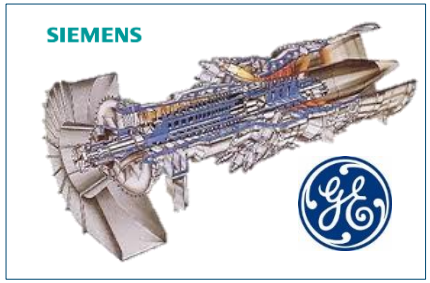
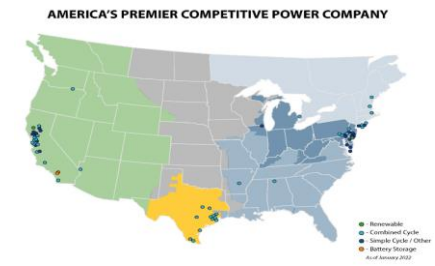
Calpine Asset Lifecycle Management

Calpine Factoids

- 76 geothermal, natural gas-fired and Battery plants
- Approx 26GW capacity across 3 regions in United States
- Retail Operations – Champion and Solutions
- Corporate Headquarters – Houston, Texas





Calpine Asset Lifecycle - Rotating Assets

Maximo

1. Create Rotating Item
2. Build Item assembly structure
3. Create PR to purchase
7 . Receive Rotating Assets
8. Generate Asset hierarchy
10. Create CAP Sheet
11. Move Assets
14.Repair Assets
16. Change status to Scrap

Peoplesoft

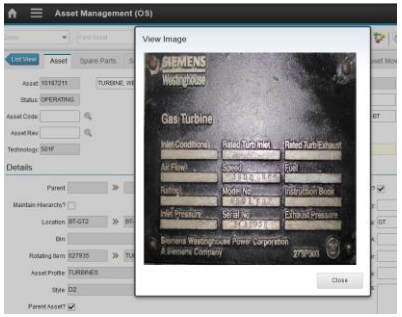
5. Issue Purchase Order
6. Create receipt
9. Pay invoice

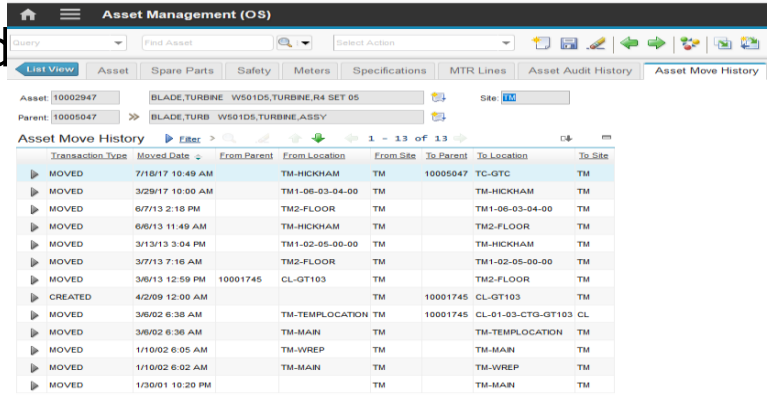
Powerplan

12. Assets In-service
13. Start depreciating
15. Scrap financial Asset

Rotating Assets Lifecycle- Functionality

- Track 100k + turbine internal assets
  - Rotating Items / Rotating Assets
  - Item Assembly Structure
  - Hours / Starts / Repairs / Since Install meters
  - Asset reservations
  - Asset Status
  - Capital Assets Movements
  - Realtime Hours / Starts Dashboard
  - Future state Hours and Starts dashboard
  - Monthly run average (1 year / 3 years)
  - Asset repair reports
  - Asset Inspection reports
  - Asset move history – 20 years
  - 5 year parts reservations and capital forecasting based on future outages





Rotating Assets - Color coding based on Asset Status

Rotating Assets - Realtime and Project Dashboards

501F PROJECTIONS DASHBOARD New

All, 2022-09, SW_CBASKET, DE-GT3, 3

LOCATION	SECTION	PERIOD	PROFILE	YEAR	TURBINE EOH	TURBINE ESS
DE-GT3	All	2022-09	SW_CBASKET	3	119,101.45	2,448

SINCEINSTALL PROJECTIONS

SECTION	EVENTDATE	LOCATION	ASSETNUM	YEAR	DESCRIPTION	PROFILE	TI EOH	TI ESS	SI EOH	SI ESS	REMAINING EOH	REMAINING ESS
COMBUSTION	2022/01/14	DE-GT3	11268351	3	BASKET,COMBUSTION, W501F	SW_CBASKET	24,000	1,800	35,073.27	965.87	▾11.1K (32%)	▴834 (86%)

LIFETODATE PROJECTIONS

SECTION	EVENTDATE	LOCATION	ASSETNUM	YEAR	DESCRIPTION	PROFILE	TL EOH	TL ESS	LTD EOH	LTD ESS	REMAINING EOH	REMAINING ESS
COMBUSTION	2022/01/14	DE-GT3	11268351	3	BASKET,COMBUSTION, W501F	SW_CBASKET	72,000	5,400	35,073.27	965.87	▴36.9K (105%)	▴4.43K (459%)

501F Real Time New

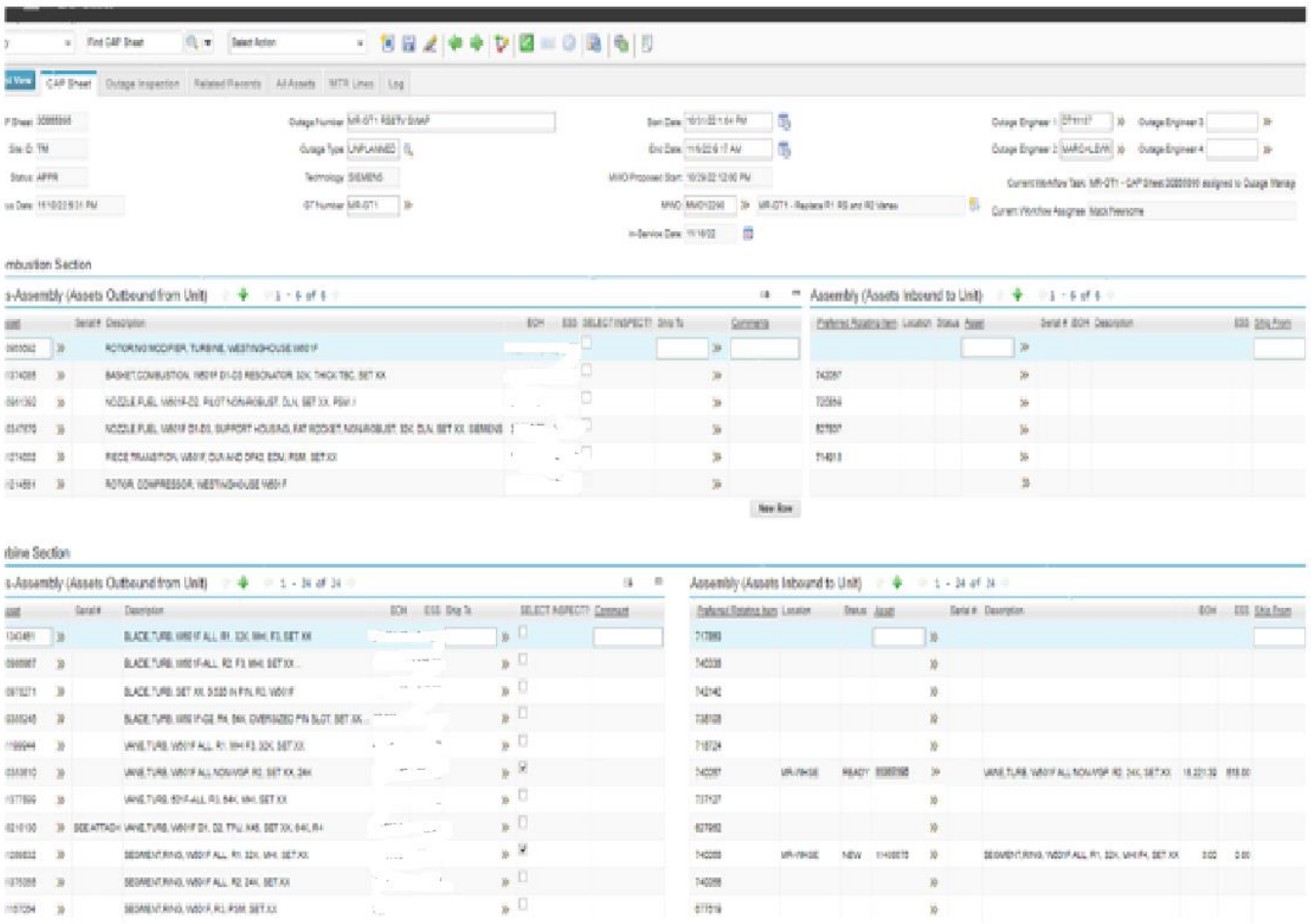
DE-GT3, TURBINE, All, LIFETODATE

LOCATION	SECTION	PROFILE ID	TYPE	TURBINE EOH	TURBINE ESS
DE-GT3	TURBINE	All	LIFETODATE	119,101.45	2,448

EOH and ESS

LOCATION	SECTION	ASSETNUM	PROFILEID	DESCRIPTION	TARGET EOH	TARGET ESS	EOH	ESS	TYPE	REMAINING EOH	REMAINING ESS
DE-GT3	TURBINE	10348095	SW_TISSR04	SEAL,AIR, W501F ALL, BB	288,000	7,200	76,993.03	1,695	LIFETODATE	▴211K (274%)	▴5.51K (325%)
DE-GT3	TURBINE	10941725	SWTBRNGR01	RING,BLADE W501F-D2,R1	288,000	7,200	53,050.07	1,344	LIFETODATE	▴235K (443%)	▴5.86K (436%)
DE-GT3	TURBINE	10187682	SWTBRNGR03	RING,BLADE W501F-D2,R3	288,000	7,200	63,229.57	1,133	LIFETODATE	▴225K (355%)	▴6.07K (535%)
DE-GT3	TURBINE	10345962	SWTBRNGR02	RING,BLADE W501F,R2 10	288,000	7,200	63,738.81	947	LIFETODATE	▴224K (352%)	▴6.25K (660%)
DE-GT3	TURBINE	10984235	SW_TISSR03	SEAL,AIR, W501F ALL, BB	288,000	7,200	37,008.33	756	LIFETODATE	▴251K (678%)	▴6.44K (852%)
DE-GT3	TURBINE	10403373	SW_RS_R03	SEGMENT,RING W501F,ROW	128,000	5,000	41,421.54	817	LIFETODATE	▴86.6K (209%)	▴4.18K (512%)
DE-GT3	TURBINE	10188208	SWTBRNGR04	RING,BLADE W501F,R4 10	288,000	7,200	52,039.60	1,259	LIFETODATE	▴236K (453%)	▴5.94K (472%)
DE-GT3	TURBINE	11290116	SW_TB_R03	BLADE,TURB, W501F-ALL, R	128,000	5,000	28,637.07	655	LIFETODATE	▴99.4K (347%)	▴4.35K (663%)
DE-GT3	TURBINE	10932450	SW_RS_R04	SEGMENT,RING W501F,ROW	128,000	5,000	77,878.41	1,105	LIFETODATE	▴50.1K (64%)	▴3.90K (352%)
DE-GT3	TURBINE	10345434	SW_TV_R04	VANE,TURB W501F,R4,SET	128,000	5,000	61,398.41	2,456	LIFETODATE	▴66.6K (108%)	▴2.54K (104%)
DE-GT3	TURBINE	11030474	SW_TISSR02	SEAL,AIR, W501F ALL, BB	288,000	7,200	31,257.39	444	LIFETODATE	▴257K (821%)	▴6.76K (1522%)
DE-GT3	TURBINE	11336045	SW_RS_R01	SEGMENT,RING, W501F-D2,	96,000	3,600	14,744.13	341	LIFETODATE	▴81.3K (551%)	▴3.26K (956%)

Asset Lifecycle - CAP Sheet



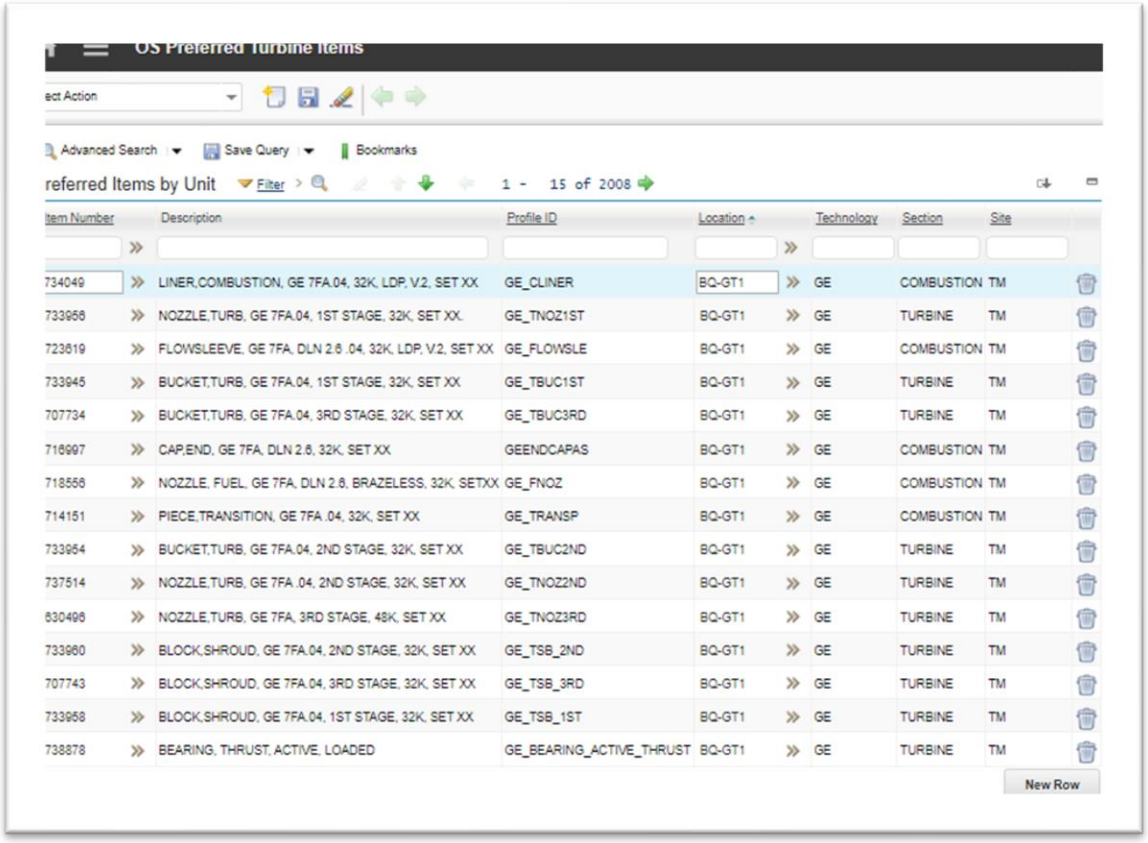
Supports Outage Planning and Outage Execution

Workflows Define Ownership of CAP Sheet Process

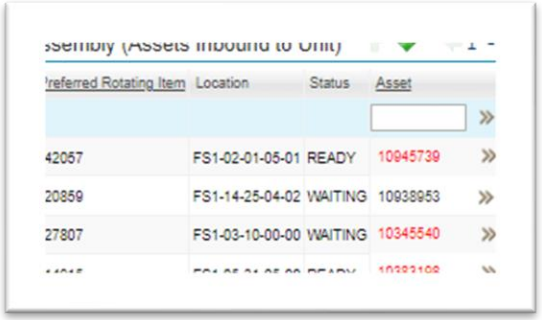
“Gold Standard Assets” are pre-populated

Safety Stock Items available for unplanned outage use.

Asset Lifecycle - CAP Sheet

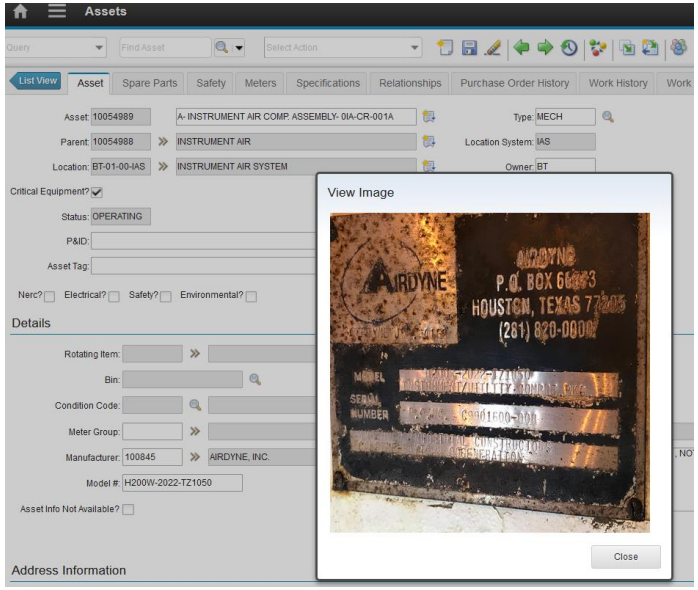


- "Preferred Item" for a specific unit
- Auto – Populates on CAP Sheet
- Ensures proper assets are used



Assets Life Cycle - Critical Assets - BOP

- Identified Critical Assets across fleet
- Captured name plate details like make, model, serial number and specifications
- Identifying critical assets opened lots of opportunities
  - **Find similar equipment across fleet**
  - **Plan for critical spares**
  - **Standardize PM and Job plans**
  - **Capex / Opex spend by critical assets**
  - **Captured name plate picture of all critical assets**



Critical Asset Identification

Tips to help Collect the Information

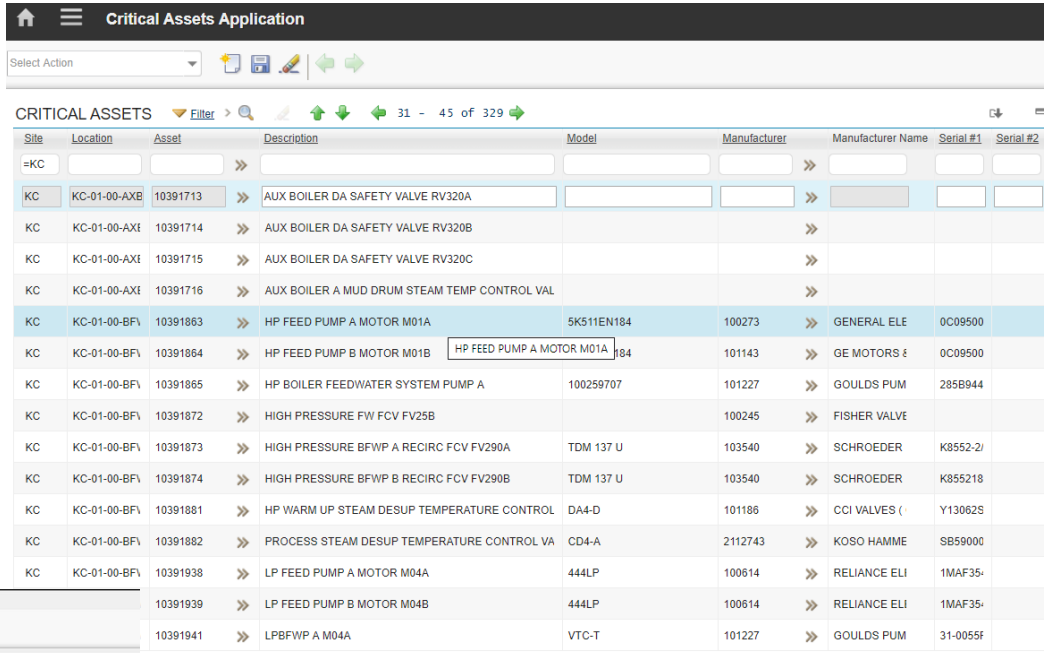
Standardize the asset list

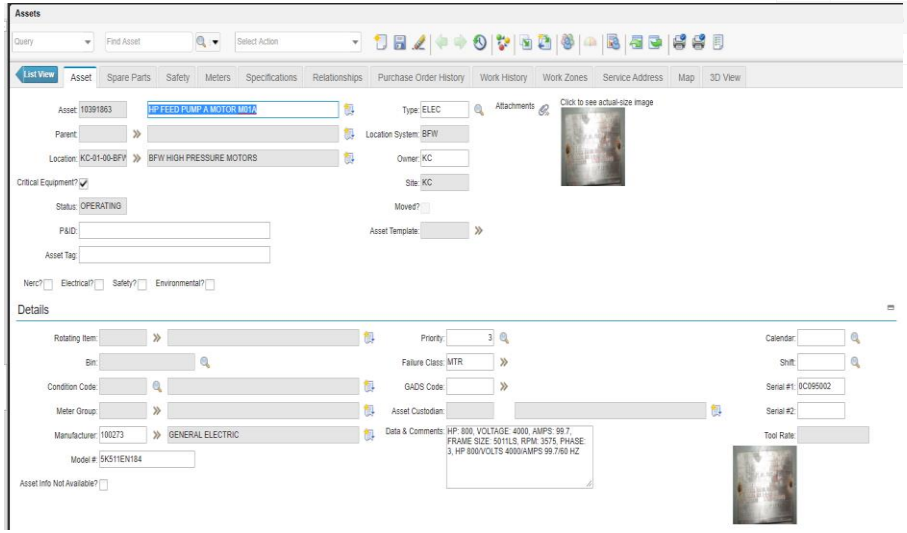
Give options to make it easier

Find a way to incentivize

Show progress being made

Communication is key!





Critical Asset Data Collection Metrics

CALPINE®

WEST CRITICAL ASSET CATALOGING PROJECT

Site	Plant Configuration	Total Assets	Critical Assets	Nameplate Info Not Available*	Missing MFG	Missing Model	Missing Nameplate Photo	% Completion Manufacturer AND Model OR Nameplate Photo: % Complete - Manufacturer	% Complete - Model #	% Complete - Nameplate Photo Upload
AGNEWS POWER PLANT	1X1X1	1387	454	22	0	0	432	100.00%	100.00%	4.85%
DELTA ENERGY CENTER	3X3X1	8077	1011	4	0	0	813	100.00%	100.00%	19.58%
GILROY COGENERATION PLANT	1X1X1	4649	340	26	0	0	5	100.00%	100.00%	98.53%
HERMISTON POWER PROJECT	2X2X1	9353	509	0	0	0	509	100.00%	100.00%	0.00%
KING CITY COGENERATION PLANT	1X1X1	5986	329	2	0	0	103	100.00%	100.00%	68.69%
LOS ESTEROS CRITICAL ENERGY CENTER	4X4X1	5283	643	69	210	222	564	67.34%	65.47%	12.29%
LOS MEDANOS ENERGY CENTER	2X2X1	4768	491	35	0	0	150	100.00%	100.00%	69.45%
METCALF ENERGY CENTER	2X2X1	1541	519	8	90	93	275	82.66%	82.08%	47.01%
OTAY MESA ENERGY CENTER	2X2X1	3353	393	0	0	0	393	100.00%	100.00%	0.00%
PASTORIA ENERGY FACILITY	3X3X2	10044	993	0	750	772	993	24.47%	22.26%	0.00%
RUSSELL CITY ENERGY CENTER	2X2X1	1402	709	37	0	0	615	100.00%	100.00%	13.26%
SUTTER ENERGY CENTER	2X2X1	4955	555	0	551	522	555	0.72%	5.95%	0.00%
WOLFSKILL ENERGY CENTER	1X0X0	6015	1792	0	724	1008	1792	59.60%	43.75%	0.00%

*Nameplate Data is missing, unreadable or currently unattainable.

Critical Asset Preventive Maintenance
Time vs. Usage Based Maintenance

Time Based

Advantages:

- Usually made up of tasks that don't require extensive training
- Simple to track and to predict

Disadvantages:

- May lead to over or under servicing assets
- Parts are often replaced before end of life

Usage Based

Advantages:

- Maintain greater control by taking usage into account
- PMs are triggered when needed and not by an arbitrary date.
- Based on collected run data, Maximo can predict future due dates.

Disadvantages:

- Front end investment is required