

# IMPROVING TOOLS FOR WORKING WITH HIGH RESOLUTION GEOGRAPHICAL AND TEMPORAL DATA OUTPUT FROM TIMES

WINTER 2025 SEMI-ANNUAL ETSAP MEETING  
MONDAY 24TH NOVEMBER 2025

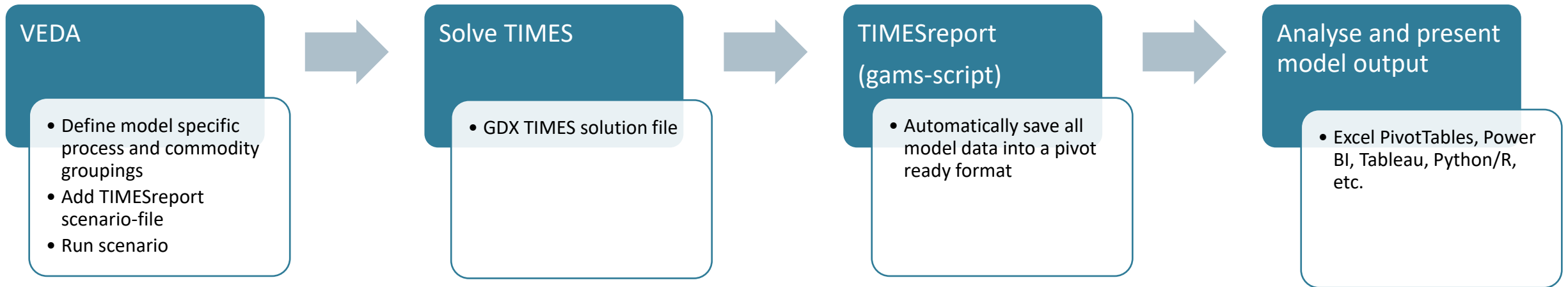
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- Motivation
- TIMES Reporting Improvements:  
Presentation Structure
- THEME 1: Compact Data  
Organization & Deployment
- THEME 2: High-Resolution Hourly  
Data Handling
- THEME 3: Cross-Model Collaboration
- Conclusion

# OVERVIEW



# THEME 1: COMPACT DATA ORGANIZATION & DEPLOYMENT



# THE CORE: A RELATIONAL DATA FRAMEWORK

- **Built-in Data Validation**

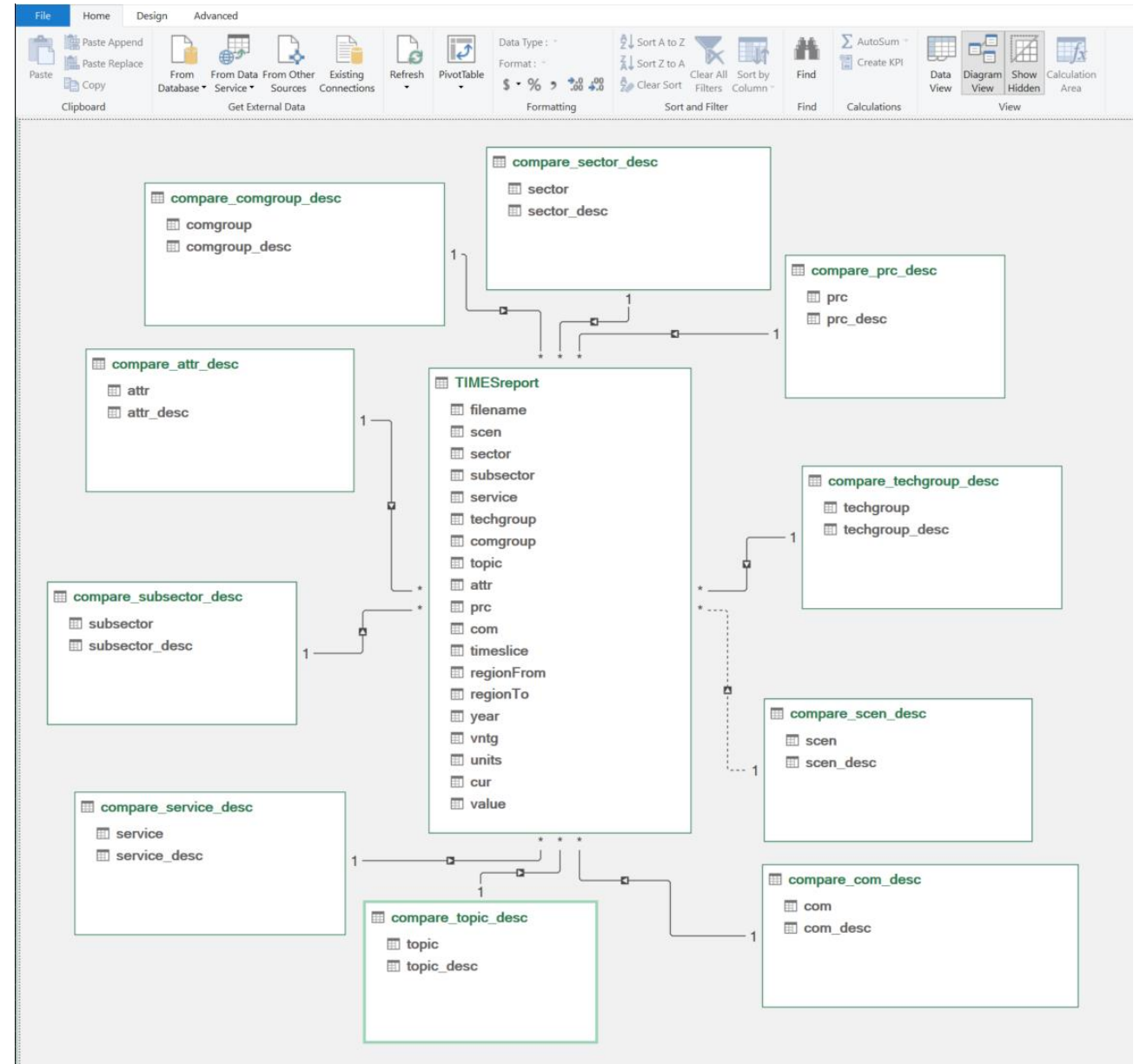
- Automated sum checks verify data integrity during processing
- Catches aggregation errors before they reach analysis
- Ensures consistency across different aggregation levels

- **Leverages Common TIMES Structure**

- Every TIMES model shares the same fundamental dimensions and topics (e.g., capacity, activity, emissions, costs)
- User-defined sets in VEDA are used to augment the data framework with technology groupings, commodity groupings, service categories
- Works across local, national, and global model scales

- **Pivot-Ready by Design**

- Slice data by any dimension combination
- No reshaping needed for standard analyses
- Direct compatibility with Excel PivotTables, Power BI, Tableau, Python/R





# REDUCING DATAOVER HEAD: CASE: TIMES-VL (HOURLY MODEL WITH 104 REGIONS)

|   | Data size<br>MB | Processing time<br>sec |
|---|-----------------|------------------------|
| Model input data (dd-files, run-file,.gdx etc.) | 354             |                        |
| TIMES.gdx output (.gdx)                         | 467             |                        |
| GDX2VEDA (vd,vde,vds-Files)                     | 2807            | 110                    |
| VEDA database - VEDA Import utility             | 3400            | 360                    |
| <b>Total</b>                                    | <b>7028</b>     | <b>470</b>             |

|  | Data size<br>MB | Processing time<br>sec |
|--|-----------------|------------------------|
| Model input data (dd-files, run-file, .gdx etc.) | 354             |                        |
| TIMES.gdx output (.gdx)                          | 467             |                        |
| TIMESreport (.gdx) *                             | 10 (up to 766)  | 150                    |
| Excel pivot table and csv-files                  | 18              | 120                    |
| <b>Total</b>                                     | <b>849</b>      | <b>270</b>             |

\*TIMESreport allows the user to filter selecting only data relevant for the analysis

# SUMMARY: HIGH-RESOLUTION HOURLY DATA HANDLING

## This is not a criticism of VEDA"

- VEDA provides comprehensive reporting capabilities
- The overhead reflects the richness of features
- Credit to the VEDA team for adding a VEDA2GDX bypass option, enabling alternative reporting approaches like TIMESreport.

## TIMESreport's Contribution

- Bypass the need to create data heavy csv-files based on the TIMES model solution.
- Offer the user flexibility in terms of what data is read from the TIMES model solution.
- Relies on the existing structure GAMS structure of the TIMES allowing reporting to be speedy.

# THEME 3: CROSS-MODEL COLLABORATION

Case: SpeedLocal (ongoing Nordic Research project)

How can we ensure a green transition in the Nordic region? According to policymakers, developing integrated energy planning is a crucial step in the right direction.

SpeedLocal engages researchers and communities across the Nordic countries in three case studies:

- Trøndelag, Norway
- Skaraborg, Sweden
- Bornholm, Denmark

A key part of the SpeedLocal project is to build a homepage to host results from three Nordic TIMES model as part of a toolkit related to downscaling of national energy and climate policy.



## Step 0: VEDA setup

- Define common groupings in VEDA sets
- TIMESreport uses these groupings automatically
- Comparison-ready output without model changes

## Step 1: Local Model Execution

- Each team runs their TIMES model independently
- Generates TIMESreport-gdx files

## Step 2: Upload to Shared Datastore

- TIMESreport files uploaded to SpeedLocal online datastore
- Centralized repository for all model results
- Version controlled and documented

## Step 3: Selective Database Merging

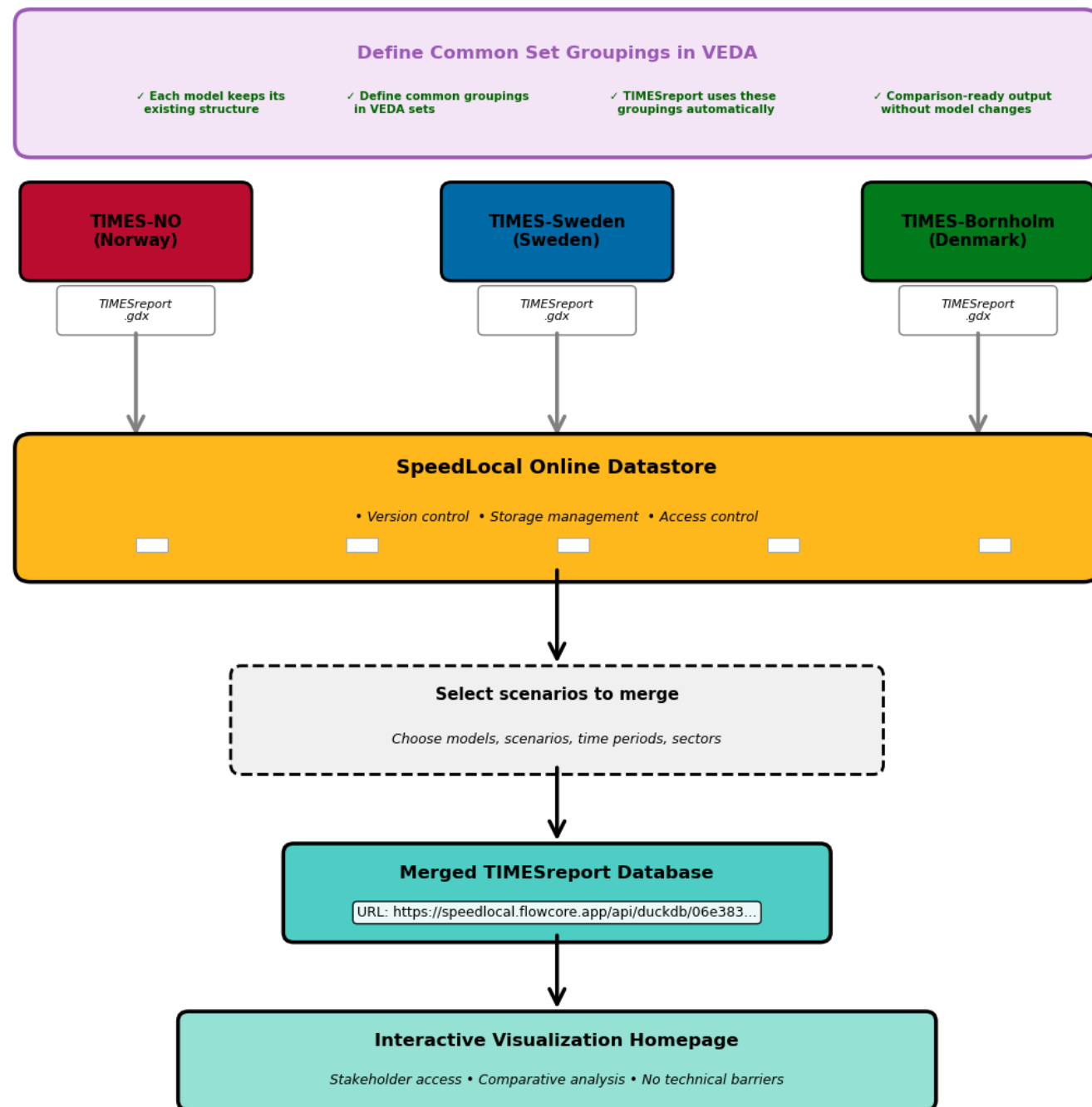
- Choose which scenarios/models to combine
- Merge selected TIMESreport-gdx files into unified database
- Flexible: Compare across models or within single model

## Step 4: Generate Shareable URL

- Create persistent URL link to merged database
- Shareable with stakeholders and research partners
- Version-specific links for reproducibility

## Step 5: Interactive Visualization

- URL connects to dedicated TIMESreport visualization homepage
- Stakeholders access results without technical barriers
- Interactive exploration of multi-model scenarios



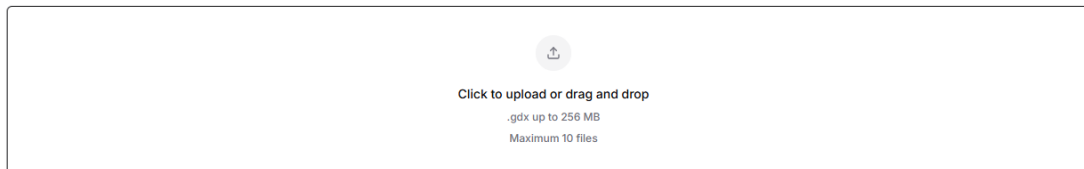
- Dashboard  
Overview and recent activity
- GDx Files  
Upload and manage GAMS files
- Datasets  
Processed datasets from GAMS files
- DuckDB Files  
Generated and combined datasets
- Users  
User management and roles
- Settings  
Application configuration

## GDx Files

Upload and manage GAMS files for processing into datasets

### File Management

Upload and manage GAMS (.gdx) files up to 256MB for automatic processing



GDx files









Up to 256MB

### Uploaded Files

Browse and manage your uploaded files

Refresh 4 files

Search files...

| Name ↓   | Size ↑    | Uploaded By  | Status | Uploaded ↑                | Dataset  | Actions |
|--|-----------|--|--------|---------------------------|--|---------|
|  n2-inc_fansi2_timesreport_TIMESreport.gdx      | 9.89 MB   | Miguel Chang<br>miguel.chang@ife.no                      | ready  | 88 days ago<br>26/08/2025 |  View Dataset | ...     |
|  N4-TECH-FansiHydro_Timesreport_TIMESreport.gdx | 10.04 MB  | Miguel Chang<br>miguel.chang@ife.no                      | ready  | 88 days ago<br>26/08/2025 |  View Dataset | ...     |
|  bornholmbase2030_TIMESreport.gdx               | 342.71 KB | Kristoffer Andersen<br>kristoffer@energymodellinglab.com | ready  | 88 days ago<br>26/08/2025 |  View Dataset | ...     |
|  wam-eml-2008-v6_TIMESreport.gdx                | 26.78 MB  | Ólavur Ellefsen<br>olavur@flowcore.com                   | ready  | 93 days ago<br>20/08/2025 |  View Dataset | ...     |

## Step 2: Upload to Shared Datastore

- TIMESreport files uploaded to SpeedLocal online datastore
- Centralized repository for all model results
- Version controlled and documented

- Dashboard  
Overview and recent activity
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## DuckDB Files

Manage your generated and combined datasets for sharing and analysis

### Single Dataset DuckDB

Create a DuckDB file from a single processed GAMS dataset

Create from Dataset

### Combined DuckDB

Combine multiple datasets into a single DuckDB file

Combine Datasets

### Upload DuckDB Files

Upload existing DuckDB files for sharing and analysis



Click to upload or drag and drop

.duckdb, .db up to 256 MB

Maximum 5 files

DuckDB database files

Up to 256MB

### DuckDB File Management

Upload and manage DuckDB files for sharing and analysis

#### DuckDB Files

15 files total

Refresh

Search files...

| File   | Status | Size    | Datasets | Visibility | Created                           | Actions |
|--|--------|---------|----------|------------|-----------------------------------|---------|
| speedlocal_times_db_bornholm_v5.duckdb<br>DuckDB | Ready  | 7.26 MB | -        | Public     | 3 days ago<br>Kristoffer Andersen |         |
| speedlocal_times_db_bornholm_v4.duckdb<br>DuckDB | Ready  | 7.26 MB | -        | Public     | 8 days ago<br>Kristoffer Andersen |         |

### Step 3: Selective Database Merging

- Choose which scenarios/models to combine
- Merge selected TIMESreport-gdx files into unified database
- Flexible: Compare across models or within single model

### Step 4: Generate Shareable URL

- Create persistent URL link to merged database
- Shareable with stakeholders and research partners
- Version-specific links for reproducibility

<https://speedlocal.flowcore.app/api/duckdb/share/06e3833d0eca22e236820c759b8441b3>

**Database Connection**

Connection Type: ?

Azure URL  
 Local File

Database URL: ?  
https://speedlocal.flowcore.a

Mapping CSV Path: ?  
inputs/mapping\_db\_views.cs

[Reload Data](#)

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**Global Filters**

Scenarios: ?

[BORNHOLM...](#) × ▼  
[BORNHOLM...](#) × ▼

## SpeedLocal: TIMES Data Explorer

Key Insights  Energy & Emissions  Energy & Emissions V2  Development

Energy  Emissions

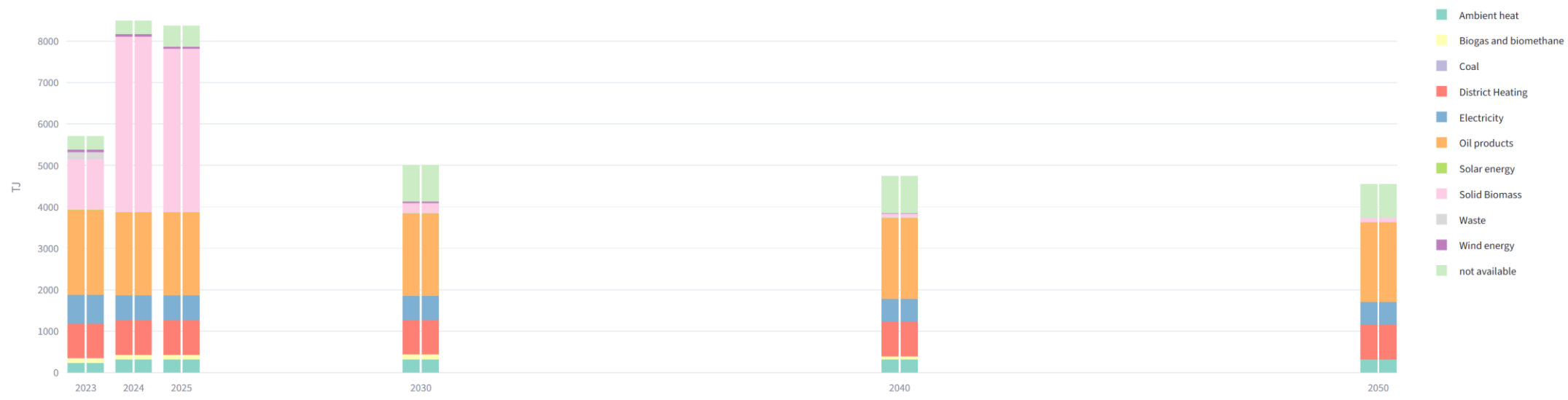
### Energy Input Visualization

#### Compiled (All Sectors)

Select sectors to include in aggregate plot

[Power & DH \(EDH\) ×](#) [Residential \(HOU\) ×](#) [Industry \(IND\) ×](#) [Commercial \(SER\) ×](#) [Supply \(SUP\) ×](#) [Transport \(TRA\) ×](#) ✕ ▼

#### Aggregate Energy Input



### Step 5: Interactive Visualization (under construction)

- URL connects to dedicated TIMESreport visualization homepage
- Stakeholders access results without technical barriers
- Interactive exploration of multi-model scenarios

## WHY THIS MATTERS FOR ETSAP COMMUNITY

### **Practicality:**

- Realistic for distributed research teams
- Respects model autonomy
- Focuses coordination where it matters most

### **Scalability:**

- Methodology works for any number of models
- New models join by adopting common set definitions

### **Flexibility:**

- Different projects can use different groupings
- Same models can participate in multiple collaborations
- Groups can evolve without model changes

**Recognition:** This is possible because of VEDA's sophisticated set definition capabilities and its seamless integration with TIMES model structure.

# SUMMARY

- Compact data organization through relational database structure
- Efficient high-resolution modeling with enhanced QA
- Cross-model collaboration via Flowcore datastore and VEDA set groupings.

## Resources:

- TIMESreport documentation: [https://github.com/Energy-Modelling-Lab/DemoS\\_012\\_timesreport](https://github.com/Energy-Modelling-Lab/DemoS_012_timesreport)
- SpeedLocal project: [SpeedLocal – Nordic Energy Research](#)

Contact: [Kristoffer@energymodellinglab.com](mailto:Kristoffer@energymodellinglab.com)

Thank you! Questions?

