Accomplishments and Lessons Learned – NRECA/CRN ARRA Demonstration Grant

Craig Miller

19 February 2014

COMPARABLE CHALLENGES – SG & SUBSTATIONS

SMART GRID
Customer Acceptance
Data Volume & Complexity
Communications
Interoperability
Cyber Security
Determining ROI
Resiliency

NRECA/CRN DEMO PROJECT SCOPE

		Activity Types											
		Demand Response				Distribution Automation (DA)				Enabling Technologies			
	Participants	IHD/Web Portal Pilots	DR over AMI	Prepaid Metering	Interac-tive Thermal Storage	Renew-ables	Smart Feeder Switching	Advanced Volt/Var Control	CVR	AMI	MDM	Comm	SCADA
Cooperative	Adams Electric Co-op, IL	45	46				67				?	7	24
	Adams-Columbia Electric Co-op, WI						38	69	70				8
	Blue Ridge Electric, NC										100		
	Clarke Electric Co-op, Inc., IA	47	48				71		72	25		19	26
	Corn Belt Power Co-op, IA											13	
	Calhoun Co. ECA		51							14			
	Humboldt Co. REC		52							15			
	Iowa Lakes EC	42a	42										
	Prairie Energy Co-op		53							16			
	Delaware County Electric Co-op, NY	54	55							1		27	
	Delta Montrose EA, CO	91		94							99		
	Energy United			96									
	Flint EMC, GA	39								2			
	Kaua'i Island Utility Co-op, HI	56	35							3	20		
	Kotzebue Electric Assn., AK	90		93		105	103	102		87	98		106
	Menard Electric Co-op, IL	58a	58					29					
	Minnesota Valley EC, MN	89			104a	104			101		97		88
	Great River Energy, MN										107		
	Lake Region Electric Co-op., MN	109									108	85	
	Owen Electric Co-op, Inc., KY	43a	43				36	76				30	11
	Salt River Electric Co-op Corp., KY						17					17a	
	Snapping Shoals EMC, GA	32a	32				78				82	18	5
	United REMC, IN	44	66				41	79	80		37	6	
	Washington-St. Tammany EC, LA						81					12	23
		15	13	3	1	2	9	5	4	8	9	9	7
											Total Listed		85

Customer Acceptance

- More than 70% of co-ops identified customer acceptance as a barrier to smart meter deployment at start of project
- Rationale:
  - Invasion of privacy
  - Fear of radiation
  - Fear of higher cost
  - General resistance to change
- Of 23 co-ops:
  - Minor issues everywhere
  - Major resistance in Kauai
- All issues resolved
- Only 6% of co-ops site resistance as barrier
- NRECA developed kit to help utilities to communicate to the members (customer) about their smart meters

Data volume and complexity

- Original concern was projections of 10^4 to 10^5
- This volume of data has not materialized and data management has not yet become an issue
- Emergence of cloud-based solutions
- Question about value of higher-frequency data
- Demonstrated need for advanced analytics
  - OMF, most powerful grid analytic tool deployed
  - Initiation of massive loud based analytics project
  - Selected as a test-bed for Interent2, IOT, and Smart American Challenge

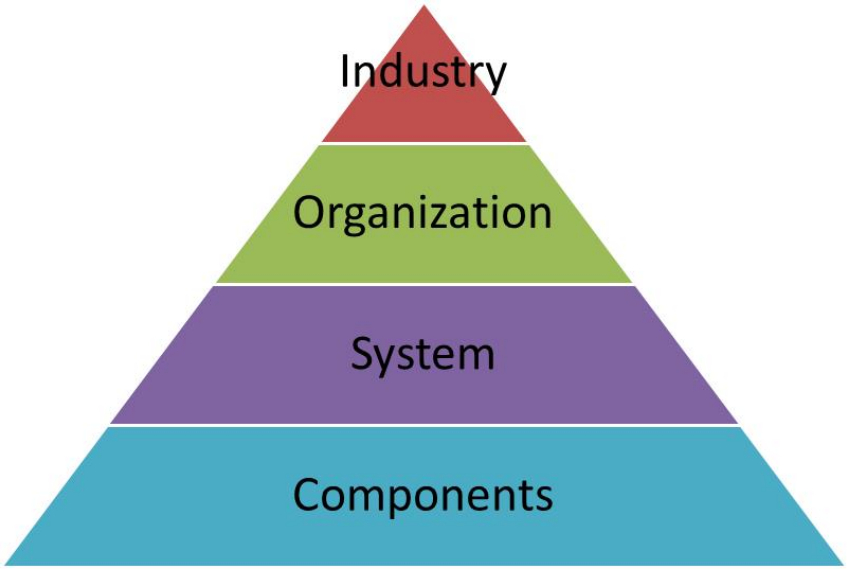
Communications

- Much larger problem than we expected
- Solved everywhere, but it took serious work
- No general solution
- Long term solution likely lies in distributed information architecture

Cyber Security

- Still a problem, but a problem with no symptoms
- NRECA approach addresses CS in four layer8000+ downloads, classes, policies
- Participation in NIST Framework, ESC2M2
- New effort on "non-prescriptive"

  cyber Security



Interoperability

Waiting for Godot (CIM)

IEC standardards have too little coverage

MultiSpeak® is easily the most practical

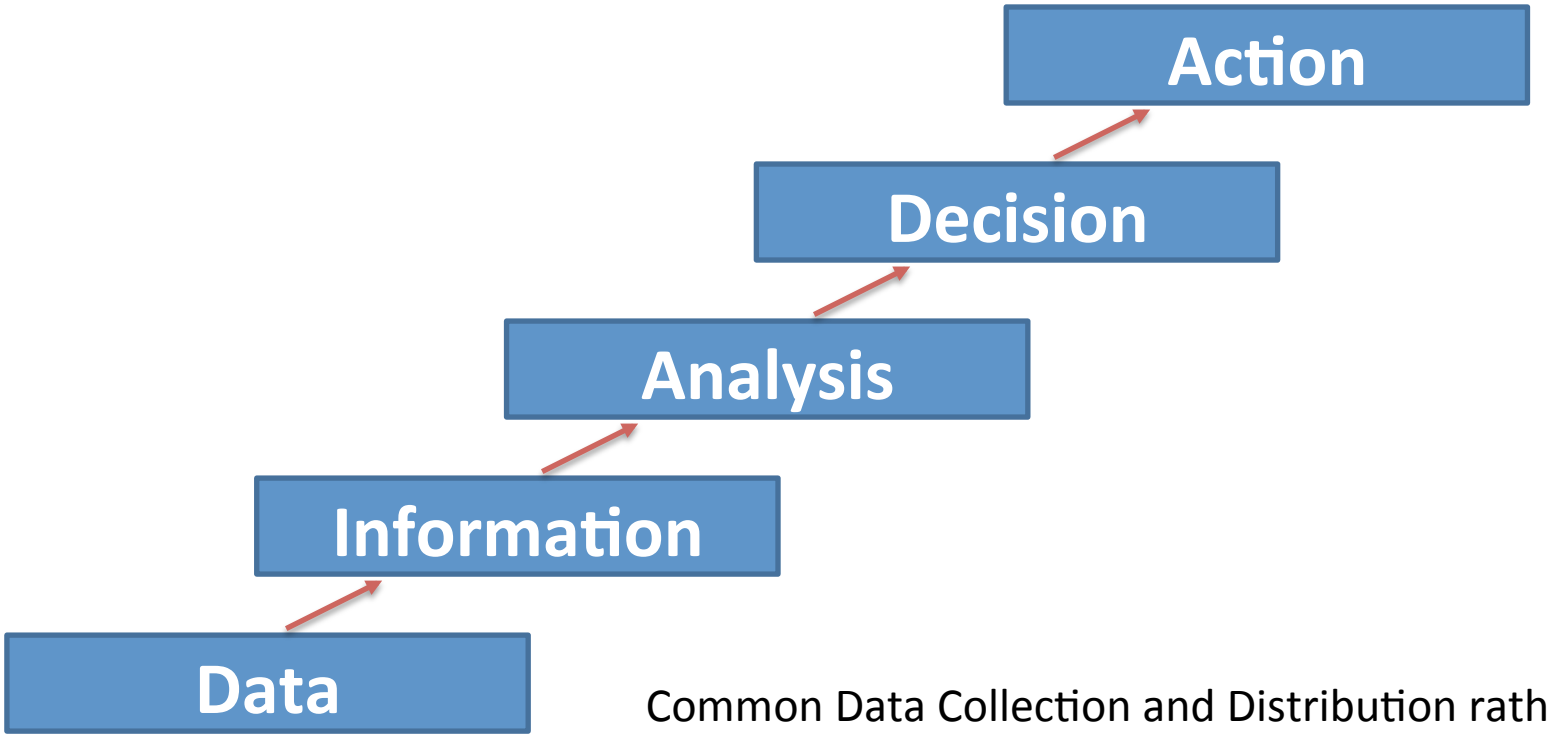
Project extended MultiSpeak®

Project added cyber security extensions

Work continues:

- Extension in application layer integration
- Exrenstion to other layers

Expanded Model for Integration



Common Data Collection and Distribution rather than data collection for different applications

Return on Investment

Big Winners:

- Conservation Voltage Redution
- Smart metering (where there was no AMR)
- Pre-paid metering
- Smart feeder switching

Resiliency – Matrix and Examples

	Operational	Technical
Before disaster	Vegetation Management	Microgrids
During Recovery	Mutual Assistance	Drones