The Regional Power Grid Team

Project Introduction and Status

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Agenda Items

- Overview of the Regional Power Grid
- Current Status on Data
- Identified Goals of Project
- Future Steps

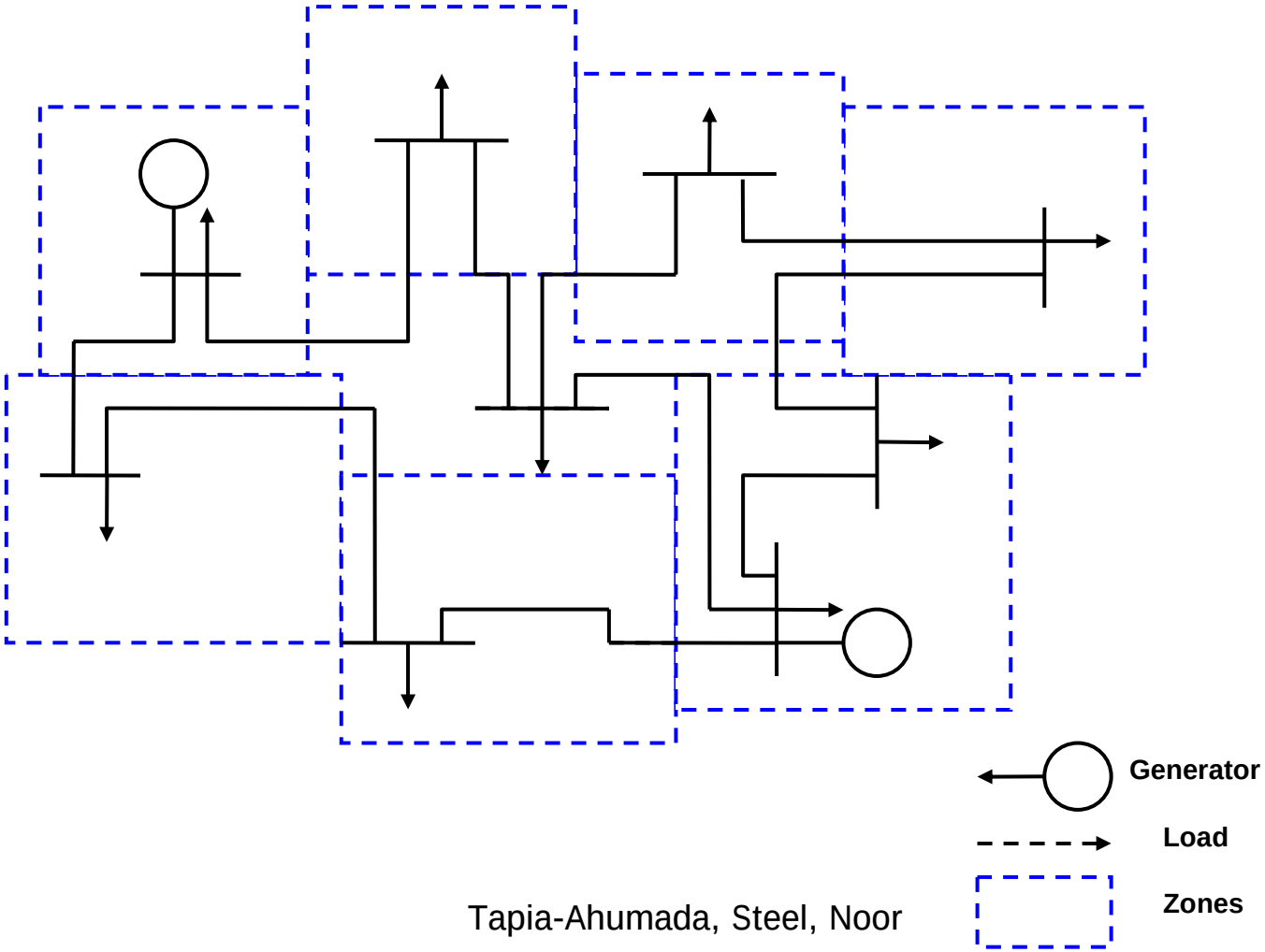
Overview of the Electric System

- Energy Sources
  - Installed capacity on the order of 10s of GW
  - Energy portfolio

Fossil	~ 60%
Carbon free	~ 40%

- Load Zones
  - Aggregation of nodes in several load zones, mostly geographic boundaries
  - Existence of pool hub for pricing reference
- Generators and Load
  - On the order of 10^3 nodes
  - Two-thirds load nodes
  - About a third generator nodes
- Tie Lines
  - Order of ~10^4 miles of HV & MV transmission lines
    - 69kV – 115kV – 230kV – 345kV – HVDC
  - Edges on the order of 10^3
  - Some external interfaces with adjacent electrical systems

Overview of the Electric System

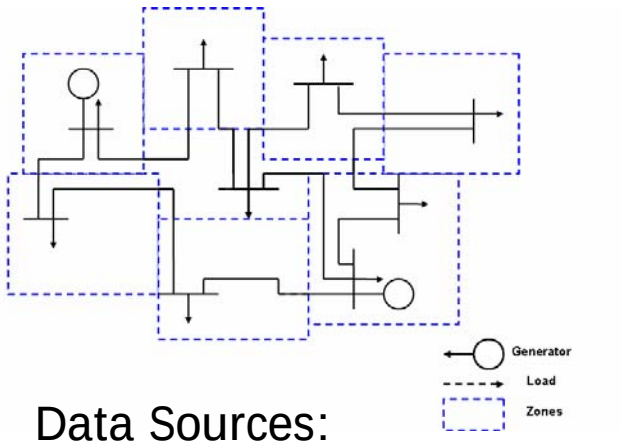


Current Status on Data

- Have acquired a map of an electric power network
- Map has nodes (stations and loads) on the order of 10^3 and edges (transmission lines) on the order of 10^3
- Currently working on translating data to Excel matrix

Current Status on Data

Nodes and edges are mapped into Excel



Name	#	1	2	3	4	
		XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX
		285	286	287	288	289
XXXXXXX	285	0				
XXXXXXX	286	0	0			
XXXXXXX	287	0	2	0		
XXXXXXX	288	0	0	1	0	
XXXXXXX	289	0	0	0	0	0

Data Sources:

-Map of physical network

-List/properties of nodes

-List/properties of edges

Current Status on Data

- About a third of the nodes have been mapped in Excel
- Next steps will be copying data into UCINET^{tm} and “playing” with structures
- Other important data sources found
  - System reliability reports
  - Public data on prices, node characteristics

Identified Goals of the Project

- Clusters and sub-sets of network
  - Identify existing clusters (using algorithms like Newman-Girvan in UCINET^{tm}) and filtering
  - Study the reasons for existence of clusters
    - Geographical
    - Sociological (industrial zones, high populations)
    - Contingency-based (addition of nodes & links)

More Identified Project Goals

- Comparison with other grids
  - See if network topology can be mapped across
  - Find potential similarities in clustering
- Degree distributions
  - Find if network follows a power or other law
  - Compare other known degree distributions
- Define “critical” nodes & identify examples

Future Steps

- Complete matrix, validate data, analyze it
- Apply various UCINET^{tm} and Matlab^{tm} routines
- Share results with industry experts to gage the usefulness of network-type analyses

Questions and Comments?

Contact information

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