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Overview

BYD Integration on Energy Toolbase

Energy Toolbase has integrated BYD’s (Build Your Dreams) energy storage solutions onto the Energy Toolbase (ETB) Platform. This integration enables ETB users to run energy storage dispatch simulations and savings analysis that are representative of how BYD Energy Storage Systems (ESS) products controlled by the Energy Toolbase Acumen EMS™ controller would operate in the field.

BYD’s integrated all-in-one energy storage solutions feature Lithium-ion Iron-Phosphate battery technology, paired with a bidirectional power conversion system (PCS), packaged into a modular system design for easy transportation, installation, and maintenance. The BYD products that Energy Toolbase is integrating its control software with, include BYD's CHESS and BHIVE product lineup, which come in both 2 and 4-hour configurations.

Energy Toolbase has worked with BYD to validate the ESS hardware specifications which have been pre-loaded onto the ETB platform. This allows users to quickly evaluate their standalone-ESS projects or PV+ESS projects, on any of Energy Toolbase’s 60,000+ utility rate schedules. The BYD integration streamlines the project development workflow for commercial storage developers and gives them confidence to know they are running validated savings and economic analysis.
Acumen EMS™

The BYD Energy Storage System utilizes Energy Toolbase’s Acumen EMS™ intelligent energy management system control software. This enables users to run BYD commercial storage dispatch simulations and savings analysis that are representative of how BYD products, controlled by Acumen EMS™, would operate in the field. Energy Toolbase’s Acumen EMS™ controls software utilizes artificial intelligence and advanced machine learning to forecast and optimally discharge energy storage systems operating in the field.

Acumen EMS™ enables developers to maximize the value of their storage assets:

- **Operating Modes.** Demand management, TOU arbitrage, PV self-consumption, and more.
- **Optimized.** Capture all available value streams in order of importance to maximize savings.
- **Experience.** 5 years of operating history and R&D training our machine learning models.
- **Re-forecasting.** Ingests real-time data to recreate forecasts every 15 minutes.
- **Standards.** Supports all industry standard communication protocols.
- **Compliance.** OEM warranty and incentive program (e.g., ITC, SGIP) compliant operations.
- **Performance Guarantee.** Backed by an industry leading performance guarantee.

[View the Acumen EMS™ data sheet]
Signing Up  
BYD Commercial ESS Integration

There is no cost for Energy Toolbase users to use BYD’s Commercial Energy Storage integration on the Energy Toolbase platform. There is a dual opt-in process, meaning ETB accounts must first apply to use the service, and then BYD must grant access.

Applying for Access to BYD Integration:

(1) In ‘Step 5 – Energy Storage’ users will initially see a greyed-out BYD logo. Click to apply for access.

(2) The pop-up window summarizes BYD’s commercial ESS offering on ETB. Note: when using the BYD ESS Integration on ETB, users are consenting to share proposal information with BYD, this does not include personally identifiable customer information. Click ‘I Accept’ to apply.

(3) BYD requires ESS developers to be approved prior to granting access to the integration. Approved users will receive the latest updates on BYD hardware, as well as personalized support on their projects.

(4) BYD will review applications and grant access accordingly. Approved users can expect to receive an email notification from ETB when access is granted.
Using BYD ESS Integration

Once an ETB account is permissioned to access the BYD ESS Integration, the BYD logo will appear blue in step 5. Both the BYD ‘ESS Designs’ and Energy Toolbase Acumen EMS™ ‘ESS Control Settings’ have been pre-configured so that users can quickly run validated BYD ESS dispatch simulations and savings analysis.

**BYD ESS Designs:**

These are the initial BYD ESS Designs. Note: these will be periodically updated as new energy storage system configurations are launched.

- Chess 120 kW | 240 kWh (2-hour)
- Chess 60 kW   | 240 kWh (4-hour)
- Bhive 1000 kW | 2000 kWh (2-hour)
- Bhive 500 kW   | 2000 kWh (4-hour)

**Using BYD ESS Integration:**

1. **System Cost:** specify the all-in, total turnkey installed ESS cost, which is inclusive of all hardware, software, developer fees, EPC costs, labor, overhead and profit. Note: the default suggested cost is set initially based on the ETB user’s simple ESS costing in their ‘Company Settings’.

2. **End of Life Treatment:** specify whether to replace the BYD ESS and associated costs at end of life. Note: the transaction will determine if the replacement cost is reflected in the cash flow, which we will detail in the next section of this guide.
(3) **ESS Design**: select the BYD validated ‘ESS Design’ from the drop-down menu list. *Note: BYD will periodically update these so ETB users can assume these are always up-to-date.*

(4) **ESS Control Setting**: select the ETB Acumen EMS™ control strategy from the drop-down list. *Note: “ETB Acumen EMS™ (ESS must charge from PV)” assumes the BYD ESS is being paired with PV, and enforces a PV charging-only requirement in order for the ESS to be eligible for the Federal (ITC) Investment Tax Credit.*

**ETB Optimizer:***

Energy Toolbase users can utilize the ‘ETB Optimizer’ feature, within the BYD ESS integration to simulate the performance and savings of (10) different BYD ESS system sizes at once, based on the selected Acumen EMS™ control logic.

**ESS Detail Summary:**

Once the Acumen EMS™ enabled BYD simulation has run, users will see the ESS Details performance summary, which displays the following values, based on the simulation performed:

- **Total Energy Capacity**: rated kWh of the ESS
- **Max Discharge Power**: rated kW of the ESS
- **Annual Equivalent Full Battery Cycles**: # of cycles
- **Annual Energy Discharged**: kWh discharged from the ESS
- **Annual System Losses**: kWh loss from ESS
- **Blended Savings per kWh**: savings from ESS, displayed in $/kWh of ESS capacity

![Energy Toolbase image](image-url)
ETB Analytics:

The ‘ETB Analytics’ feature enables users to view a project summary with detailed information of the Acumen EMS™ enabled BYD ESS dispatch simulation and corresponding utility bill savings of the project.

‘Monthly Electricity Costs’ – users can view a 12-month summary view of: energy (kWh), demand (kW), and utility bill cost information both pre & post: PV & ESS. Note: selecting the ‘Show Advanced Options’ hyperlink unlocks additional display options.

‘Demand Profile Visualization’ – an interactive charting environment that allows users to visualize interval data, including usage data, solar PV data, ESS charge/discharge data, and net usage data. The charting element across the bottom displays the energy & demand costs of the selected utility rate schedule(s).

‘Download Proposal Data’ tab – allows users to download out different types of data into Excel (.csv) formatted files. The Proposal Data Download file shows all the raw project inputs and calculated values. The Interval Data Download exports 365-days of 15-minute interval data for Current Usage, PV Generation, ESS Performance, and Net Usage in a multi-column format.
Transactions When Using the BYD ESS Integration

Energy Toolbase has created a special transaction template that is designed to be used with the BYD ESS Integration. The transaction has the Acumen EMS™ renewal fee pre-configured, so it will dynamically auto-calculate based on the selected size of the BYD energy storage system. The transaction is entitled: “ETB Acumen EMS™ – Cash Purchase”.

Specifying Project Cost:

As noted in the previous section, when using the BYD ESS Integration, users should specify the all-in, total turnkey installed ESS cost, which is inclusive of all hardware, EMS software, developer fees, EPC costs, labor, overhead and profit. Note: this is advantageous for tax purposes as it allows users to have a higher tax basis when claiming the Federal (ITC) Investment Tax Credit and any Depreciation benefit.

‘Equipment Replacement’ Cost:

By default, the “ETB Acumen EMS™ – Cash Purchase” transaction includes a cash flow for Equipment Replacement. Therefore, it is important that users intentionally set their BYD ESS Hardware - Equipment Replacement costing estimate in their company settings, as this flows into the financial analysis. This applies when users select ‘Replace ESS and include associated costs’ for their project in Step 5.

The BYD ‘Replacement Cost’ is initially defaulted based on how users have defined their ‘Simple Battery Replacement $/kWh’ cost in their company settings.

When setting your BYD Replacement Cost, only include your estimate for ESS Hardware, as the Acumen EMS™ control software replacement cost, which renews at year 11, is already dynamically calculated in the transaction, and has its own dedicated cash flow column as shown below. The Acumen EMS™ replacement cost value is based on ESS kWh capacity.
Sample: “ETB Acumen EMS™ – Cash Purchase” cash flow table:

3.1 Cash Purchase - EMS Services Paid Upfront

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<th>Years</th>
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<th>OEM &amp; Equipment Replacement</th>
<th>EMMS License Renewal</th>
<th>SGIP Incentive</th>
<th>Electric Bill Savings (kWh)</th>
<th>Change in State Tax Liability</th>
<th>Change in Federal Tax Liability</th>
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</table>

Editing BYD ‘Replacement Cost’ go to ‘Company Settings’ > ‘Energy Storage Settings’ tab > ‘BYD’ > click on individual ‘detailed ESS system design’ > to redefine those values.

Note: be mindful of how the PV inverter ‘replacement cost’ is defined in ‘company settings’, as that value will also pull into the financial model when modeling PV+ESS projects.
**BYD ESS Life Span & Degradation:**

BYD has set the ESS Battery Life Span at 10 years, and Battery Degradation Rate at 3.5%. Approved ETB uses can view the ‘BYD ESS System Design’ characteristics in their company settings.

**Term (Years) of the Transaction:**

For this default Transaction, ETB has fixed the Transaction Term to 20 years. If a user prefers to model and present a different transaction term, you can simply copy/duplicate the Transaction and custom configure the term in the ‘transaction details’ section like any other Transaction.

As shown in the sample cash flow table on the preceding page, the Energy Toolbase Acumen EMS™ license renews at year 11, and the BYD energy storage system and PV inverter are replaced at year 11.

**Including other ESS Monetary Value Streams:**

Users can elect to further customize their Financial Transaction template(s) to include additional cash flows, to account for additional value streams in their financial analysis. Cash flows can be structured as either a one-time payment or as an annual recurring payment.

One example of a recurring value stream could a Grid Services program, where the BYD ESS captures value by providing a benefit to the utility or independent system operator. An example of a one-time value stream could be the Resiliency value that a BYD ESS provides for a specific customer, by providing back-up power in the event of a grid outage and eliminating the need for a generator.

**Creating other Transaction Types:**

Users can easily configure other Transaction types (e.g., Loan, Lease, PPA) by copy/duplicating the existing ETB Acumen EMS™ transaction template. We encourage you to contact your ETB account manager for assistance on this.
Final Checklist

We have compiled a final checklist of items for users to ensure that they are accurately modeling and optimizing the project economics of BYD ESS projects for their customers.

Final Checklist Items:

1. **ESS System Price** – doublecheck to confirm that your ‘System Cost’ in Step 5 represents the all-in, total turnkey installed cost of the ESS System.

2. **Transaction** – make sure to utilize the ‘ETB Acumen EMS™ – Cash Purchase’ transaction template, which dynamically calculates the EMS renewal fee. Contact your ETB account manager if you want to create different variations of the transaction, like a Loan, Lease or PPA.

3. **Equipment Replacement Cost** – make sure you define the BYD ESS Hardware ‘Equipment Replacement Cost’ in ‘Company Settings’, which will flow into your cash flow statement and project economics when you elect to ‘Replace the ESS’ for the ‘End of Life Treatment’.

4. **Utility Rate Schedule** – select the most advantageous, eligible utility rate schedule option for post-ESS or post-PV+ESS savings.

5. **Demand Throttle** – verify the demand reduction throttle in ‘Step 2’ is set to 100% in order to capture the full demand charge management savings opportunity from both PV & ESS.

6. **Incentives** – in ‘Step 3’ be sure to select all eligible ESS incentives for the project, based on the customer’s eligibility (i.e. SGIP, SMART, Federal ITC, Depreciation, etc.).

*Contact your Energy Toolbase Account Manager to discuss any of these items in more detail.*