

Big Data and Demand Response:

How Big Data Analysis Techniques Can Provide M&V Results in Near Real-Time

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**ENERGY RESEARCH
AND EVALUATION**

BIG DATA – Blessing or a Curse?

Imagine a DR Program
with...

60,000 DR Participants +
50,000 Control Homes +
15-Minute Meter Data =

~60 million data points

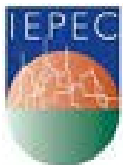
*If rows of meter data
were dollar bills, we
could cover Mile-High
field 120 times with the
data required to analyze
a single DR event.*



Presentation is a “How-To”

Brief introduction to the Big Data analysis concepts used to evaluate a large Demand Response program in Near-Real-Time.

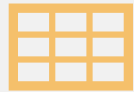
Rapid M&V feedback is a hallmark of the M&V 2.0 paradigm.



Big Data Analysis Concepts



Functional Programming



Matrix Based Operations



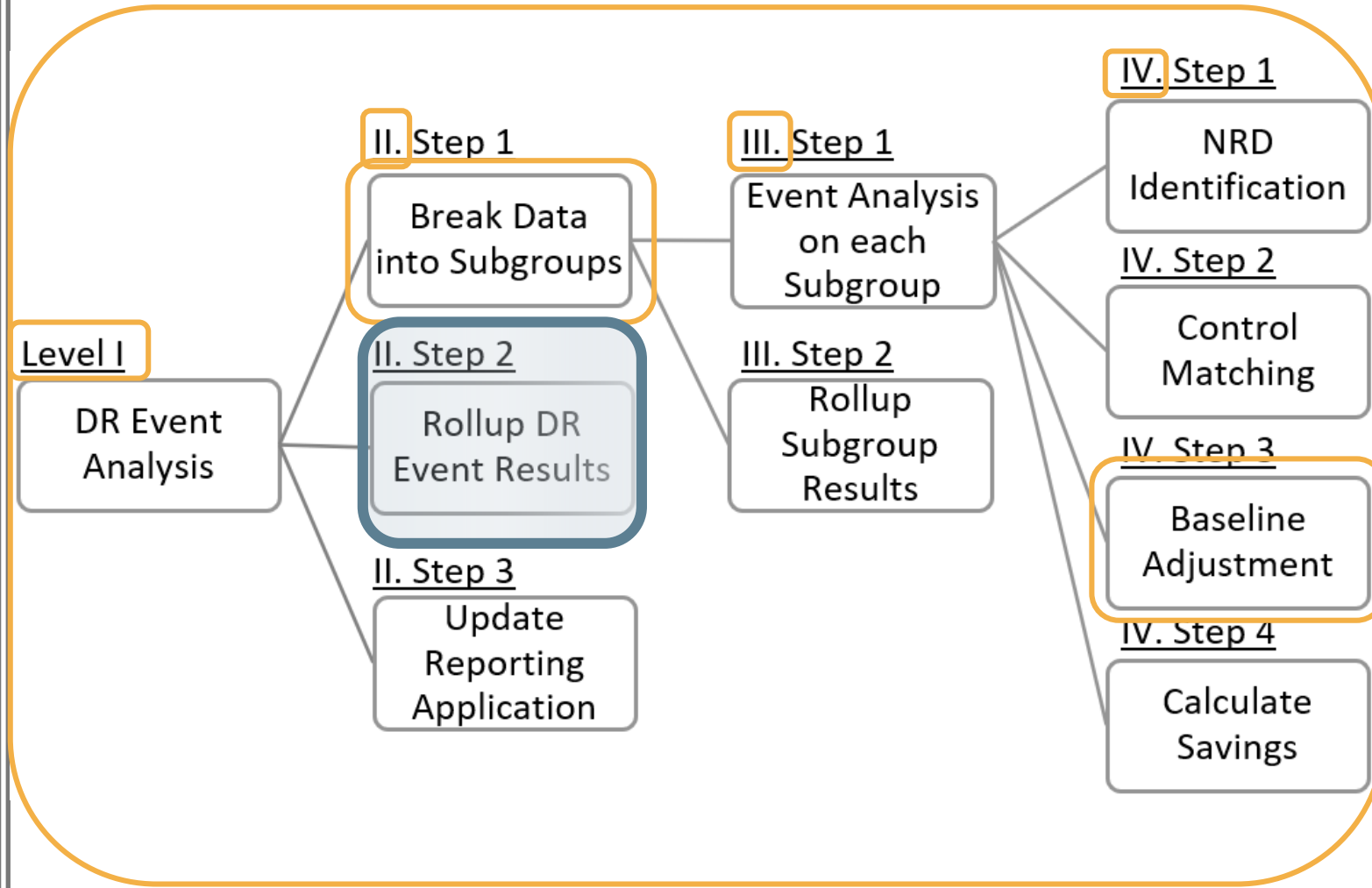
“Near-Real-Time” M&V Results

Functionally Programming a DR Analysis

Functions

Reactive Programming

Hierarchal Analysis



Matrix Based Analysis of DR Data

Data Tables

Referencing

Vectorization

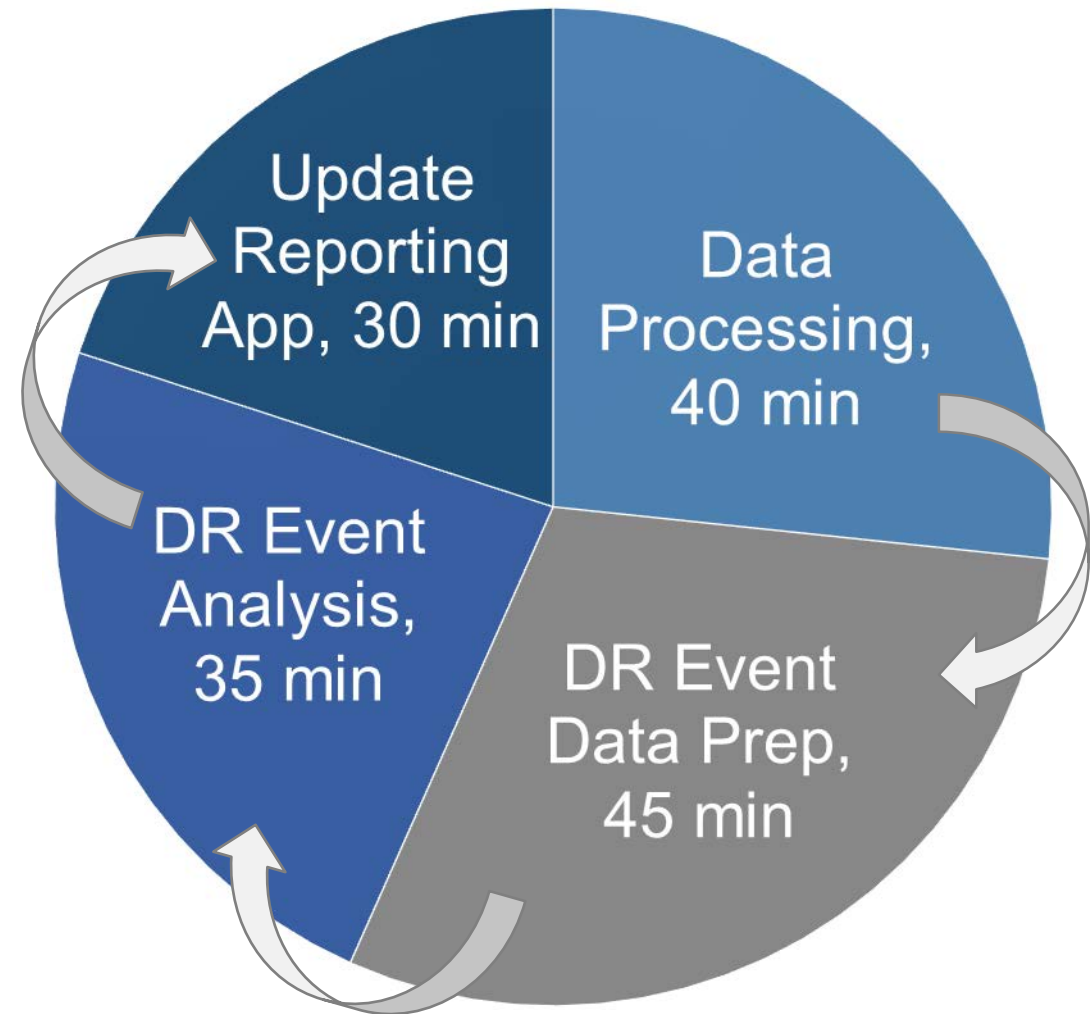
Categorical Variables			Data Sets				
Device Type	Rate Code	DR Event Phase	Date Time	DR kWh	Control kWh	Event kW	
D e v i c e A	Single Family	Phase 1	7/5/2019 15:00	4.5	4.5		
			7/5/2019 16:00	1.8	4.8		
			7/5/2019 17:00	2.1	5.1		
			7/5/2019 18:00	5.1	4.7		
		Phase 2	7/5/2019 15:15	5.1	5.1		
			7/5/2019 16:15	1.9	5.2		
	Multi Family	Phase 2	7/5/2019 17:15	2.2	5.1		
			7/5/2019 18:15	5.2	4.9		
			7/5/2019 15:15	2.9	2.9		
		Phase 3	7/5/2019 16:15	0.9	3.1		
			7/5/2019 17:15	1.1	3.1		
			7/5/2019 18:15	3.1	2.8		
			7/5/2019 15:30	3.2	3.2		
			7/5/2019 16:30	1.1	3.3		
			7/5/2019 17:30	1.4	3.2		
D e v i c e B	Single Family	Phase 4	7/5/2019 18:30	3.1	2.7		
			7/5/2019 15:45	4.6	4.6		
			7/5/2019 16:45	1.9	4.9		
		Phase 5	7/5/2019 17:45	2.2	5.1		
			7/5/2019 18:45	5.2	4.8		
			7/5/2019 16:00	4.4	4.4		
	Multi Family	Phase 5	7/5/2019 17:00	1.7	4.5		
			7/5/2019 18:00	1.9	4.8		
			7/5/2019 19:00	4.9	4.6		
		Phase 3	7/5/2019 15:30	3.1	3.1		
			7/5/2019 16:30	0.7	3.2		
			7/5/2019 17:30	1.1	3.1		
			7/5/2019 18:30	2.9	2.8		
			Phase 4	7/5/2019 15:45	2.7	2.7	
				7/5/2019 16:45	0.6	2.9	
7/5/2019 17:45	0.9	3.1					
		7/5/2019 18:45	2.8	2.8			



“Near-Real-Time” M&V is Possible

Once data is received,
M&V results can be
provided in **2hr 30min.**

Dependent on the
efficiency of the data
pipeline between the
Utility, Implementer,
and Evaluator.



Questions?

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*Visit our website,
www.admenergy.com*

*for information on Data Science,
Demand Response, and Near-
Realtime-M&V.*