NRIC National Reactor Innovation Center

Demonstration Reactor Siting and Capabilities Study

Michael Ford, Ph.D.

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Argonne NATIONAL LABORATORY

INL Idaho National Laboratory

OAK RIDGE National Laboratory

FASTEST PATH TO ZERO UNIVERSITY OF MICHIGAN

NRIC Goals for the Siting Study

Near Term - Phase I

- Capture information/evaluation on eight identified sites that:
  - Assists innovators in selection of optimal demonstration sites
  - Informs NRIC investments in sites
  - Informs Stakeholders

Medium Term - Phase II

- Capture information/evaluation on additional and previously unidentified sites
  - Commercial sites
  - Other DOD sites
  - University and/or other sites?
- Improve/refine information/evaluation

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Study Process

- Use ORNL tool to constrain for physical and regulatory factors
- Use UMich tool to constrain for social, political, and economic factors (e.g. economic health of the hosting community, rather than the cost of the reactor)
- Conduct Gap analysis (Argonne) to ensure other key siting factors are included in assessment
- Incorporate model outputs and other attributes from gap analysis into tailorable decision tool
  - Model to be expanded in Phase II
- Follow on – potential for additional qualitative assessments to prioritize sites and design tailored outreach plans
- Phase I "quicklook" report to NRIC: Summer 2020

ORNL OR-SAGE Model

Oak **R**idge **S**iting **A**nalysis for Power **G**eneration **E**xpansion

Background		
The Genesis	Model Construction	Process Overview

- Work proposed in Fall of 2008
- Initial work focused on Nuclear
  - Principal obstacles of wind, solar, clean coal, energy storage, etc. are public opinion and technical
  - Principal challenges to nuclear are cost, public opinion, and availability of sites

- Initial Key Questions:

1. What if nuclear energy must carry the burden of enabling us to achieve our energy security and climate goals ?
2. Can we site 300 GWe of new nuclear?
3. Does the answer change with a mix of large and small reactors?
4. How critical are technology breakthroughs such as "dry cooling"?

Objectives:

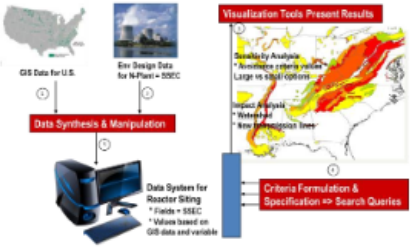
- Use industry-accepted parameters for screening
- Use array of GIS data sources and spatial modeling capabilities at ORNL

Approach:

- Adapted 2002 EPRI Siting Guide screening criteria, NRC RG 4.7, and approach for obtaining early site permits (ESPs) for nuclear power plants to GIS technology
- Use ~ 35 datasets to scan the contiguous U.S. (~1.8 billion acres) using 100 m by 100 m grid cells (2.5 acres)

Or approximately 3X football fields…

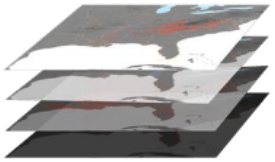
Searchable land database of ~ 700 million cells



ORNL OR-SAGE

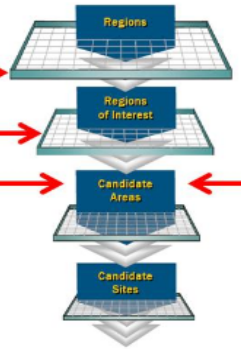
OR-SAGE Supports Initial Screening and More Detailed Analysis of Candidate Areas

GIS View of Site Selection Evaluation Criteria



SSEC Comprised of

- Exclusion Criteria
- Avoidance Criteria
- Suitability Criteria



Preferred Site(s)

Analysis capabilities for further evaluations

- Proximity to
  - Electrical Grid
  - Railways/highways
  - Additional hazards (oil pipelines)
- Population
  - Within specified distances
  - Profiles by 1 km x 1 km cells for EPZ studies
  - Growth from census data
- Socioeconomic factors
- Political – pro vs anti nuclear states
- Hypothetical siting to meet projected demand
- Scoring algorithm
- Sanity check on proposed energy mix

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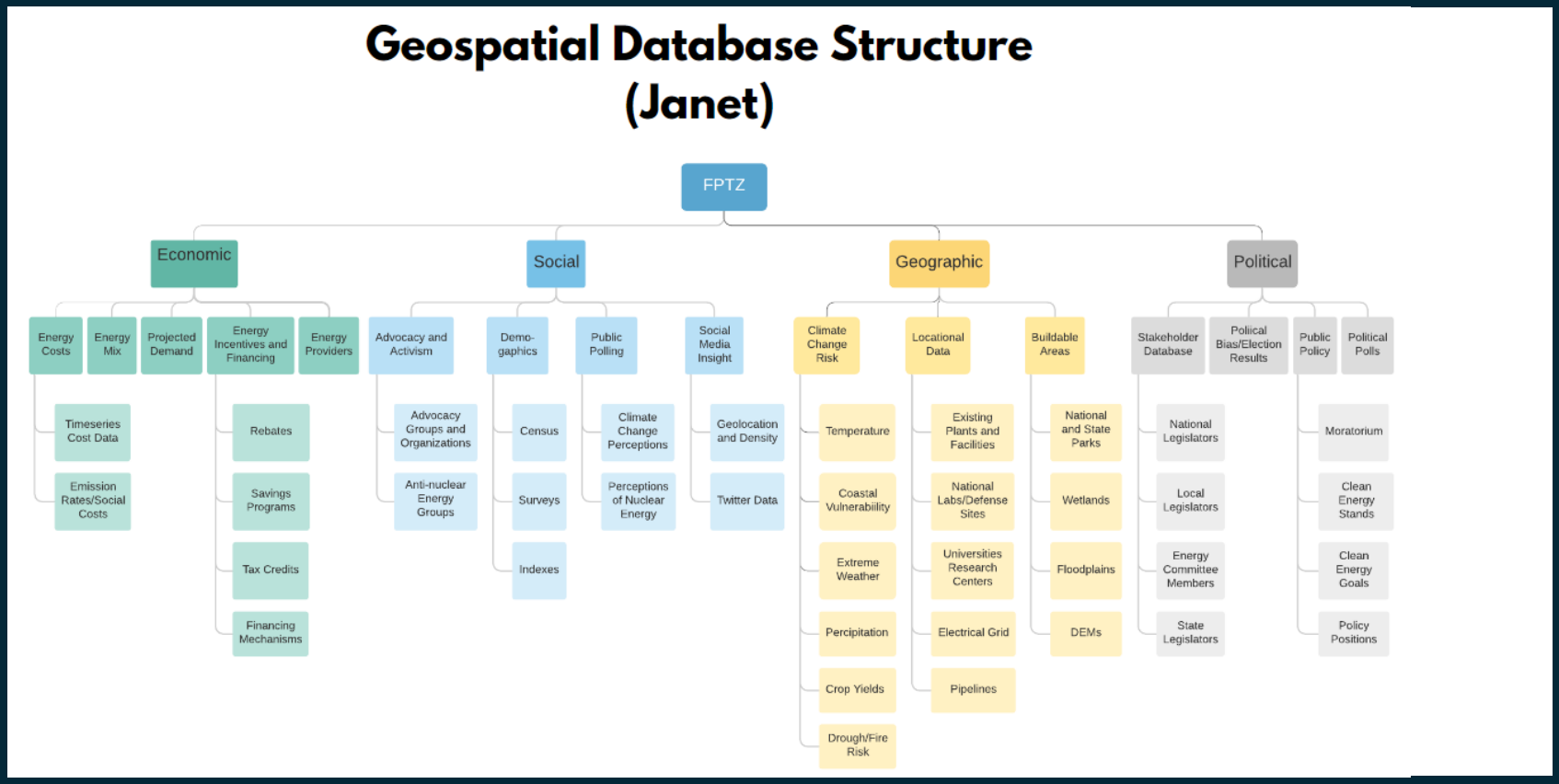
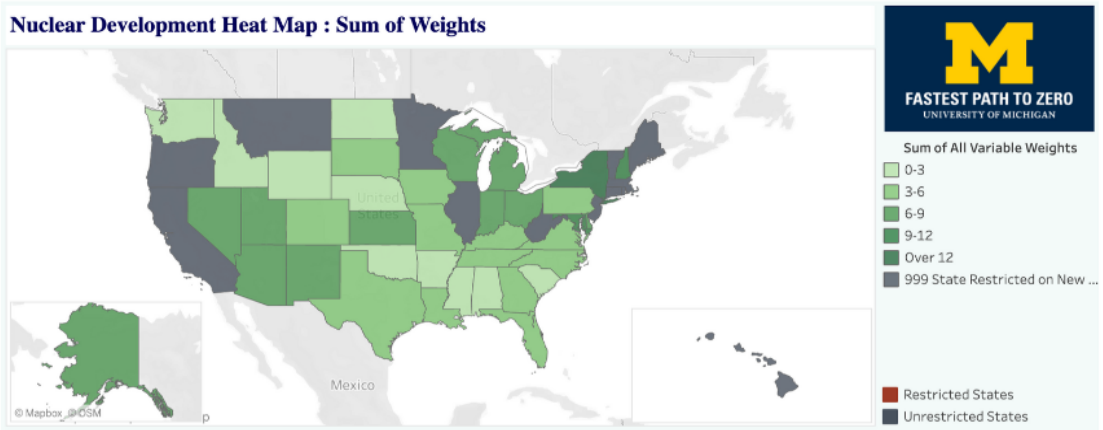
Michigan "JANET" Model



Michigan "JANET" Model

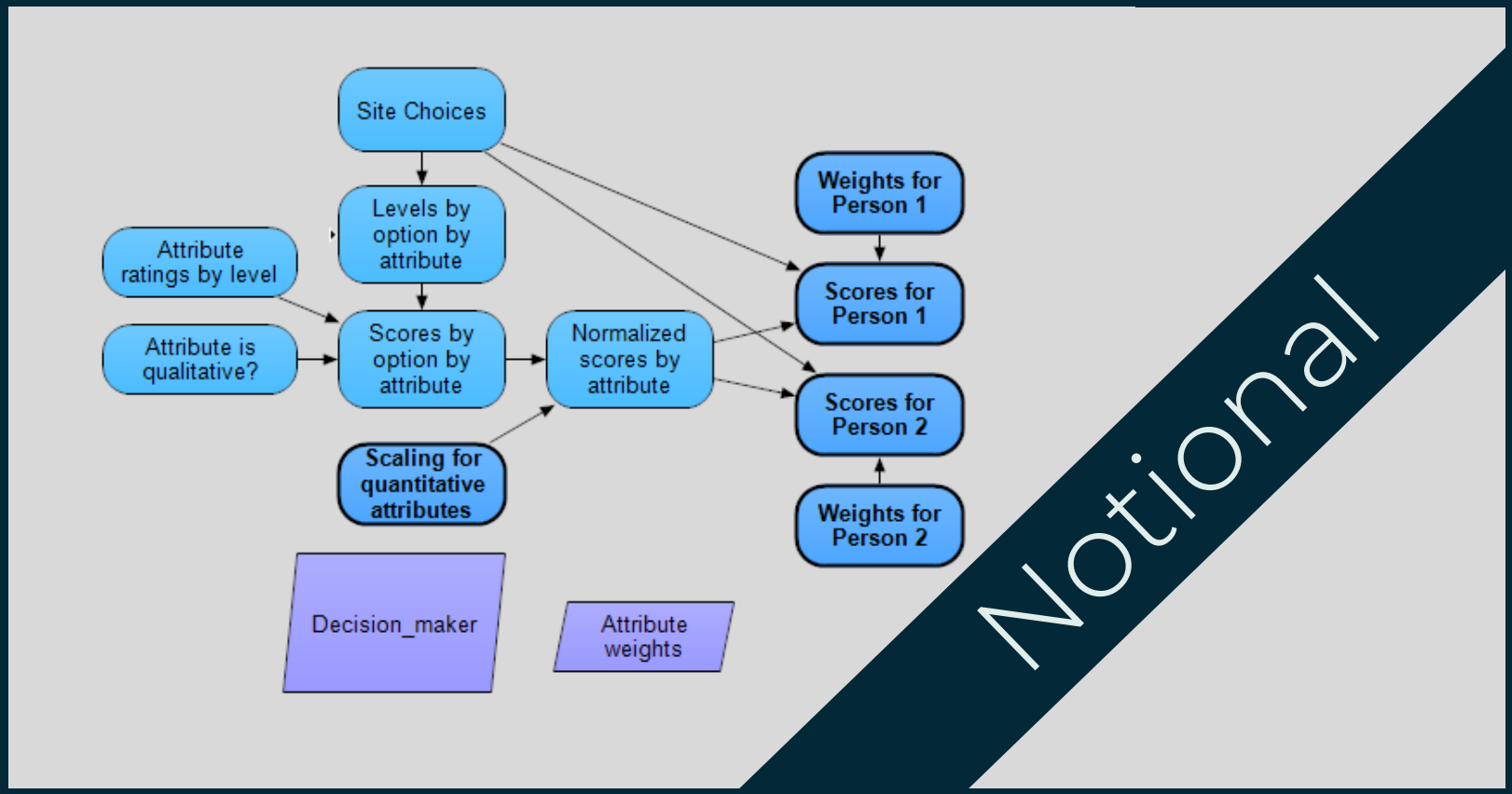
Modeling multi-factor comparisons at the national, state, and local levels



Variable Weights

State	Flow Weight	Net FlowWeight	Total Flow Weight	Retail Electric Energy ..	Total Energy Price We..	State Clean Energy Go..	State
New York	1.00	4.00	5.00	14.74	2.00		
California	-1.00	4.00	3.00	16.06	4.00		
Hawaii	0.00	0.00	3.00	26.05	4.00		
Maine	0.00	3.00	3.00	13.02	2.00		
Massachus..	-1.00	4.00	3.00	17.12	4.00		
Maryland	0.00	4.00	4.00	11.98	2.00		
New Hamps..	0.00	2.00	2.00	16.17	4.00		
Rhode Island	0.00	2.00	2.00	16.42	4.00		
Vermont	1.00	3.00	4.00	14.60	2.00		
Connecticut	-1.00	2.00	1.00	17.55	4.00		

ARGONNE Multi-attribute model



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Thank you

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