

# Adapting the RE Zones Process

Jessica Katz, National  
Renewable Energy  
Laboratory

30 March 2017

# Afternoon learning objectives

---

- **Describe the general steps of the REZ process that can be adapted to various power system contexts**
- **Conduct a thought experiment on how a REZ process would be constructed in each country context, including key drivers, stakeholders, and RE zone parameters**
- **Understand how to utilize the Renewable Energy Data Explorer to support the identification of RE Zones**
- **Identify potential country-specific next steps (or barriers) to incorporating REZ into transmission planning**

# Recap



- A renewable energy zone (RE Zone) is a geographic area characterized by high-quality RE resources, suitable topography, and strong developer interest.
- The RE Zone *process* customizes transmission planning and approval for renewables.

# Adapting the CREZ approach elsewhere

- **Objective: Upgrade and expand transmission infrastructure to cost-effectively convey renewable to meet electricity demand.**



# Deciding if the REZ approach is right

---

- **Is the policy and regulatory environment to transmission planning a barrier to RE deployment?**
  - Will a REZ help overcome those considerations?
- **Potential considerations:**
  - Coordination among local and regional regulatory authorities
  - Legal authority for land acquisition and/or right-of-way authorization
  - Social and environmental concerns and other land-use restrictions
  - Any other factors that might arise in transmission siting decisions (e.g., land tenure, eminent domain)
- **Potential drawback: increased variability associated with concentrating resources in zones**

## **Program Design & Vision Statement**

### **Renewable Energy Assessment**

Summary: Select areas with highest potential

Output: Study Areas map and supply curves

### **Candidate Zones Selection**

Summary: Identify zones with highest probability of development

Output: Candidate Zone map and supply curves

### **Transmission Scenario Development**

Summary: Bundle candidate zones and run economic scenario analyses

Output: Cost, benefit and reliability results for each transmission scenario

### **Final Transmission Plan Designation**

Summary: Select transmission scenario according to pre-set criteria

Output: Final transmission order

### **Transmission Upgrade**

# Step 1: Program design and vision statement



**Summary:** Design a nationally-appropriate process and produce a vision statement



**Final outputs:** Vision statement and program design document



**Estimated time:** 3 months



**Central actors:** Energy and environment ministries, regulatory authorities, and the system operator

# Stakeholder Engagement is Essential Across All Steps

- **Why?**
  - Provides transparency for assumptions, improves stakeholder buy-in
  - A diverse committee with a broad range of experience can bring new information to bear on unusual questions that arise
  - Analysts will inevitably need guidance on unanticipated questions that arise
  - ***Defensibility after the process is complete***

## Example Advisory Committee Composition

Senior staff from energy ministries

System/market operator

RE industry representatives

Environmental interests

Special stakeholders who might be affected

# Step 2: RE Assessment



**Summary:** Identify areas with the highest potential for low-cost development; allow state and local governments to identify priority or avoidance areas



**Final output:** Study areas map and supply curves (one per area)



**Estimated Time:** 8 months



**Central actors:** Energy ministry, regulatory agencies, state and local governments, energy research institutes, developers and the public

## Steps 2: RE Resource Assessment and Screening

- **Key questions these steps should settle:**
  - What areas are off limits to RE development?
  - What remaining areas have the highest concentrations of high-quality resources?

### GIS data needs:

- ✓ RE resource data
- ✓ Land cover/land use
- ✓ Elevation/slope
- ✓ Protected areas  
(environmental, cultural, historical)
- ✓ Other environmental or social constraints

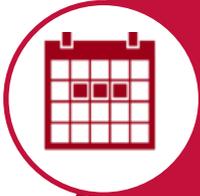
# Step 3: Candidate zones selection



**Summary:** Select areas with the highest probability of commercial development



**Final output:** Candidate zone map



**Estimated time:** 2 months



**Central actors:** Energy ministry, regulatory agencies, private developers

## Step 3: Conduct a Formalized Input process for Developers to Indicate Interest

- **Necessary input: RE screening delivers clearly identified areas for commercial consideration**
- **Objective: obtain from developers a prioritization of areas with development potential**
  - Eliminate areas for which developers demonstrate no interest
- **End result: zone designation by authority in charge of REZ**



# Evidence of Market Demand

---

- **Traditional transmission planning relies on certainty of a known generation project**
  - Utilization is known, low-risk
- **Issue for REZ: No specific project at the time a transmission decision is made, so how can regulators know that market demand is robust enough?**
- **REZ approach:**
  - Developers provide demonstrations of financial commitment
  - Regulators weigh each proposed zone's combined demonstrations of commitment to determine which ones show the strongest demand

# Step 4: Transmission scenarios development



**Summary:** Bundle candidate zones into a set of transmission scenarios



**Final output:** Economic Analysis results for each scenario



**Estimated time:** 9 to 12 months



**Central actors:** Energy ministry, system operator, regulatory authorities

## Step 4: Conduct Economic Analyses of Zones with High Interest

---

- Ultimate objective is to identify “no regrets” options for transmission expansion that are robust across several scenarios, e.g.,
  - Accelerated carbon reduction
  - High/low natural gas prices
  - Accelerated distributed generation and demand response
  - Other “what-if” scenarios?
- Main analytical questions:
  - Given the zones that the regulator has designated, what is the best transmission plan for interconnecting the zones?
  - Network plan or high-voltage trunk lines?
  - What additional actions are needed to maintain reliability (e.g., ancillary services, contingency studies)?

# Economic Analyses of REZ Scenarios

- Production cost modeling
  - Model dispatch on the entire network to determine how the variable cost of production changes under different REZ scenarios
  - Outcomes include total production costs over a test year, congestion costs (could be more, could be less), local marginal cost of power
- **Cost-benefit analysis**
  - Production cost savings against the cost of new transmission
  - Scenarios based on process completed by advisory committee

## **Other technical studies:**

**Ancillary services needs**

**Dynamic stability studies**

**Power flow studies**

# Step 5: Final Transmission Plan Designation



**Summary:** The regulatory authority issues transmission plan



**Final output:** Final transmission plan



**Estimated time:** 3 to 9 months



**Central actor:** Regulatory authority

# Step 6: Transmission Upgrade



**Summary:** Execution of the transmission development plan through the implementation of system upgrades



**Final output:** Transmission upgrades



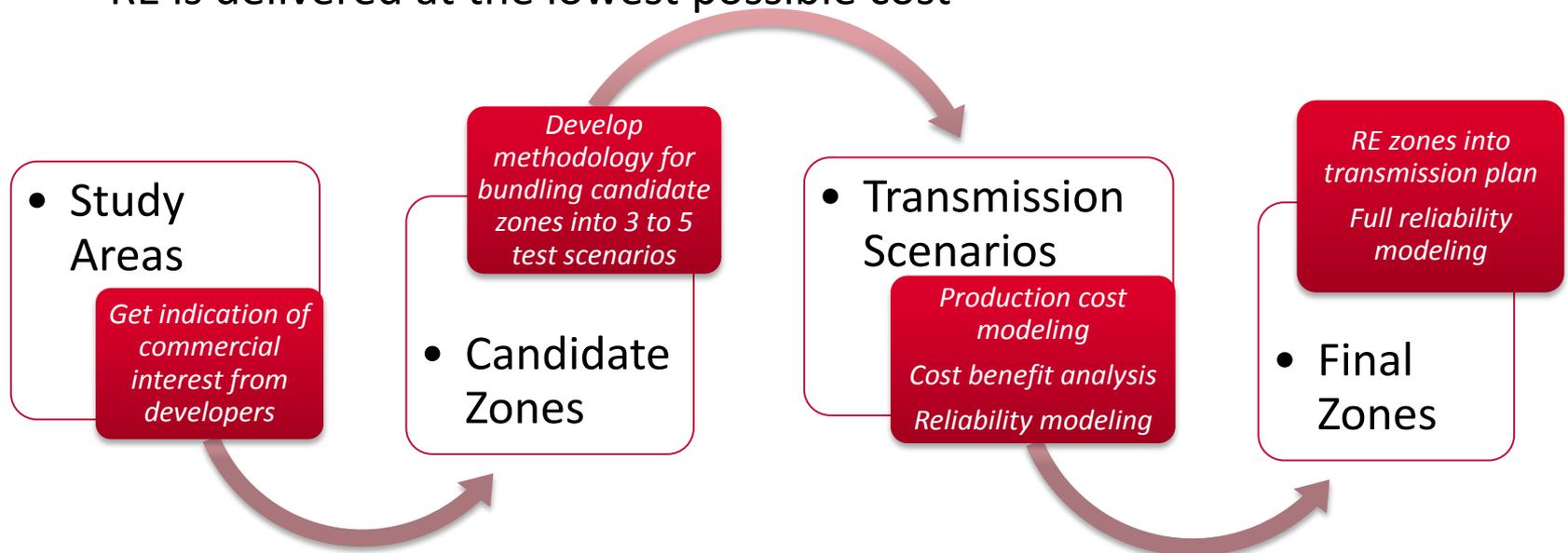
**Estimated time:** 1 to 4 years



**Central actor:** Regulatory authorities, system operator, utilities, private developers

# Steps 5-6: Designate REZs and Approve Transmission Plan

- **Assuming each step is sufficiently completed:**
  - ✓ Zones are the best and most developable areas, with demonstrated commercial interest
  - ✓ Grid impacts are modeled and reasonably known
  - ✓ Regulators have information necessary to select and approve a transmission plan
  - ✓ Cost recovery authorized, construction begins
  - ✓ RE is delivered at the lowest possible cost



# Summary and Takeaways

---

- **Development follows transmission**
  - Intent of REZ is to geographically direct new development to where cost per MWh would be lowest
- **Authority to order new transmission construction comes before zone designation**
  - When analysis begins, question is “where” not “whether”
  - Analysis without authority is advisory
- **Data, analysis, and stakeholder engagement underlie the implementation of REZs**
- **Defining the end goal is important—e.g., the process does not end with REZ designation, but with an approved transmission plan**