Bridging the Gap between Atmospheric Science and Grid Modeling

Status and Next Steps

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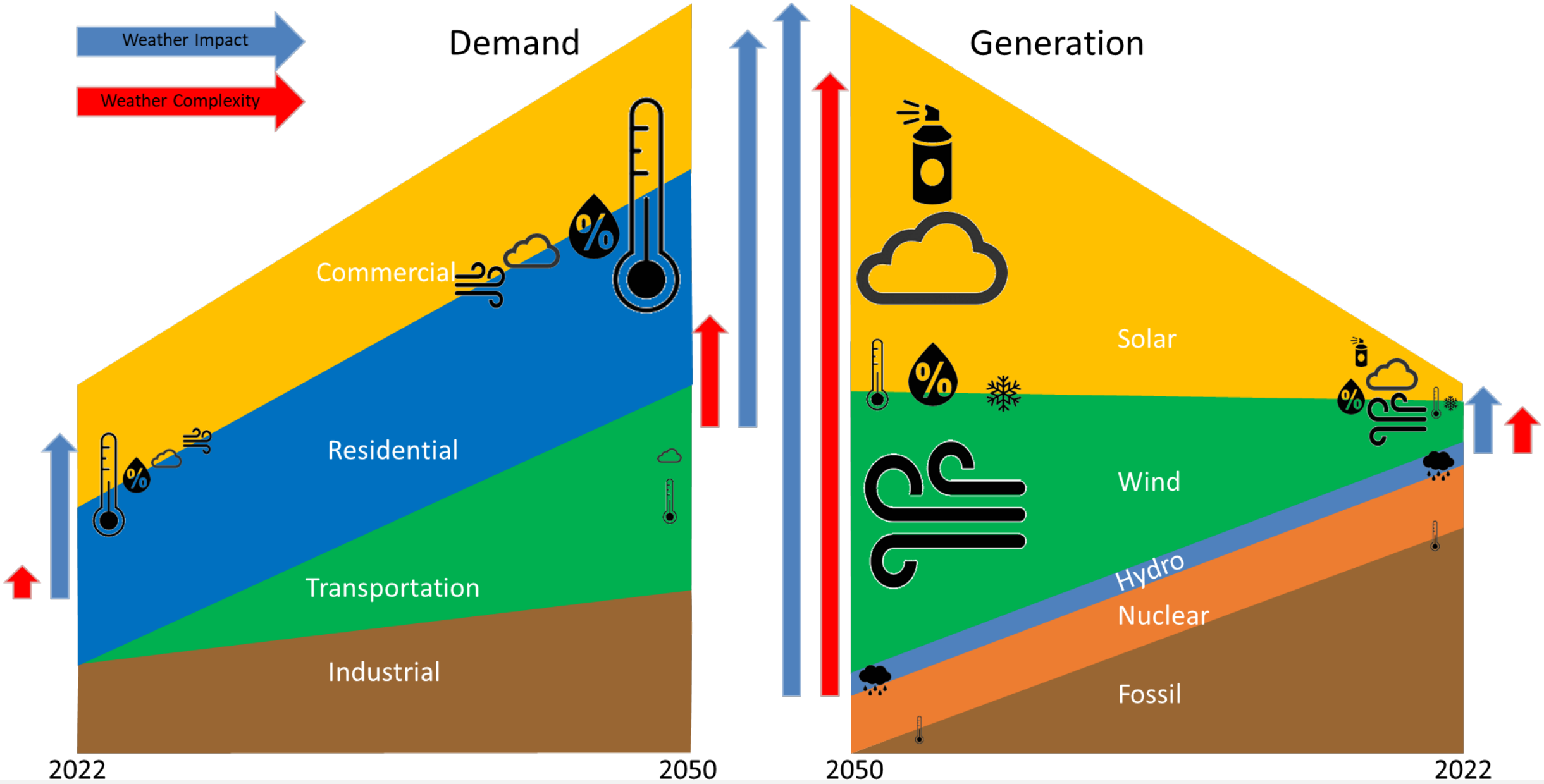
Support and content provided by:

ESIG
ENERGY SYSTEMS INTEGRATION GROUP

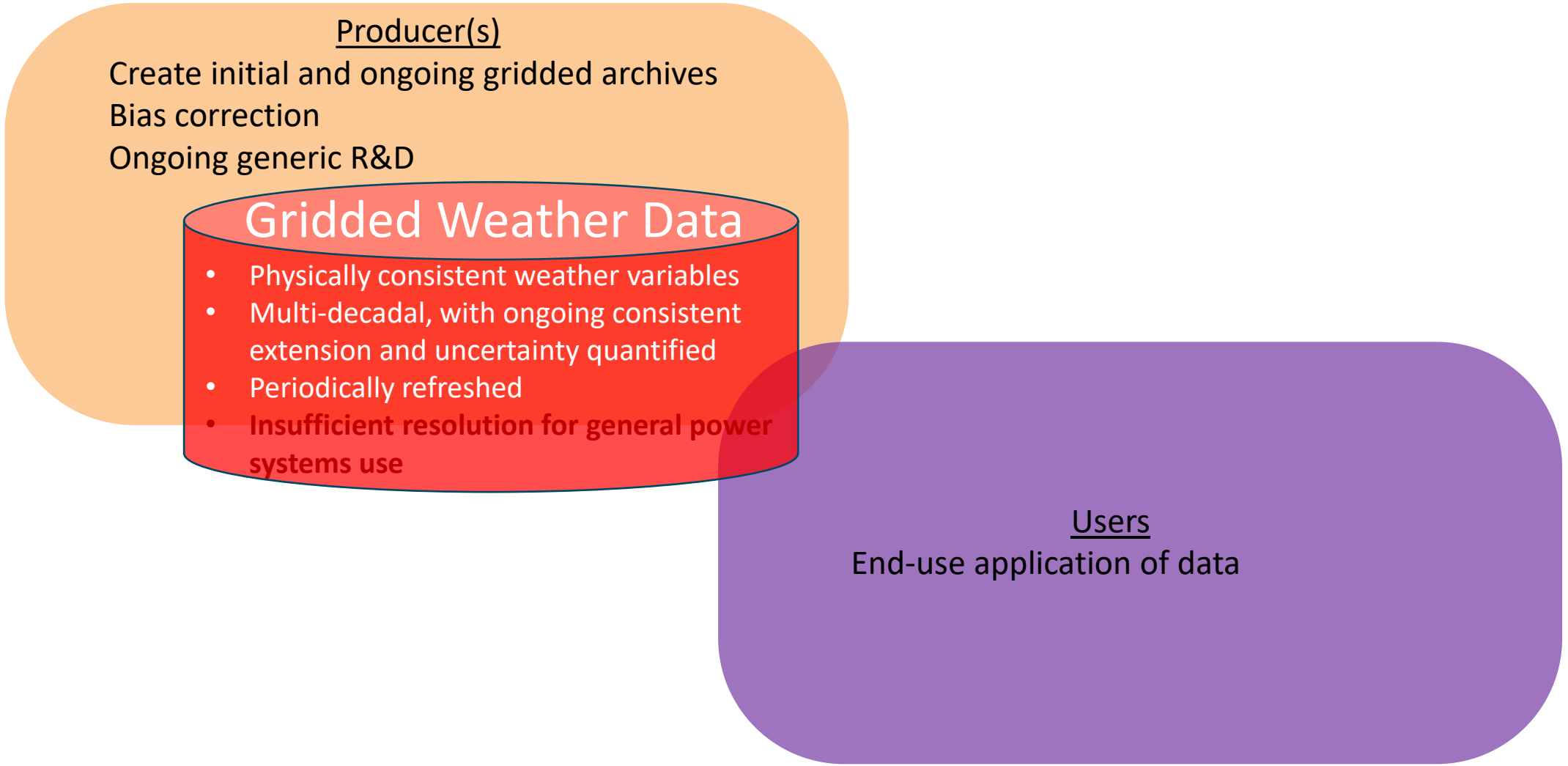
GridLAB

Sharply Focused
Understanding Renewable Resources

The Evolving Energy – Weather Nexus

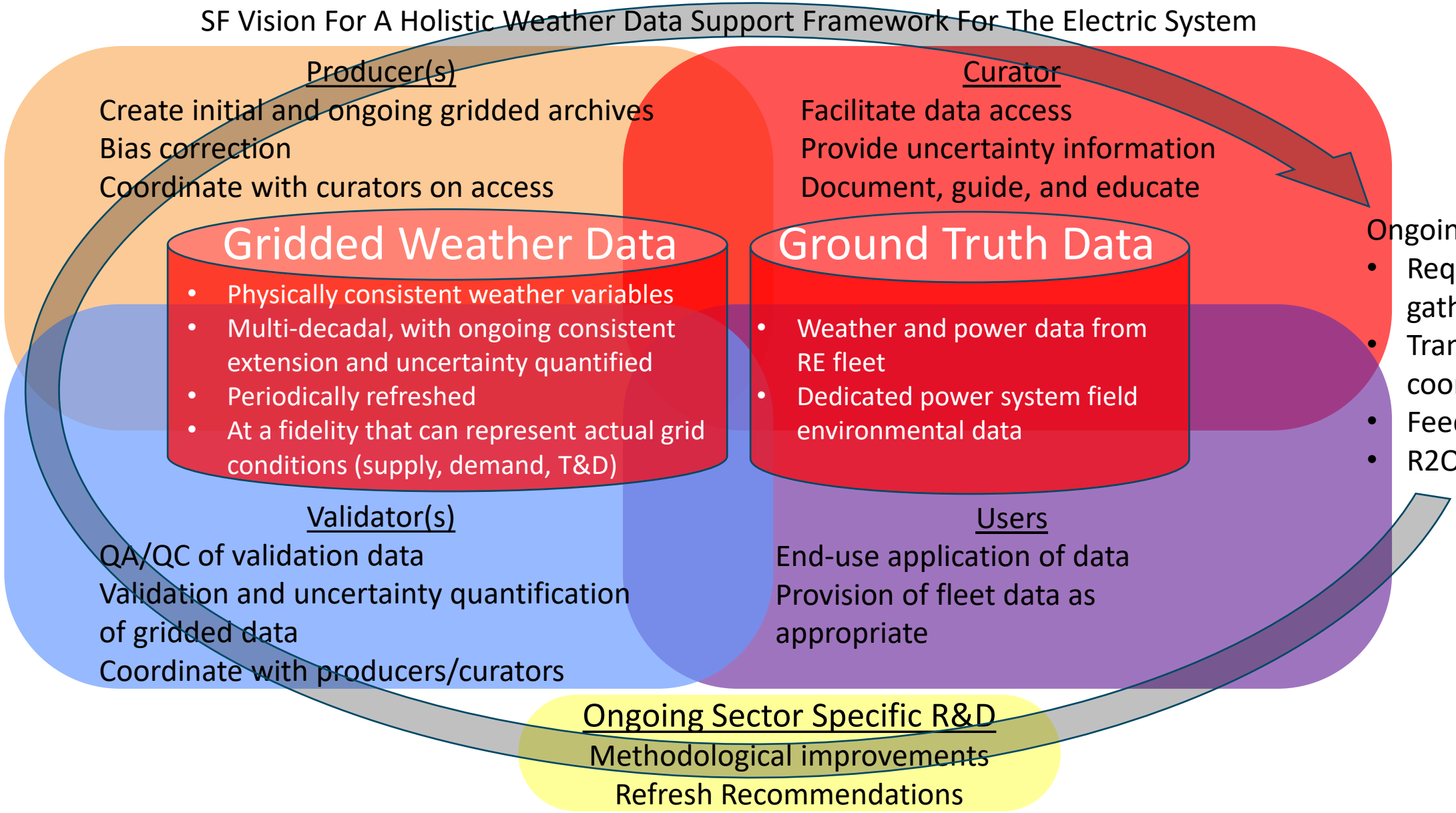


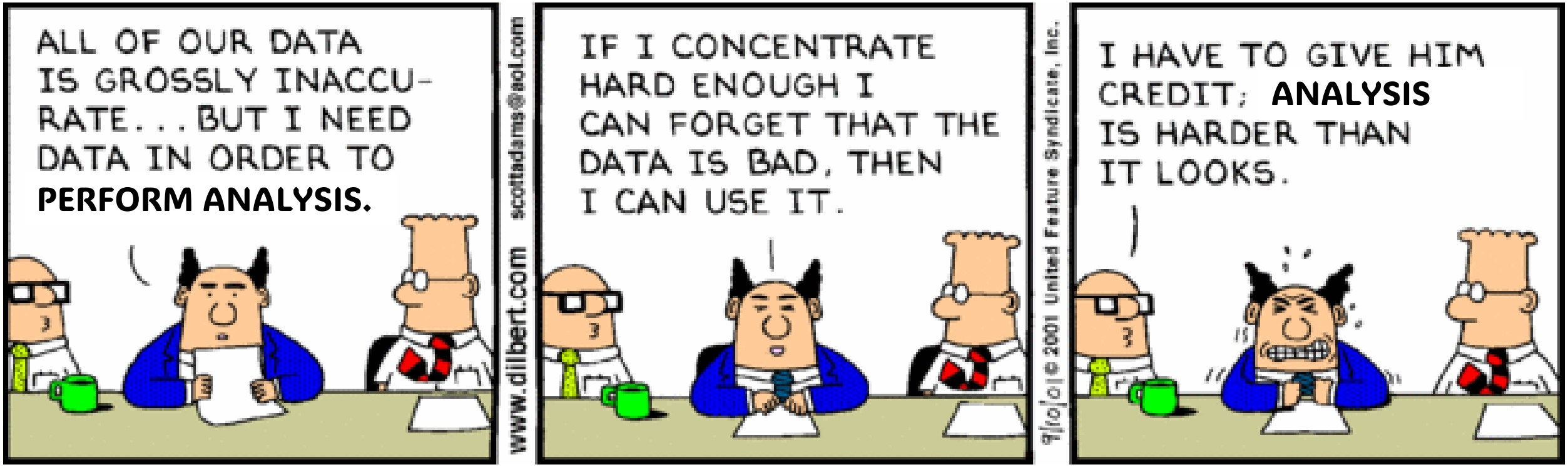
Our Weather “Intelligence” is Inadequate



We Need Vision, Investment & Leadership

SF Vision For A Holistic Weather Data Support Framework For The Electric System

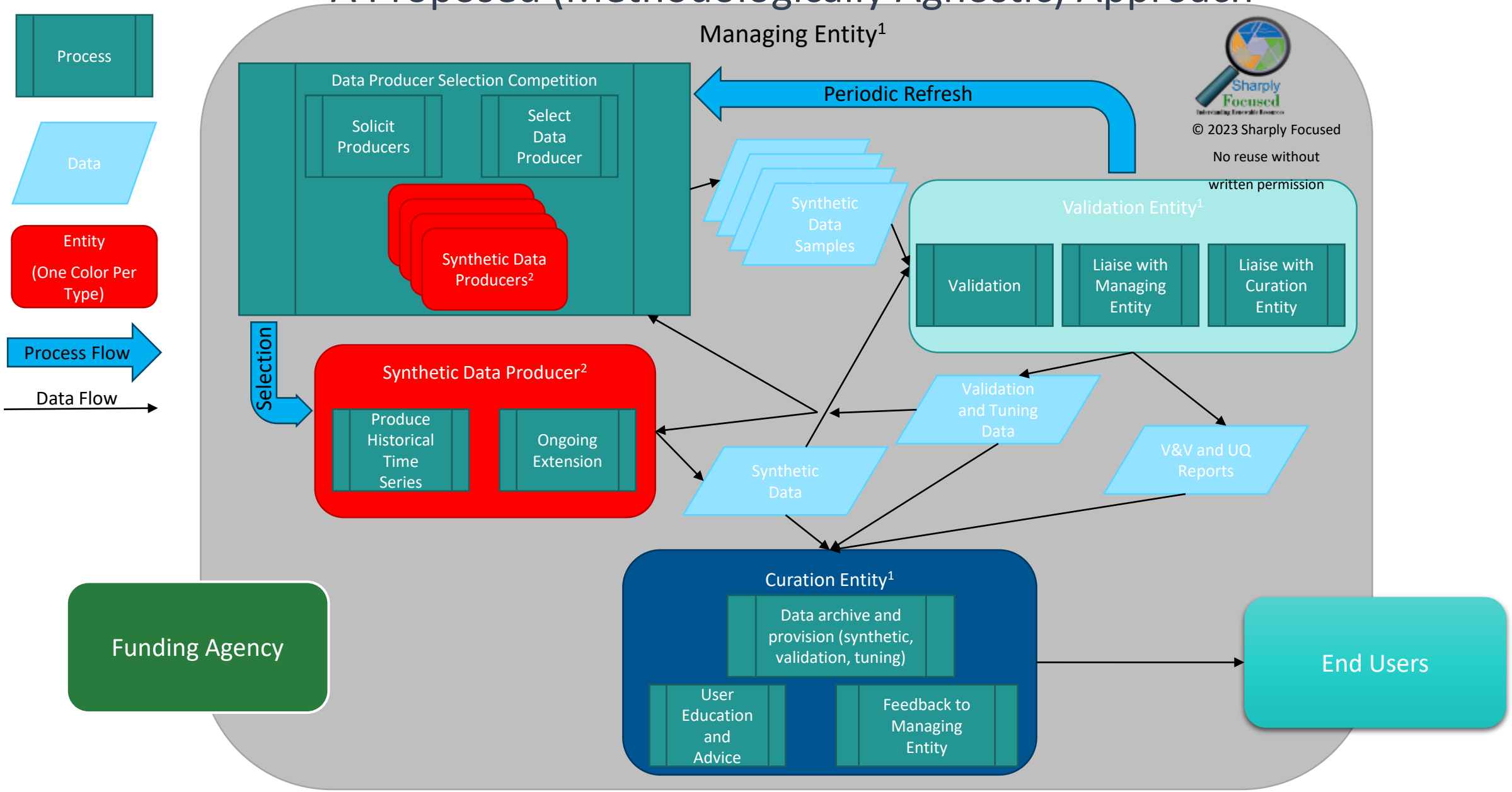




Status/Next Steps

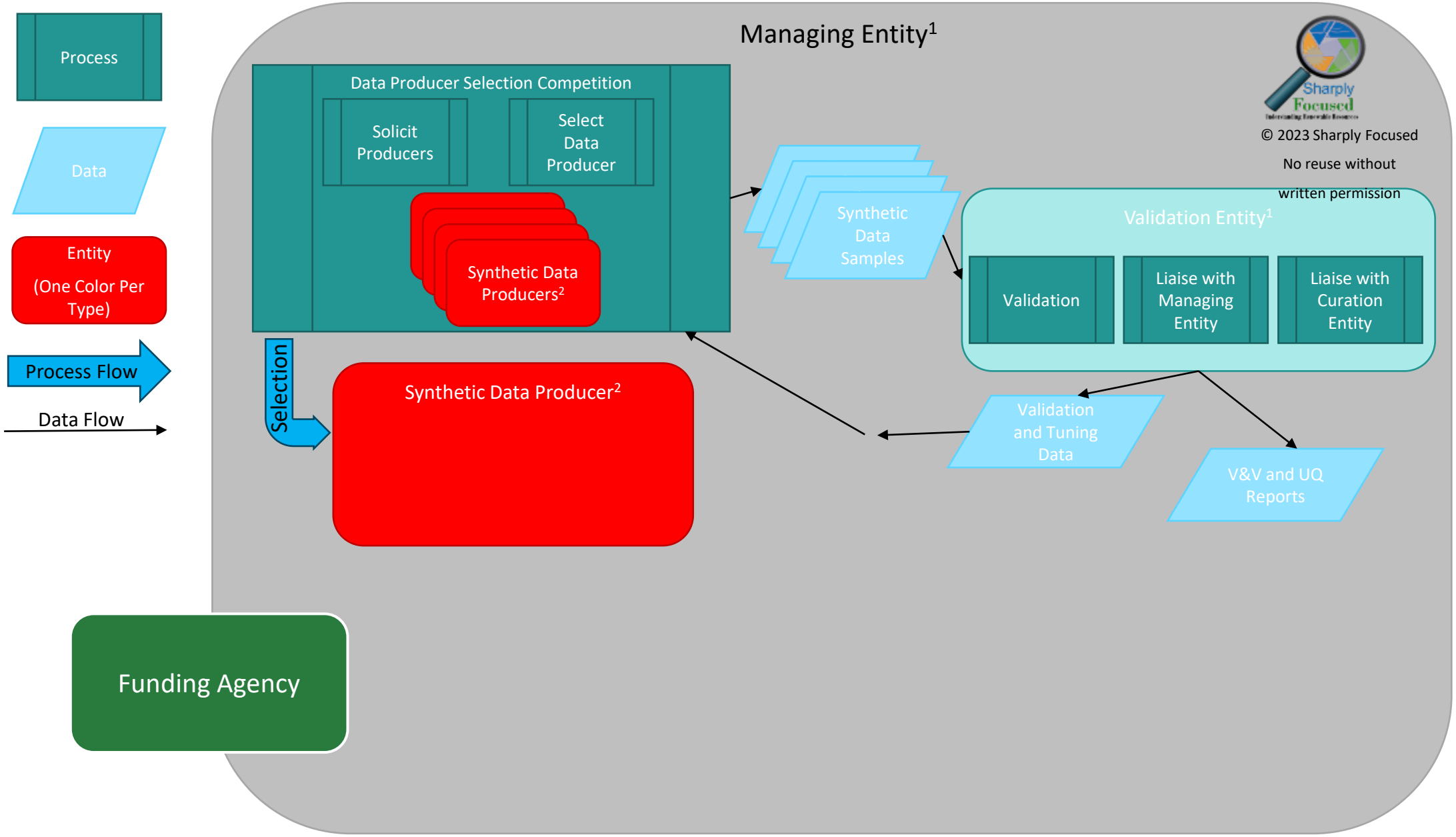
- The ESIG report and socialization activities have received very positive attention
  - The need is now widely understood. Work is still needed to establish meaningful ongoing funding, and to leverage industry data
- Presentations socializing the report given in many venues:
  - ESIG webinar and workshops, AMS Presidential Forum, WECC RAC, ISGT, WCEA RA meeting
- IEA TEM#111
  - Initially driven by reanalysis needs for Wind Assessment
  - ESIG report inspired organizers to explode their IEA wind task silo and expand the meeting objectives to the needs of the entire power system. Next steps include finding an international home for collaboration around this effort.
- NREL Bridging the Gap between Atmospheric Science and Grid Integration
  - Meeting to some degree inspired and enabled by the ESIG report
  - Positive development but activity is in the WETO silo
- Report has the attention of govt, regulatory, and RTO leaders, and even federal policy makers
  - Report and it's ESIG taskforce credentials welcomed by DOE and NERC
  - Initial informal conversations have been productive
- Brief sprint to obtain GRIP funding for next steps. **Leverage the next round if possible.**
  - Too late to the game to submit proposal. BUT…enthusiastic interest/support obtained from major RTO's and utilities. They see the need and want the work done.
  - Continue stakeholder outreach and engagement.

A Proposed (Methodologically Agnostic) Approach



[1]May all be the same organization. [2] Should *not* be the same organization; creates a conflict of interest.

Selection Process



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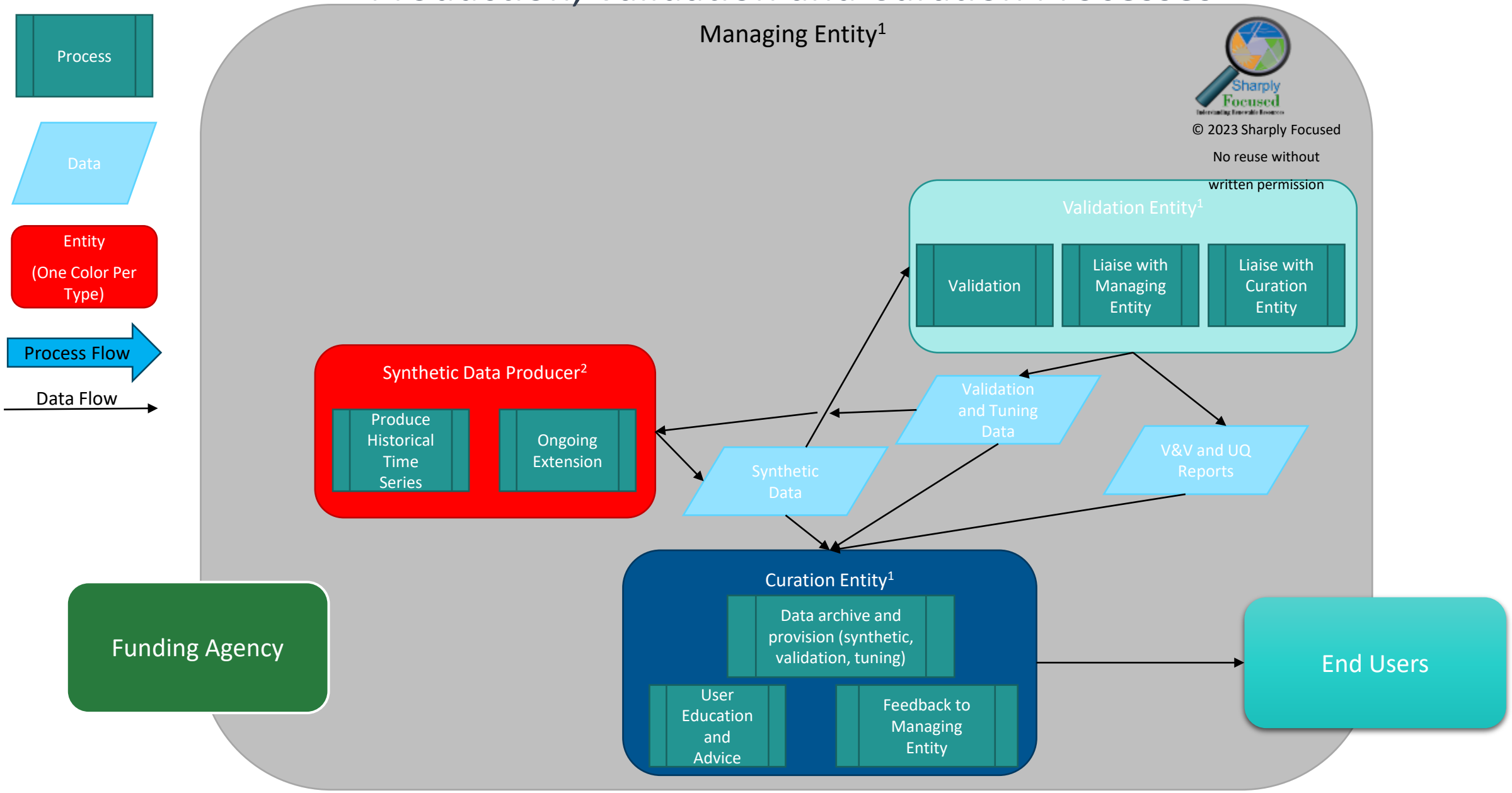
Production, Validation and Curation Processes



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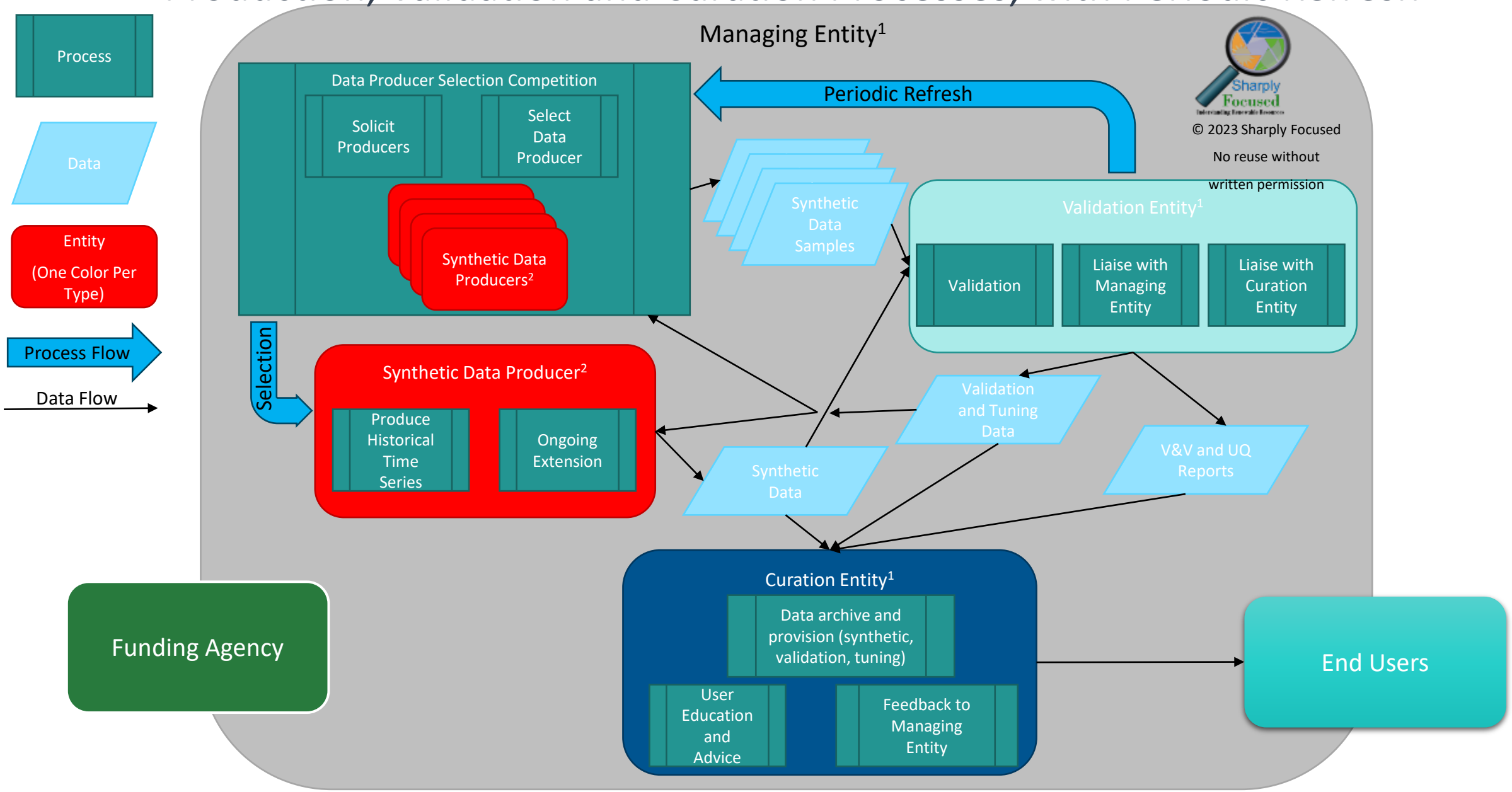
Production, Validation and Curation Processes, with Periodic Refresh



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How Much Will It Cost/How Long Will It Take?

Rough figures based on costs for high volume NWP work and field instrument costs for high-cost case (1-km CONUS NWP) back to 1990, extended continually to 2035 with extensive validation.

- Multi-vendor competition with comprehensive validation and comparison to existing datasets: $2-3M
- Dataset Production. Initial: $8-15 M. Ongoing $1-2 M/yr. Includes all storage
- Dissemination, curation: Initial $400K, Ongoing: $400-700K/yr. Management: $200/yr
- Validation and uncertainty quantification:
  - Expensive physical instrumentation is required to collect validation data.Imperative to leverage the RE buildout
  - People and IT: $300-$400K/yr
  - Standardize equipment and maintenance and require meteorological data collection and sharing. Cost share the physical assets to incentivize cooperation
  - Cost are difficult to ballpark. Towers are expensive. Industry support level and validation thoroughness ultimately sets the cost
- Total for 1990-2035: $30-70M + validation hardware costs. Includes overhead but not profit
- Time: Six months on for first 35 yrs. 1 ½ year project
- Detailed cost-benefit analysis is needed to establish the value of an observational network to support data production and validation
  - In the AI world, quality ground truth data is king.

OR

Investment to decarbonize the grid by 2035: $330-740B[1]

Less than 0.01%. The potential cost of flying blind is…???

[1] NREL 2022: https://www.energy.gov/eere/articles/nrel-study-identifies-opportunities-and-challenges-achieving-us-transformational-goal

A Quick Word About Climate Change

- It is a very important topic in electric utility planning and operations
- But addressing climate ***variability*** is the #1 priority
- We implicitly address climate trends by doing this in an ongoing fashion
- And we validate and quantify the uncertainty of climate change models