History of the Definition of Peak Demand Reduction

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First Definition, from 1999

(22) **Peak demand**—Electrical demand at the time of highest annual demand on the utility's system, measured in 15 minute intervals.

(23) **Peak demand reduction**—peak demand reduction on the utility system during the utility system's peak period.

(24) **Peak period**—Period during which a utility's system experiences its maximum demand. For the purposes of this section, the peak period is from May 1 through September 30.

Generally, we looked at the load reduction associated with an efficiency measure and picked the demand reduction coincident with the region's extreme weather, a proxy for system peak.

The highest 15-minute reading was our focus, although in practice an hour was typically used because simulation models work in hourly time periods.

We broke Texas into four regions (El Paso was not included at that time.)

Often, coincidence factors from other states were used to estimate demand reduction when we didn't have 8760 hourly savings profiles.

Second Definition, from 2002

(25) **Peak demand** — Electrical demand at the time of highest annual demand on the utility's system, measured in 15 minute intervals.

(26) **Peak demand reduction** — Peak demand reduction on the utility system during the utility system's peak period, calculated as the maximum average demand reduction over a period of one hour during the peak period.

(27) **Peak period** — Period during which a utility's system experiences its maximum demand. For the purposes of this section, the peak period is from May 1 through September 30, during the hours between 1:00 p.m. and 7:00 p.m., excluding federal holidays and weekends.

The commission agrees that requiring load curtailment to occur for a continuous hour would preclude most residential applications. The commission finds that the intent of the definition is that the value of the peak load curtailment refers to the average total during an hour. The commission adopts EUMMOT's recommendation and has revised the rule accordingly.

With this definition, we continued to calculate savings as reduction coincident with system peaks.

Frontier resisted proposing too many NCP (non-coincident peak) calculations. These were proposed by some parties and might be possible under this definition. But, NCP calculations lead to gaming and need for diversity factors to calculate progress in meeting goals. However, Nexant's calculations prior to 2012 often used an NCP definition.

Third Definition, from 2005

(24) **Peak demand** -- Electrical demand at the times of highest annual demand on the utility's system.

(25) **Peak demand reduction** -- Reduction in demand on the utility system throughout the utility system's peak period.

(26) **Peak period** -- For the purpose of this section, the peak period consists of the hours from one p.m. to seven p.m., during the months of June, July, August, and September, excluding weekends and Federal holidays.

What happened?

Third Definition, from 2005. From the Order:

From the preamble:

Good Company proposed modifying the definition of "peak demand reduction" in proposed subsection (c)(25) to refer to a reduction in demand on the utility system "throughout" the utility system's peak period, instead of "during" the system's peak period.

Good Company noted that the previous definition of "peak demand reduction" calculated the reduction as the maximum average demand reduction over a period of one hour during the peak period. Good Company stated this definition was addressed in the Summit Blue report (Project Number 30170), which stated that these one-hour reductions may not meet commission requirements that measures contribute to a "reduction in growth of demand ... measured at the utility's annual system peak." Good Company stated that Summit Blue recommended that the new definition require load reductions to occur throughout the entire Peak Period. Good Company noted that the new definition, as written, is quite vague, and could be interpreted to mean either one hour during the peak period, or throughout the entire period.

Commission response

The commission agrees with Good Company's modification that would change the definition to mean a reduction in demand on the utility system *throughout* the utility system's peak period .

. . .

What Does the 2005 Order Mean?

We didn't make any major changes.

Rulemaking in 2010

The definitions didn't change.

However, when we asked whether we could clarify that peak demand reduction was to be calculated as the impact of a measure upon demand at the time of the utility's system peak, the PUCT Staff informed us that this wasn't their interpretation of the throughout the utility system's peak period language. It was suggested that we should be looking at average impacts within peak periods.

We informed the staff that it wasn't practical to change everything. We were told us it was fine to gradually introduce more averaging.

Deemed Savings Changes in 2011

So, at Frontier, we started doing some averaging (e.g., August 2011 deemed savings petition for Heat Pump Water Heaters):

Figure 1 is the hourly hot water usage profile (gal/hr) for a residential home. This profile was used to develop the resultant peak kW and coincidence factor (CF) for this measure.
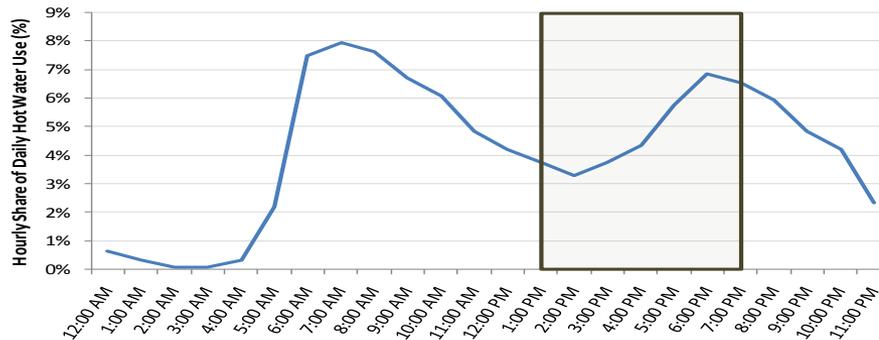

Figure 1. Daily Hot Water Use Profile[1]

Current PUC rules define the summer peak demand period as the hours between 1 PM and 7 PM from June through September. Based on this definition, the peak demand impacts of this measure are associated with the average demand during this window, which is approximately 4.6 percent of daily domestic hot water energy usage.

Deemed Savings Changes In 2011

For certain Photovoltaic Project savings where the PV Watts model was applied, we used the average of the savings over the peak period.

Nexant at first used their traditional approaches for calculating Commercial HVAC savings updates. Then, we suggested they switch to average peak period calculations to comply with the PUC Staff's request. But, because the results were implausible when averaging was performed, they went back to the method they traditionally used.

In 2011-2012

Staff turnover at the PUC.

We stopped averaging the impacts over peak periods, and went back to our previous approaches.

In 2012

The utilities (other than Oncor) filed a petition for new HVAC and Lighting Controls efficiency measures with the PUCT using calculations prepared by CLEAResults. These used the "average" definition again:

The definition of peak kW reduction is based on the average kW savings available "throughout the utility system peak period." The peak period is defined as the "the hours from one p.m. to seven p.m., during the months of June, July, August and September, excluding weekends and Federal holidays." The demand savings are:

$DemandSavings\ [kW]= CFBaseline * kWBaseiine - CFNew * kWNew$

Where:

$CFBaseline = Total\ kWh\ /\ kWhBaseline\ *510$ during the utility defined peak period (510 hours)

$kWBaseline=$ maximum baseline demand during the utility defined peak period

$CFNew = Total\ kWh\ /kWNew*510$ during the utility defined peak period (510 hours in total)

$KWNew=$ maximum post-installation demand during the utility defined peak period

Rulemaking in 2013 (present language)

(44) **Peak demand --** Electrical demand at the times of highest annual demand on the utility's system. Peak demand refers to Texas retail peak demand and, therefore, does not include demand of retail customers in other states or wholesale customers.

(45) **Peak demand reduction --** Reduction in demand on the utility's system at the times of the utility's summer peak period or winter peak period.

(46) **Peak period --** For the purpose of this section, the peak period consists of the hours from one p.m. to seven p.m., during the months of June, July, August, and September, and the hours of 6 to 10 a.m. and 6 to 10 p.m., during the months of December, January, and February, excluding weekends and Federal holidays.

Note that the word "throughout" no longer appears.

From the Order:

The commission notes that the peak period reflects the time of highest peak demand on the utility's system.

Where Are We Now?

We have different deemed savings values and calculator spreadsheets which use different definitions of peak demand reduction (depending upon the vintage of the savings calculation and who prepared them).

This is a consequence of:

- The PUCT changing the definitions every couple years, and

- Unclear rule language which can be interpreted many different ways.

Most of the calculations try to estimate the impact of an efficiency measures coincident with the utility's system peak. But, there are exceptions.

Demand Reduction Comparison Under Various Definitions

Calculations Based on Five Different Definitions

- **Frontier's suggested approach:** Select 20 peak hours for each season (summer and winter) using a probabilistic approach based on years of historical ERCOT load data. (Utility-specific data would be used if this were actually applied.)

- **Top 2 Hours of All Peak Months:** 4:00-6:00pm in summer (June, July, August and September) non-holiday weekdays; 7:00-9:00pm in winter (December, January and February)

- **Top Hour, Peak Month:** summer - 2 hours with highest temperature in each month (June, July, August and September); winter – 2 hours with lowest temperature in each month (December, January and February) while within peak period (6-10am and 6-10pm). TMY weather data are applied here.

- **Heat Wave/Cold Snap:** summer - 2-5pm each day for hottest 3 consecutive days within a year; winter – 6-8am & 8-10pm each day for coldest 3 consecutive days within a year. TMY weather data are applied here.

- **Average Impact over 510 Hours:** summer – 1-7 pm every weekday in summer (June, July, August and September); winter – 6-10am and 6-10pm every weekday in winter (December, January and February)

Calculation Steps

- **Data Source:**

  8760-hour (whole year hourly) load profile for "base" situation simulated by EnergyGauge or eQuest

  8760-hour (whole year hourly) load profile for "change" situation – after making several energy-saving adjustments

- **Calculation Procedure:**

  1. 8760 kW Savings = "Base" kW – "Change" kW

  2. Picking out specific hours based on different methods criteria mentioned above

  3. Calculate average kW savings of these specific hours

- **Specifically, for lighting kW saving:**

  Frontier assumed an average of 30% of the original usage would be saved if some energy-saving lighting equipment is installed.

Examples: Demand Savings Estimates Under Various Scenarios

- Summer – kW Savings
    - Ceiling Insulation added to a home in Austin
    - Air Infiltration reduction in an Austin home
    - Indoor Lighting efficiency (the same % reduction in each hour of the year)
    - Outdoor Lighting efficiency
    - CFL installed in households
- Winter – kW Savings
    - *Same measures as the Summer calculations*
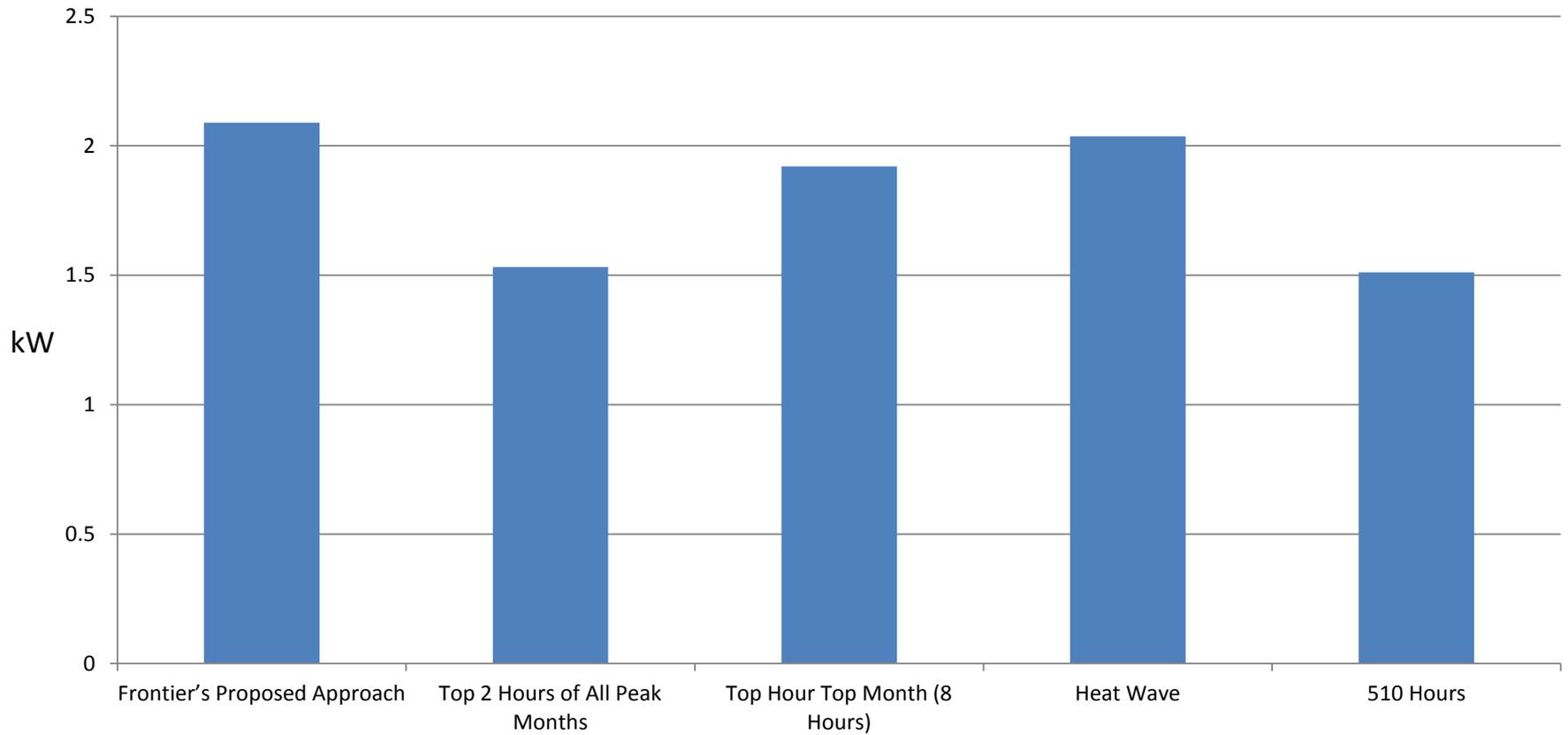- Schools (with limited summer sessions) – Summer kW Savings
    - Lighting
    - HVAC

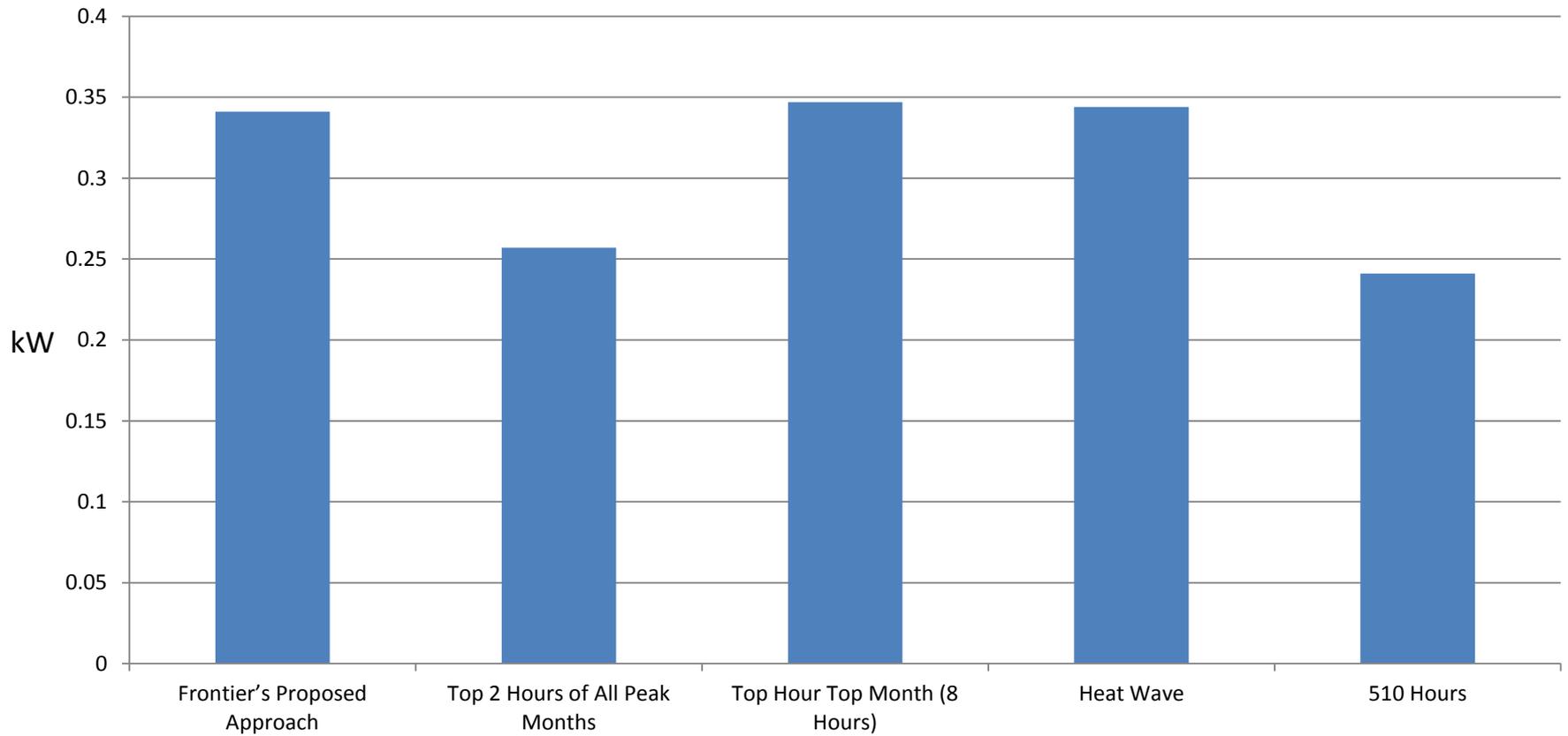# Summer Peak Demand Savings Estimates

	Summer - Ceiling Insulation Austin (kW)	Summer - Air Infiltration Austin (kW)	Summer - Indoor Lighting Austin (kW)	Summer - Outdoor Lighting Austin (kW)
Frontier's Proposed Approach	2.089	0.341	0.062	0
Top 2 Hours of All Peak Months	1.531	0.257	0.087	0
Top Hour Top Month (8 Hours)	1.92	0.347	0.052	0
Heat Wave	2.036	0.344	0.056	0
510 Hours	1.511	0.241	0.069	0

Summer - Ceiling Insulation Austin (kW)

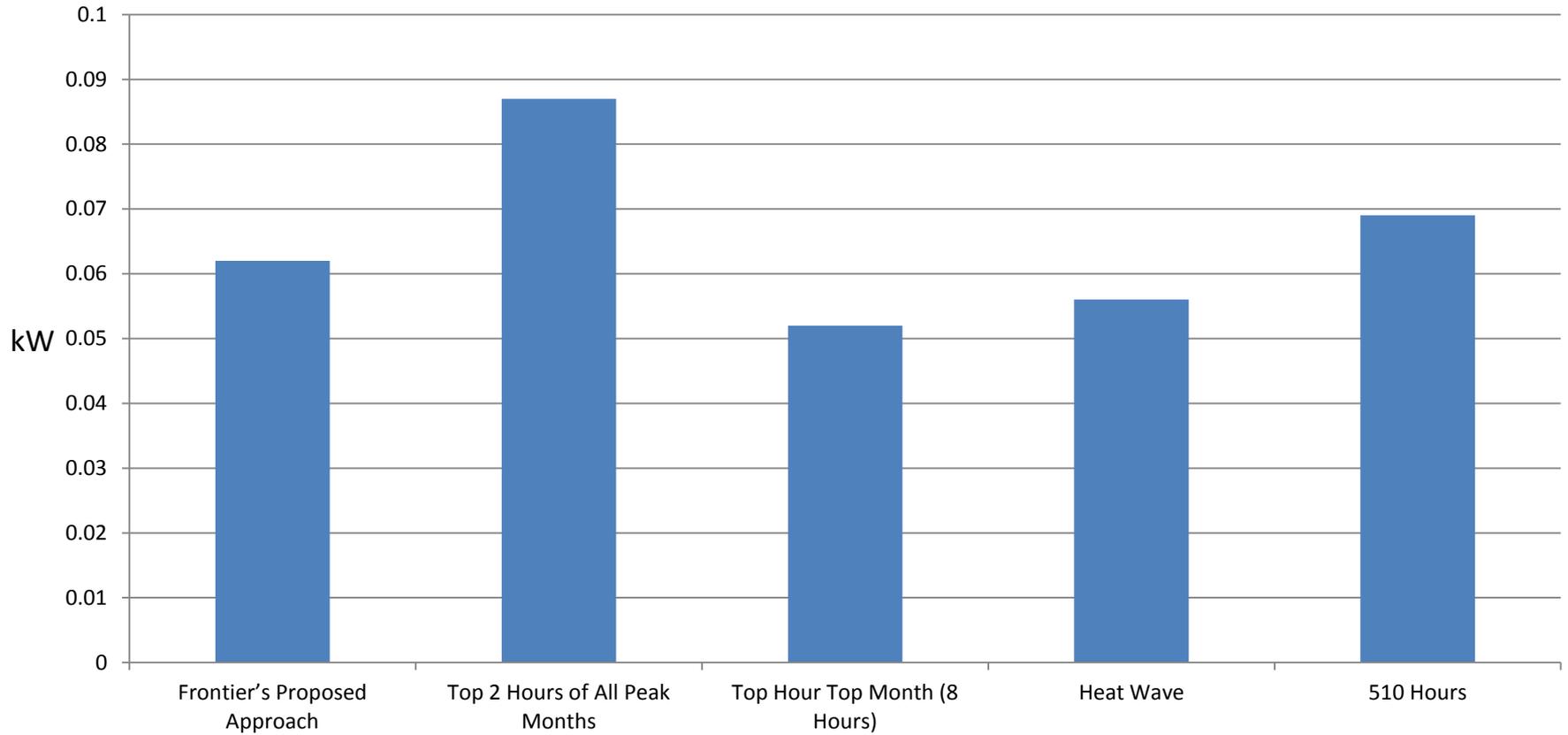| Category	kW
Frontier's Proposed Approach	2.09
Top 2 Hours of All Peak Months	1.53
Top Hour Top Month (8 Hours)	1.92
Heat Wave	2.04
510 Hours	1.51

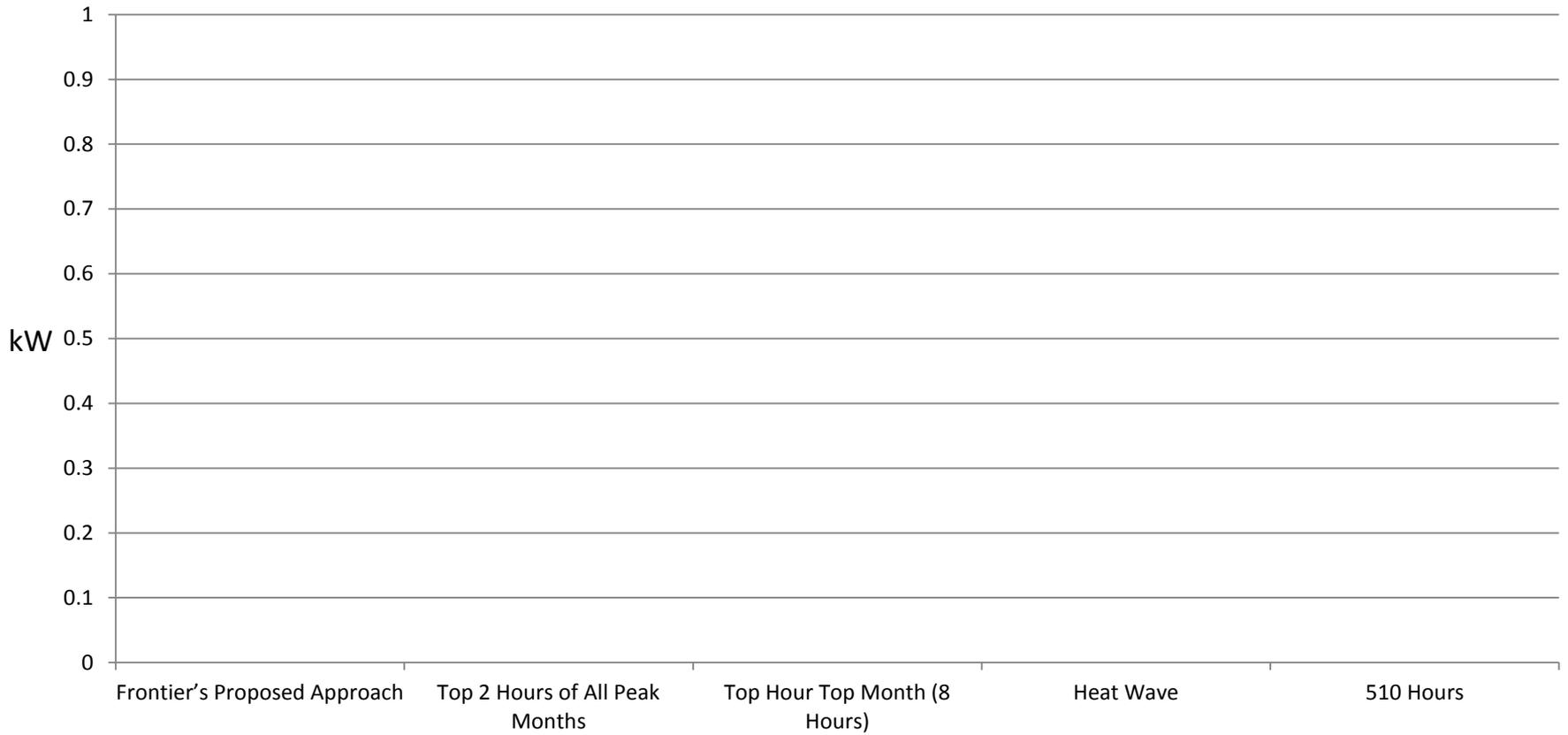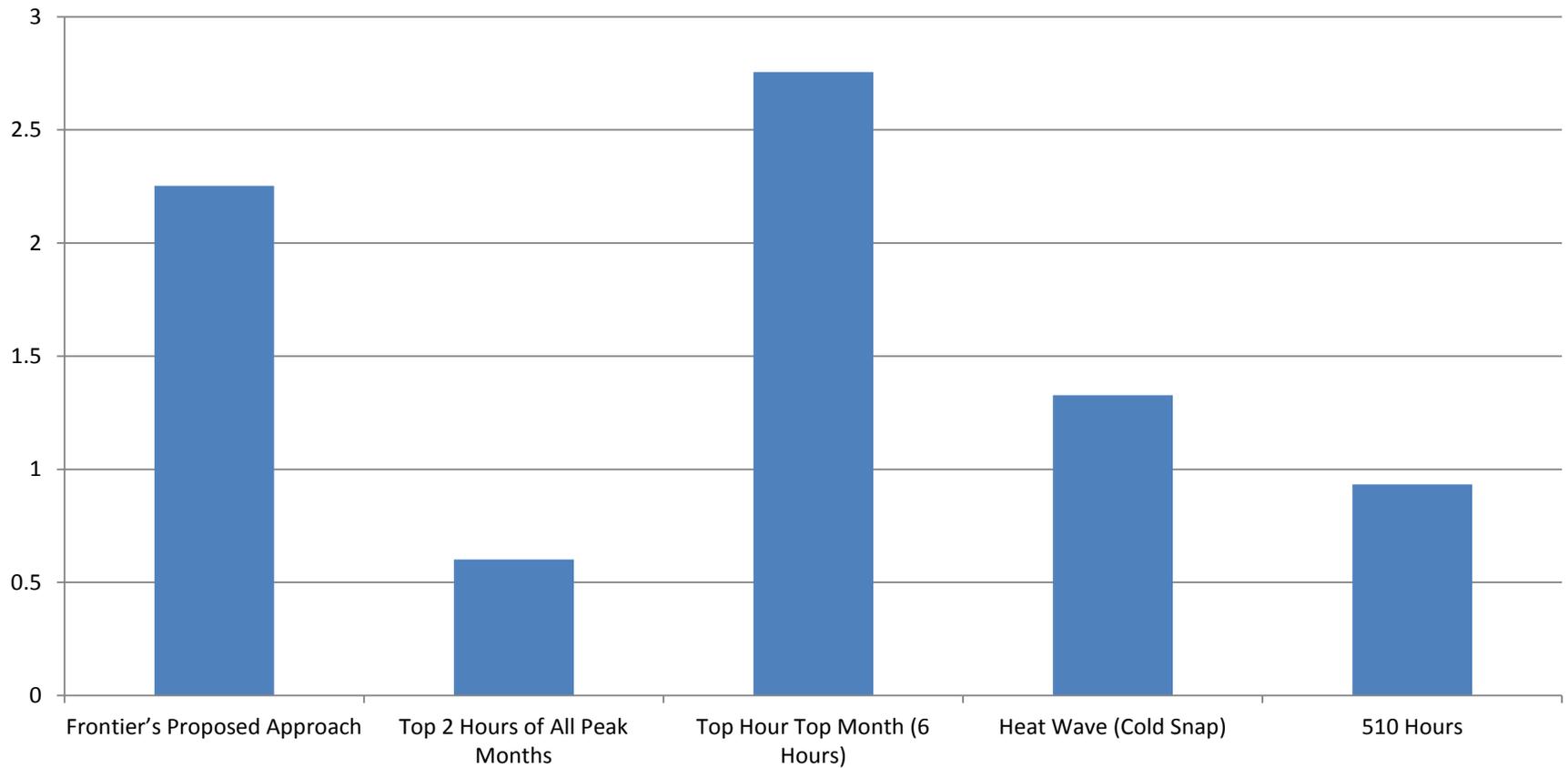Summer - Air Infiltration Austin (kW)

Summer - Indoor Lighting Austin (kW)

Summer - Outdoor Lighting Austin (kW)
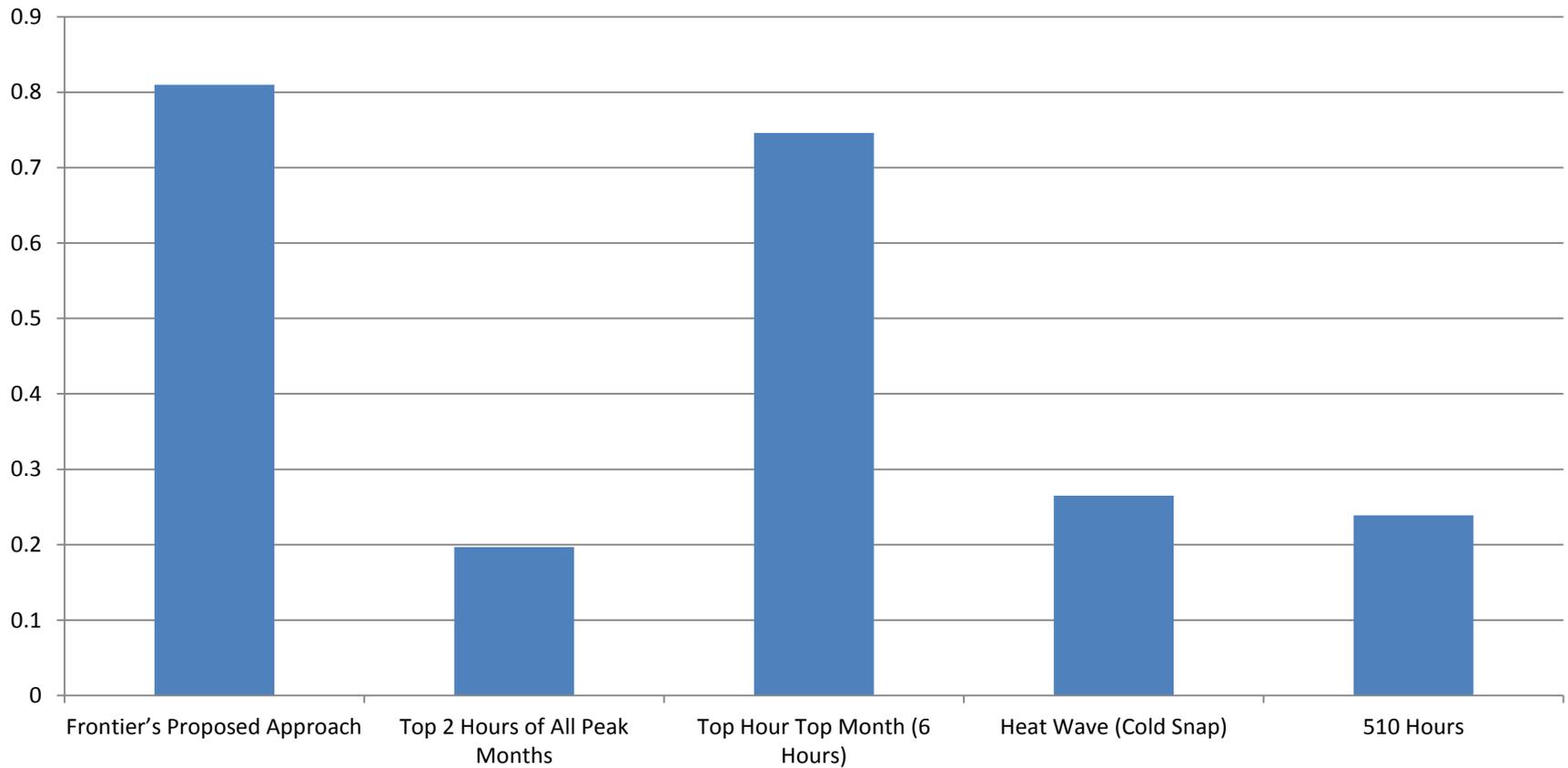
Peak Hour kW Savings Estimates - Winter

	Winter - Ceiling Insulation Austin (kW)	Winter - Air Infiltration Austin (kW)	Winter - Indoor Lighting Austin (kW)	Winter - Outdoor Lighting Austin (kW)
Frontier's Proposed Approach	2.253	0.81	0.134	5
Top 2 Hours of All Peak Months	0.601	0.197	0.183	5
Top Hour Top Month (6 Hours)	2.756	0.746	0.064	5
Heat Wave (Cold Snap)	1.327	0.265	0.123	5
510 Hours	0.933	0.239	0.105	3.583

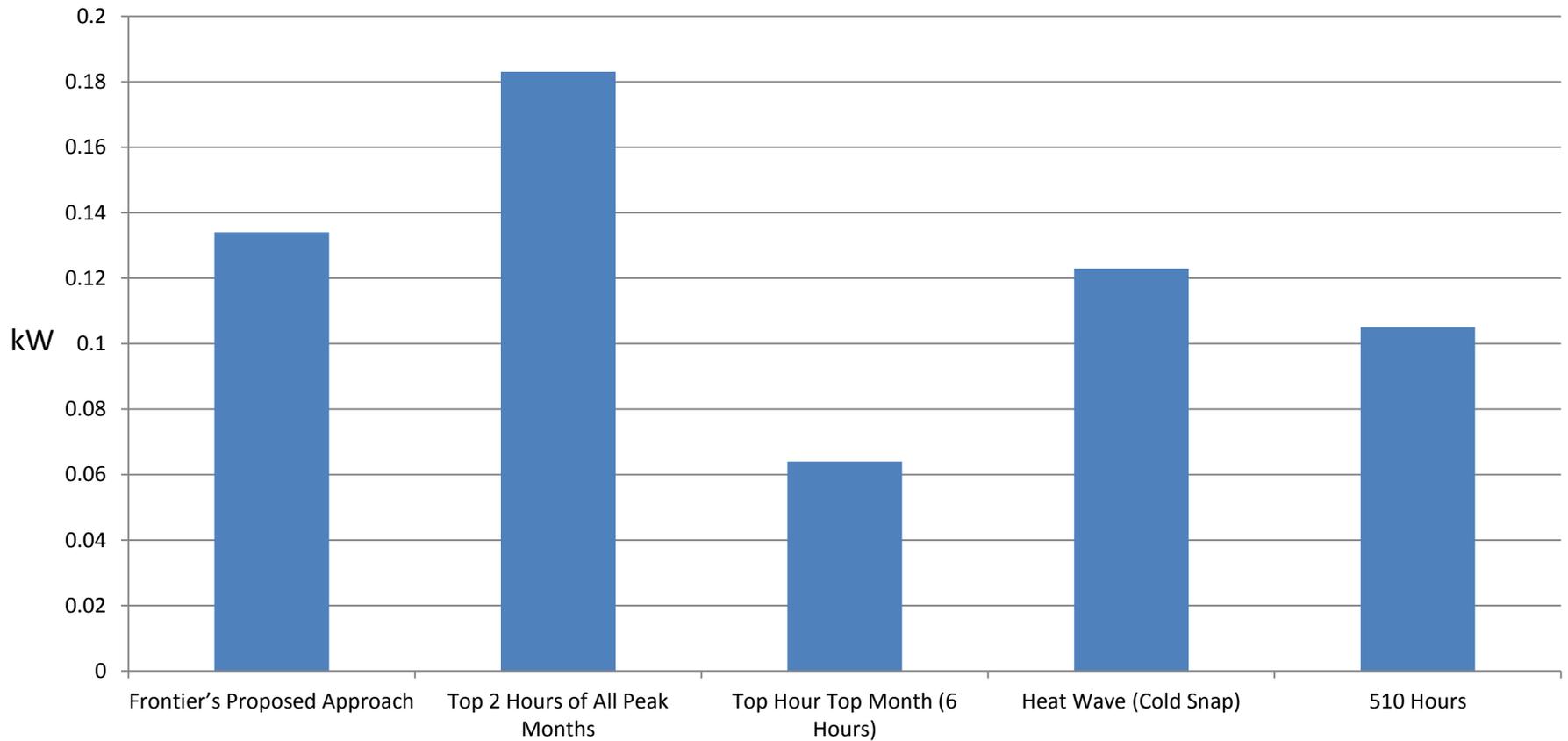# Winter - Ceiling Insulation Austin (kW)
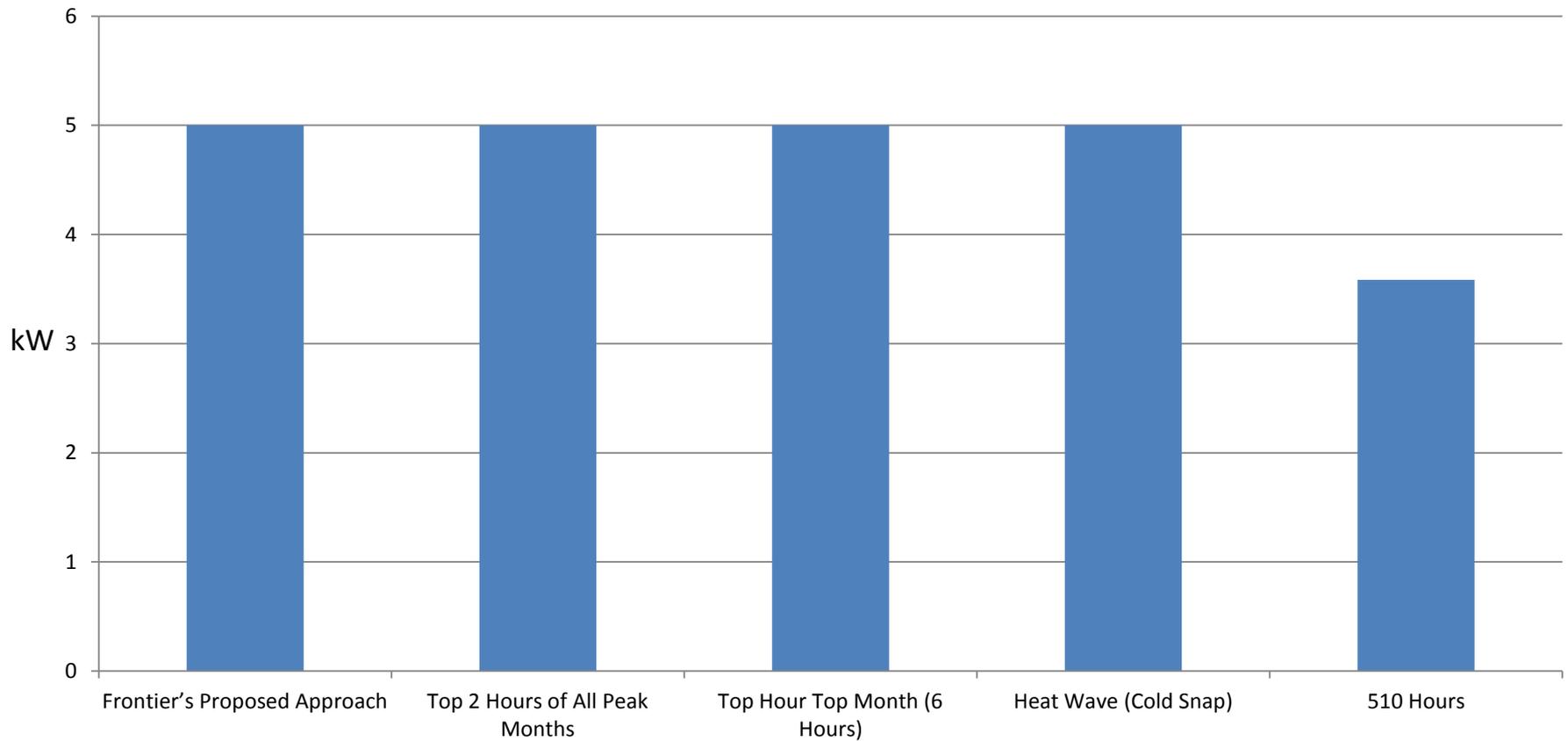
Winter - Air Infiltration Austin (kW)

Winter - Indoor Lighting Austin (kW)

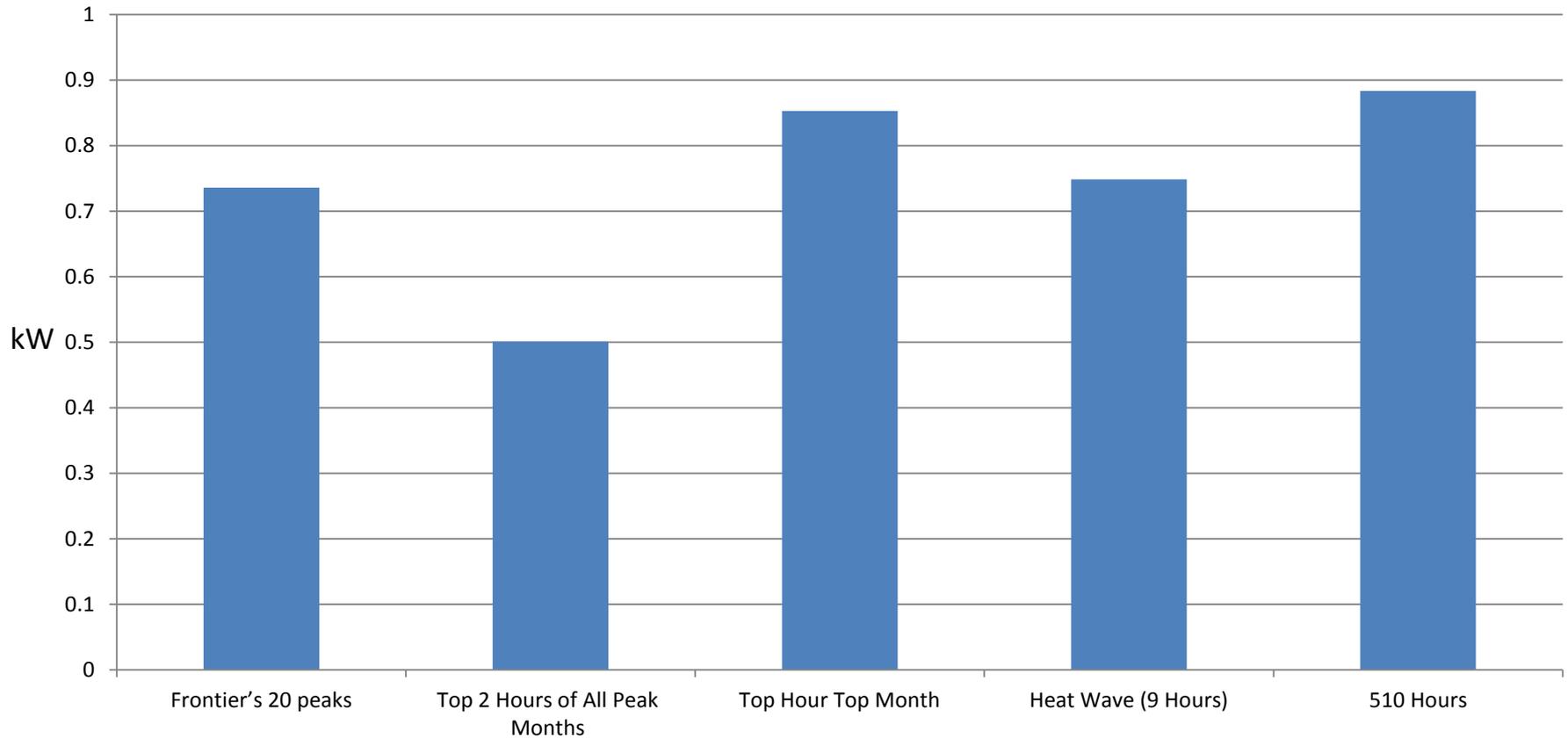Winter - Outdoor Lighting Austin (kW)

Summer Peak Hour kW Savings Estimates - Schools

	Lighting – School with limited summer sessions (kW)	HVAC – School with limited summer sessions (kW)
Frontier's 20 peaks	0.73544	3.973
Top 2 Hours of All Peak Months	0.5007	3.239
Top Hour Top Month	0.8527	3.723
Heat Wave (9 Hours)	0.7486	4.697
510 Hours	0.8832	3.247

Lighting – School with limited summer sessions (kW)

Bar chart with y-axis labeled "kW" ranging from 0 to 1:
- Frontier's 20 peaks: ~0.735
- Top 2 Hours of All Peak Months: ~0.50
- Top Hour Top Month: ~0.85
- Heat Wave (9 Hours): ~0.75
- 510 Hours: ~0.885

HVAC – School with limited summer sessions (kW)