Enterprise Asset Management

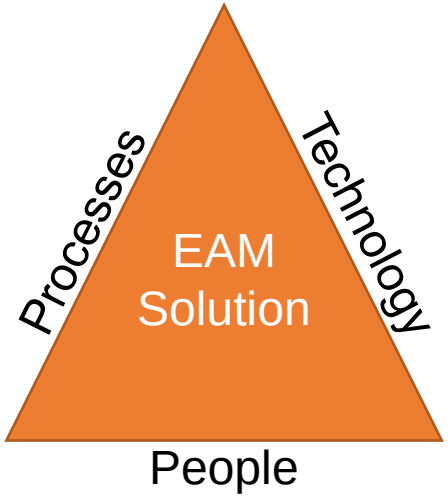
LES' Journey towards EAM Maturity

Lincoln Electric System (LES) *Fast* Facts

- **Municipally-owned, vertically integrated electric utility**
- **Governed by semi-autonomous 9 member board**
- **500+ Employees**
- **City Council retains rights to approve budgets, rates, and deb**
- **~140,000 Customers (88% Residential)**
  Averaging ~1% annual growth in customers
- **$1.7B in capital assets**
- **$321M in Operating Revenues**
- **3,200 MWh in annual retail sales**
  Averaging 0-1% annual energy growth
- **Peak Demand 786 MW (August 2011)**
- **LES is proud to have the lowest residential rates in the Big 10!**

Background

- **People**
  - Asset owners spread throughout LES' in multiple divisions
  - No clear "owner" of Enterprise Asset Management
- **Processes**
  - Inconsistent across LES
- **Technology**
  - Enterprise system is SAP
  - Inconsistent utilization across LES
  - Multiply other systems "filling the gap"



Background

- **SAP at LES**
  - Major implementation in 1999 (Y2k project)
  - Major expansion in 2011
  - Processes implemented:
    - Financials
    - Enterprise Asset Management
    - Materials Management
    - Customer Management
    - Human Resources
    - Content Management

Background

- **Problem:**
  - Enterprise Asset Management needs to improve
  - It is big!
    - **Where do we start?**
    - **Where do we go?**
    - **Who is most important?**
    - **Why is important?**

- **Solution:**
  - Create business-driven roadmap before we started any new initiatives

LES EAM Roadmap Objectives

- Establish strategically focused and directionally correct plan
- Prioritize, fund and implement the right initiatives
- Prioritize processes impacted by the new LES Operations Center that is opening in Spring of 2019

EAM Roadmap Development in 6 Easy Steps

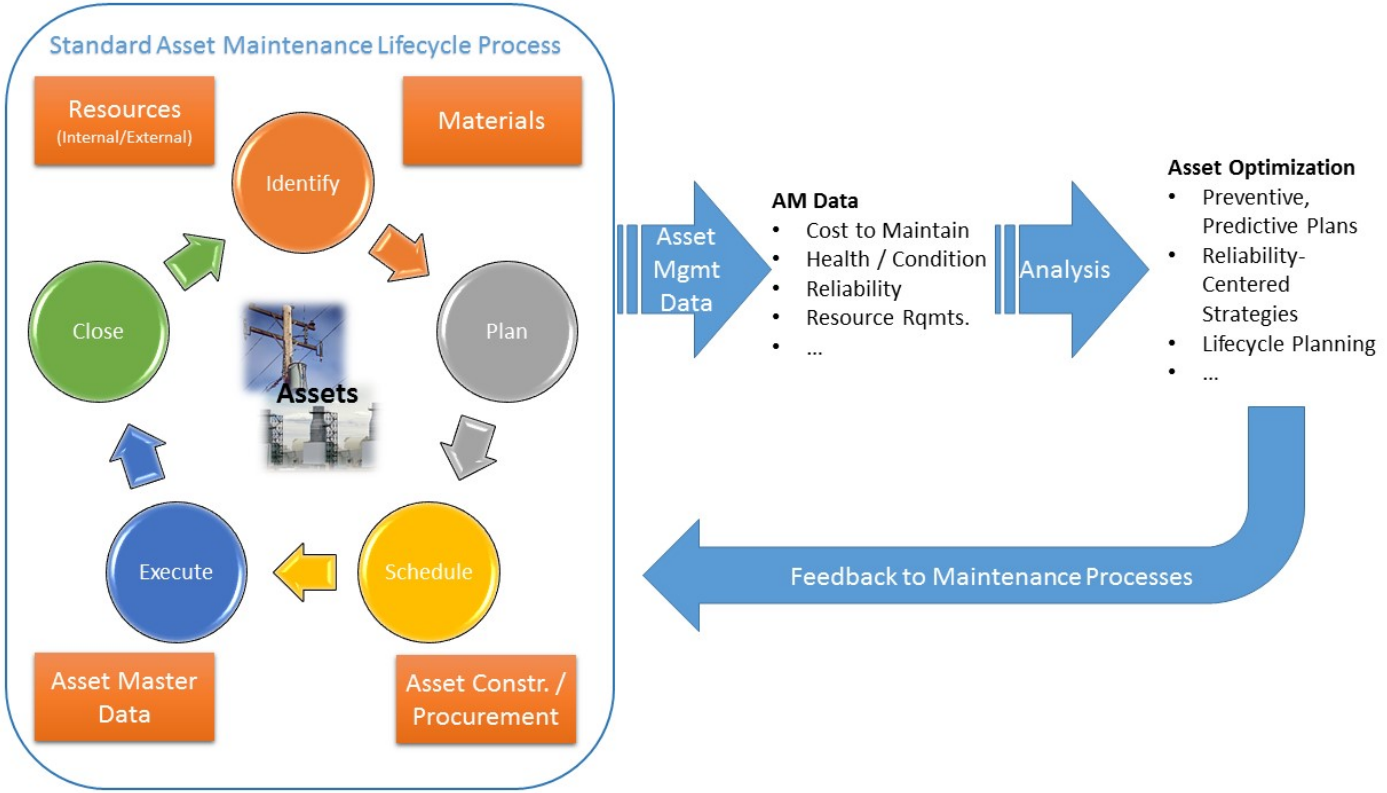
- **We had “assessment overload” from consultants**
  - Drafted internally-driven program to define, develop, implement and refresh our EAM roadmap
- **Not really 6 Easy Steps, but also not rocket science**
  - Define Enterprise Asset Management
  - Identify the current state
  - Analyze the results
  - Identify drivers/initiatives to close gaps
  - Develop the formal roadmap
  - Confirm the first project (we need to get moving!)

Step 1 – Define Enterprise Asset Management

- **Ask ten utility people what EAM means, how many different answers will you get?**
- **First challenge was to agree on a working definition of what Enterprise Asset Management means for LES.**
- **Our definition:**

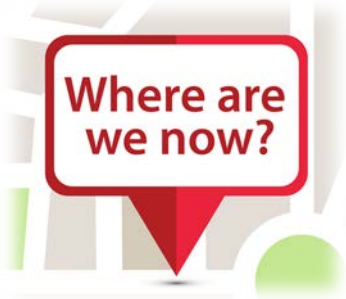
The people, processes and technology that ensure we are building, operating and maintaining our physical assets in a manner that optimizes reliability and cost.

The LES EAM Process Model



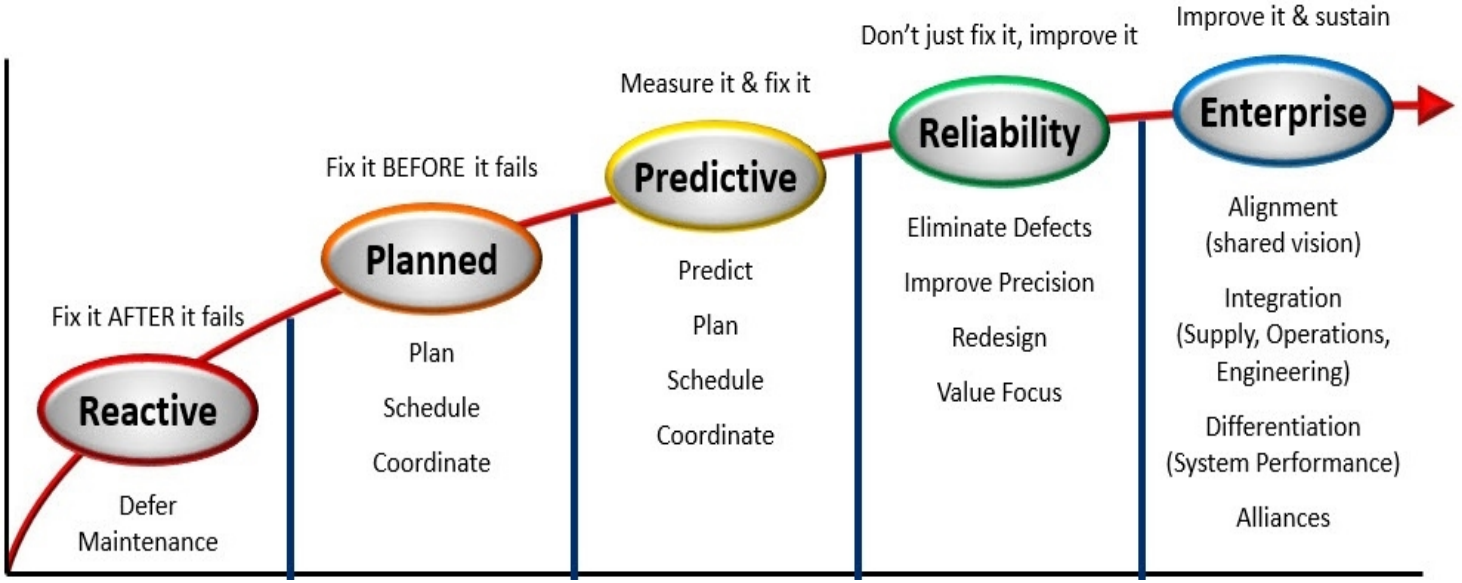
Step 2 – Identify Current State

- **“You can’t really know where you are going until you know where you have been” – Maya Angelou**
- **Internally conducted an EAM Maturity Evaluation**
- **Probably the most critical part of the whole road mapping process**



EAM Maturity Model

- **Used a common maturity model to evaluate our level of effectiveness**



Genesis (2016)/Winston Ledet (1999)

EAM Maturity Evaluation Methodology

- **Broke the EAM function into sub-processes:**
  - Work Management Processes
    - **Work Identification, Planning, Scheduling, Execution, Close**
  - Planned Maintenance Processes
    - **Preventive, condition-based programs**
  - Asset Analytics
    - **Reliability analysis, maintenance cost analysis**
  - Asset Master Data Management
    - **Asset data quality, management processes**
  - Asset Construction & Accounting
    - **Capital projects processes, asset accounting**
  - EAM Supporting Processes
    - **Maintenance, materials management, procurement, etc.**

EAM Maturity Evaluation Methodology

- **Defined maturity scoring to measure process and SAP usage maturity:**

Maturity Score	Process	SAP System Use
0	No defined process	No use of SAP functionality
1	Informal process	Minimal use of SAP functionality
2	Minimally defined process	Partial use of SAP functionality
3	Basic process and process compliance	Basic use of SAP functionality
4	Well defined and followed process	SAP functionality critical to process
5	Optimized process	Full and enhanced use of SAP functionality

EAM Maturity Evaluation Methodology

- **Created definitions of what a 5 looks like based on industry leading practices and SAP EAM functionality.**

Asset Management Process Area	Related SAP Functions	Leading-Practice Process/SAP Usage (What's a 5 look like)
Work Management Processes		
Identify - Screening, classification, prioritization of asset maintenance items	PM Notifications, Maintenance Plans	• All maintenance requirements identified via a consistent process, with standard priorities assigned, related to the appropriate asset, through a single point of review and approval. Majority of requirements identified through preventive planning vs unplanned corrective maintenance. • Use of SAP PM Notifications as initiation point for all maintenance work, referenced to the Equipment and/or Functional Location(s), with appropriate causes recorded.
Plan - Defining work scope, required resources and materials	PM Orders, Networks	• All needed resources (internal labor, external labor/services, stock and non-stock materials, vehicles and special equipment) for maintenance requirements identified, accurately planned, using repeatable task and material templates for a majority of work. Type of maintenance work (planned, unplanned, preventive, corrective, etc.) classified. • Use of SAP PM Orders (or Networks for larger construction projects), with BOMs and Task Lists for pre-planned work.
Schedule - Scheduling according to priority, date mgmt., resource & material availability	PM Orders, Networks	• All work for maintenance and construction activities is combined into a single schedule based on priority, resource availability (internal and external), material availability, required system conditions, etc. The schedule is maintained and modified as actual progress is recorded and other emergent or planned work is added or completed. • Use of SAP PM and PS scheduling and data management

EAM Maturity Evaluation Methodology

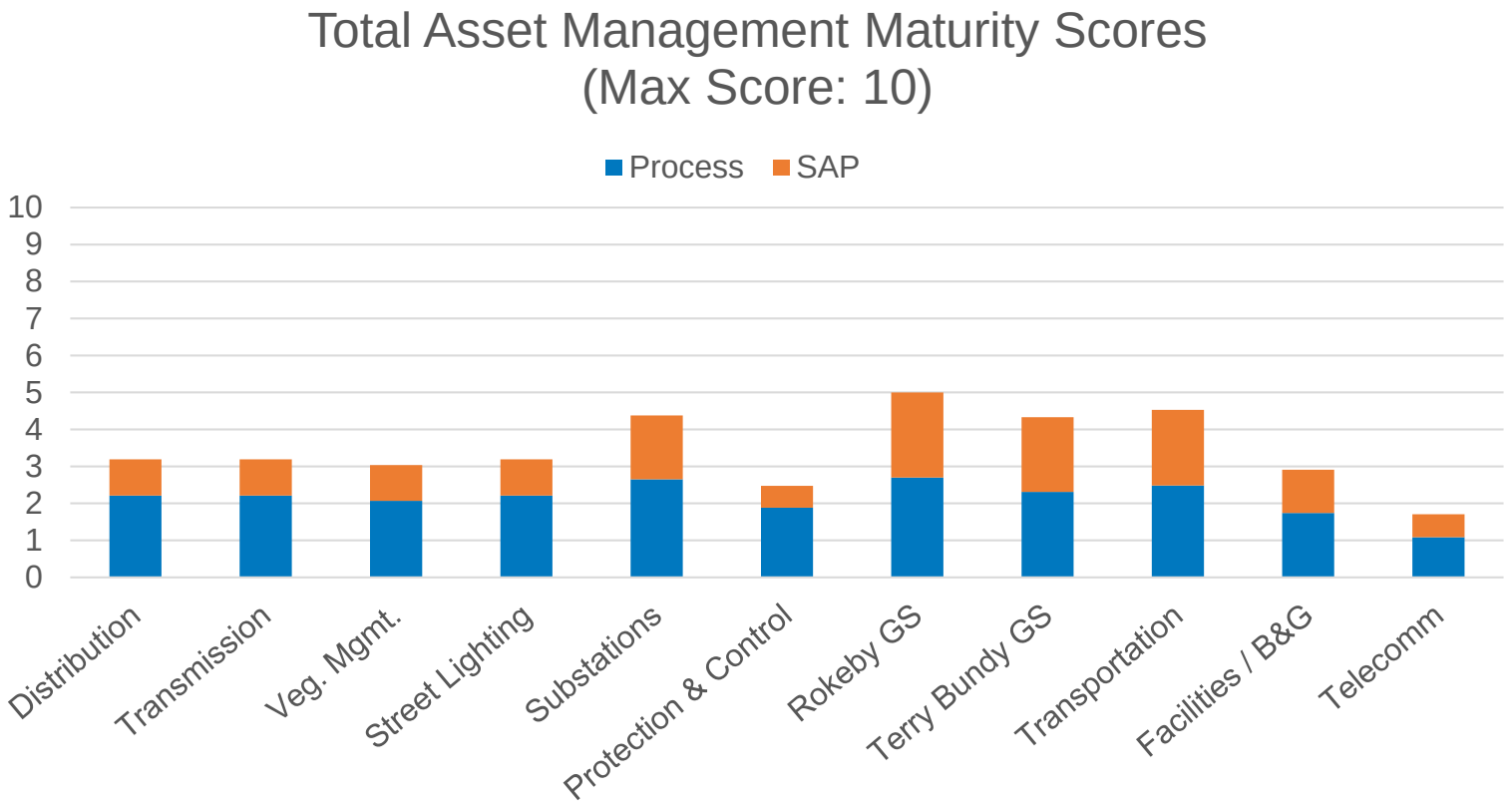
- **Inputs to Maturity Evaluation:**
  - Results of previous assessments
  - Data gathering from current SAP system
  - Workshops with SMEs from each asset area
    - **Explained the purpose, methodology, scoring**
    - **Asked the SMEs for each area to score themselves first**
    - **Follow-up workshops to review and finalize (in most cases lower) the self-assessed maturity scores**

EAM Maturity Evaluation Methodology

- **Results on a Scoring Matrix – asset area and process category**

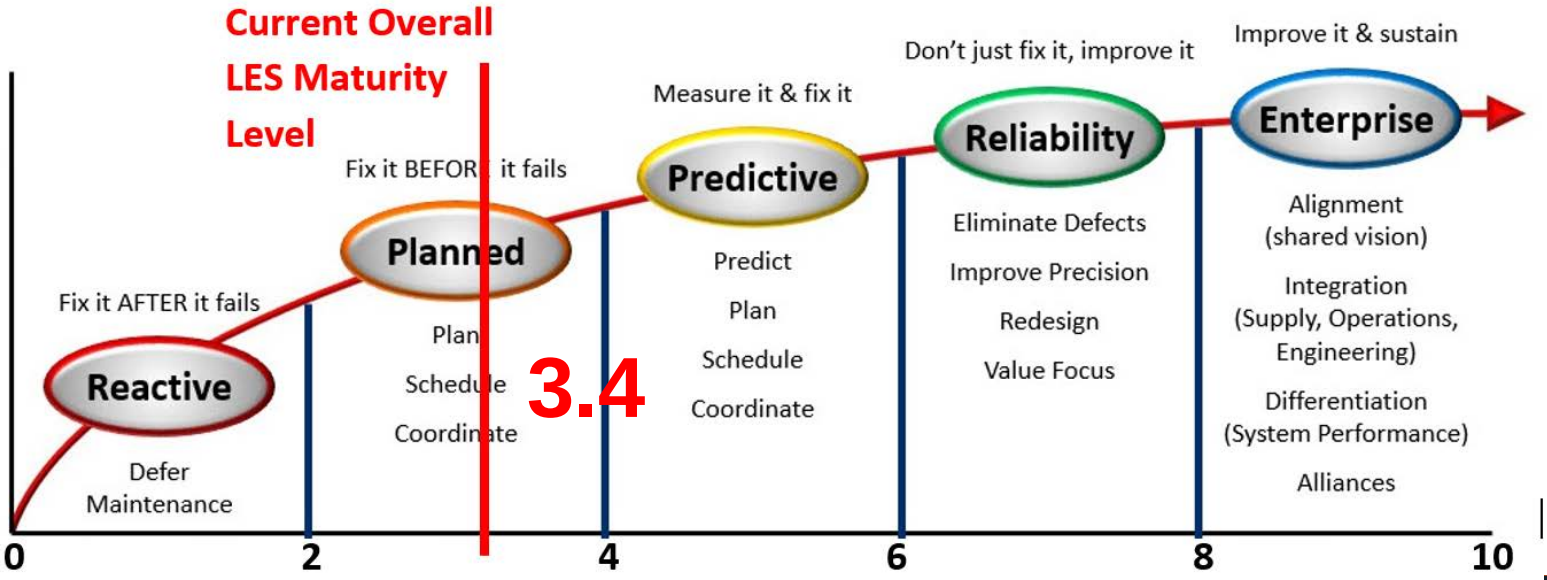
Asset Management Processes	SAP System Areas / Data Objects	Distribution		Transmission		Veg. Mgmt.		Street Lighting		Substations		Protection & Control		Rokeby GS		Terry Bundy GS		Transportation		Facilities / B&G		Telecomm	
		Process	SAP System	Process	SAP System	Process	SAP System	Process	SAP System	Process	SAP System	Process	SAP System	Process	SAP System	Process	SAP System	Process	SAP System	Process	SAP System	Process	SAP System
Work Management Processes		2.6	1.4	2.6	1.4	2.2	1.4	2.6	1.4	3.0	2.6	2.6	0.2	2.6	2.6	2.6	2.4	2.6	2.4	2.2	1.2	1.6	0.6
Identify	PM Notifications	2	0	2	0	2	1	2	1	3	2	3	0	3	3	3	3	3	2	3	1	2	0
Plan	PM Orders, Networks	3	2	3	2	2	2	3	2	3	3	2	0	3	3	3	3	2	3	2	1	2	1
Schedule	PM Orders, Networks	3	0	3	0	2	2	3	0	3	3	3	0	2	2	2	2	2	2	2	2	1	1
Execute	PM Orders, Networks, Completion Confirmations	2	3	2	3	3	1	2	2	3	3	2	1	2	2	2	2	3	3	2	1	1	1
Closeout	PM Orders, Networks, Completion Confirmations, Notifications	3	2	3	2	2	1	3	2	3	2	3	0	3	3	3	2	3	2	2	1	2	0
Planned Maintenance Processes		2.0	0.0	2.0	0.0	2.0	1.0	2.0	0.0	3.5	1.5	1.5	0.0	3.0	3.0	2.5	2.5	3.0	3.0	1.5	1.5	0.0	0.0
Condition-Based Maintenance processes	Measuring Points, Measurement Documents	2	0	2	0	1	0	2	0	3	0	2	0	3	3	2	2	3	3	0	0	0	0
Preventive Maintenance planning	PM Plans, Maintenance Items	2	0	2	0	3	2	2	0	4	3	1	0	3	3	3	3	3	3	3	3	0	0
Asset Analytics		1.5	1.0	1.5	1.0	NA	NA	1.5	1.0	1.5	1.0	1.5	0.0	2.5	2.0	1.0	1.0	2.0	2.0	0.5	0.0	0.0	0.0
Reliability analytics - MTBF, etc	Varies	1	0	1	0	NA	NA	1	0	1	0	1	0	3	2	0	0	2	2	0	0	0	0
Maintenance cost & value analytics	Varies	2	2	2	2	NA	NA	2	2	2	2	2	0	2	2	2	2	2	2	1	0	0	0
Asset Master Data Management		2.7	0.7	2.7	0.7	2.0	0.5	2.7	0.7	3.0	1.7	2.0	0.3	3.0	2.0	2.7	2.0	3.0	1.7	2.3	1.3	1.0	0.3
Asset Master Data - quality, coverage, accuracy, data management processes	Functional Locations, Equipment	3	0	3	0	2	1	3	0	4	3	3	0	4	3	3	3	4	3	3	3	2	0
Materials master data - quality, coverage, accuracy, data management processes	Material Masters	3	2	3	2	NA	NA	3	2	3	2	2	1	3	3	3	3	3	2	2	1	1	1
Maintenance Labor/Equipment Resources master data - organization, capacities	Work Centers	2	0	2	0	2	0	2	0	2	0	1	0	2	0	2	0	2	0	2	0	0	0

EAM Maturity Evaluation Results by Asset Area



EAM Maturity Evaluation Results

- **Confirmed that improvements were needed, helped target key areas to address first.**



Step 3: Analyze the Results

- **Key question:**
  - What level of EAM Maturity do we need to be at in different areas of the business?
- **Not all assets are equally critical to serving our customers**
- **Looked for common low-maturity process areas, and low-maturity business areas**

Step 4: Identify Drivers/Initiatives to Close Gaps

- **Consolidate and Standardize EAM processes & systems (including materials, procurement, financials)**
  - Gain scalability, reduce support costs, allow better sharing of personnel
- **Exploit window of opportunity before LES Operations Center startup**
  - Standardization changes will be more difficult after transition
  - Led to our focus on T&D work/asset management
- **Better information on asset costs, maintenance, operating histor**
  - To enable improved asset performance, reliability
- **Best use of current SAP & GIS investments**
- **Reduce effort and costs of current fragmented processes**
  - Free up capacity for higher value activities such as planning and analysis.

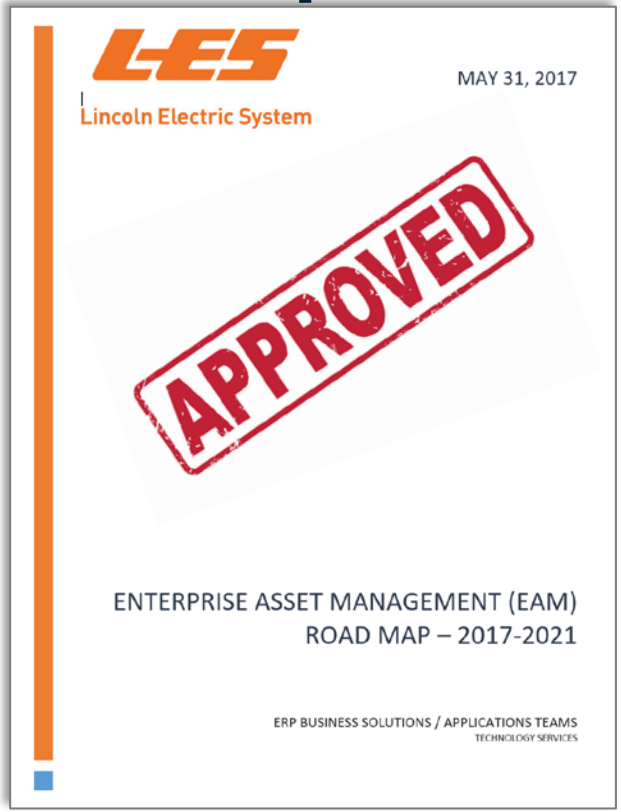
Step 5: Develop the Roadmap

- **LES' EAM Roadmap laid out in four main stages, with individual projects in each stage:**
  - Preparation
    - Assess and Plan
  - Foundation
    - Establish the Base
  - Extension
    - Extend the Base
  - Optimization
    - Build on the Base

What's in the LES EAM Roadmap (2017 version)?

Stage / Initiative	Start	Finish	Duration
Preparation			
Energy Delivery Asset Data Discovery / Readiness	6/5/17	8/11/17	50 days
Power Supply AM Process / SAP PM Improvements	6/12/17	9/29/17	80 days
Foundation			
EAM / SAP PM Foundation Implementation	10/2/17	11/9/18	290 days
Phase 1 - Structural Foundation	10/2/17	3/2/18	110 days
Phase 2 - Process Foundation	3/5/18	8/10/18	115 days
Phase 3 - Foundation Go Live	8/13/18	11/9/18	65 days
Extension			
Asset Management Analytics	1/7/19	6/21/19	120 days
EAM / PM Extension	5/6/19	8/9/19	70 days
Optimization			
Construction Project Design Automation	9/30/19	6/5/20	180 days
Implement Standard Work Scheduling	8/3/20	12/18/20	100 days
Condition-Based Maintenance	3/16/20	11/20/20	180 days
Implement SAP SD for Billed Work	1/4/21	5/7/21	90 days

Step 6: Confirm the First Project



- **The LES EAM Roadmap for 2017-2021 was presented to the Executive Team in May 2017, and approved as a plan.**
- **The initial Foundation Project was also approved to begin work as soon as detailed planning and mobilization could be done.**

Where Are We on Our EAM Maturity Journey?

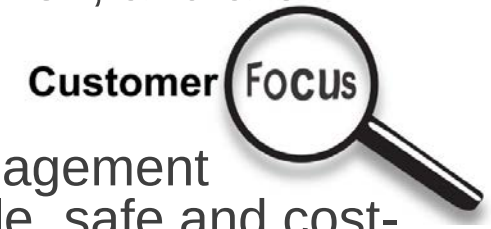
- **Launched the Foundation Project in October 2017.**
- **Phase 1**
  - Master Data & integration with GIS completed in April
- **Phase 2 (Realization)**
  - Standard Process & System, for initial T&D rollout
  - Includes SAP Work Manager mobile field solution with GIS map integration set for November

Where Are We Seeing Value?

- **Transparency/clarity**
  - Reference to help everyone see and know what's planned, when it's coming, and why
- **Planning/Scoping**
  - Already preparing for next two Roadmap projects
- **Ownership**
  - Catalyst to form an internal EAM Process Owners Group of SMEs from across LES to help steer and coordinate
- **Managing internal resources**
  - Enabling limited SAP and EAM resources to focus on the prioritized Roadmap projects first

Where Are We Seeing Value?

- **Strategic**
  - Enterprise Asset Management is now seen as a core business function that needs to be done well, critical to our effective and efficient operations.
- **Collaborative**
  - Asset business areas know what's planned and when, and are able to work together to benefit all of LES.
- **Customer Focus**
  - The Roadmap helps relate our internal Asset Management performance to being better able to provide reliable, safe and cost-effective energy to our customers and community.



What Comes Next?

- **Finish the Foundation Projects**
- **Revisit and Refresh the Roadmap**
  - The EAM Roadmap isn’t a static plan, since we aren’t in a static business
  - Plan to revisit and update the EAM Roadmap after each major initiative, or at least annually
  - First refresh at the end of this year after the Foundation completion
- **Continue Down the Road…**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