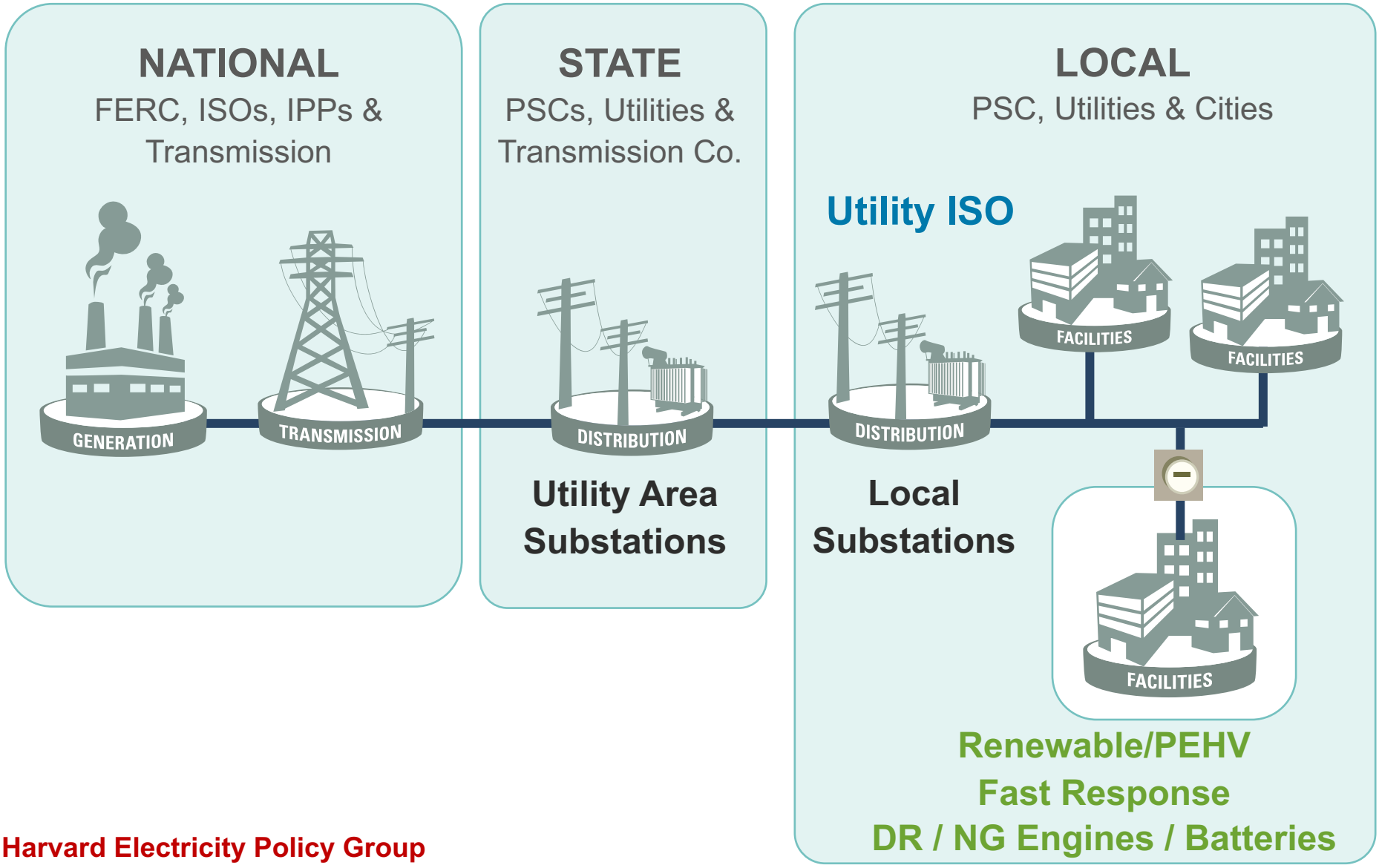
Why Focus on Transmission and Distribution?

- Behind the meter market may already be lost, to the private sector. Is this a diversion or distraction?
- About half of the electricity market is restructured and the rest may move in this direction
  - Zero carbon future could strand coal and simple cycle gas assets
  - Prices in regulated markets are rising faster, 63% vs 39%
- Electricity distribution is an essential service and core competency

State	Cost Change, % Since 1997	Electricity Cost 2017, $/MWh
Midwest		
IL	23%	$95
IA	46%	$87
MI	60%	$113
MN	83%	$103
IN	85%	$98
WI	106%	$108
Larger Regulated States		
NC	40%	$90
FL	45%	$104
VA	50%	$92
GA	54%	$98
CA	68%	$161
TN	78%	$95
Larger Restructured States		
NJ	26%	$133
PA	27%	$101
NY	32%	$147
TX	36%	$84

Utility of the Future



What is the Role of the Utility of the Future?

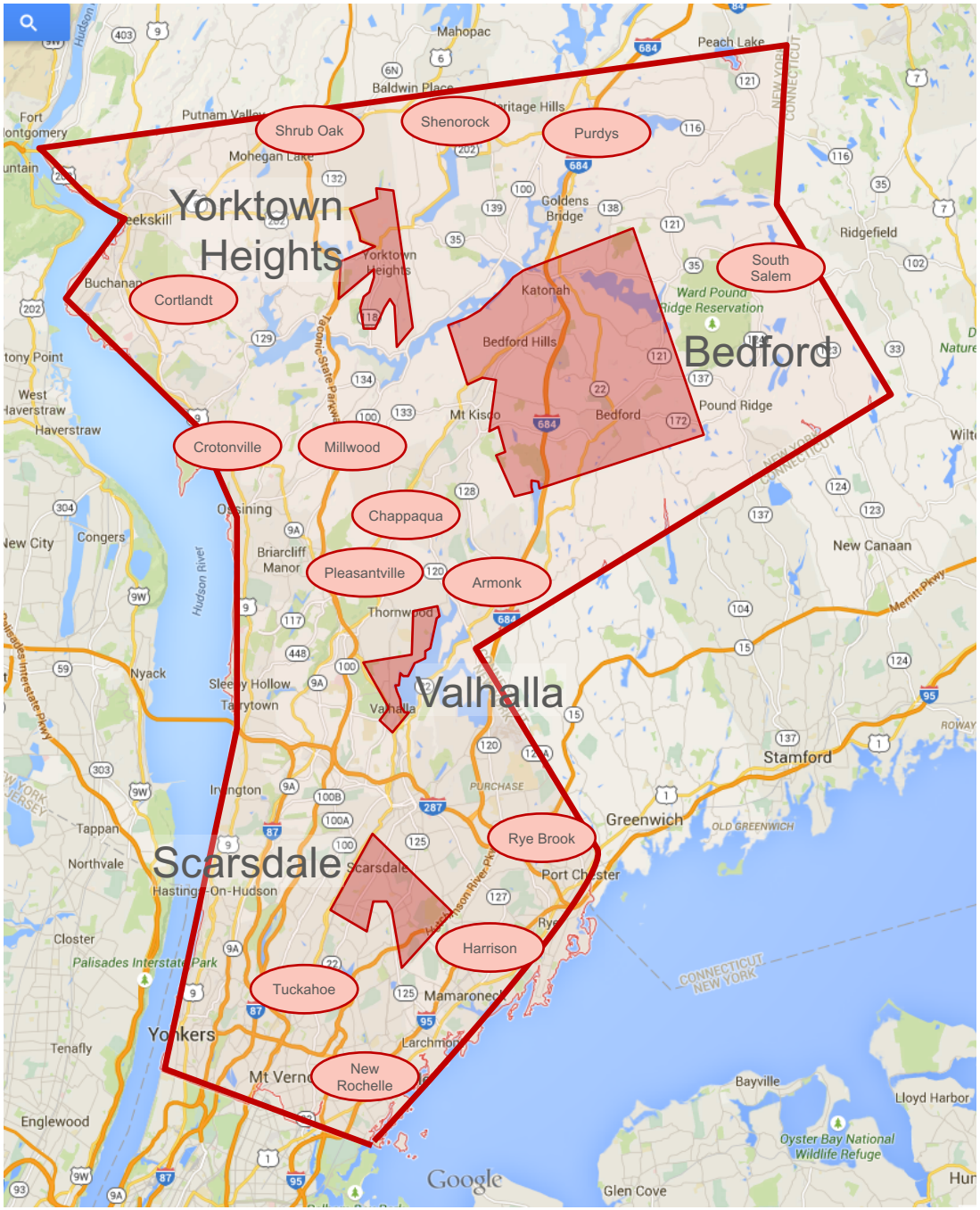
- Two-way power flow – renewable power
- Deliver power to electric transportation system
- Manage real-time system balancing, D-ISO
- Build high reliability distribution system
- Manage power quality
- Provide for resiliency – substation microgrids

How?

Step	Description
1	Create distribution system ISO and microgrid program
2	Create a new performance scorecard: get what you measure
3	Build high reliability distribution system with two-way power flow
4	Protect critical facilities
5	Team with local government (city) and private sector
6	Leverage rate riders to accelerate utility investment

Step 1: System Mapping, Utility Microgrids, and D-ISO

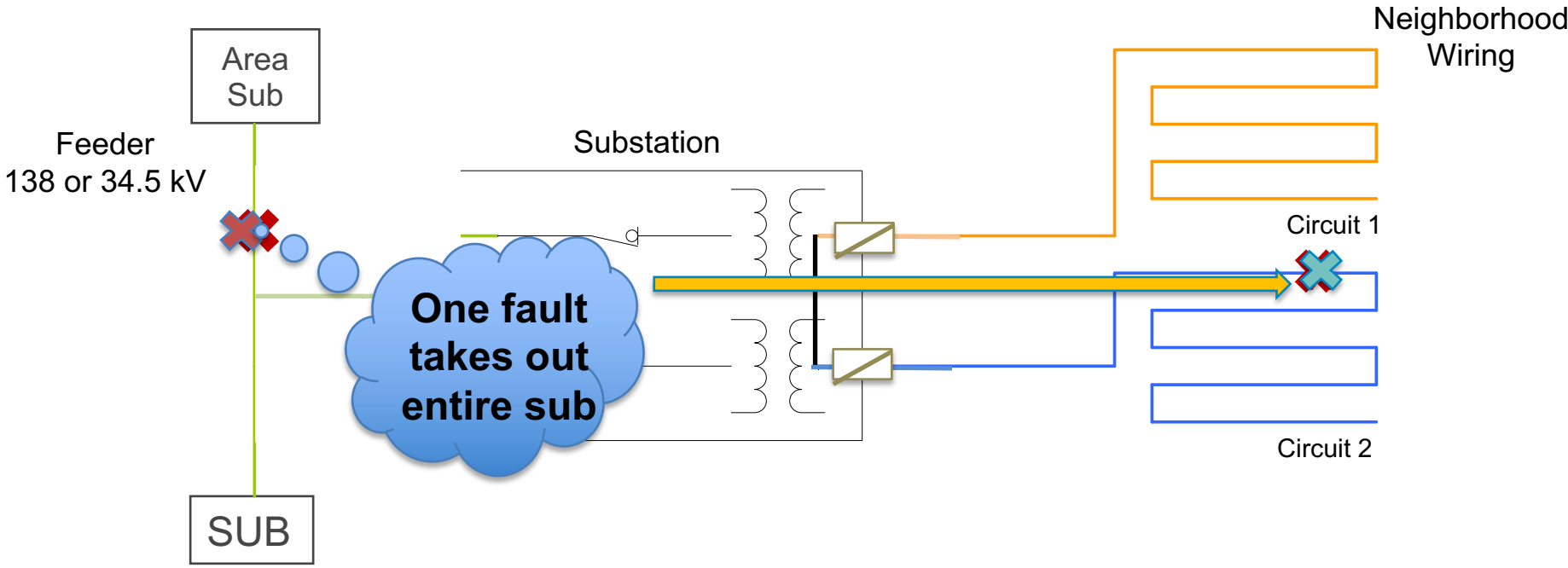
- Dynamic rates
- Demand charges
- Demand response payment
- Substation generation



Step 2: Apply Performance Scorecard

Performance Criteria - Outcomes	Baseline or Benchmark	Current	Target
Cost, $/MWh	**$150**	**$75**	
Interruptions Duration / Frequency	**270 min / 1.0**	**20 min / 0.1**	
Power Quality Events	**120**	**25**	
Utilization	**52%**	**70%**	
Resiliency Capability and Grid Service			
Islanding	20%	80%	
Alternate Supply	0%	100%	
Distribution Auto Restoration	10%	80%	
Distribution Redundancy	40%	80%	
Damage & Exposure Prevention	60%	95%	
Local Response (Storage, DR, NG Gen)	**25%**	**80%**	
Local Renewable	**5%**	**25%**	
Advanced Metering	**25%**	**100%**	

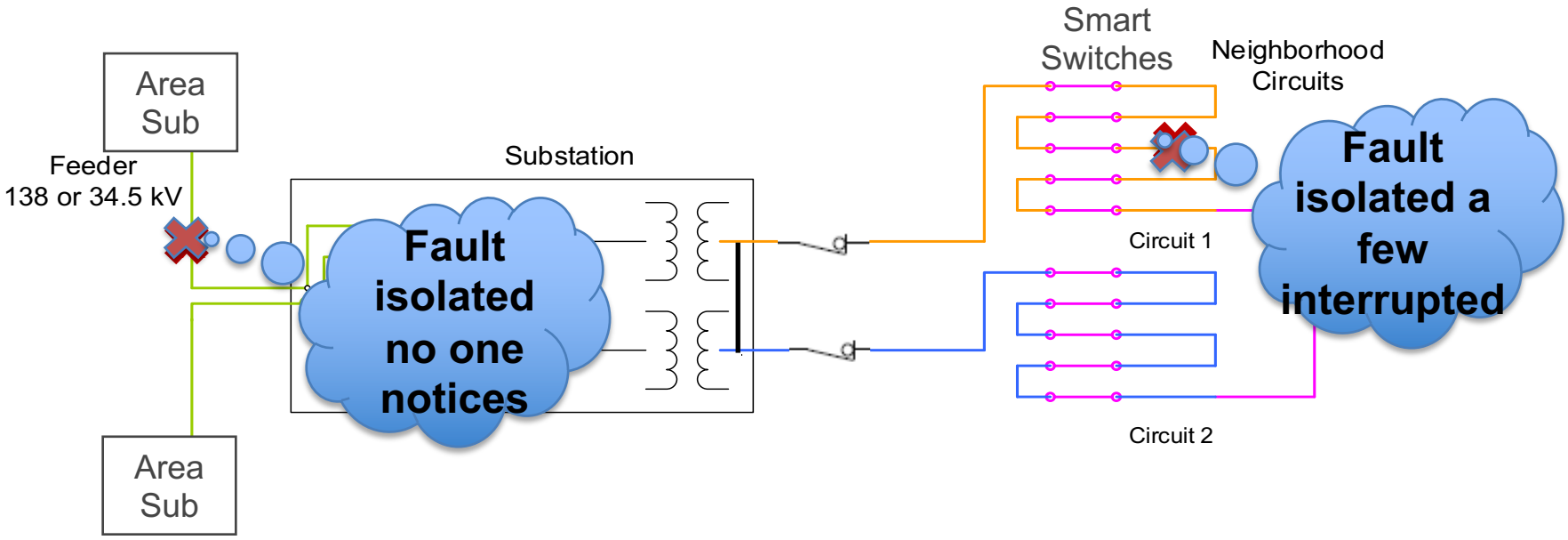
Step 3: Build Self Healing Distribution with Two-Way Power Flow



Sources of Supply: 1

Distribution: Radial with no redundancy or auto-restoration

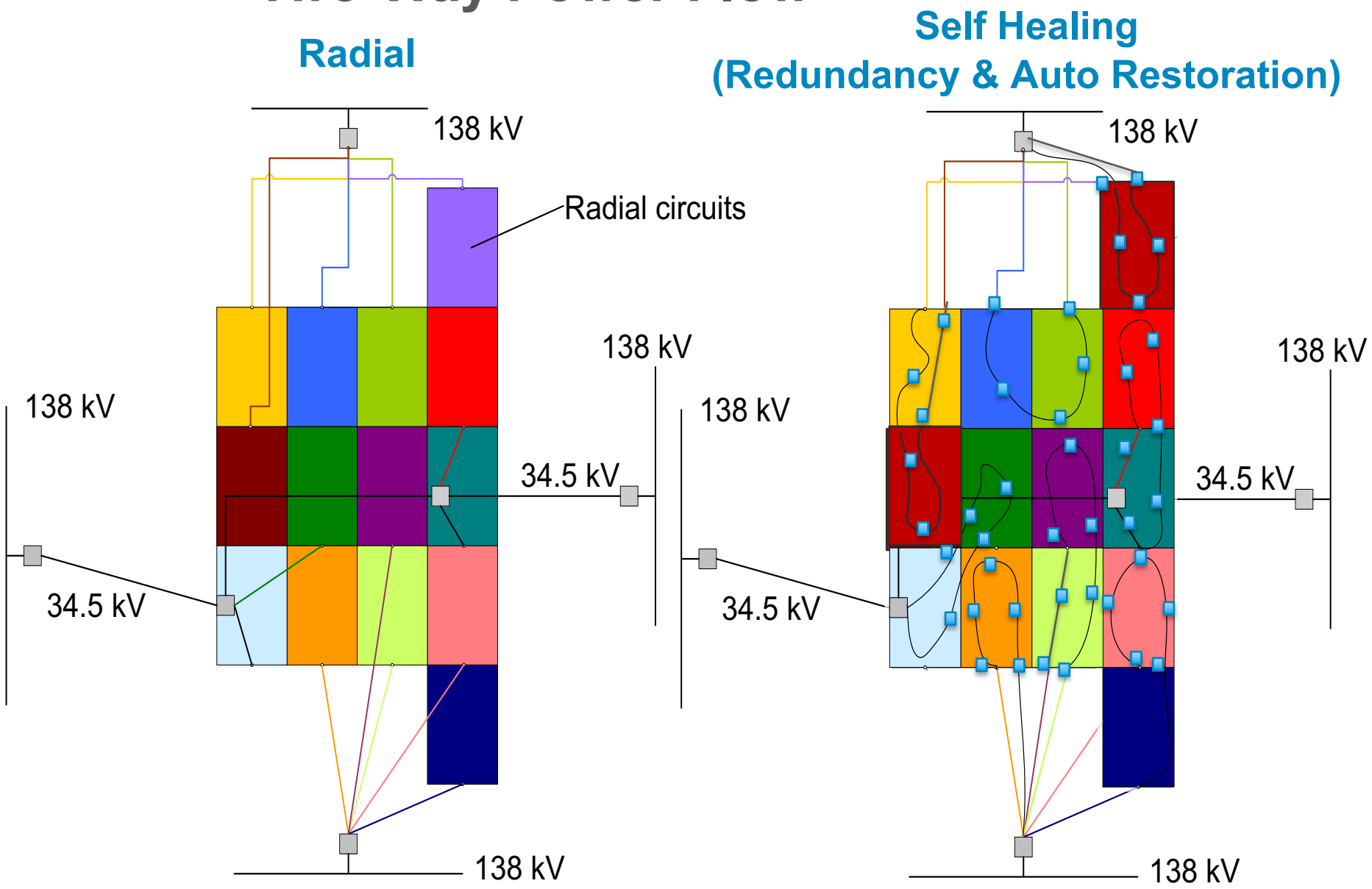
Step 3: Build Self Healing Distribution with Two-Way Power Flow



Sources of Supply: 2

Distribution:
Self Healing with Redundancy
And Auto Restoration

Step 3: Build Self Healing Distribution with Two-Way Power Flow



Step 4: Protect Critical Facilities

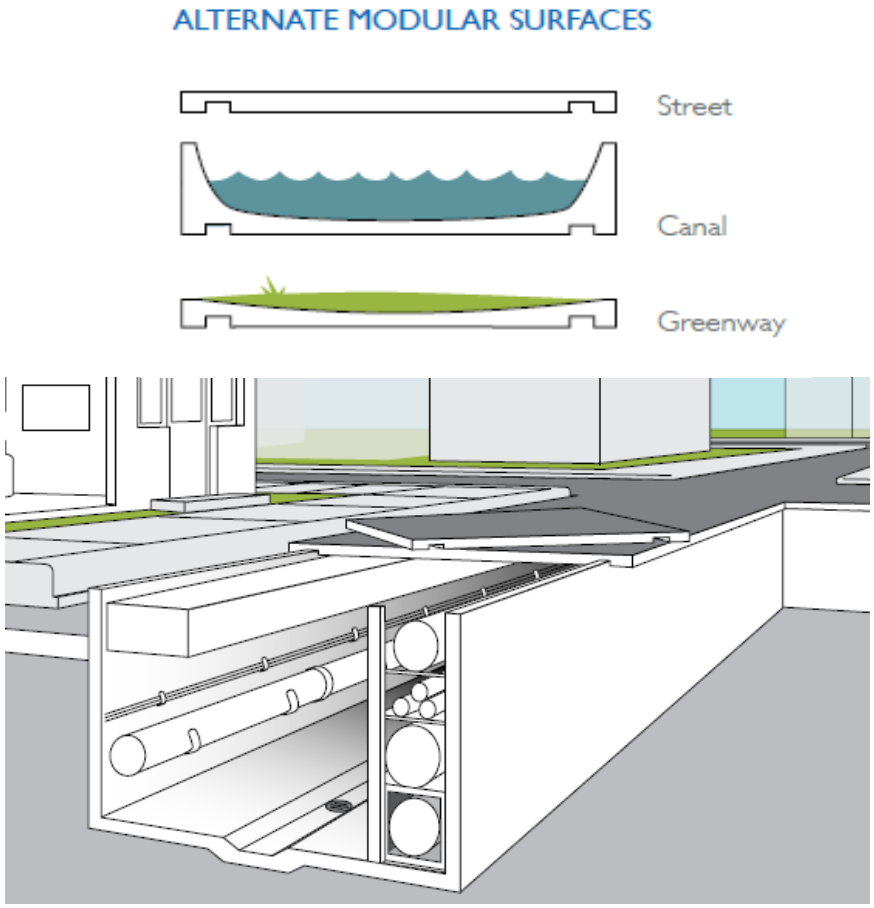
Critical and Essential Service	Circuits	Address	Resiliency Capability
Local Hospital	W430		
Police Station/Coms	D5143		
Jackson Storm Station	W6610Y, W668X		
Harrison Storm Station	W6610Y, W668X		
Convalescent Center	W3509		
Lexington Senior Home	W6612		
High School (Shelter)	W349, W4564, D4912		
Jackson Storm Station	W6610Y, W668X		

Step 5: Leverage Local Government

- City investment – Illinois Rider LGC used for reliability
- Coordinated undergrounding with road and sewer work
- Coordinated identification and action on critical and essential services
- Leveraging city resilient facilities for grid service
- Coordinated tree planting, trimming, removal
  - Right tree right place, invasive pest control
  - Developing greenways Coordinated communications and emergency response
- Coordinated communications and education

Step 6: Leverage Rate Riders

- Rider LGC
- New Development
- Reliability & Two-way Power Flow Investment
- Master Controller
- District Energy
- Resiliency/Microgrid



Available Tools and Examples

- Rider LGC,
  - https://www.comed.com/SiteCollectionDocuments/MyAccount/MyBillUsage/CurrentRates/RiderLGC.pdf
- ComEd RTP rate BESH
  - https://hourlypricing.comed.com/live-prices/five-minute-prices/
  - https://www.comed.com/SiteCollectionDocuments/MyAccount/MyBillUsage/CurrentRates/Ratebook.pdf
- USGBC PEER Program, www.gbci/peer.org
- IPP tools – email jkelly@ippconnect.com
  - Example utility city scale smart grid plan
  - Excel tool for modeling financial impact of applying innovative rate riders