

Panel Discussion

PI System for Data Science Research & Curricula

Presented by **John Matranga, OSIsoft**

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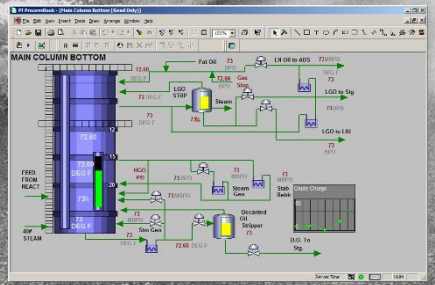
Speakers Today

- John Matranga - OSIsoft
  - Director Customer Innovation & Academia
- Dan Lopresti - Lehigh University
  - Professor and Chair of Lehigh's Department of Computer Science
    Director of Lehigh Data X Initiative
- Donald Paul - University of Southern California
  - Executive Director, USC Energy Institute
    William M. Keck Chair of Energy Resources
    Research Professor of Engineering
- Juliette Spinnato - Total
  - Data Scientist, Refining & Chemical Business unit
- Rob Mulla - Pepco Holdings, Inc.
  - Senior Engineer

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OSIsoft Transformation



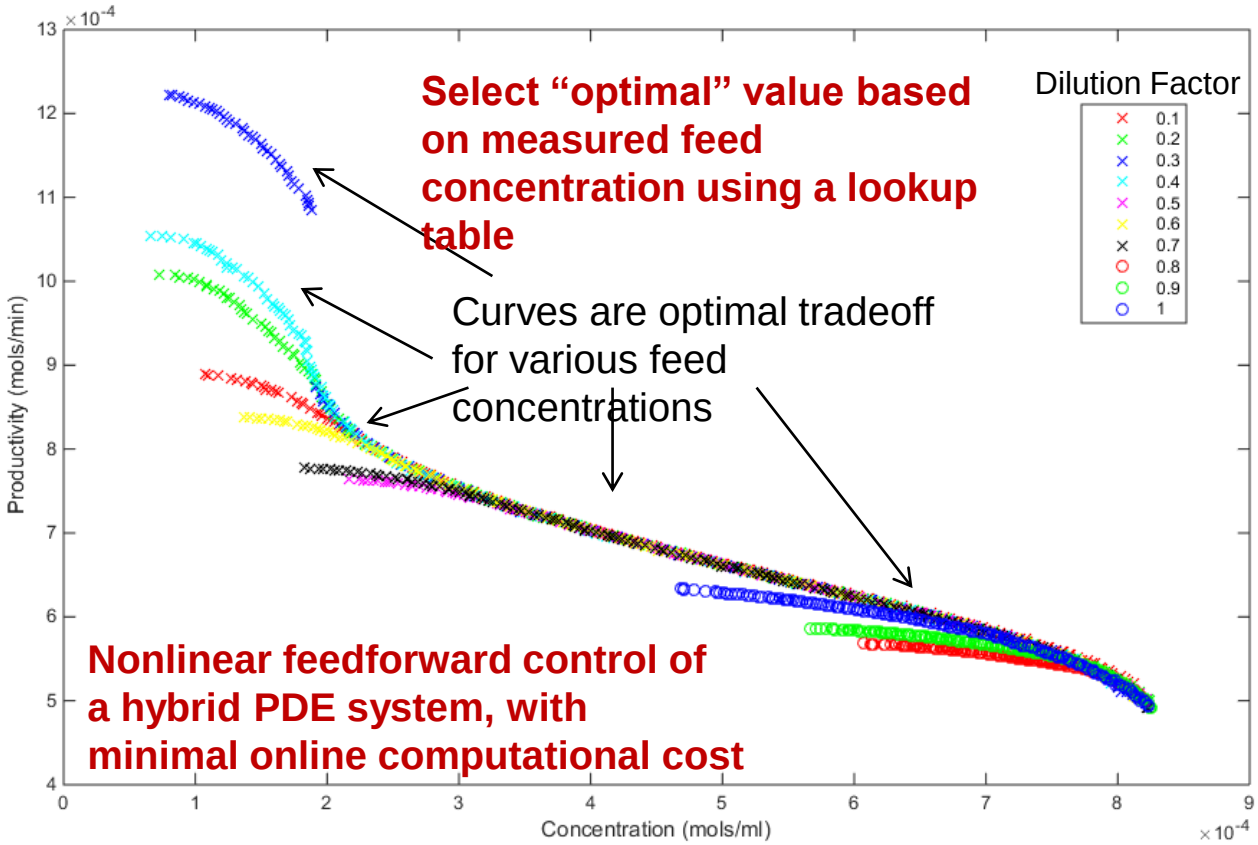






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Pareto Optimality (Tradeoff Curve)



A.E. Lu, J.A. Paulson, N.J. Mozdzierz, A. Stockdale, A.N. Ford Versypt, K.R. Love, J.C. Love, R.D. Braatz (2015). Control systems technology in the advanced manufacturing of biologic drugs. Proc. of the IEEE Conference on Control Applications, 1505-1515.

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The PI System: Real-Time Data Infrastructure in Action



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OSISOFT Academic Symposium

Energy Systems Research and Education

Donald L. Paul

Executive Director, USC Energy Institute

Professor of Engineering

William M. Keck Chair of Energy Resources

20 March 2017

USC Viterbi School of Engineering

University of Southern California

PI as a research and education platform

- Enabling complex systems research
- Supporting industrial partnerships
- Building “Engineering +” education

Chevron – USC Partnership

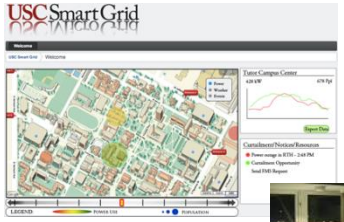
CiSoft

Center for
Interactive
Smart Oilfield
Technologies

Est. Dec. 2003



USC Smart Grid with OT / IT analytics for operational and information security



50,000 Person
USC Campus



USC Power Grid
Control Center

Campus
LAN

Securit
y Lab



Northrop
Grumman



Industrial Apps



OSISoft PI

SCADA
Sniffer

SCADA
Sniffer

SCADA
Sniffer



Power Sub-
stations



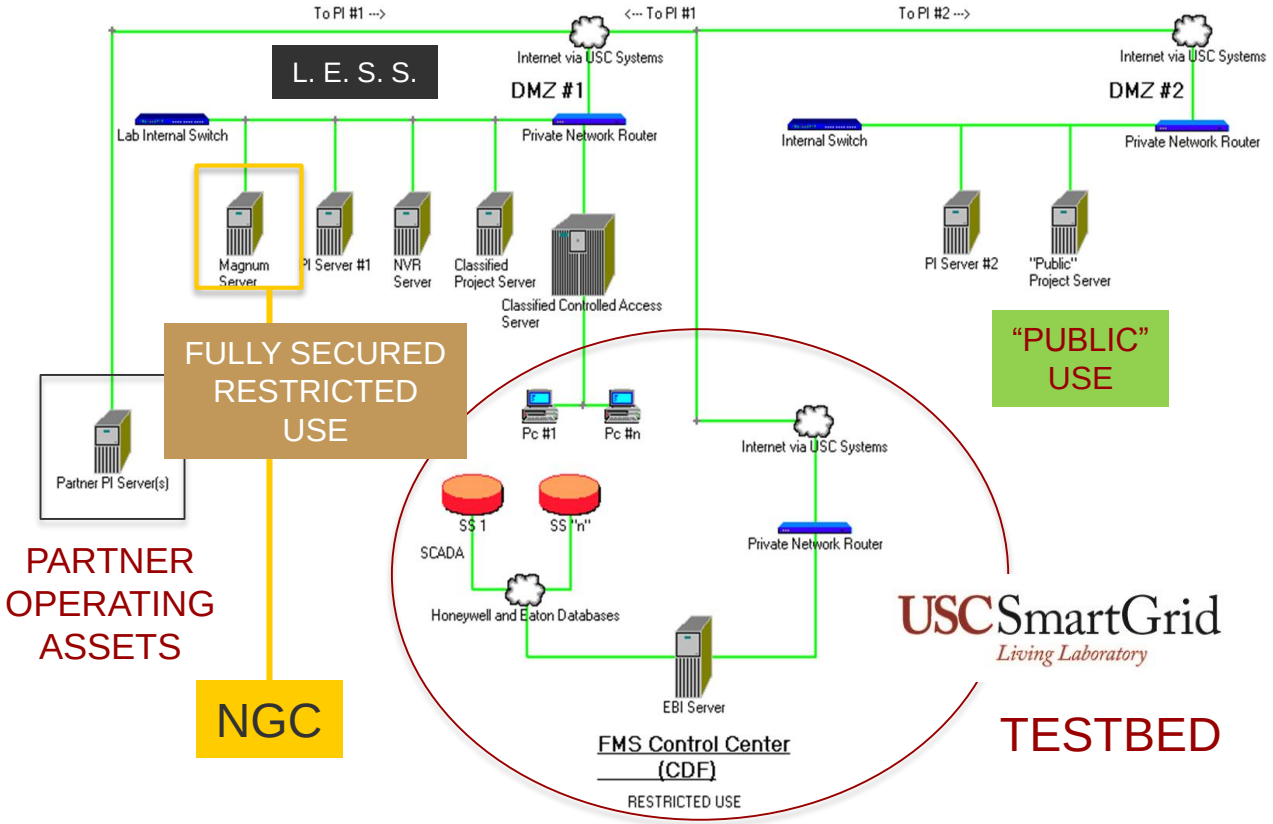
SCADA
Systems



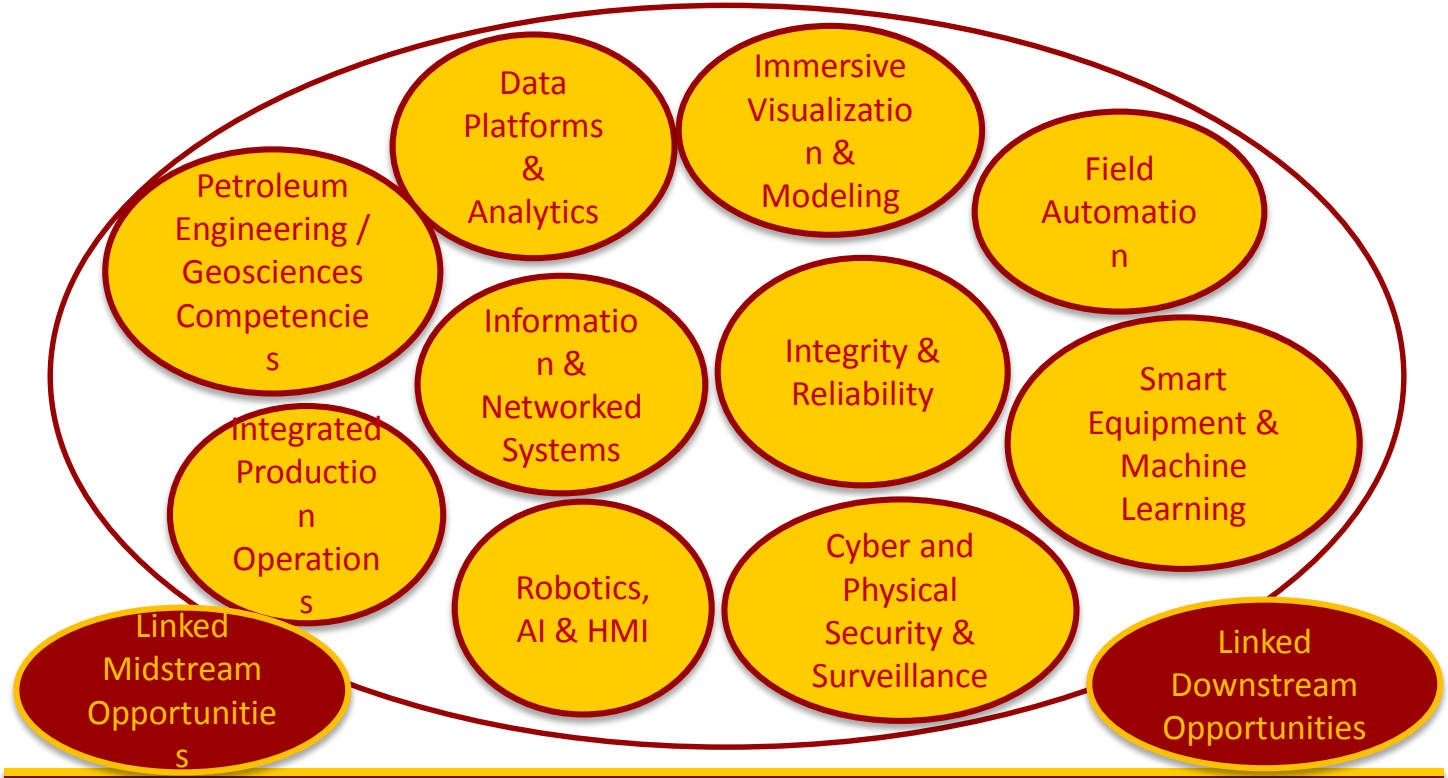
Buildings
and System
Metering

Research and Demonstration Infrastructure:

USC Smart Grid and the NG Laboratory for Energy Security Systems



Next Gen Smart Oilfield Technologies: focus areas



Engineering +

- Petroleum Engineering +
  - Petroleum Data Science
  - Petroleum Informatics
  - Cyber-physical Security for Oil and Gas Operations
  - IIoT for Oil and Gas Systems

Panel Discussion: **PI System for Data Science Research & Curricula**

Presented by **SPINNATO Juliette**

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TOTAL: Examples of Data Science use cases using PI System®

A DATA-DRIVEN PHILOSPHY WITHIN TOTAL – Refining and Chemical activities

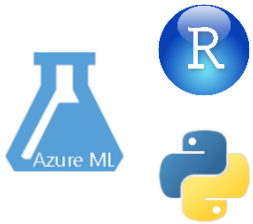
WHAT?

- Industrial assets parameters (qualities, perfomances) **estimation and prediction**
- **Root causes analysis** to
  - Get new insights on a failure, a process, a particular event, …
  - Anticipate future events

Black or white box Machine Learning algorithms?

HOW?

Data extraction, Modeling,
Results presentation



PI DataLink®



Asset Framework (AF)



Performance Equation (PE)

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TOTAL: Examples of Data Science use cases using PI System®

A DATA-DRIVEN PHILOSPHY WITHIN TOTAL – Refining and Chemical activities

MULTI DISCIPLINARY TEAM

Data scientists need to work together with Business experts, data architect and PI system® administrators

COLLABORATIONS

- Master and PhD Students in Computer Science, Mathematics & Machine Learning
- Scientific watch and conferences

A DETAILED EXAMPLE?

Real-time Estimations and Online Learning for Industrial Assets at Total

Thursday 23rd March – 3.00pm – 4.15pm

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Analyzing PI Data with R

Presented by **Rob Mulla**

Pepco Holdings
An Exelon Company

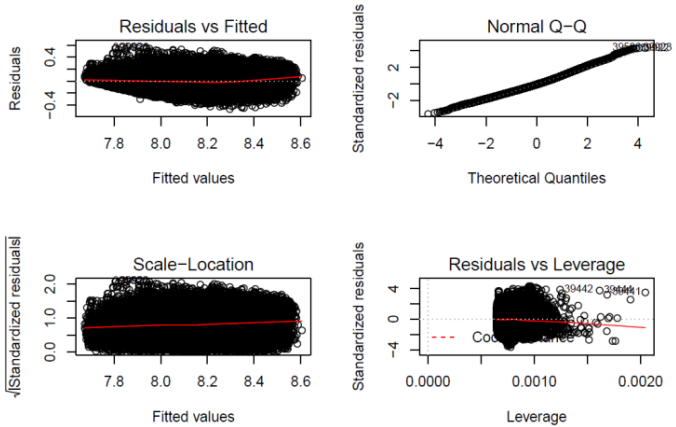
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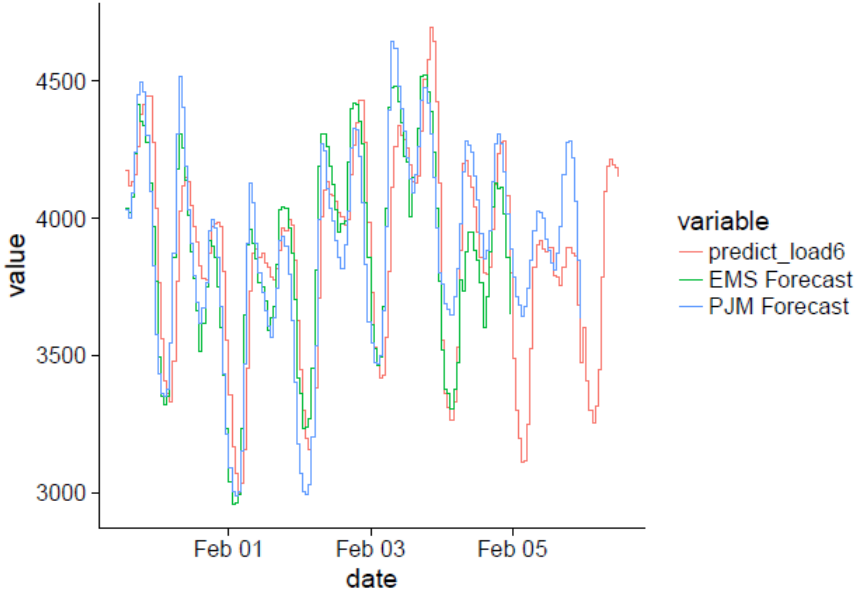
Near-Term Load Forecast Model

Pepco Holdings
An Exelon Company

Feature Selection, Transformation and Model Creation

```
lm_model <- lm(log(SystemLoad) ~ temperature + temperature_sq + temperature_dewpoint +
                 temperature_dewpoint_sq + wind_speed + M + TWT + F + SU + holiday +
                 month1 + month2 + month3 + month4 + month5 + month6 + month7 + month8 +
                 month9 + month10 + month11 + month1*temperature + month2*temperature +
                 month3*temperature + month4*temperature + month5*temperature +
                 month6*temperature + month7*temperature + month8*temperature +
                 month9*temperature + month10*temperature + month11*temperature +
                 hour0 + hour1 + hour2 + hour3 + hour4 + hour5 + hour6 + hour7 + hour8 +
                 hour9 + hour10 + hour11 + hour12 + hour13 + hour14 + hour15 + hour16 +
                 hour17 + hour18 + hour19 + hour20 + hour21 + hour22,
               data=w_load, na.action=na.exclude)
```



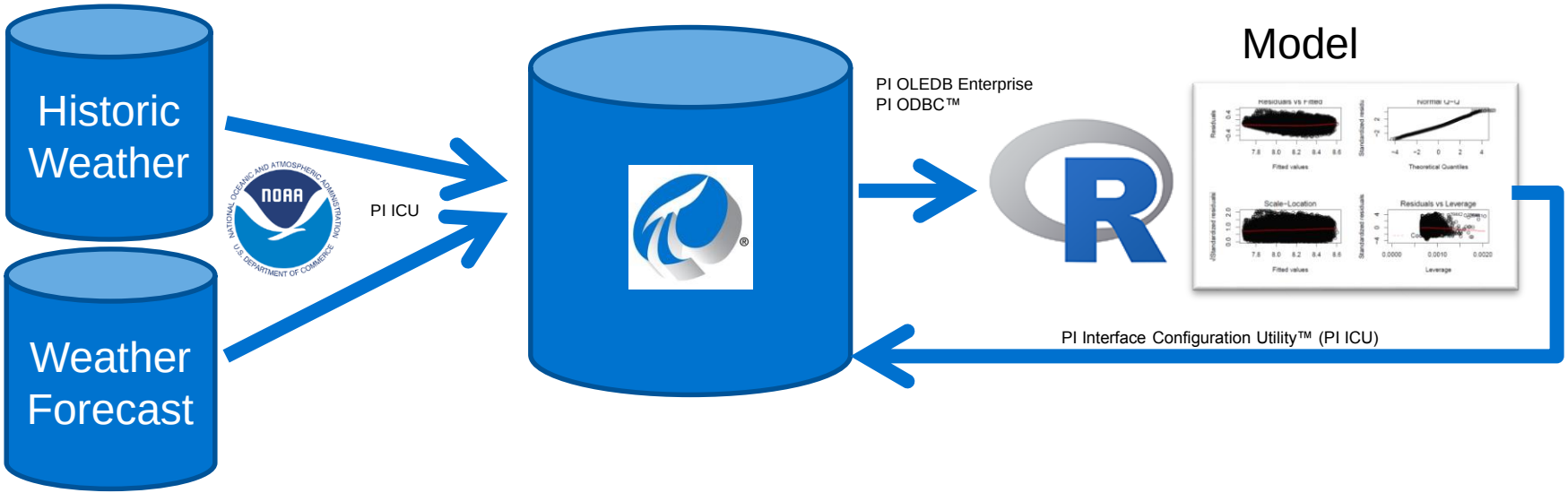


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Near-Term Load Forecast Model

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Creating and OLS Regression Model based on Historic Weather

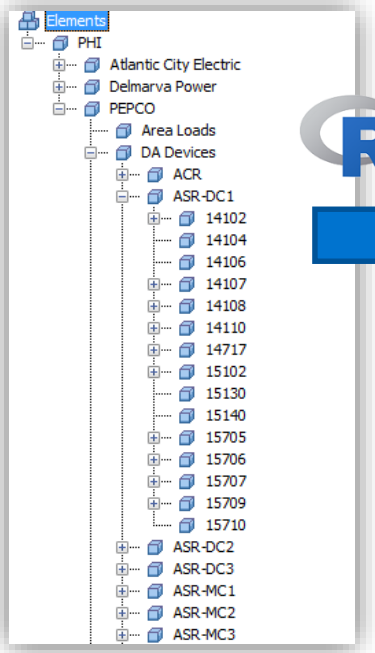


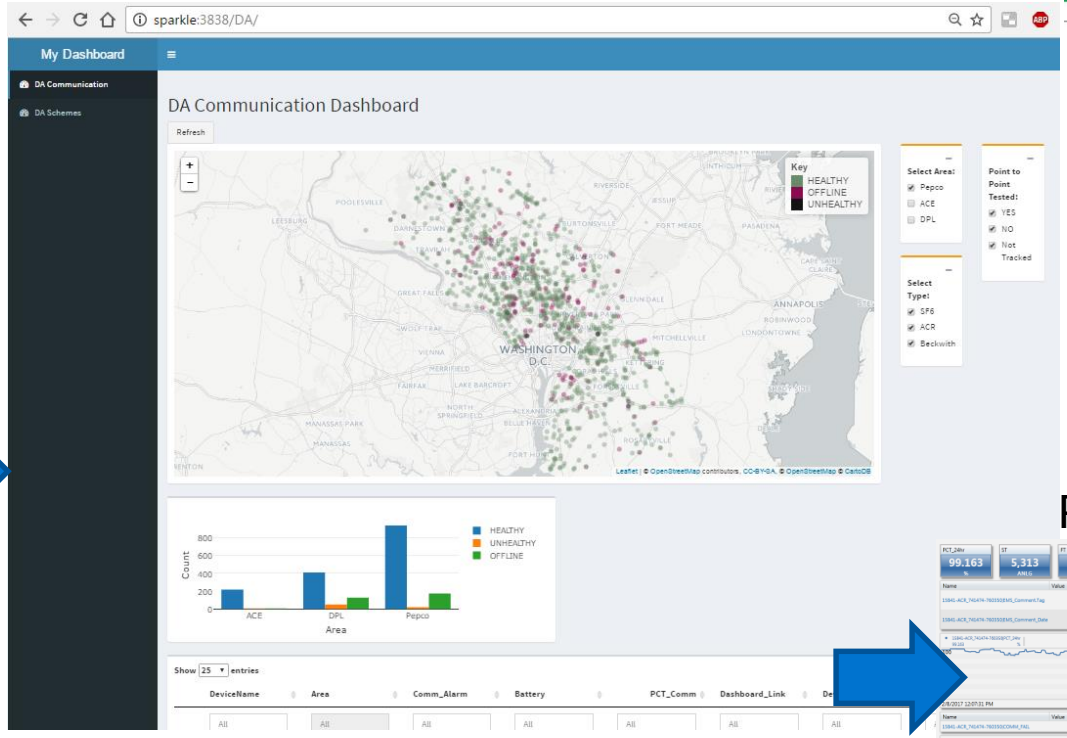
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Shiny
by RStudio

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Asset Framework (AF)





PI Coresight™

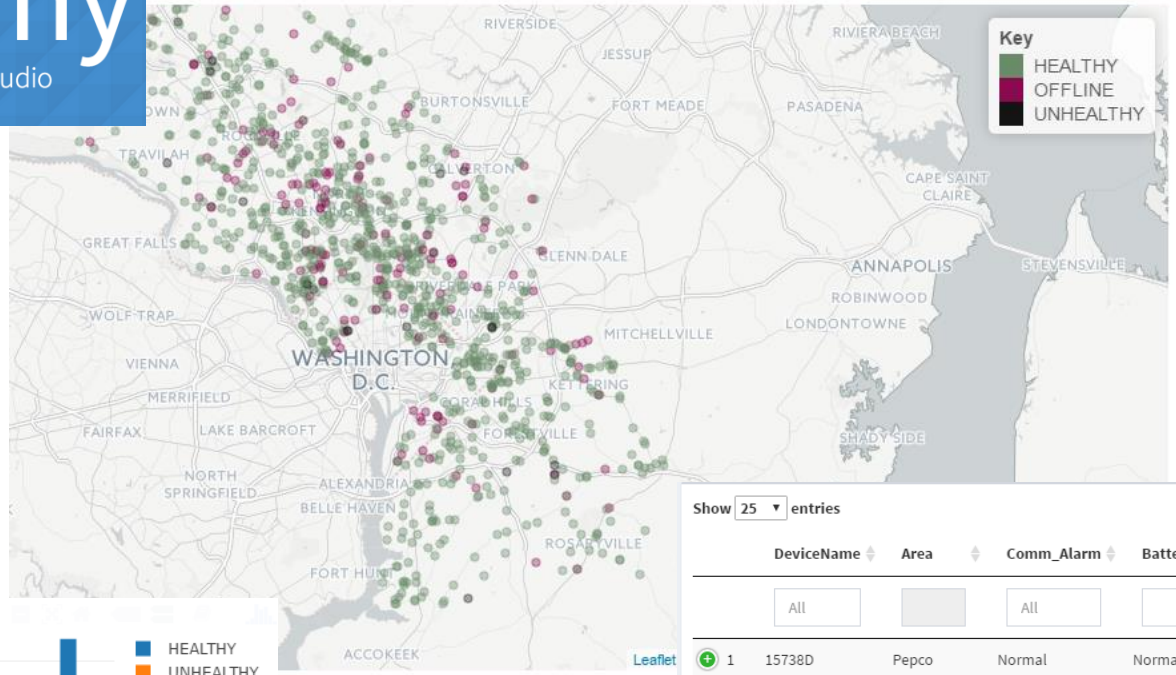


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PI Integrator for Business Analytics

Shiny by RStudio

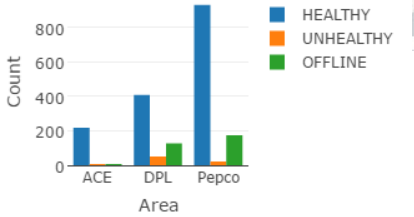
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An Exelon Company



Select Area:
- [x] Pepco
- [ ] ACE
- [ ] DPL

Point to Point Tested:
- [x] YES
- [x] NO
- [x] Not Tracked

Select Type:
- [x] SF6
- [x] ACR
- [x] Beckwith



Show 25 entries Search:

	DeviceName	Area	Comm_Alarm	Battery	PCT_Comm	Dashboard_Link	Device_Type
	All		All		Al	All	All
1	15738D	Pepco	Normal	Normal	97.67	Dashboard Link	ACR
2	15097D	Pepco	Normal	Normal	100	Dashboard Link	ACR
3	15095D	Pepco	Normal	Normal	99.33	Dashboard Link	ACR
4	15083D	Pepco	Normal	Normal	100	Dashboard Link	ACR
5	15044E	Pepco	Comm Fail	Normal	0	Dashboard Link	ACR

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