



In 2016, Massachusetts found the top 1% of hours = 8% of state energy spend, and top 10% of hours = 40% of energy spend!

X-Axis is the top and bottom 10% of the 8760 hours in the year, by declining price.

Y-Axis is the electricity price for each hour.

Source:
 2021 State of the Market Report for the ERCOT Electricity Market, page 15.

Demand Management Allows Us to:

- Decarbonize the grid and electrify our lives more quickly,
 - By integrating more renewable energy resources, and
 - Keeping our grid smaller (building less)
 - By using it more fully, and
 - Saving money via lower hourly power costs AND less grid investment
-

The Washington Post



ADVICE

The iPhone is staging a quiet revolution in how we charge our devices

BY MICHAEL J. COREN
MARCH 14 AT 6:30 AM

The illustration shows a worker in a hard hat and safety vest using a long-handled brush to clean the screens of several iPhones. The phones are arranged on a surface, and the worker is positioned in the foreground, reaching towards the devices. The background is a warm, orange-brown color.

3:26

Battery Health & Charging

relative to when it was new. Lower capacity may result in fewer hours of usage between charges.

Peak Performance Capability

Built-in dynamic software and hardware systems will help counter performance impacts that may be noticed as your iPhone battery chemically ages.

Optimized Battery Charging

To reduce battery aging, iPhone learns from your daily charging routine so it can wait to finish charging past 80% until you need to use it.

Clean Energy Charging

In your region, iPhone will try to reduce your carbon footprint by selectively charging when lower carbon emission electricity is available. iPhone learns from your daily charging routine so it can reach full charge before you need to use it. [Learn More...](#)