ACE is an Estimating Platform

- **What is ACE?**
  - Framework to build models
  - Calculation engine to compute/process information

- **ACE files (sessions) contain user-developed cost estimate**
  - Methodology
  - Documentation
  - Inputs
  - Integrated uncertainty analysis

Create risk adjusted, integrated cost/schedule life cycle estimates for any project!
Each workscreen shows only the relevant fields supporting specific functions involved in building a cost estimate.

- Building a WBS/CES
- Implementing methodologies
  - Adjusting for FY, dollar units, Fee, Overhead, G&A
  - Applying learning curve theory
  - Time phasing the estimate (Annual and Monthly)
  - Incorporating a risk analysis
- Viewing What if results
- Entering documentation
ACE uses an indenture structure to sum elements, thereby ensuring proper calculation
- Add/remove elements when the WBS changes without need to redo summing equations
- Tools available to simplify navigation and data entry
- Specific columns are used to enter equations and annual data
- Data is referenced by naming of rows / columns by Unique IDs
- All data used for the estimate is immediately visible
Standard Methods / Techniques to Ensure Reliable Calculations

- Integrated inflation indices to correctly normalize results and develop annual outlays
- Logs to show potential estimate errors
- Tools to trace model logic
ACE offers several types of built-in functions to automate relationships between elements in an ACE session:

- Mathematical
- Date
- Economic Analysis
- Time Period (operate on specific yearly or monthly inputs or results)
- ACE Specific
- Inflation
- Logic and Mathematical
- Matrix
- Operational Life
- RI$K
Functions for specific cost estimating calculations

- Several functions automatically calculate common cost estimating operations
- For example, many cost elements are calculated based on the number of Operational Fielded Units in any given year. The `OpFieldedUnits()` function calculates operational fielded units in each year based on a buy schedule, fielding lag and life expectancy.

### Example:

<table>
<thead>
<tr>
<th>WBS/CES</th>
<th>UNIQUE ID</th>
<th>POINT ESTIMATE</th>
<th>EQ/THROUGHPUT</th>
<th>PM</th>
<th>FY 2015</th>
<th>FY 2016</th>
<th>FY 2017</th>
<th>FY 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fielded Units</td>
<td></td>
<td>96</td>
<td><code>OpFieldedUnits(@BQ, OpLife, LagInYears)</code></td>
<td>F</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Inputs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Procurement Units</td>
<td>BQ</td>
<td>24</td>
<td>[Input Throughputs]</td>
<td>IS</td>
<td>6</td>
<td>8</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Operational Life</td>
<td>OpLife</td>
<td>4</td>
<td></td>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lag in Years</td>
<td>LagInYears</td>
<td>1</td>
<td></td>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Results:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fielded Units</td>
<td>96</td>
<td>6</td>
<td>6+8=14</td>
<td>6+8+10=24</td>
<td>6+8+10=24</td>
<td>8+10=18</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Open Platform Allows Integration with 3rd Party Applications

- Multiple methods for integration with other applications
  - Direct export to .rtf and .txt file formats
  - ACE results integrate with Excel through POST
  - ACE clipboard allows dynamic data export/import from/to an ACE session
  - ACE API enables
    - Ability to embed ACE sessions into other tools
    - Ability to create plug-ins that allow direct interaction inside ACE

- Current ACE plug-ins
  - Getting data into ACE
    - ACE-to-ACE
    - Microsoft Excel
    - Microsoft Project
    - Price
    - SEER
Analysts can document in real time:
- WBS
- Methodology
- Phasing
- Risk
- Adjustments

Documentation can be imported via:
- RTF and MS Word files
- Copy and Paste Commands

Documentation Available via:
- Input All Form
- Narrative Report
- MS-Word Document
Quick Access to Estimate Results

- Time-Phased Base Year and Then Year results can be quickly generated
- Estimated costs can be “racked and stacked” by various breakouts (Appropriation, Funding Agency, Contract Line Item, Job Order Number, Budget Line Item, etc.)
Baselines can be Established as Basis for Scenario Evaluation

- Main methodologies are basis for all calculations
- Add an unlimited number of alternative scenarios (what if cases)
- Scenarios are enabled by overriding methodology equations and/or input variables (total or yearly)
- Supporting documentation, reports, time-phased (BY or TY) and risk results can be created for any scenario
- Cost Benefit Analysis calculations can be added to the session and evaluated for each alternative
Graphically View
Results in ACE

Export charts to PowerPoint or Word

RI$K Charts

Estimate Charts (Single Case, Drill down)

Comparative Charts (Multiple Cases)
Graphical Outputs to Compare What-if Cases

Multiple cases
Second Level of Visibility for POWER GENERATION PLANT
Results as BY

BY 2014 $K

$0
$60,000
$120,000
$180,000
$240,000
$300,000
$360,000

RDT&E
Procurement

Tech Baseline
Protect Scenario

BY 2014 $K

$0
$20,000
$40,000
$60,000
$80,000
$100,000

2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022

Tech Baseline
Protect Scenario
Uncertainty Analysis in ACE
What Does an Estimator Need to Perform Uncertainty Analysis?

- Ability to apply uncertainty throughout the estimate
  - Estimating Methodology (CERs)
  - Configuration (inputs)
  - Technical / Schedule
  - Discrete events
  - Correlate uncertainties
  - Sensitive to risk mitigation plans

- Method to generate a defendable estimate of the overall uncertainty

- Ability to adjust the point estimate to a desired confidence level and to control how the risk dollars will be phased

- Charts/tables to present estimate uncertainty
RI$K Wizard. Designed for new analysts, provides easy-to-follow screens that apply RI$K distributions to the estimate

- The wizard gives guidance on whether uncertainty should be specified:
  - on the current row
  - and/or on the variables
  - or not recommended for that type of methodology

- Easy-to-understand options help the analyst characterize the uncertainty

- The wizard also displays any rows or variables feeding into the current row and shows if they already have uncertainty specified. The analyst is given the opportunity to specify uncertainty on these rows also.

**NOTE:** Advanced analysts will most likely continue to use the Advanced mode of the Input All form or the RI$K workscreens to enter uncertainty.
Input All Form: Basic and Advanced Mode

**Basic mode:**
- Provides descriptive choices for specifying uncertainty
- Diagram changes based on selection

**Advanced mode:**
- Guides you through valid parameter choice
- Status tells you when the specification is Complete
Uncertainty Specification

- Apply uncertainty to cost methods and cost drivers
- All uncertainty specifications available at a glance:
  - **RI$K Spec**: Review or edit entire specification for that row
  - **Distribution**: Select shape (Normal, Log-normal, Student’s t, Log-t, Triangular, Uniform, Beta, BetaPERT, Weibull, or user-defined CDF)
  - **Spread/Skew**: Assign default dispersion, or
  - **Define dispersion**: low/high as a value or % of PE, Stdev, CV, others
  - **Group**: apply correlation
  - **RI$K On/Off**: Control RI$K distributions used in the simulation

<table>
<thead>
<tr>
<th>WBS/CES</th>
<th>ID</th>
<th>Tech Baseline</th>
<th>Eq / Thruput</th>
<th>RI$K Spec</th>
<th>Group</th>
<th>Strength</th>
<th>Dist</th>
<th>PE Pos</th>
</tr>
</thead>
<tbody>
<tr>
<td>73</td>
<td>Engine_T1</td>
<td>Engine_T1</td>
<td>$ 602.875 *</td>
<td>[From CO$TAT] 370.4 * kHpPerTon ^ 0.8747 * 0.878 ^ Oil</td>
<td>Form=Log-t, PE=Median, High^t=126.16,</td>
<td>HW</td>
<td>CorrHw_ Other</td>
<td>Log-t Median</td>
</tr>
<tr>
<td>74</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>75</td>
<td>kHp per Ton</td>
<td>kHpPerTon</td>
<td>2.000 *</td>
<td></td>
<td>Form=lognormal,</td>
<td>lognormal Median</td>
<td></td>
<td></td>
</tr>
<tr>
<td>76</td>
<td>Oil = 1, Coal = 0</td>
<td>Oil</td>
<td>1.0 *</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>77</td>
<td>Learning Slope</td>
<td>EngLmSlp</td>
<td>95.000 *</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Correlation can be Assessed and Modeled
Risk Statistics Easily Available

Tech Baseline
Choose 1:No Con, 2:Given Con

Power Plant System Estimate

POWER GENERATION PLANT

R&D&E
Prime Mission Product
Hardware (HW)
Structure
Cables, Conduits, and Connectors (I)
Engine (with learning)
Software (SW)
CIS1
CIS2
CIS3
Integration and Assembly (I&A)
HW/SSW Integration
Testing and Test Equipment
SEPM (R&D&E)
Training
Data
System Test and Evaluation (ST&E)
Procurement
Manufacturing
Hardware (HW)
Structure
Cables, Conduits, and Connectors (I)
Engine (with learning)
SEPM (Procurement)
Estimates can be Adjusted to Desired Confidence Levels

In constant or then year dollars
TY RI$K Results

- TY time phased RI$K results allocated at specified confidence level from a specified level in the WBS
- In this case, 50% from 2\textsuperscript{nd} level, meaning RDT&E and Procurement are the 50% statistical results, remaining levels adjusted to sum

TY RI$K cumulative distribution curve
Graphical Outputs to Present Uncertainty Results

Tech Baseline
POWER GENERATION PLANT
Results as 84 Statistics
Calculated with 7600 Iterations, CV = 0.145

Multiple cases
POWER GENERATION PLANT
Results as 84 Statistics
Calculated with 7600 Iterations, CV (Tech Baseline) = 0.145

Tech Baseline
Convergence for POWER GENERATION PLANT
Calculated with 16000 Iterations, CV = 0.145

Tech Baseline
Cost Contributors for POWER GENERATION PLANT
Results as 84 Statistics
Calculated with 7600 Iterations, CV = 0.145
Sorted on 90% Total Value

Techn Baseline
POWER GENERATION PLANT
Annual BY2014 $K Costs By Year
Results as 84 Statistics
Calculated with 7600 Iterations, CV = 0.145

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Benefits of Using ACEIT are Substantial

- **Implements standardized process and increases estimate quality**
  - Supports development of consistent, systematic, and defendable Life Cycle Cost Estimates
  - Delivers integrated, automated documentation, with complete audit trail
  - Improves estimate review and verification process through consistent model structure
  - Contains industry approved algorithms and databases to model inflation, learning, and phasing
  - Integrates statistical and risk analysis to quantify uncertainty in estimates
  - Enhances quality by eliminating many errors often made in spreadsheets (which frequently go undetected)

- **Provides flexibility to model any system type**
  - Unlimited flexibility to model any type of system linking all life cycle phases and facilitate any type of Analysis of Alternatives
  - Huge variety of automated and customizable reports

- **Integrates with other applications through an open platform**
  - Ability to link to virtually any other tool
  - Robust Application Programming Interface (API) to facilitate electronic interaction

- **Reduces management challenges**
  - Structured modeling platform shortens time for ACE users to learn a new model
  - Eases organization-wide distribution of key standards (WBS, inflation, etc.)
  - Empowers the analysts to answer Key Program/Project Management questions