2027 Electric and Natural Gas Integrated Resource Plans

Technical Advisory Committee Meeting No. 11 Agenda

Monday, September 21, 2026

Virtual Meeting – 1:00 pm to 3:30 pm Pacific Time

Topic	State	Audience
• Introduction		
• Aurora Overview	ID/WA	Electric
• PRiSM Model Tour	ID/WA	Electric
• New Electric Resource Cost Model	ID/WA	Electric
• CROME Model Tour	All	Gas

Microsoft Teams meeting

Join:

https://teams.microsoft.com/meet/251493155285174?p=c1X2P44Yhr5A00bptp

Meeting ID: 251 493 155 285 174

Passcode: w4Mj7n9b

Need help? | System reference

Dial in by phone

+1 509-931-1514,,424670831# United States, Spokane

Find a local number

Phone conference ID: 424 670 831#

For organizers: Meeting options | Reset dial-in PIN

Aurora Modeling

TAC 11 Technical Modeling Workshop

September 21, 2026

Robert Hughes (Resource Planning Analyst) & Mike Hermanson (Senior Power Supply Analyst)

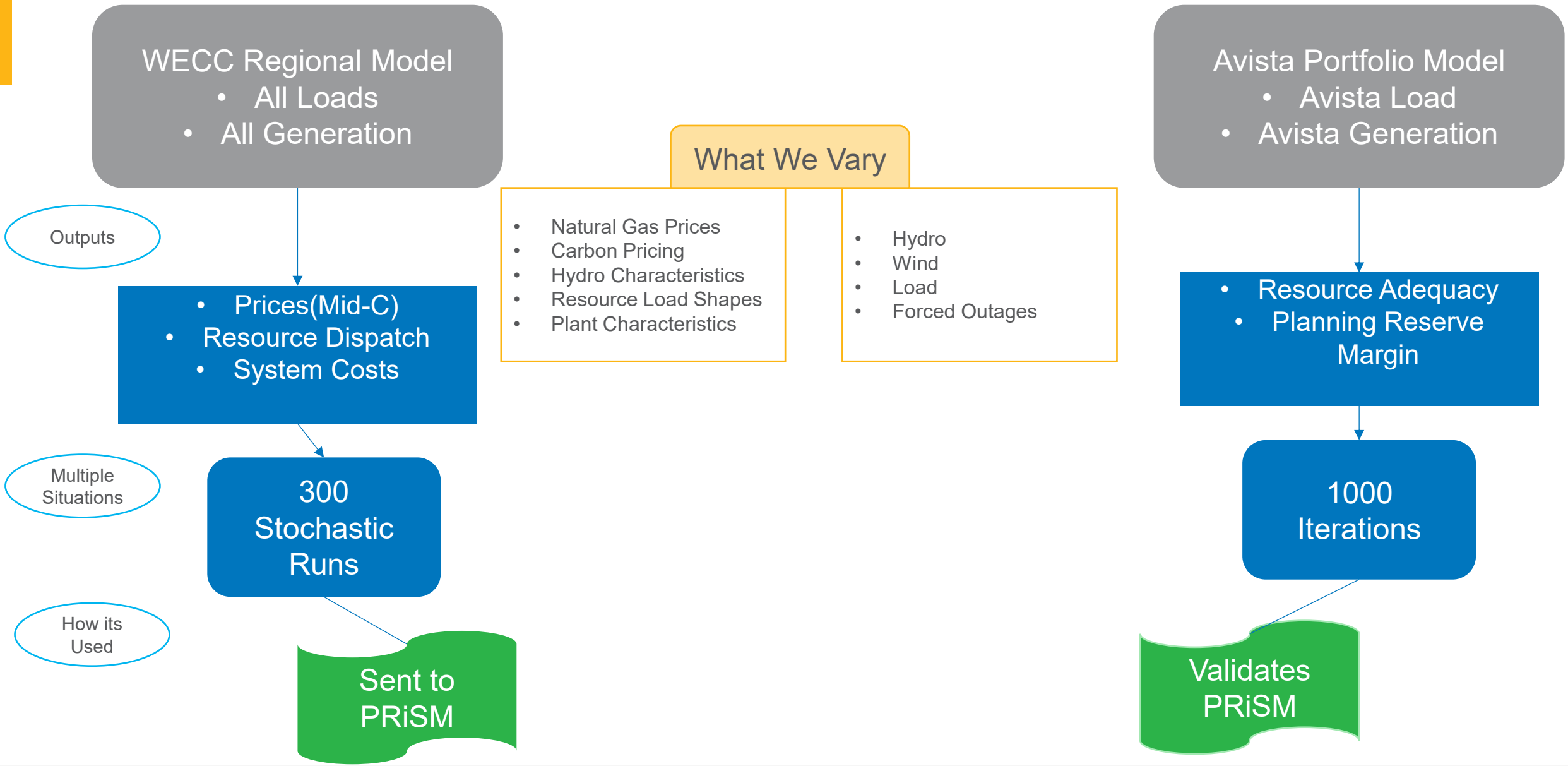
Aurora Energy Forecasting Software

- Originally developed by Portland General Electric (called Monet)
  - During Enron ownership, creators took the model to market with EPIS in 1999
  - Relocated to Sandpoint, ID until sold to Energy Exemplar in 2018
  - Energy Exemplar later was sold to a private equity firm (Blackstone) in 2024
  - Energy Exemplar also sells the Plexos model
- Now owned by Energy Exemplar
  - Over 600 clients in 90 countries

What is Aurora?

- Production Cost Model
  - Hourly or sub-hourly dispatch of resources to load for 1 month to 20+ years
- Long Term Capacity Expansion
- Portfolio Optimization
- Maintenance Scheduling
  - Develop a maintenance schedule that maximizes the daily reserve margin for the zone or pool where the plant resides
- Ability to Do Nodal Analysis

How Avista Uses Aurora
(since 2002)



How Avista Uses Aurora

- **Price Forecast**
  - Generate an estimate of electric market prices (Mid Columbia price)
- **Resource Adequacy**
  - Analysis to determine if the system can meet load during peak events.
  - Process: Monte Carlo analysis - run the system with varied inputs for each iteration (hydro, wind, load) to determine how often the system cannot meet load. 1,000 iterations of the same year is run with a goal of meeting 0.01 Loss of Load Expectation in January and 0.01 Loss of Load Expectation in August.
- Secondary Objectives
  - Resource Dispatch
  - Resource Valuation
  - Capacity Expansion
  - System Power Costs
  - Emissions
  - Regional Operations and how Avista's resources interact in the region

Supply Side Resource Model

TAC 11 Technical Modelling Workshop

September 21, 2026

Robert Hughes (Resource Planning Analyst)

Overview and Considerations

- IRP supply-side resources are near commercially available technologies with potential for development within or near Avista's service territory.
- Resource costs vary depending on location, equipment, fuel prices and ownership; while IRPs use point estimates, actual costs will be different.
- Certain resources will be modeled as purchase power agreements (PPA) while others will be modeled as Avista "owned". These assumptions do not mean they are the only means of resource acquisition.
- No transmission or interconnection costs are included at this time.
  - Interconnect included for off-system resources.
- An Excel file will be distributed with all resources, assumptions and cost calculations for TAC members to review and provide feedback.

Pipeline to PRiSM Model

The supply resource model will produce outputs that are then fed to the PRiSM model for the preferred resource strategy.

- Uses levelized fixed and variable costs for potential resources
- Uses PPA $/MWh or $/kW-yr costs for resources.

To the Model!

PRiSM Model Overview

TAC 11 – Sept 21, 2026

Jacob Heimbigner – Resource Planning Analyst

What is PRiSM?

- Preferred Resource Strategy Model
- Mixed Integer Program (MIP) used to select new resources to meet resource needs of our customers

Excel — The user interface

LINDO SYSTEMS INC. — What's Best! — The solver interface

GUROBI OPTIMIZATION — The solver

What is new in PRiSM for this IRP?

- Removed simplified natural gas LDC system to objective function
- No shared resources between states
- Built in opportunity savings for transmission capital investments
- 4-year compliance for meeting the CETA

Objective Function

Minimize: (WA "Societal" $NPV_{2028\text{-}50}$) + (ID $NPV_{2028\text{-}50}$)

Where:

WA $NPV_{2028\text{-}50}$ = Market Value of Load + Existing & Future Resource Cost/Operating Margin + Social Cost of Carbon + EE TRC + NEI

ID $NPV_{2028\text{-}50}$ = Market Value of Load + Existing & Future Resource Cost/Operating Margin + EE UTC

Subject to:

- Energy Efficiency Potential
- Demand Response Potential
- Monthly Peak Requirements
- Monthly Energy Requirements
- Annual/4-yr Clean Energy Targets

Optimization Tolerance: 0.00001 or 1,500 seconds (Note: certain studies longer solution times allowed)

Optimized Cost

- Objective function includes social costs for Washington that are not part of utility revenue requirement.
- This is used for resource optimization only.
- Social costs may include:
  - Energy Efficiency
    - TRC
    - Non-energy impacts
    - Power Act 10% adder
    - T&D Savings
  - Social Cost of Carbon

Forecasted Costs

- Actual costs illustrate expected cost ratepayers will pay.
- Estimate annual revenue requirements.
- Estimate average rates.

Aurora Integration

- Aurora's price forecast and resource dispatch are inputs into PRiSM.
- Each supply resource's operations is included by iteration.
  - Includes MWh, GHG, Revenue, Fuel Cost, VOM costs.
- Avista load and existing contracts are also entered in totals.
- Energy efficiency load shapes are marked to market and used for the energy value of these programs.
- Demand response options are not modeled in Aurora but use hourly price results for a market value.

CROME Model Tour

Technical Modeling Workshop (TAC 11)

September 21, 2026

Michael Brutocao, Natural Gas Planning Manager

Timeline: IRP Modeling Software

Prior to 2023

SENDOUT®

2023 IRP

PLEXOS®

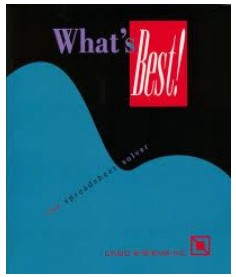
2025 IRP

Avista CROME

What is CROME?

- Comprehensive Resource Optimization Model in Excel
- Mixed Integer Program (MIP)
- Optimizes nodal and zonal systems, selecting least-cost portfolio of resources to simultaneously solve for daily customer needs and periodic regulatory compliance

The user interface



The solver interface

The solver

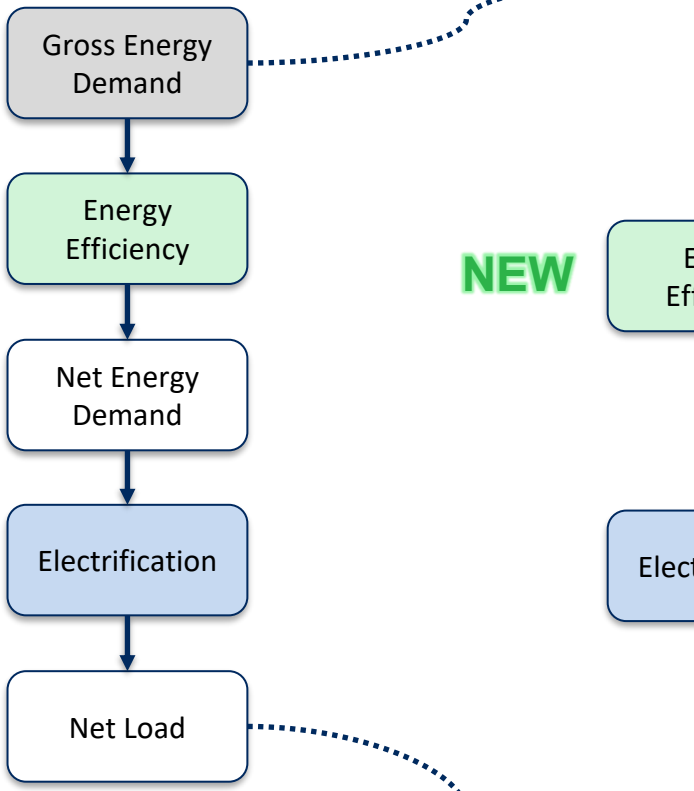
CROME Overview

- **Objective**
  - Find least-cost mix of resources to serve load between 2028 and 2050
- **Constraints**
  - Resources
    - Supply, capacity, min/max storage targets, hydrogen blending
  - Daily resource requirements
    - Load
  - Environmental policy
    - CCA, CPP
- **Considerations**
  - Existing gas portfolio (pipeline transport costs, Jackson Prairie)
  - Capital and operating costs of demand- and supply-side resources
  - Cost of compliance mechanisms
  - Non-energy impact (NEI) adders

CROME Outputs

- **Resource Selection**
  - **Load-Reducing:** energy efficiency (demand side management), electrification
  - **Load-Serving:** supply-side resources (alternative fuels, natural gas), storage optimization
  - **Transportation & Storage:** pipeline contract renewal, storage resources
  - **Environmental Policy:** compliance mechanisms
- **Portfolio Cost**
  - Annual, levelized, net present value revenue requirement
  - Deterministic and stochastic
  - Energy Burden
- **State-Specific Portfolio Emissions**

Energy Demand and Demand-Side Resources



This is the load forecast

NEW

Energy Efficiency

- Modeled at measure level (monthly load shape, price)
- Take all or nothing constraint
- ETO study results and EE model selection are hardcoded into model
- Constrained by supply forecast

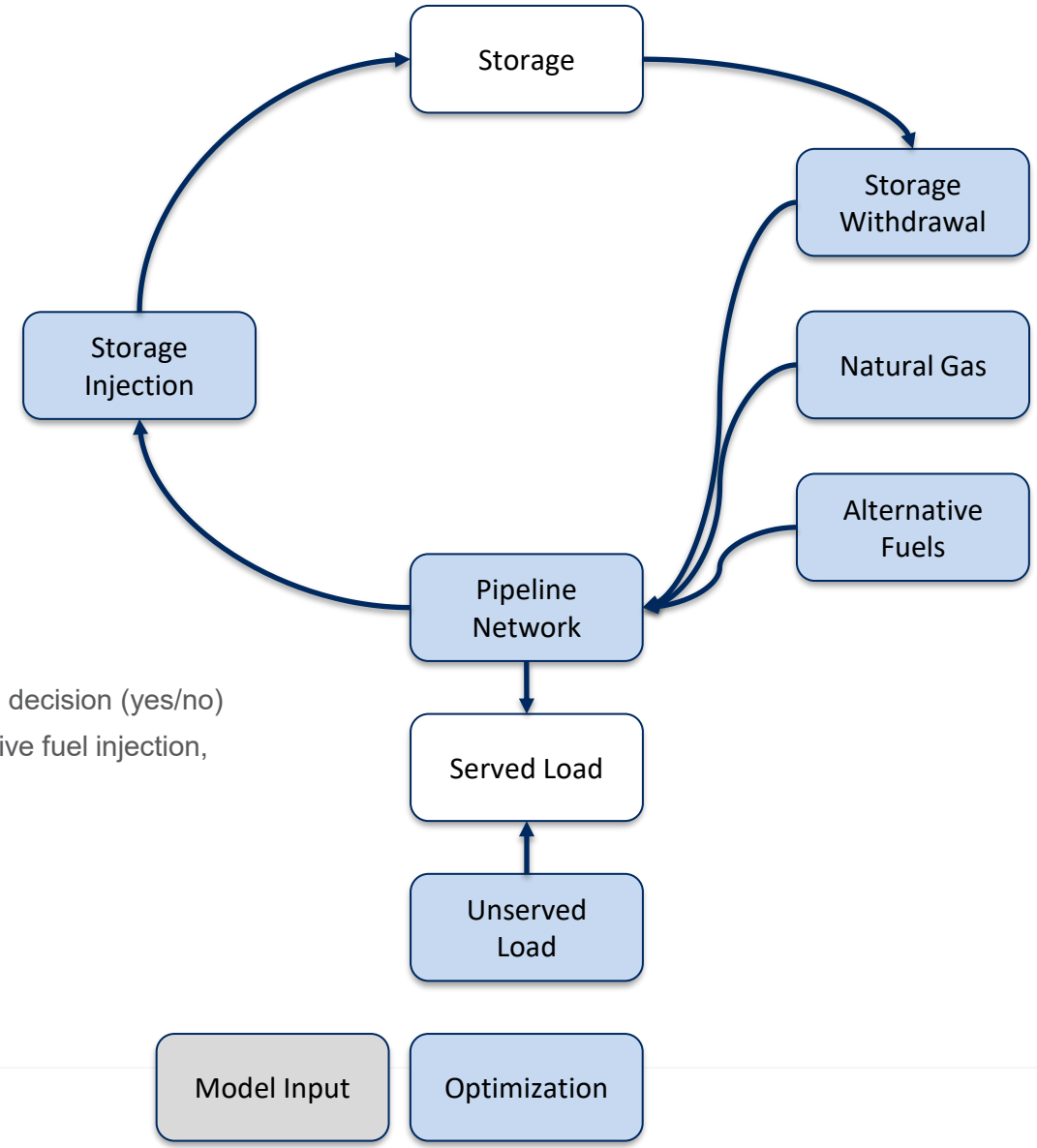
Electrification

- Modeled with unique load shapes, prices
- Procured for modeled horizon (once taken, always taken)
- Constrained by supply forecast
  - Residential: existing space heating, water heating, and other (80% by 2050)
  - Commercial: existing space and water heating (80% by 2050)

Remaining energy demand will be served with supply-side resources

Model Input | Optimization | Optimization & Model Input

Serving Load with Supply-Side Resources



Pipeline Network

- Flow constrained by contracted capacities
- Includes fixed (reservation) and variable (flow) charges
- Accounts for fuel losses from transportation
- Renewal decision at contract expiration

Storage

Storage Injection | **Storage Withdrawal**

- Jackson Prairie (JP): Capital and O&M costs
- LNG/Propane: fixed and variable costs, build decision (yes/no)
- JP, LNG: accepts natural gas and/or alternative fuel injection, seasonal injection/withdrawal constraints

Unserved Load

- Very high cost if selected
- Necessary for modeling purposes

Alternative Fuels

- Procured for modeled horizon (once taken, always taken)
- Selection constrained by forecasted supply
- Prices vary by technology and quantity of supply selected (more costly as model selection approaches supply constraint) and include both fixed and variable cost components
- Can be injected into storage (JP, LNG) or delivered to serve load

Natural Gas

- Procured volumes can vary by day
- Can be injected into storage (JP, LNG) or delivered to serve load
- Costs are variable and vary by basin
- Constrained by pipeline capacities

Emission Contributions, Offsets, and Constraints

Emission Constraints

- Washington Climate Commitment Act:
  - No-Cost Allowance supply
  - Allowance procurement at auction price constrained; additional available at ceiling price
- Oregon Climate Protection Program:
  - Compliance Instrument supply
  - Community Climate Investment credit procurement constrained

Natural Gas

- Only modeled source of emissions

Third Party Compliance Mechanisms

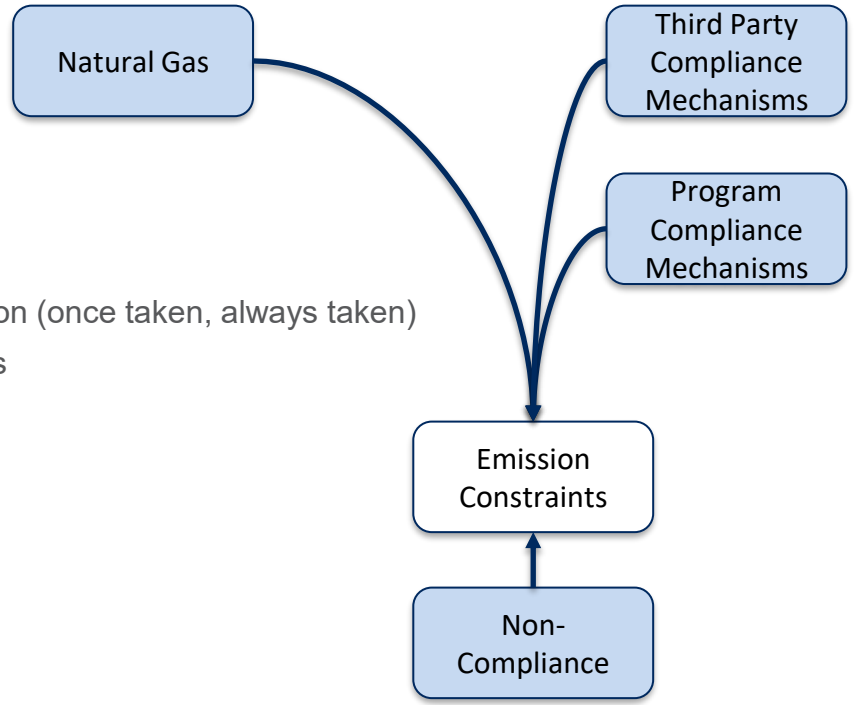
- Environmental attribute only (i.e., does not provide energy to serve load)
- Used to offset emissions from natural gas
- Selection constrained by supply forecast
- Carbon Capture, Utilization, and Sequestration selected for modeled horizon (once taken, always taken)
  - Selection can vary year-to-year for all other compliance mechanisms
  - Current RTC contract prices and quantities held constant

Program Compliance Mechanisms

- Environmental attribute only (i.e., does not provide energy to serve load)
- Used to offset emissions from natural gas
- Selection constrained by supply forecast
- Selection can vary year-to-year

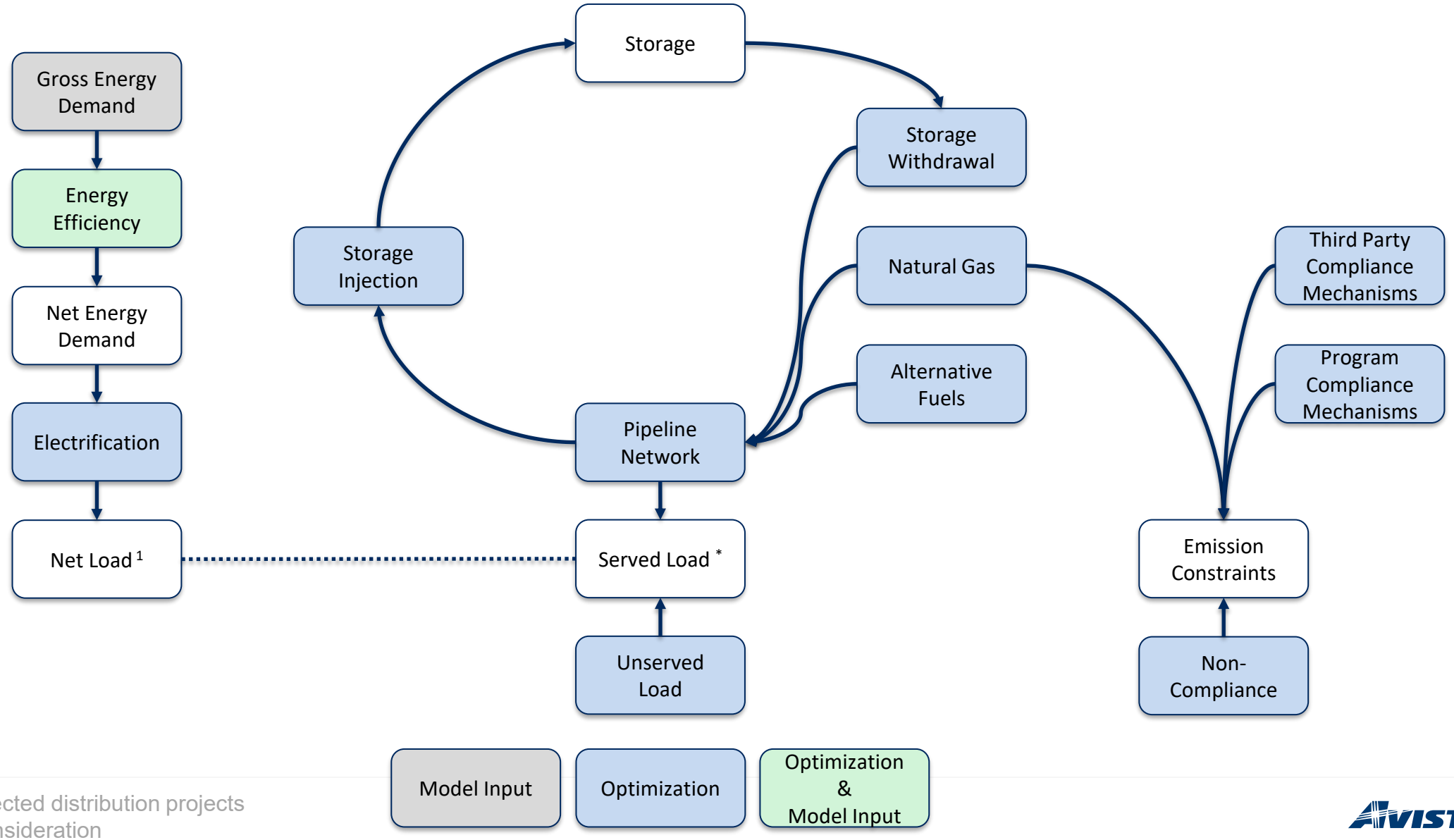
Non-Compliance

- Penalty applied for non-compliance



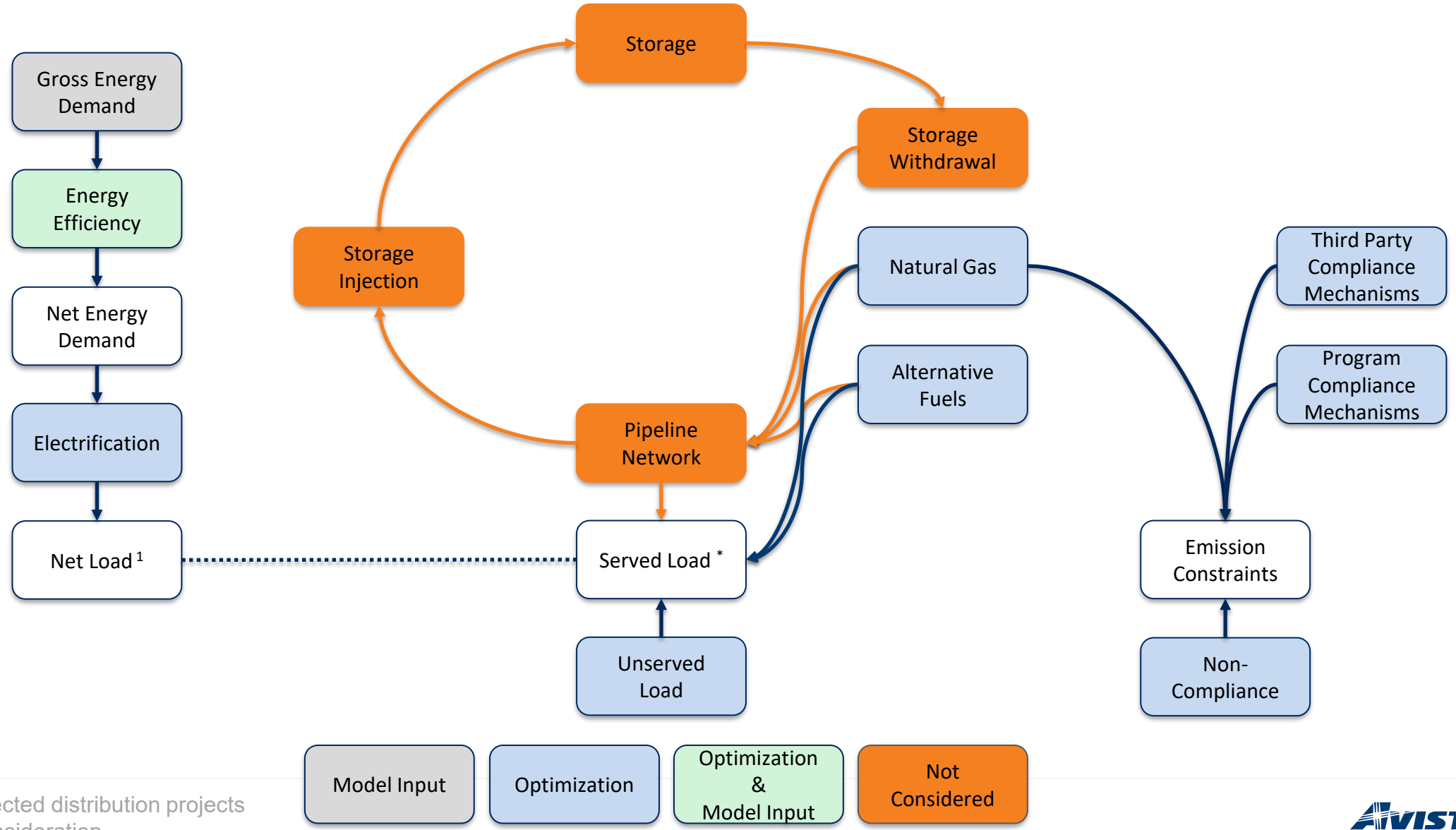
Model Input | Optimization

Bringing it all together… Residential, Commercial, Industrial



[1] Cost of expected distribution projects
* NEI cost consideration

Bringing it all together… Transport



[1] Cost of expected distribution projects
* NEI cost consideration