Residential Demand Rates: APS Case Study

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Arizona Public Service Company
Arizona's largest and longest-serving electric utility

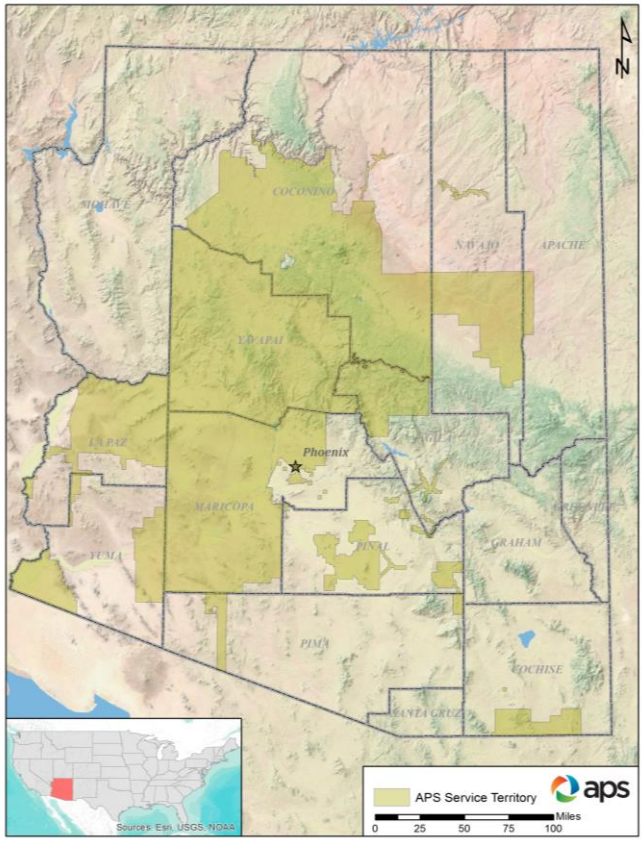
Customers: 1.2 million (89% residential)

Service Territory:
- 34,646 square miles
- 11 of the 15 Arizona counties

2014 Peak Demand: 7,007 MW
- All time high of 7,236 in July 2006

Generation Capacity: Over 6,400 MW of owned or leased capacity (~9,400 MW with long-term contracts)
- Including 29.1% interest in Palo Verde Nuclear Generating Station, the largest in the U.S.

Transmission & Distribution: 34,937 miles
- Transmission: 5,958 miles
- Distribution: 28,979 miles



APS Residential Demand Rates

- Started in 1981 as a mandatory rate for new homes with central air conditioning
- Today, over 110,000 (11%) customers have voluntarily selected the rate
- APS helps customers select the best rate at time of new service or through website rate comparison tool
- Today's metering technology has enabled this level of sophisticated rate offering

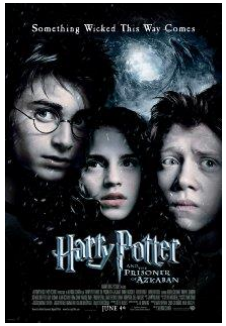
APS's Residential Demand Rate Evolution

Mid 1970's

Residential use of **central air conditioning (AC)** flourishes in the Phoenix area – begins to **drive system peak** demand

Late 1970's

APS requests approval of a mandatory residential **demand rate** for any new home with **central air conditioning** - charges based on 1) the highest kW demand in a single hour; 2) kWh energy consumed; and 3) a basic service charge



Early 1980's

APS implements **inclining block** and **TOU** rates and demand rate becomes voluntary

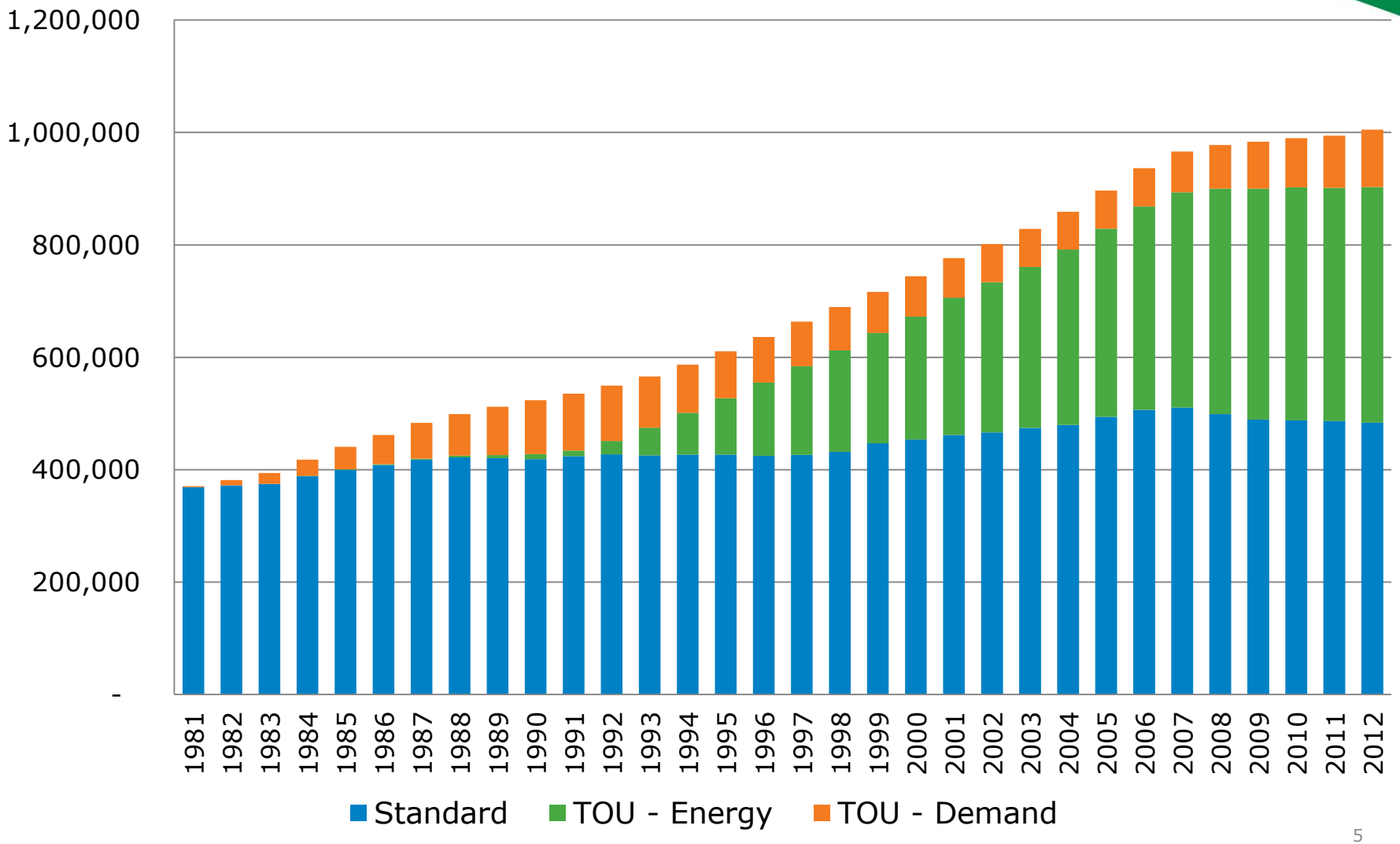
Early 1990's

Almost all TOU Adoption is demand based

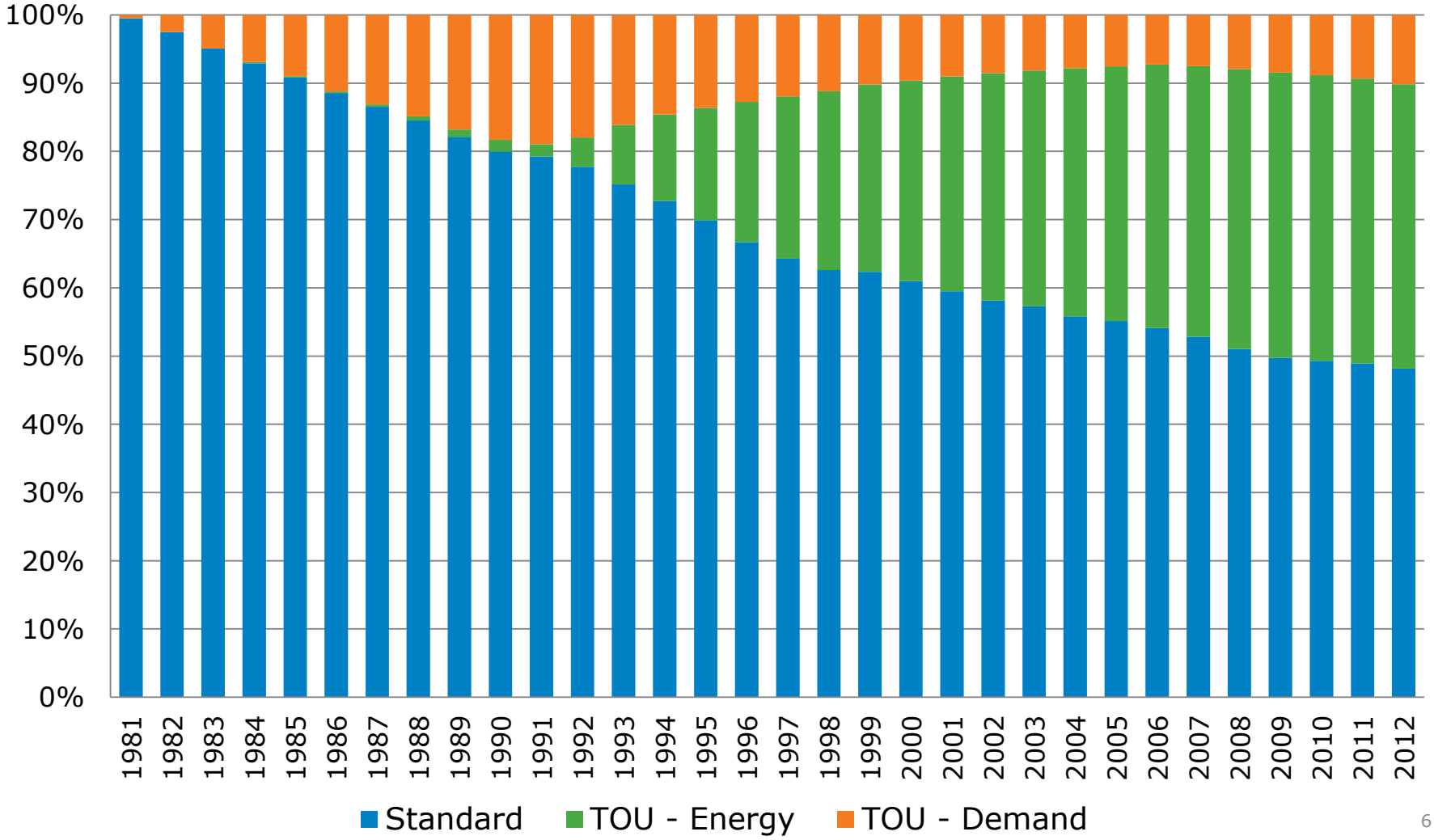
Early 2000's

TOU Adoption exceeds **40% and demand adoption ebbs to just over 7%**

APS
Historical Customer Count
Standard vs. Time of Use vs. Demand TOU



APS
Historical Customer Count Percentage
Standard vs. Time of Use vs. Demand TOU



How did APS reach 11% demand rate adoption?

Point of Sale

Leverage the new service process to **educate** customers on their rate options and the **best rate fit**

Technology Enhancements

Initially, residential demand rates were marketed with **load control technology** that would limit peak demand, for example, by **limiting** an electric clothes dryer or electric water heater **from turning on at the same time** as an air conditioning unit

Rate Calculator and Customer Lifestyle

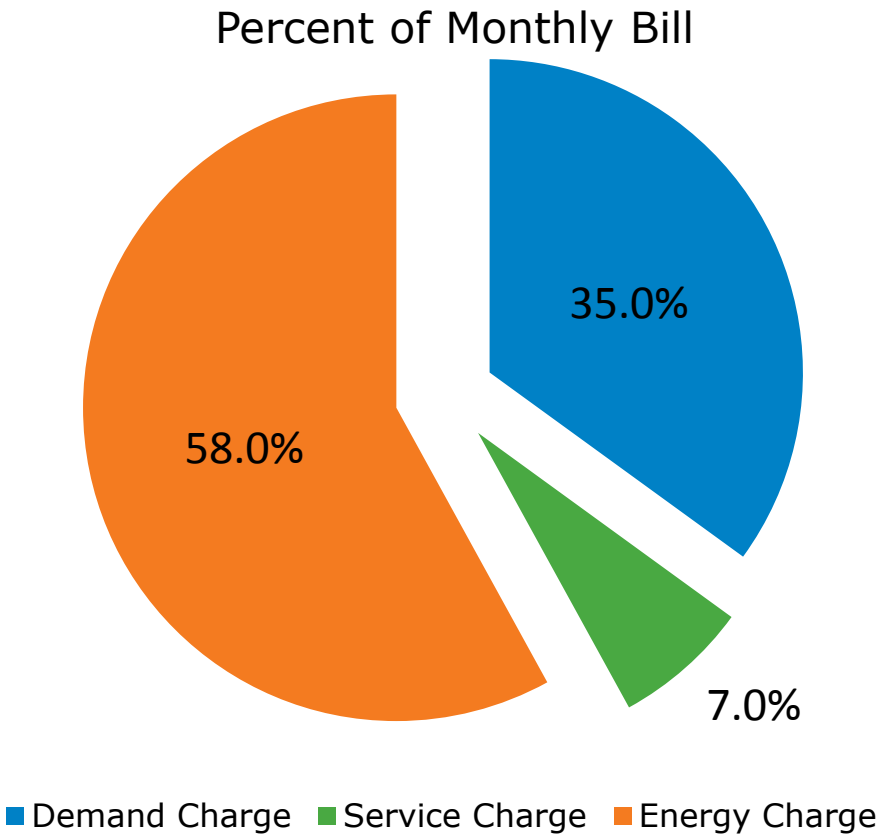
Average monthly consumption is very different for each rate family:

Inclining Block Rate = **700 kWh**

Energy Only TOU = **1,300 kWh**

Demand Based TOU = **2,000 kWh**

Residential TOU-Demand Rate



Service Charge ($ per Month)

All Service Amps	**$**	**16.91**

Demand Charges ($ per kW) [1]

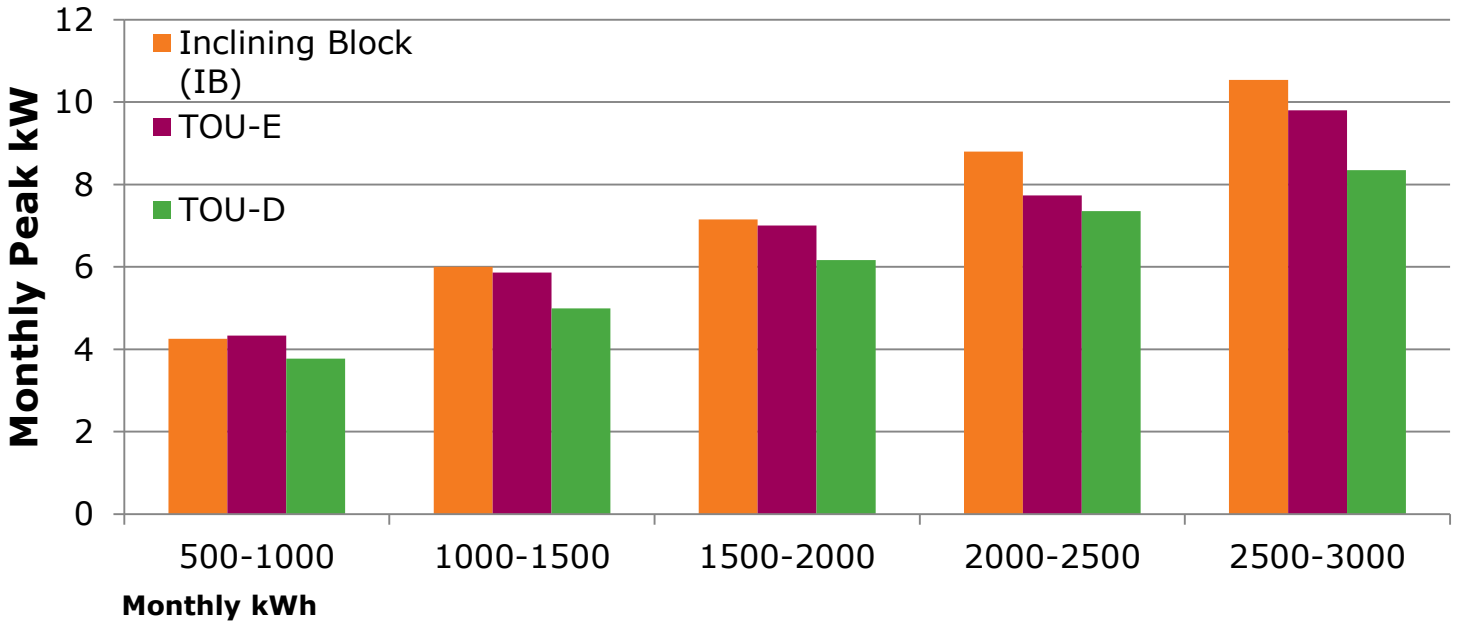
Summer	**$**	**13.50**
Winter	**$**	**9.30**

Energy Charges ($ per kWh)

	Peak [2]	Off Peak
Summer	**0.08867**	**0.04417**
Winter	**0.05747**	**0.04107**

1. Demand is based on the highest one-hour kW read during on-peak hours in a billing month.
2. On peak hours are 12 noon to 7 pm, excluding weekends and holidays.

Typical Monthly Demand by kWh Range

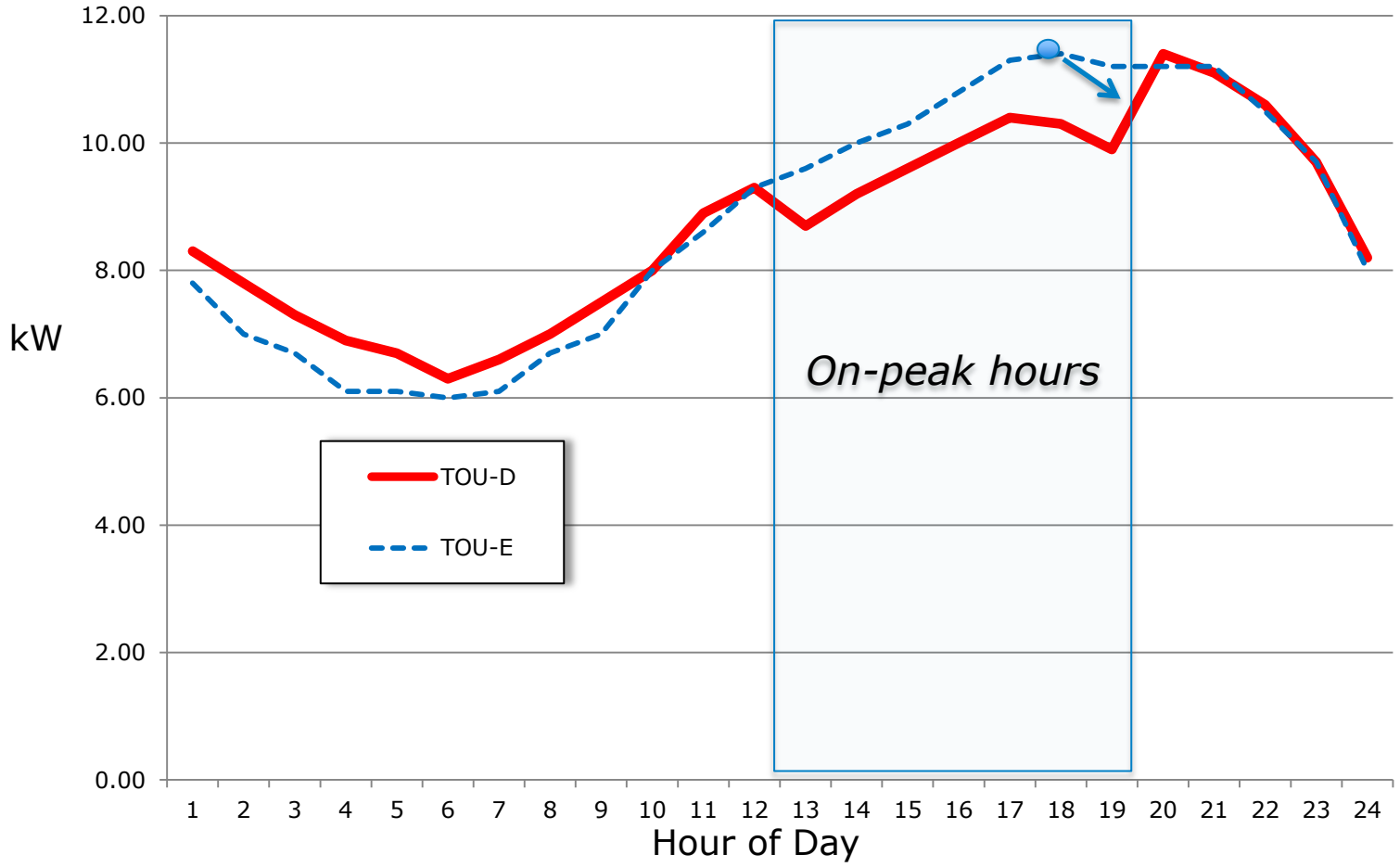


kWh	IB kW	TOU-E kW	TOU-D kW	TOU-D vs IB kW	TOU-D vs TOU-E kW
500-1000	4.3	4.3	3.8	11%	13%
1000-1500	6.0	5.9	5.0	17%	15%
1500-2000	7.2	7.0	6.2	14%	12%
2000-2500	8.8	7.7	7.4	16%	5%
2500-3000	10.5	9.8	8.3	21%	15%

Peak Day Load Shapes

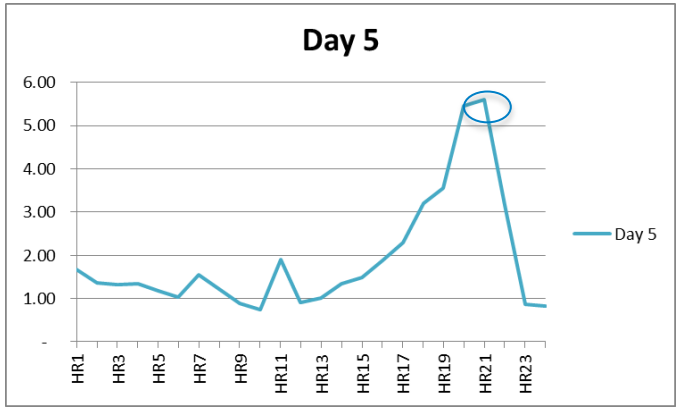
TOU-Demand, TOU-Energy

kW per hour of day, July peak day

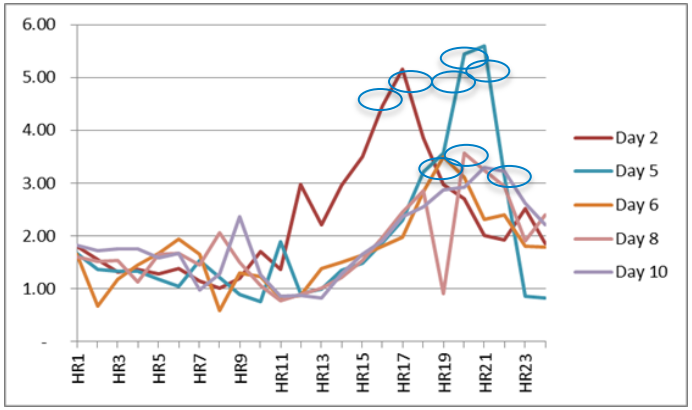


Demand Charge Concepts (Examples)

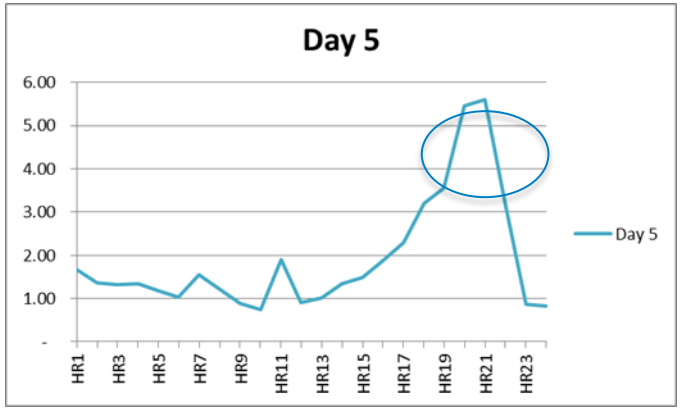
1 hr Max, e.g. 5.6 kW



Top 10 hr Avg Max, e.g. 4.3 kW



5 hr Avg Max, Contiguous Hours, e.g. 4.0 kW



Options Considered:

- 15 min, 30 min or 1 hour demand
- Additional contiguous hours
- Additional non-contiguous hours
- Super peak kWh – maximum day
- On-peak only vs untimed
- Limits or caps

Concluding Thoughts

- Residential demand charges can work
- Residential demand charges can be understood by residential customers
- Residential demand charges can reduce a customer's peak demand and result in a win for both the customer and the utility
- Technology can help simplify the customer experience and improve results