

# The Electric Generation Expansion Analysis System (EGEAS) Software 2015 EPRI Update

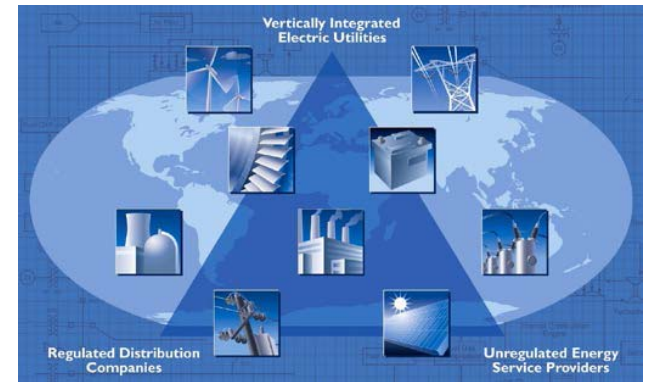
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**EGEAS Users Group Meeting**  
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# Overview of EPRI's Electric Generation Expansion Analysis System (EGEAS)

- EGEAS is a state-of-the-art modular production costing and generation expansion software package.
- EGEAS is used by electric company planners and others to develop and evaluate integrated resource plans, avoided costs, plant life management plans, and environmental compliance plans.
- EGEAS accommodates dispatchable generation sources (e.g., coal, gas, nuclear), demand-side management (DSM) and renewable energy sources.
- EGEAS was the forerunner of the current generation planning simulation and optimization models, and continues to be used today by a number of electric companies and regional planning organizations (e.g., MISO).
- To learn more about EGEAS, please visit EPRI.com here: <http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=00000000001016192> and here: <http://eea.epri.com/models.html#tab.=3>



# Short History of EGEAS

- EPRI originally developed EGEAS in 1983 as a research project. Key contractors included Stone & Webster Engineering Corp. and the MIT Energy Lab.
- In the 1990s, Stone & Webster Management Consultants Inc. developed a graphic user interface (GUI) to ease data input.
- In 2013, EPRI reactivated EGEAS v9.02.
- In April, 2014, EPRI released v10 – an updated and integrated version that included a new GUI and improved “back end.”
- In June 2015, EPRI released a new, updated EGEAS v11.0
  - Software development by NG Planning
  - Financial support provided by MISO & EPRI

# EGEAS has Evolved to Meet the Needs of Company Generation Planners, Regulators, ISOs and Others

- Version 1 – 1983 Initial release
- Version 2 – 1985 Storage optimization, Must-run, Spinning reserve
- Version 3 – 1986 Purchase & sale contracts, Incremental costs
- Version 4 – 1989 Financial constraints
- Version 5 – 1990 Fuel constraints, Multi-area modeling
- Version 6 – 1990 Emission Constraints, System average rate
- Version 7 – 1993 Revenues, Avoided costs, Risk analysis
- Version 8 – 1996 Multi-Parameter Gamma method
- Version 9 – 1997 Bid-based pricing
- Version 9.02 – 2007 Cost and Revenues report; Ability to change measurement units; increase # of plant types and load blocks
- Version 9.02 – 2013 Reactivated by EPRI
- Version 10.0 – 2014 Integrated GUI and underlying EGEAS code; removed Finance + and RISKMIN
- Version 11.0 – 2015 Added “dump energy “ penalty and State RPS

# Important EGEAS Features

- Includes dynamic programming algorithm to develop candidate portfolios from identified alternatives meeting a reliability constraint (e.g., maintain 10% capacity reserve margin).
- Conducts minimum present value revenue requirements (PVRR), or lowest electric rate economic ranking of candidate portfolios dispatched, with an existing and future set of assets.
- Once data inputs are set-up, many different scenarios can be run to test different generation plans easily and quickly.
- Simple economics based on present worth method - easy to understand and explain results.
- EGEAS is used by electric utilities, state regulators and various regional planning organizations.
- Results are easily understood, and well accepted by regulators.

# EGEAS Version 10 — Key Features

- One-stop software licensing process via EPRI or EPRI software “commercializers,” such as NG Planning LLC.
- Consolidated EGEAS, Graphic User Interface, DSMLINK, and RPWorkstation programs
- Eliminated Finance+ and Riskmin programs which are no longer supported or used
- Updated EGEAS Capabilities Manual and all other User’s Guides / Manuals
  - Capabilities Manual
  - DSMLink Manual
  - Users Guide
  - RPW Users Guide
- Revised EGEAS documentation and manuals with consistent EPRI copyright, logo, and disclaimers.
- At MISO's request, EPRI made the Capabilities Manual and Users Guide available to the public online for free.

# EGEAS Version 11 — Software Development

- MISO provided “base” funding to develop v11.
- EPRI provided needed “supplemental” funding, and engaged NG Planning to develop v11.
- Project execution included developing and testing of a pre-production “beta” version 11 with MISO.
- EPRI’s Software Quality Assurance (QA) process was completed successfully for both the beta and final production versions of EGEAS v11.

# EGEAS Version 11 — New Enhancements

- Two new features added:
  1. Dump Energy Penalty Factor
  2. Renewable Portfolio Standard (RPS) Constraint
- Fixed EGEAS program bugs
- Updated software users manuals as appropriate
- Updated to operate with Windows Vista, Windows 7 (32-bit and 64-bit), and **Windows 8**.



# Renewable Portfolio Standards (RPS) Constraint

- EGEAS v11 includes new regional Renewable Portfolio Standard (RPS) constraints.
- EGEAS users can now create regional annual RPS constraints directly in EGEAS.
- EGEAS users now can develop optimized generation expansion plans that comply with the annual RPS requirements over the study period.

# Dump Energy Penalty Factor

- “Dump energy” refers to electricity expected to be generated in EGEAS from a proposed generation asset portfolio that is greater than the amount needed to meet forecasted demand.
- EGEAS v11 incorporates a new “dump energy penalty factor,” so the cost of dump energy can be directly “charged” a financial or other type of penalty.
- EPRI and NG planning worked with MISO to define appropriate methods to apply the dump energy penalty.
- Previously, EGEAS simply noted how much dump energy would be produced, and priced dump energy at the cost of the resources producing it for each generation expansion plan.

# EGEAS Version 11 — Pricing & Licensing

- EGEAS can be licensed (i) directly from EPRI, or (ii) from one of EPRI's EGEAS software commercializers, including:
  - NG Planning LLC
  - Lummus Consulting
- EPRI charges \$30,000 for a new EGEAS v11 user license
  - One-time license fee; no annual license maintenance fee
  - No limit on the amount of users in a single company
  - Existing registered licensees of v10 only can obtain a one-time upgrade to v11 for \$5,000 from EPRI
- Members of EPRI programs 178 / 178b receive an EGEAS v11 license at no additional cost
- EPRI software commercializers may charge different EGEAS licensing fees

# The Status of EGEAS at EPRI

- EGEAS's "home" is EPRI research program #178b which focuses on "*Fuels, Power Markets and Resource Planning.*"
  - Only a very few P178b members use EGEAS
  - There is no support among P178 members to pay for enhancements to EGEAS, or to provide end-user support
  - EPRI receives little revenue from EGEAS, and P178 does not receive any revenue from EGEAS licensing
- EPRI members funded the original development of EGEAS in 1983, and enhancements through v9.02 in 2013.
- EPRI has continued to update EGEAS with funding largely provided by MISO supplemented with internal EPRI funds.
- Going forward, EPRI is willing to continue to develop new versions of EGEAS so long as 3<sup>rd</sup> parties pay the full cost of software development and EPRI QA testing.

# EGEAS End-user Support and Services

- EPRI does not provide end-user support or training
- EPRI does not provide end-users with maintenance, consulting or technical support services
- EPRI has licensed two firms to commercialize EGEAS and provide end-user support services, including:
  - Sublicensing EGEAS to new users
  - Providing resource planning consulting services with EGEAS
  - Providing EGEAS software training, installation, support and maintenance services

## EPRI Collaboration with NG Planning LLC

- EPRI has provided NG Planning with a license to commercialize EGEAS
- EPRI and NG Planning are collaborating to explore development of new enhanced versions of EGEAS
- NG Planning coordinates the annual EGEAS User Group meeting in conjunction with MISO
- In recent years, NG Planning has helped to increase the EGEAS user base by licensing EGEAS to state PUCs and several electric companies

# In March 2015, EPRI Awarded John Lawhorn of MISO an Environment Sector *Technology Transfer Award*

“Using the Electric Generation Expansion Analysis Software System (EGEAS) to Address Electric Sector Planning and Reliability Challenges”

## Challenge

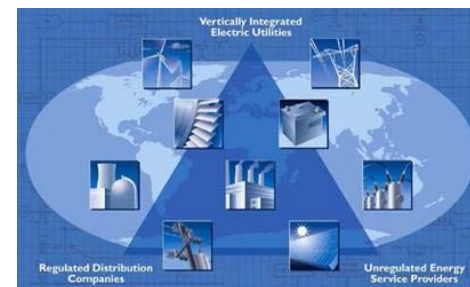
MISO wanted to expand use of EGEAS among its members to facilitate communication and planning for the proposed federal Clean Power Plan.

## Solution

MISO brought EGEAS to the attention of the Organization of MISO States (OMS), and helped OMS members purchase EGEAS and obtain training.

## Results and Benefits

- Ten of the 15 states in MISO’s region now use EGEAS. Several state public utility commissions and electric companies in MISO’s region are using EGEAS.
- MISO helped promote and expand the EGEAS User’s Group.



# Contact Information



## Together...Shaping the Future of Electricity

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