



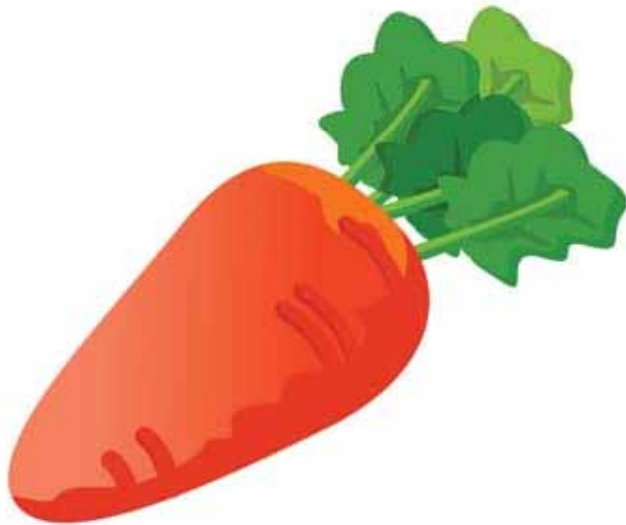
Demand Response: The Stick is Mightier Than the Carrot

Yingjuan Du, Priya Sathe, Dave Hanna and Jean Shelton
Itron Inc., San Diego, CA
Feb 2012

We Energy DR Programs

- PTR

\$0.47/kWh saved.
Nothing to lose



- CPP

Price increased from
\$0.287 to \$0.88



Overview

- Data
- Estimation of the impacts of the two programs
- What factors contributed to the impacts
- Comparison between the two programs

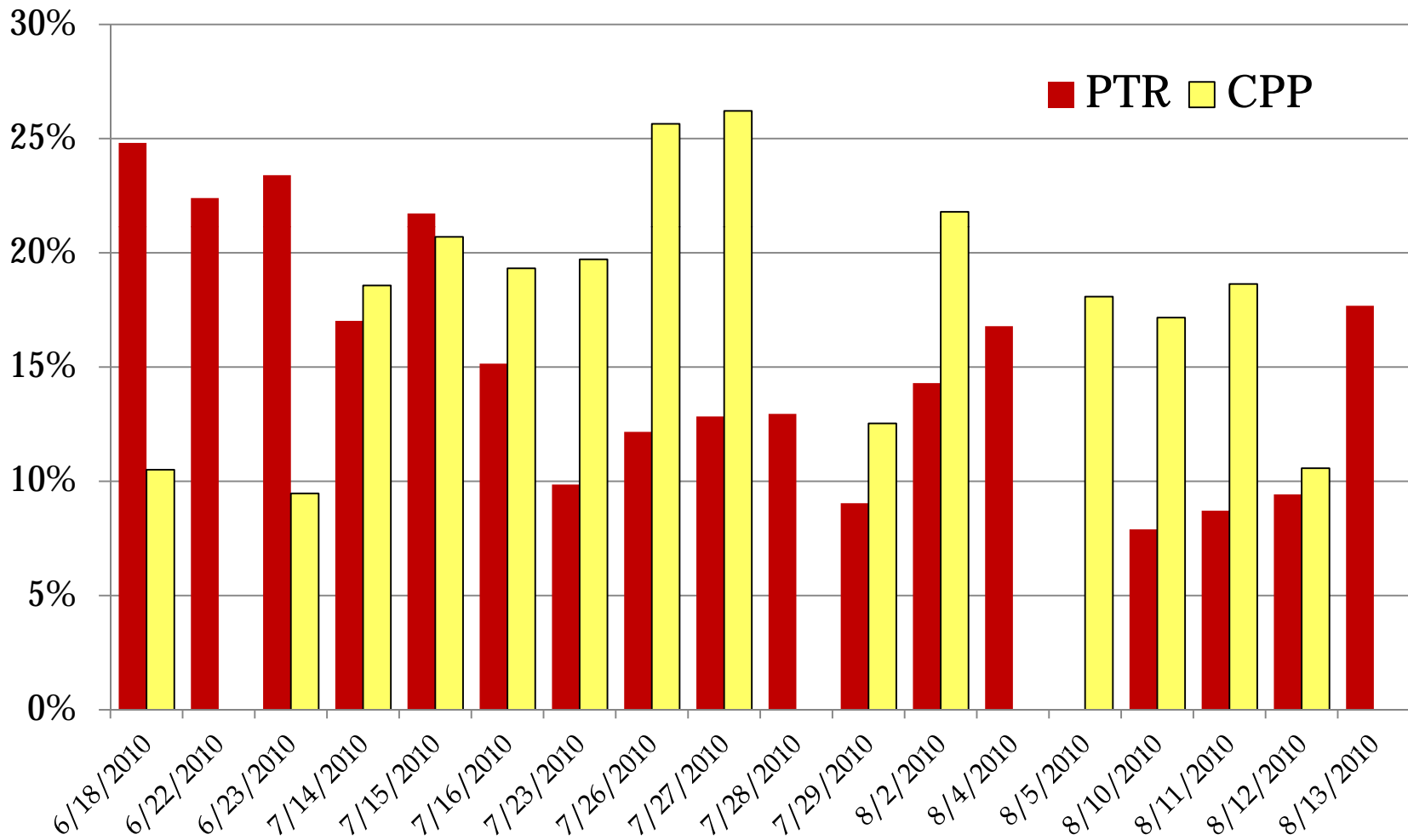
Data

- TOU data From May 1, 2010 to September 10, 2010, excluding holidays and weekends
- 500 PTR Participants
- 111 CPP Participants
- 17 PTR events
- 14 CPP events

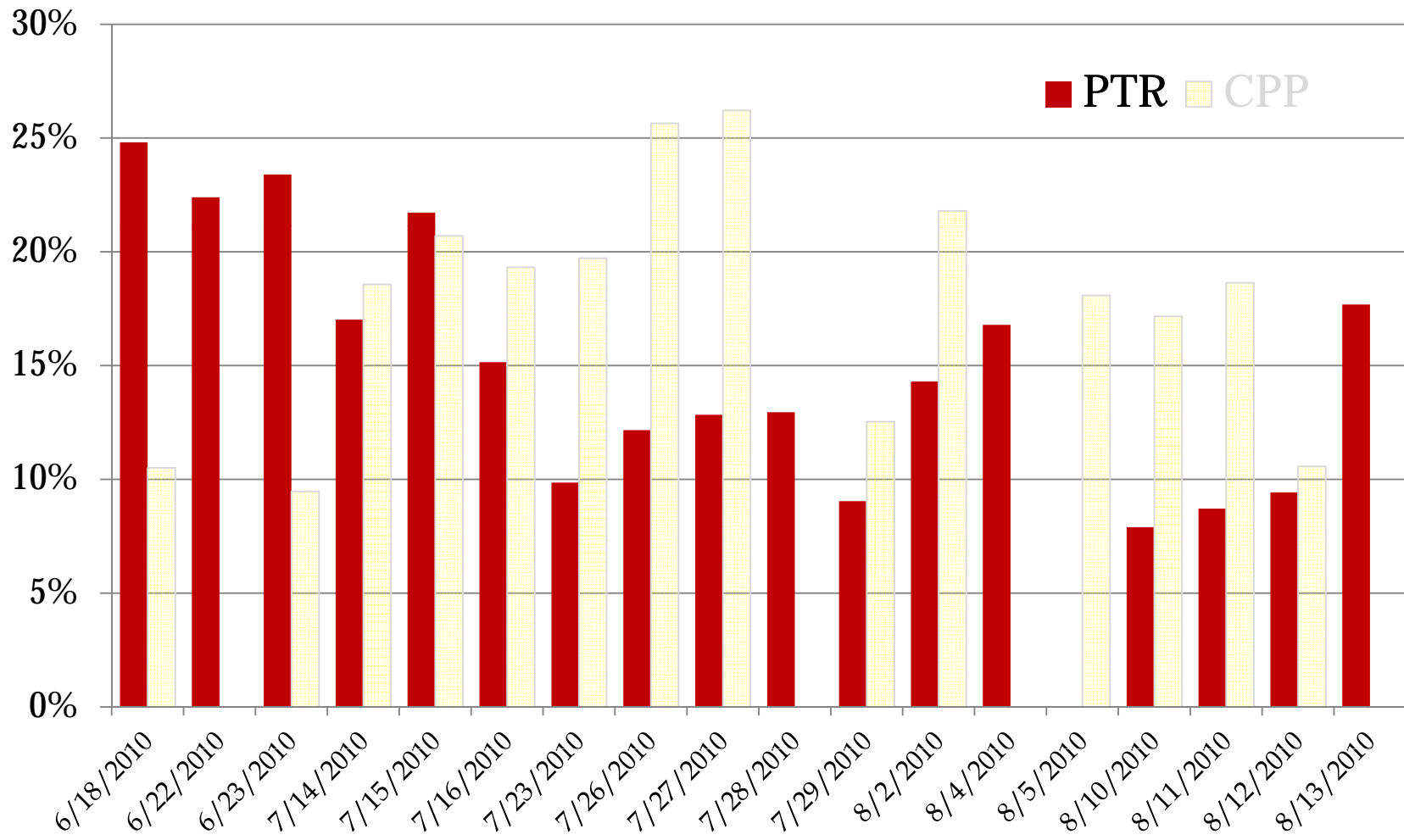
Estimate the Impacts

$$\begin{aligned} \textit{OnPeakUsage} &= \beta_0 + \beta_1 \times \textit{Event} \\ &+ \beta_2 \times \textit{MidPeakUsage} + \beta_3 \times \textit{OffPeakUsage} \\ &+ \beta_4 \times \textit{MidPeakUsage} \times \textit{Event} \\ &+ \beta_5 \times \textit{OffPeakUsage} \times \textit{Event} \\ &+ \beta_6 \times \textit{CDD}_{70} + \beta_7 \times \textit{CDD}_{84} + \beta_8 \times \textit{HDD}_{60} + \beta_9 \times \textit{CTHI} \\ &+ \beta_{10} \times \textit{CDD}_{70} \times \textit{Event} \\ &+ \beta_{11} \times \textit{CDD}_{84} \times \textit{Event} \\ &+ \beta_{12} \times \textit{CTHI} \times \textit{Event} \\ &+ \beta_{13} \times \textit{Third} + \sum_d \beta_{14}^d \times \textit{day}_d + \sum_m \beta_{15}^m \times \textit{month}_m \end{aligned}$$

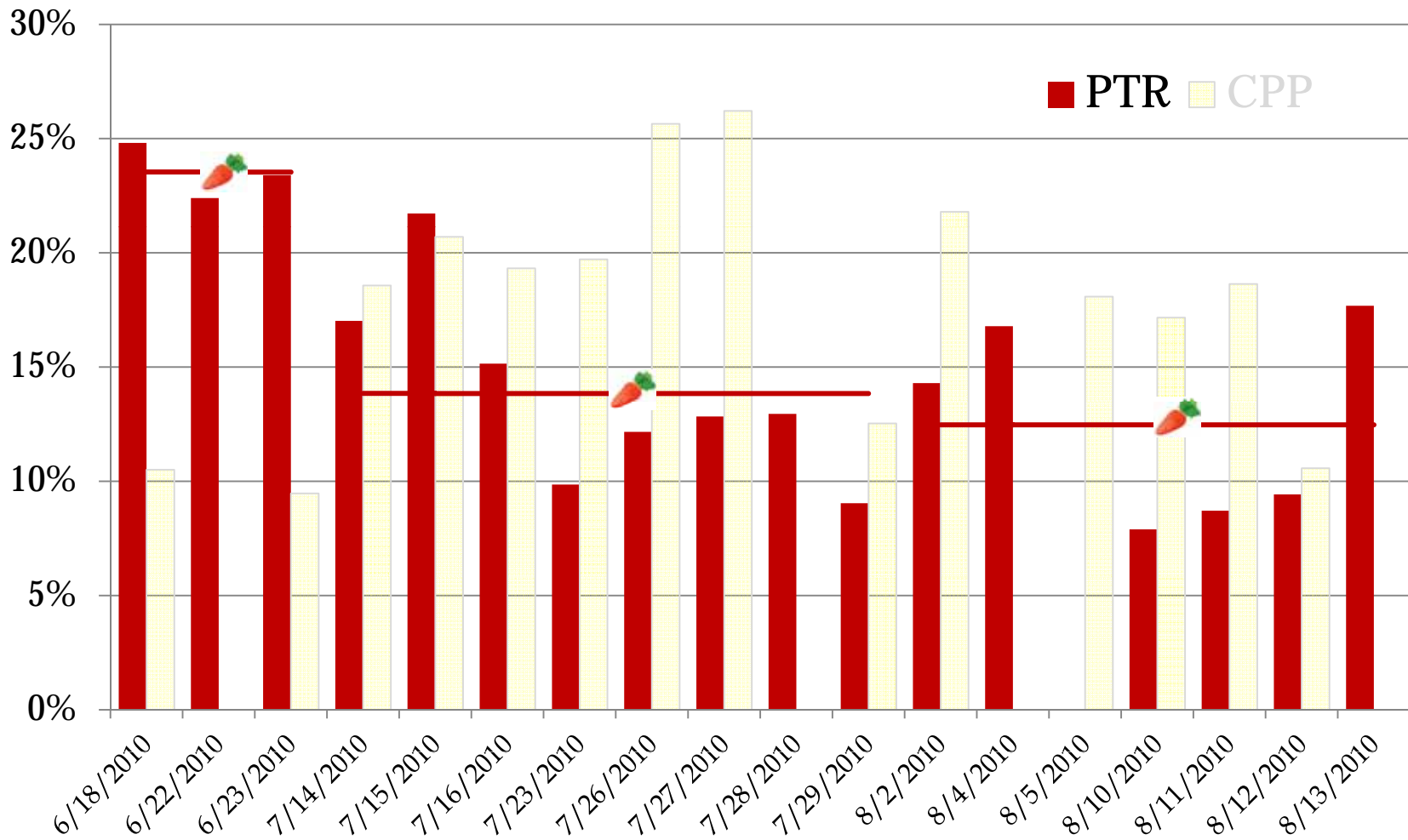
Percentage Impacts



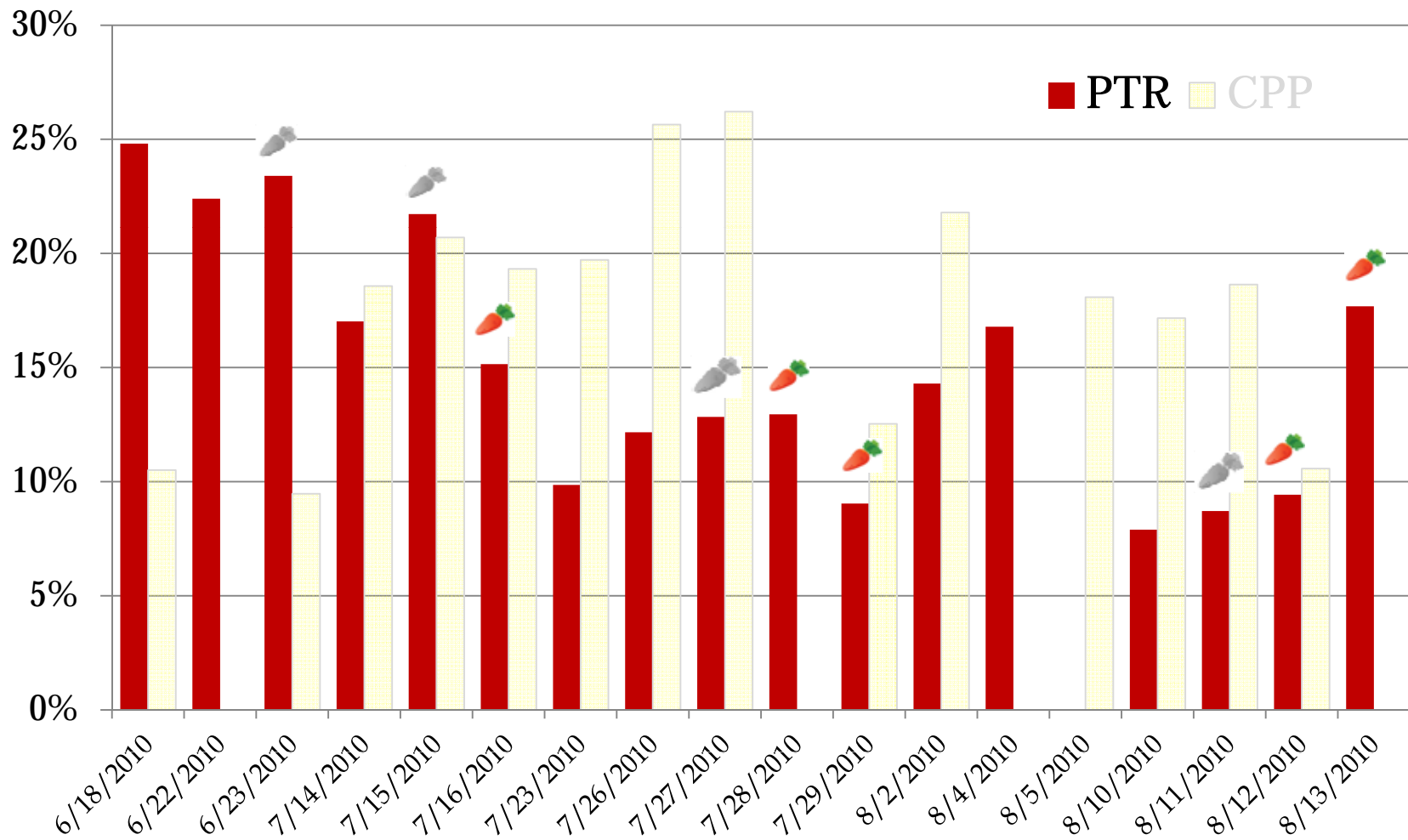
Percentage Impacts – PTR



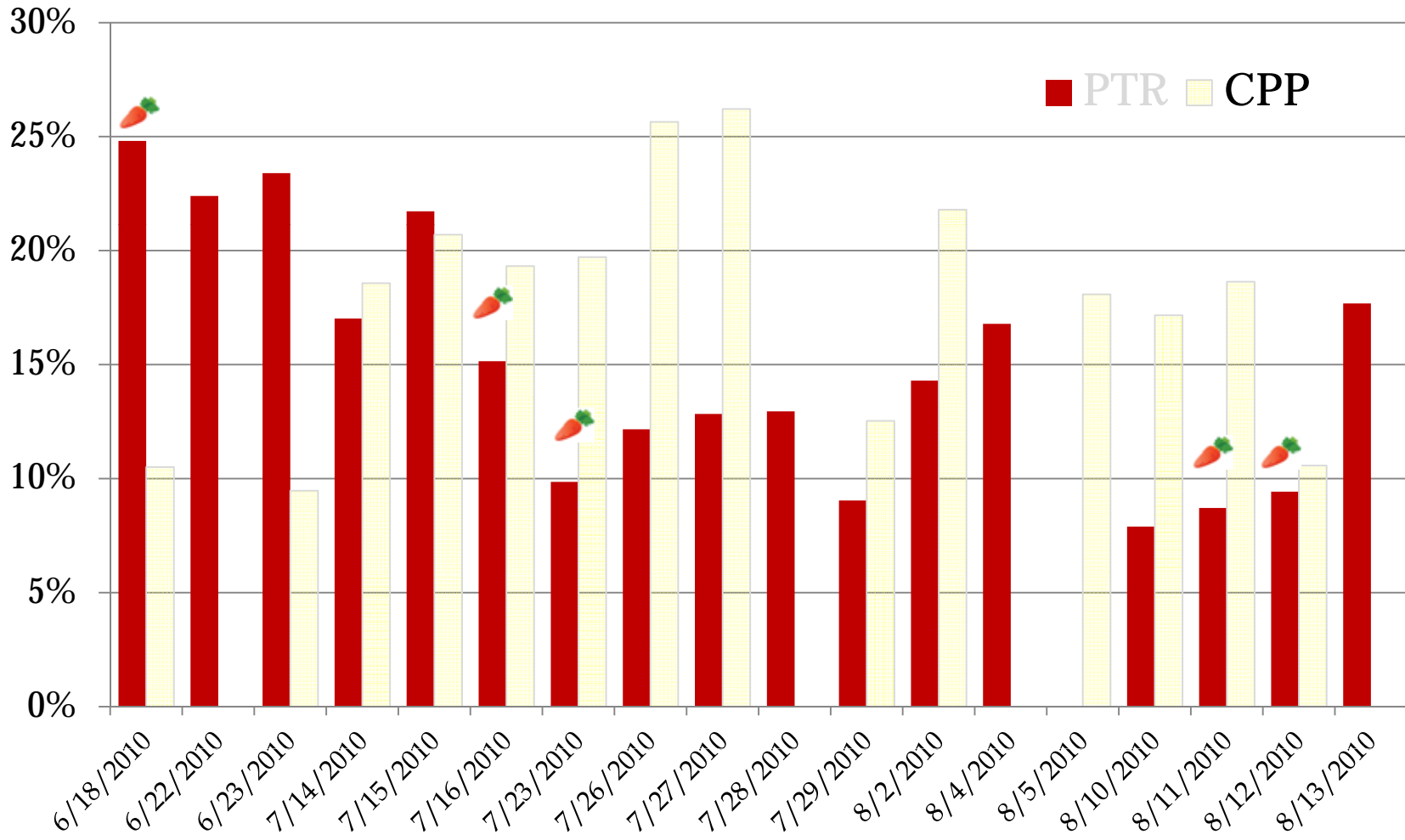
PTR % Impacts – by Month



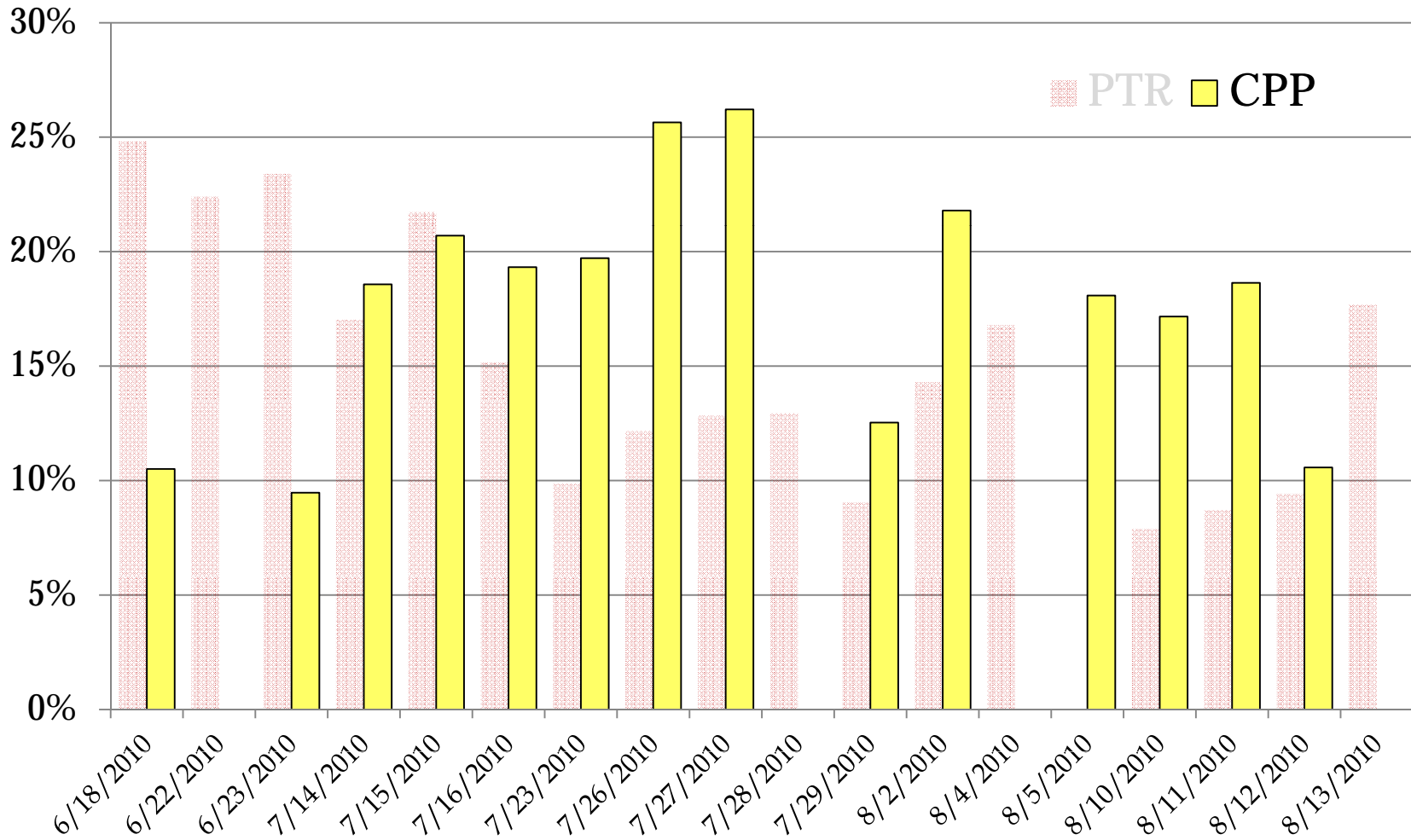
PTR % Impacts – Consecutive Events



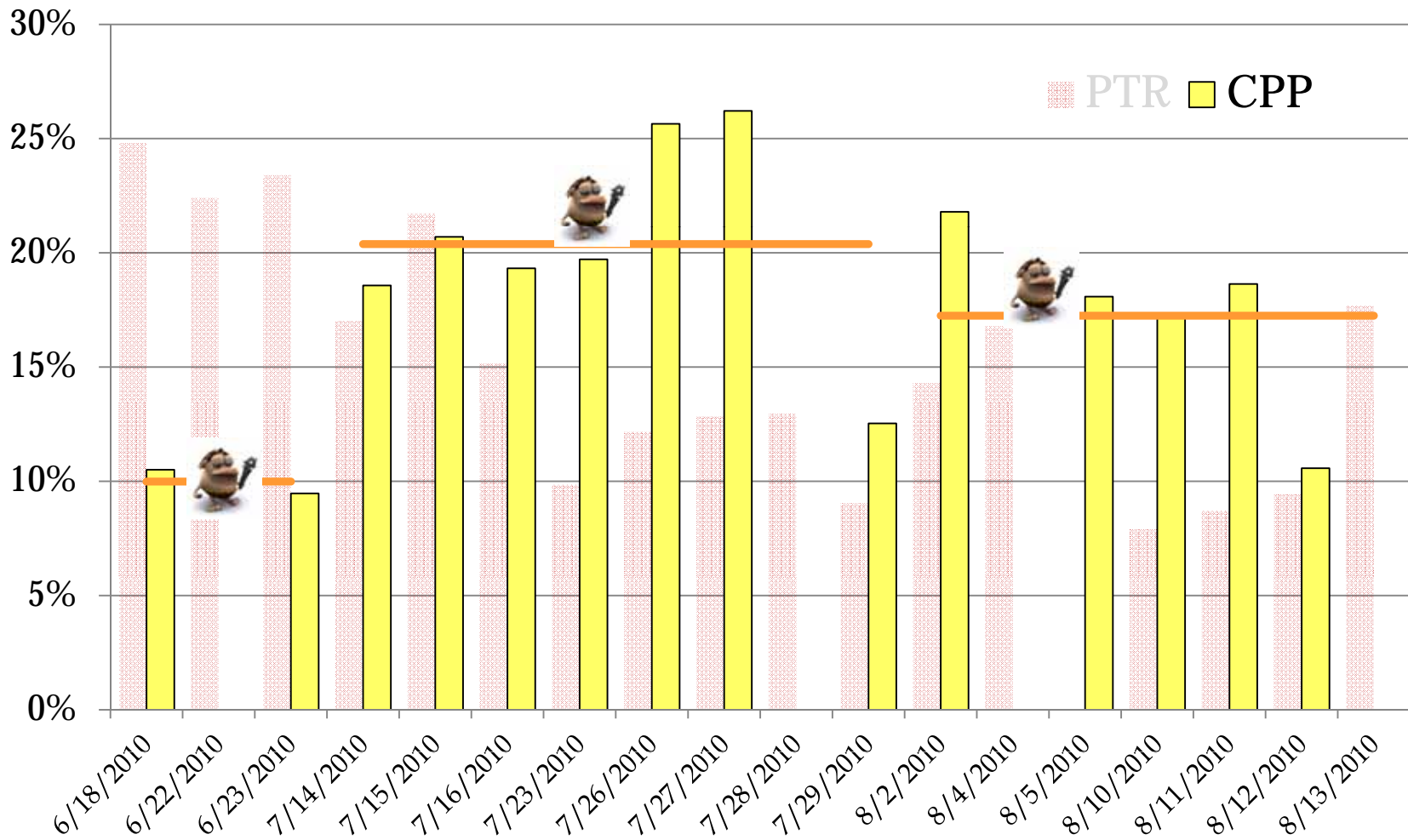
PTR % Impacts – Temperature?



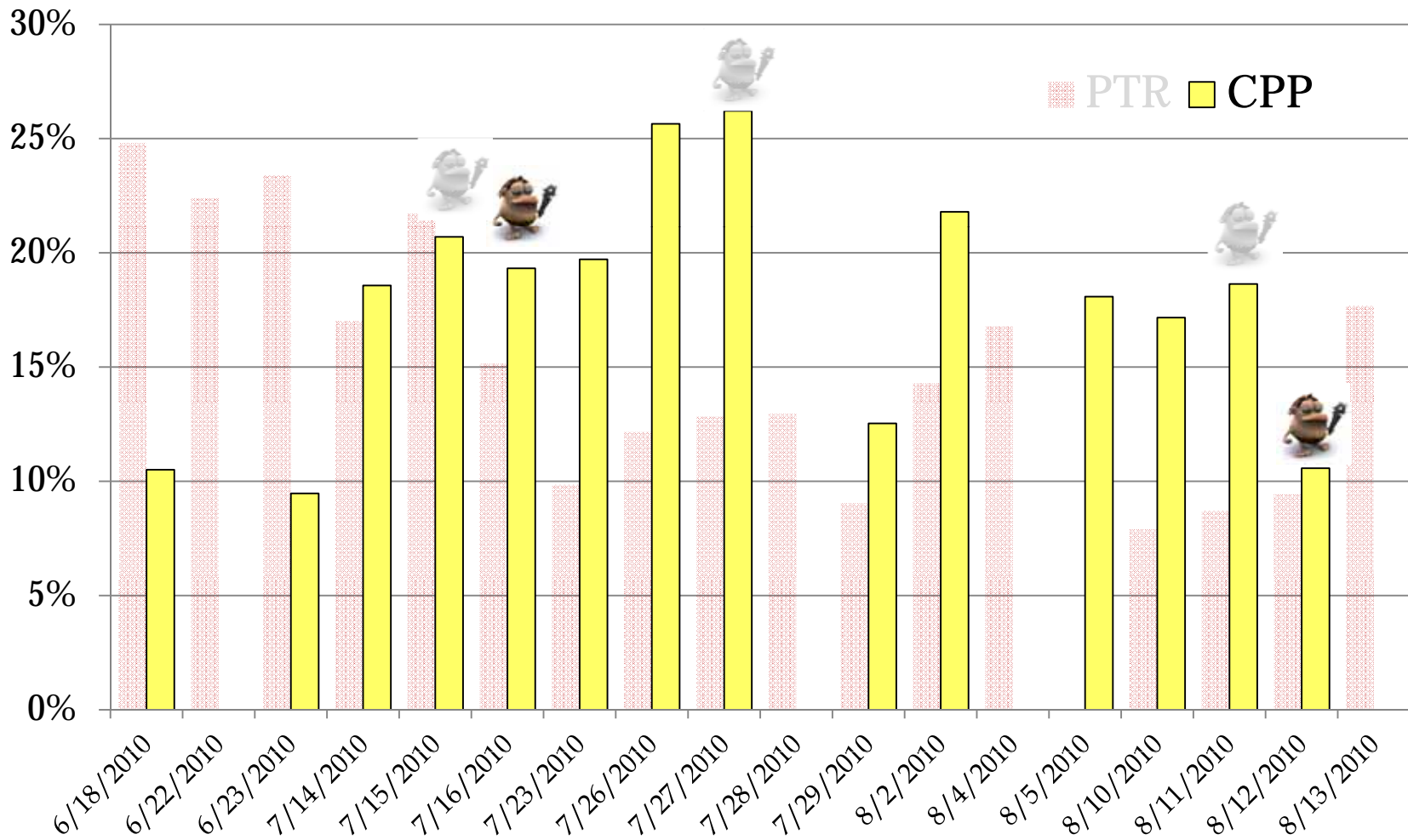
Percentage Impacts – CPP



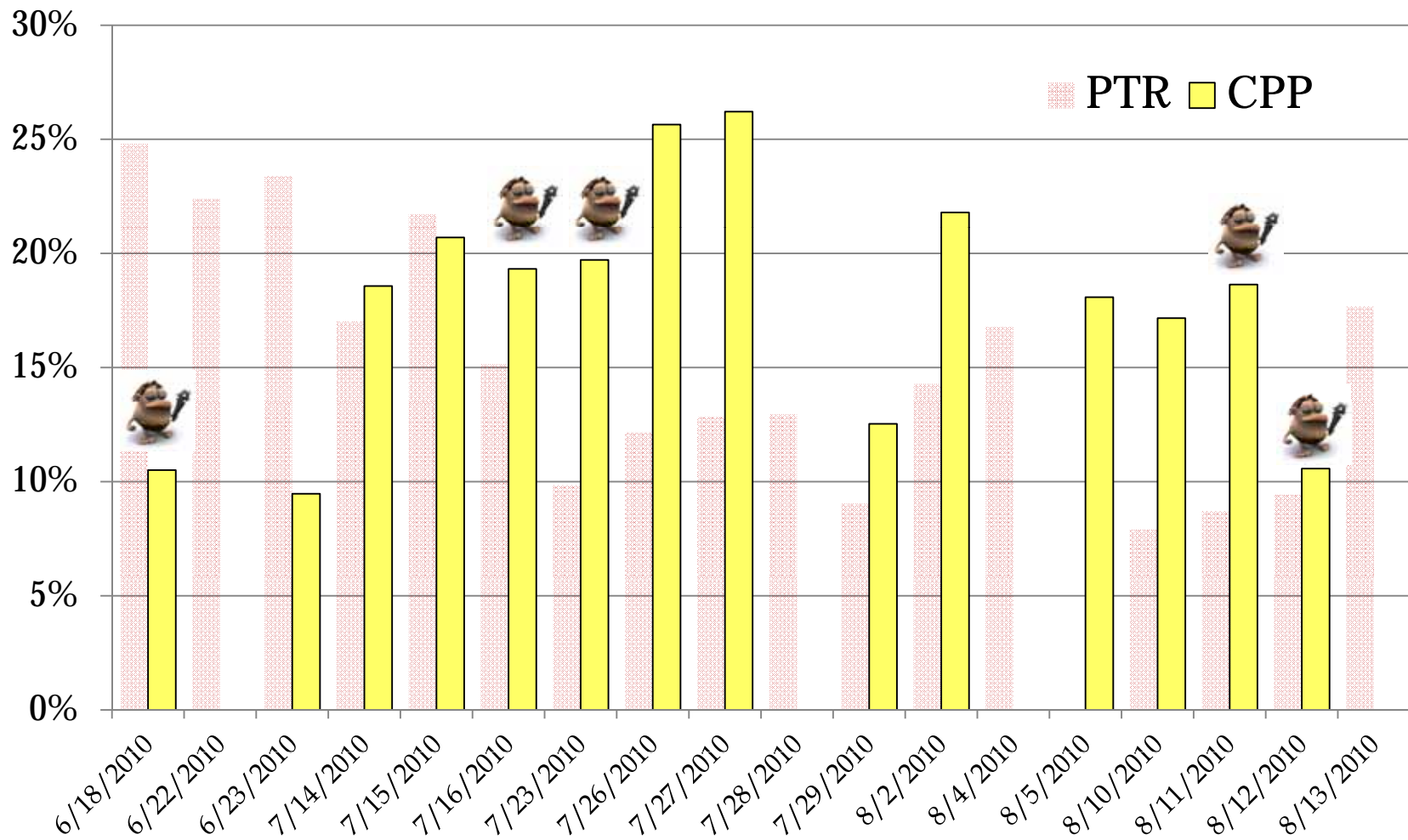
CPP % Impacts – By Month



CPP % Impacts – Consecutive Events



CPP % Impacts – Temperature (?)



Analyze the Impacts – PTR

Dependent variable = IMPACT

Variable	Parameter Estimate	Standard Error	t Value	Pr > t
Second	-0.040	0.043	-0.94	0.3470
Third	-0.089	0.042	-2.14	0.0320
CTHI	0.047	0.016	2.88	0.0040
CDD_70	0.009	0.014	0.69	0.4890
CDD_84	-0.072	0.024	-3.02	0.0030
July	-0.151	0.036	-4.24	<.0001
August	-0.272	0.063	-4.31	<.0001
Day2	-0.001	0.052	-0.01	0.9900
Day3	0.026	0.051	0.51	0.6100
Day4	0.037	0.054	0.70	0.4860
Day5	-0.019	0.062	-0.31	0.7550

* 500 site dummy variables not reported to save space

Analyze the Impacts – CPP

Dependent variable = IMPACT

Variable	Parameter Estimate	Standard Error	t Value	Pr > t
Second	0.326	0.153	2.13	0.033
Third	0.182	0.218	0.83	0.404
CTHI	0.053	0.044	1.22	0.223
CDD_70	-0.027	0.028	-0.95	0.342
CDD_84	-0.069	0.068	-1.01	0.312
July	0.196	0.113	1.73	0.084
August	0.327	0.175	1.87	0.062
Day2	0.010	0.109	0.09	0.930
Day3	-0.046	0.187	-0.25	0.806
Day4	-0.102	0.089	-1.14	0.254
Day5	0.101	0.187	0.54	0.589

* 111 site dummy variables not reported to save space

PTR vs. CPP

- **PTR**

- **Average impact: 15%**
- **Impacts decreased for consecutive events**
- **Impacts decreased as time went by**
- **Weather effects significant**

- **CPP**

- **Average impact: 18%**
- **Impacts increased for consecutive events**
- **Impacts increased as time went by**
- **Weather effects not significant**



Thank you for coming!

謝



Save the Date

May 15-17, 2012

**AESP's Spring Conference
Baltimore, MD**

Oct. 15-17, 2012

**AESP's Fall Conference
Long Beach, CA**

Jan. 28-31, 2013

**AESP's 23rd National Conference
Orlando, FL**

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