

# 2014 Electricity Forms Re-clearance: Renewable Electricity



# Overview

- We have three types of effort, with a variety of specific data elements
- New data survey forms
  - Focus on data that we don't collect
  - New survey frames
- New questions on existing forms
  - Collecting additional data from the current frame
- Reviving discontinued data collection
- At this point we are going for “maximum sweep”
  - Trying to capture all potentially useful data
  - Later, we will prioritize items for management's consideration



# New Form: Renewable Energy Equipment Installers Survey

- What: Collect data on U.S. renewable energy equipment installations: solar thermal panels and (esp.) PV cells/modules
- Why: 1. Manufacturer's survey provides no detail about where and what kind of systems are being installed, nor about price of installed systems; 2. Calibrate NEMS models, esp. res. & comm.; 3. Eliminate gap in solar heating; 4. Improve details and accuracy in EIA distributed/disbursed electricity data, electricity providers, and res/comm heating;
- Who: U.S. installers of and PV systems and distributed solar thermal. May need to do stratified sample for a manageable frame
- Frequency: Annual
- Notes: Same approach could be used for small wind as well

# Equipment Installers: Details

- How many systems did you install?
  - Count and total MW
  - How many/much were commercial systems (including multi-family buildings and condo associations)
  - How many/much were residential systems (sold to individual owners of a home)
- How much revenue did you earn from this activity?
  - For leased systems, need to ask about costs or present value revenue
- How many (count and capacity) were of the following type:
  - For PV: Crystalline, thin film, or other
  - For thermal: domestic hot water, swimming pool, other

# Additional Detail on Utility-Scale Installed Capacity

- What: Obtain additional information on renewable equipment installed at facilities already subject to the Form 860 reporting requirement
- Why: Basic physical characteristics of renewable generating capacity are not currently tracked, but would be useful in analyzing trends for cost, performance, and market development
- Who: Wind, solar, and storage facilities greater than 1-MW, as contained in the Form 860 frame
- When: Upon initial reporting and as warranted by changes in facility design

## Utility-Scale Installed Capacity (con't)

- Justification for additional information request: (1) to better model costs, in particular for the AEO and (2) to analyze technology-specific performance using actual data.
- General Approach: Add additional questions to Schedules 3b and 3c, for respondents who have answered that predominant or second-most predominant energy source is solar or wind.
- Additional burden should be minimal. The questions pertain to a limited subset of 860 respondents, fit into an existing survey schedule, and are few in number.
- Some data may be available from GADS, but we would need to coordinate with NERC

# Wind Plant Installed Capacity Details

- Ensure reported “units” do not aggregate turbines with significantly different technology specifications
- For each unit (or aggregation of units with similar specification):
  - Rotor diameter
  - Wind speed at which turbine achieves rated power under prevailing local conditions
  - Tower height
  - FAA tower identification number
  - Power conversion type (pick from induction, induction-slip, double-fed induction, complete AC-DC-AC conversion)
  - Primary equipment manufacturer

# Wind Plant Installed Capacity Details

- For the site
  - Lat/Lon of reference point (already asked)
  - Identify nature of reference point (is this a wind turbine or a building?)
  - Altitude above sea level of reference point, at ground level
  - Average annual wind speed
  - Area of land (or seabed) leased or owned that is exclusively reserved for plant operations

# Solar PV Plant Installed Capacity Details

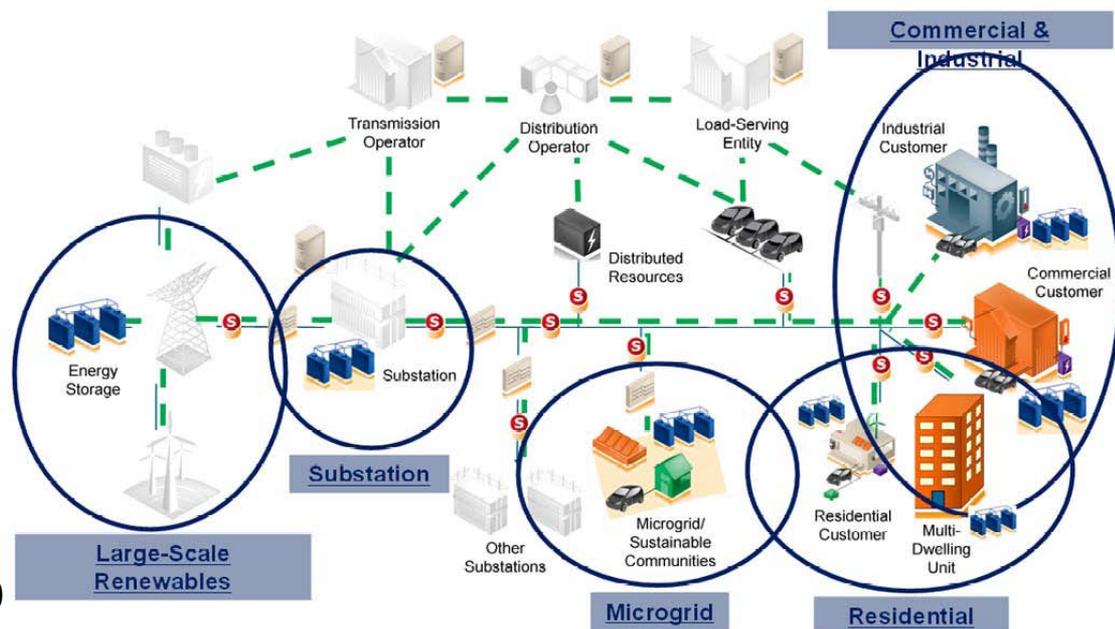
- Use of Tracking or Concentrating Technologies. Check at least one of the below statements that apply: (a) system uses lenses or mirrors to concentrate sunlight (b) modules are installed with single-axis tracking technology (c) modules are installed with dual-axis tracking technology (d) modules are installed at a fixed tilt
- DC nameplate capacity of modules. Report the total DC capacity of all modules in the system. Note that this should be larger than the generator nameplate capacity reported in 3.B.1 (which corresponds to AC nameplate rating of the inverter).
- Panel material. Identify the predominant type of panel used, in order of descending total capacity [include three boxes for each generator, each containing the following options]: (a) crystalline silicon (b) thin-film, CdTe (c) thin-film, A-Si, (d) thin-film, CIGS, (e) thin-film, other (f) other (please identify in schedule 7)
- Manufacturer of module
- Area of land leased or owned and exclusively reserved for plant operations

# Solar Thermal Installed Capacity Details

- Data Elements for respondents where fuel is solar and prime mover is ST/OT/CA/CP (i.e. is classified as “solar thermal”)
- Thermal Energy Storage. If system includes capability for thermal energy storage, how many hours of additional generation (at full capacity) does the storage system yield?
- Solar Collector Technology. Identify the type of solar collector used: (a) parabolic trough, (b) linear Fresnel, (c) power tower, (d) dish engine, (e) other.
- Solar Collector Field Size or Solar Multiple. (We want to ask *one* of the following, depending on stakeholder input regarding relative perceived burden.) (1) Specify the solar multiple (the ratio of the solar field size in  $MW_{th}$  to the capacity of the turbine);(2) Specify the total size of the solar collector field, in terms of  $MW_{th}$  ; or (3) Specify the aperture (in  $m^2$ ) of the solar field.
- Major equipment manufacturer
- Area of land leased or owned and exclusively reserved for plant operations

# New Question: Electricity storage

- What: Identify storage installations and functions used by 860 and 861 respondents
- Why:
  - Support efforts to track storage technology trends.
    - Benefitting DOE, Congress, States, academia, industry, general public
  - Provide historical data to support developing NEMS model w/r/t storage
  - Who: Plants reporting to Form 860 and utilities reporting to Form 861
  - When: Annual



\*Including a few questions with a low response burden at this relatively early stage in the technology's penetration will leave EIA in a good position to develop a more comprehensive survey approach if warranted by market growth.\*

## Storage Details

- Notify respondents to include any storage devices on Schedule 3, *including any devices <1MW*
- Existing data elements:
  - Prime mover (add: capacitor, SMS?)
  - Capacity
- New data elements for storage:
  - Operational discharge time OR total energy stored
  - Function (choose all that apply: frequency regulation, spinning reserve, voltage support, other ancillary services, smoothing/firming intermittent sources, load leveling or shifting)
  - Battery type

## Storage: Proposed form changes for 861

- Propose adding storage questions to Schedule 6e (distribution infrastructure)
- Data elements:
  1. Are there storage devices on your distribution system Y/N?
  2. Total storage capacity (MW)
  3. Function (choose all that apply: load leveling or shifting, voltage support, frequency regulation, other ancillary services, smoothing/firming intermittent sources)
  4. If there is a predominant storage technology type, provide type, typical unit capacity, and discharge time
  5. Location (community, distribution substation, transmission substation, other)
  6. Load served through infrastructure supported by storage, if known
  7. Number of customers served by infrastructure supported by storage, if known

# New Questions: State RPS Compliance

- What: Collect data to document the impact of the various State RPS policies on the growth in renewable generation
- Why: Calibrate AEO model; serve as a public record for a subject of substantial interest among policymakers, public-at-large, and other key interest groups
- Who: Utilities subject to RPS requirements (Form 861) *or* State PUC/energy offices that implement them (new form?)
- When: Annual data collection

# State RPS Compliance: Details

- Indicate, by state, target, and source the number of MWh used to comply with all specific requirements you are subject to
  - Physical generation only, list any “alternative compliance” credits separately
  - Regardless of source (“in-house”, purchased power, or purchased “credits”)
- How much generation/credits did you purchase (not generate yourself)?
  - How much did you pay for this generation

# New Questions: Biomass Fuel Usage

- What: Enhance data collection to better determine the origins and characteristics of biomass fuels as well as their utilization
- Why: Improve EIA estimates of biomass supply curves; serve as a public record for a subject of substantial interest among policymakers, public-at-large, and other key interest groups interested in biomass power plant performance
- Who: Utilities that co-fire biomass in existing coal plants or in dedicated facilities. Frame would be contained in current Form 923.
- When: Annual data collection

# Biomass Fuel Usage: Details

- Examine the origin and characteristics of the biomass fuel
  - What are the characteristics of the fuel purchasing agreements? (With whom are they made? For what duration?) What transportation method is used to ship the materials to the plant?
  - What types of feedstocks are procured for the plant? Are they stored at the plant for long periods of time? What are their attributes as they enter the boiler for combustion (moisture content, size)?
- Determine the type of facility that is using biomass
  - Does the combustion occur in a dedicated combustion unit or is it co-fired?
    - If co-fired, how much of the plant's boiler capacity is retrofitted to accommodate biomass?
    - Does the biomass portion of the plant require additional maintenance?

# New Question: Plant Revenue

- What: Collect data on the power purchase agreements from renewable generators
- Why: Requested by EERE. Help improve understanding of the actual market cost and value of renewable generation.
- Who: Independent power producers and other generators with power purchase agreements.
- When: Annual data collection

# Plant Revenue: Details

- Some information on PPAs is already collected on FERC Form 1, from the perspective of the purchasing utility.
- FERC data suggests that PPAs can be complicated instruments,
- Instead of PPAs, EIA could ask for gross annual revenue received from plant generation, with possible break-out by:
  - Energy revenue
  - Capacity payments
  - Ancillary services payments
  - REC payments (where separated from energy payments)
- However, it would be difficult to structure suitable questions on actual PPA terms, conditions, and structures

# Revived Survey: Renewable Energy Equipment Manufacturers/Importers Survey

- What: Collect data on renewable energy equipment : solar thermal panels, PV cells/modules, wind turbines, wood stoves, geothermal heat pumps
- Why: 1. Calibrate NEMS models; 2. provide requested information on U.S. “green energy” industry; 3. Eliminate gaps in EIA data; 3. Subject of substantial interest among policymakers, public-at-large, and other key interest groups; 4. Collect requested info on rare earths
- Who: U.S. manufacturers and U.S. subsidiaries of foreign companies that ship to U.S. destinations.
- Frequency: Annual

# Equipment Manufacturers Survey: Details

- Current EIA-63B is a template which can be used for all renewable energy equipment—only the technical column headings change. *Major cost savings over prior approach; 1 survey collects data for 5 fuel areas.*
- Collect full accounting balance (production, imports, exports, shipments, inventory)
  - Collect number of units, capacity, and equipment efficiency. Unclear whether it makes sense to collect “systems” shipped.
- For PV and wind, include questions on rare earth consumption
- Either EIA or program offices have respondent lists (ex. wood)
- Prior separate surveys were inefficient, not viable.

# Equipment Manufacturers Survey: Details

## (cont'd)

- A complete list of EPA-certified wood stove manufacturers, including contact information, is available at

<http://www.epa.gov/oecaerth/resources/publications/monitoring/caa/woodstoves/certifiedwood.pdf>

- Several lists of PV installers exist with contact information. In addition, we propose to ask electricity providers if they installed renewable equipment during the year (see later slide).

# Cost and Operating Expenses

- Effort being coordinated with Jim Hewlett's group
- Cost questions are largely the same as other facilities
- O&M questions may require additional specification for renewables