EIA's Residential Energy Demand Survey

For:
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Purpose

To provide experiential background to help one ask the right questions when considering contracting out survey work to support end-use energy consumption statistics

Presumptions

- Contractor will have survey but likely not energy industry expertise

=> Heavy interaction needed between contractor and sponsor

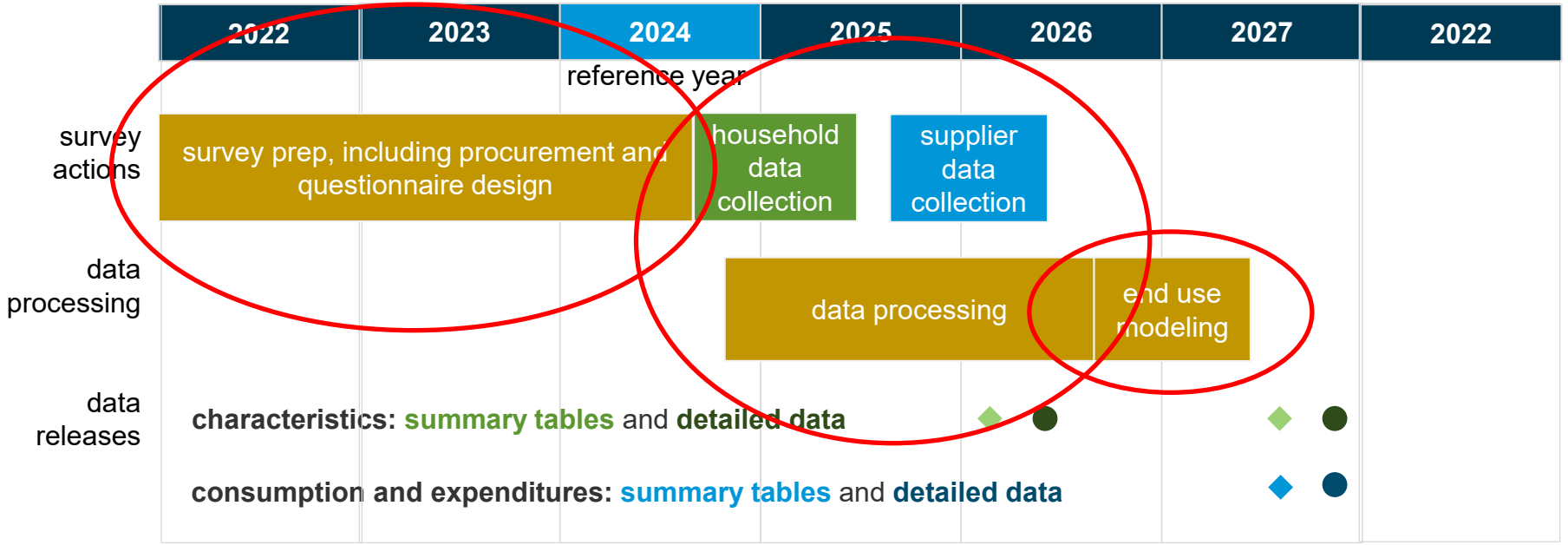
- Only households know characteristics of homes and equipment; utilities know consumption best

=> Characteristics from households; bills from utilities

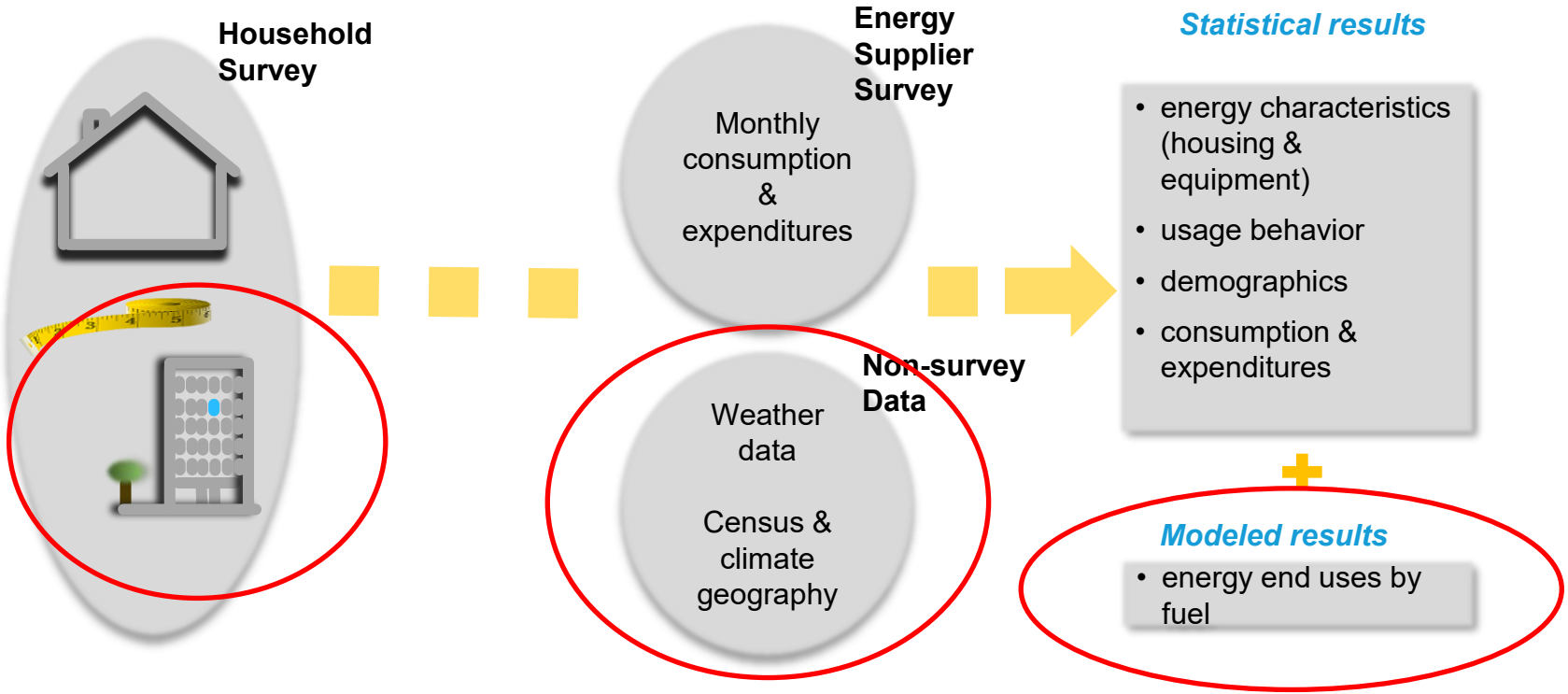
- Benchmark household consumption surveys are expensive

=> If possible, pilot study before major methodological changes

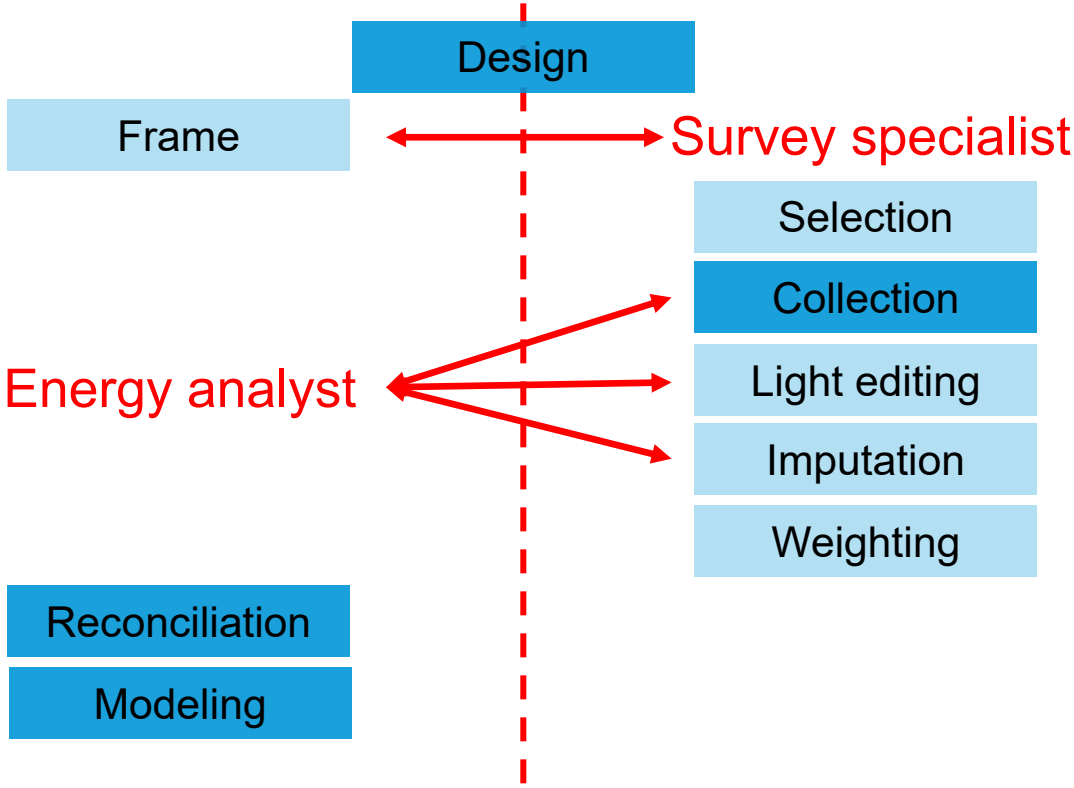
2024 RECS timeline



End-use data: Result of a series of surveys and models



Comparative advantage



Survey design

Energy analyst

- General content
  - Fuels
  - Characteristics/equipment
  - End-use modeling needs
- Geography
  - Geographic detail
  - Needed for all variables?
  - Priorities (loss function)
- Acceptable error rates

Survey specialist

- Pretesting
  - Collection mode
  - Instrument design
- Sampling strategy
  - Collection targets (completes)
  - Non-response follow up
  - Bias tests
- Imputation/editing strategy
  - Data needs
  - Techniques

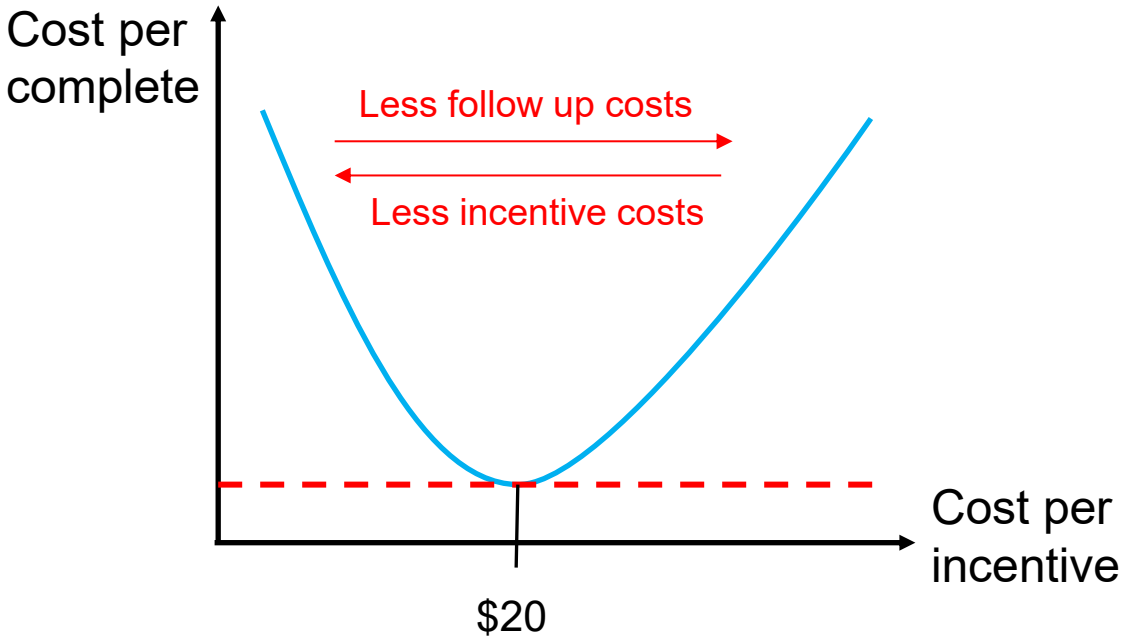
Lessons: Survey design and collection (big picture)

- Pretesting is important
  - Can the respondent easily and accurately report the information?
  - Does the respondent understand the question (and are pictures necessary)?
  - Do the skip patters work (no early drop out and beware of open-ended questions)?
- Strategy for nonresponse is needed
  - Protocols for follow up (follow up letters, monetary incentives, when to cut bait)
  - Official government logo on materials and legislation may help
- Survey collection should be monitored and allow for flexibility
  - “Real-time” dashboard to redirect sample where needed
  - Opportunity to examine different tranches of data shortly after collection

Lessons: Survey design and collection (detailed)

- Make sure to define household and what is considered “space”
- Space conditioning is most often the largest consumption item
  - Make sure to collect information on fuel and/or equipment type
  - Protocols for follow up (follow up letters, monetary incentives, when to cut bait)
- Square footage is an extremely important data collection need
- Collect weather data from local weather service
  - Greatest variant in explaining energy use across sessions and over years
  - Important information for most end-use modeling

Monetary incentives (field test)



Reconciliation

- Process to compare and edit data from two different sources
- Directly compare overlapping variables when they exist
- See if results make sense across related variables
- Edit or add new imputations where necessary

Lessons: Reconciliation

- A few overlapping variables help in validation
- Respondents are often not good at estimating square space
  - If conducting field interviews, agents can measure the house for survey
  - Trade off is that field agents can be expensive
- If possible, collect historical monthly billing data covering period
  - Ask respondents for utility companies on survey
  - Does not need to be collected every month
  - Utilities can easily pull historical customer billing records
  - Monthly data is very helpful for editing during reconciliation

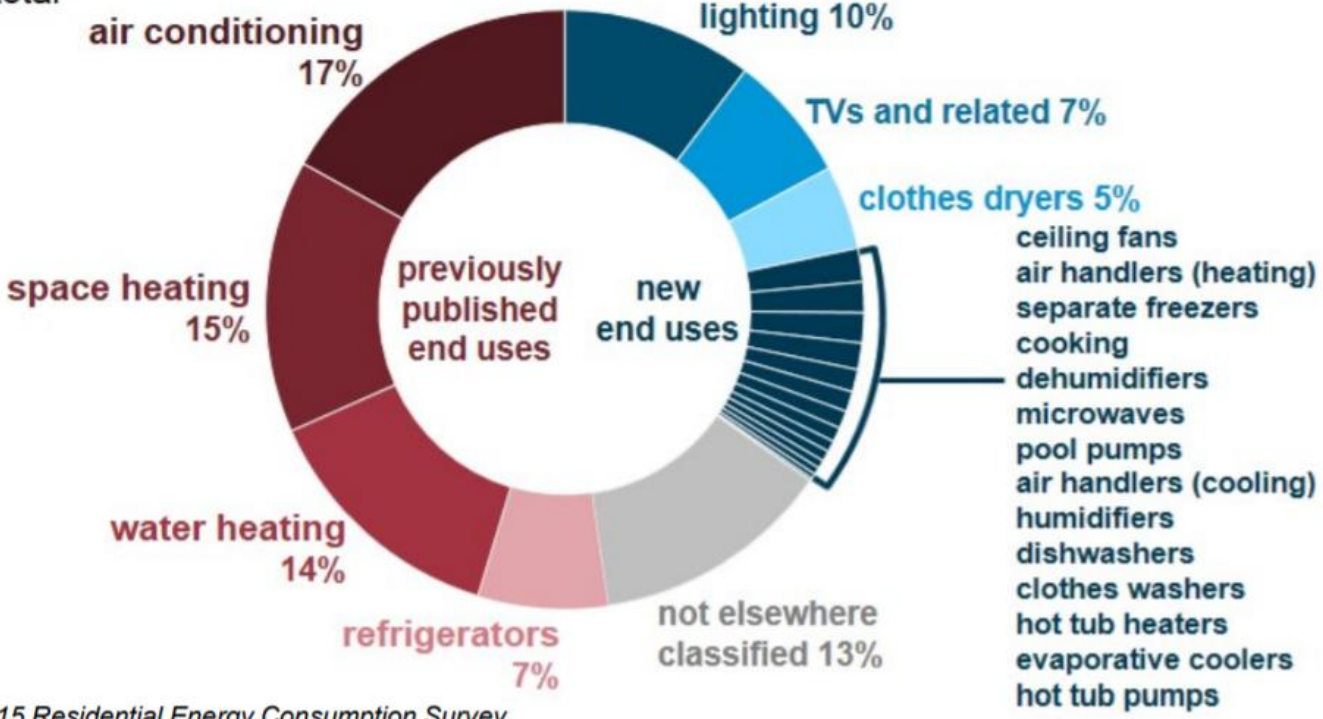
End-use modeling: Data needs

- Sadly, no submetering data across a representative, national sample
- Hence, end-use consumption must be ***Estimated*** from available information:
  - Annualized Billing data (required)
  - Building characteristics data (required, but detail can vary)
  - Administrative data (Not always necessary, but can improve results)

  - Wider Community Knowledge!

2015 RECS reports 26 electricity end-use estimates, up from 5 in previous rounds

Residential electricity consumption by end use, 2015
percent of total



Source: EIA, 2015 Residential Energy Consumption Survey

The basics of end-use estimation

Use ***Calibration*** to synthesize available information:

- ***Task 1*: *Expectations***, quantified by *Models*
  - Housing characteristics data
  - Weather data
  - Wider community knowledge
- EIA models each energy source separately
- ***Task 2*: *Final measurements (with control totals)***
  - Annualized billing data

Options based on data and resource ability (approaches)

- ***Expectations***, quantified by *Models*
  - Statistical approach:
    - Regression analysis with nationally representative sample
    - Coefficient values used to determine values for individual observations
  - Engineering approach:
    - Calculations based on engineering formulas
- ***Final measurements (with control totals)***
    - Simple normalization (*e.g.,* prorate)
    - Minimum variance estimation (preferred)

Takeaways

- Planning is an important and lengthily process
  - Think about final tables and what data are needed to get there
  - Think about who would be the most knowledgeable and could provide the best data
  - Leverage administrative data whenever possible (e.g., weather, equipment efficiency ratings)
- When contracting out work be respectful of relative strengths
- Ensure ability to monitor collection and adjust if necessary
- Leverage the work of others to determine needed content