
AABC Commissioning Group

AIA Provider Number 50111116



Completing a Global Enterprise Building Commissioning Program in Six Months

Course Number: CXENERGY1614

Michael Chimack, PE, QCxP, CEM, PMP, LEED GA

Steven Dodd, EMP, LEED GA

Siemens

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Course Description

Six months to complete an existing building commissioning program at 12 facilities in 8 countries is daunting. This, real-world case study with lessons learned shows how with coordination, global resources and a proven approach, it was completed and exceeded Cx Objectives.

Learning Objectives

At the end of the this course, participants will be able to:

1. Tailor common commissioning practices and strategies to meet global market challenges.
2. Understand how commissioning strategies can be used to enhance system performance and increase energy efficiency.
3. Learn how to deliver maximum value to customers with a fixed budget and a significantly compressed project timeline.
4. Understand some of the key managerial, financial and tactical challenges of managing a global commissioning project.

Building Commissioning Market Drivers

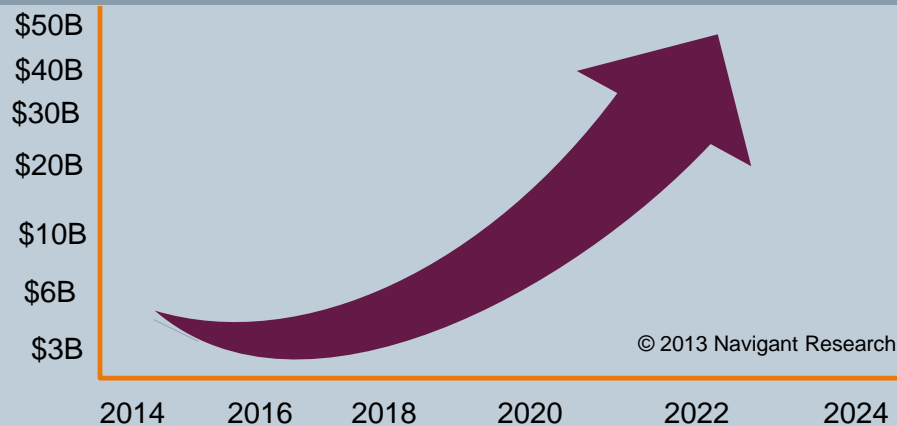


Demand and expectations for commissioning continue to grow

Value drivers

- Energy savings
- Improve building performance/value
- Increase tenant satisfaction/retention
- Other-specific owner/manager goals

Global revenue projection from building commissioning services



Challenges

Financial

- Meet payback expectations
- Address RFP variances

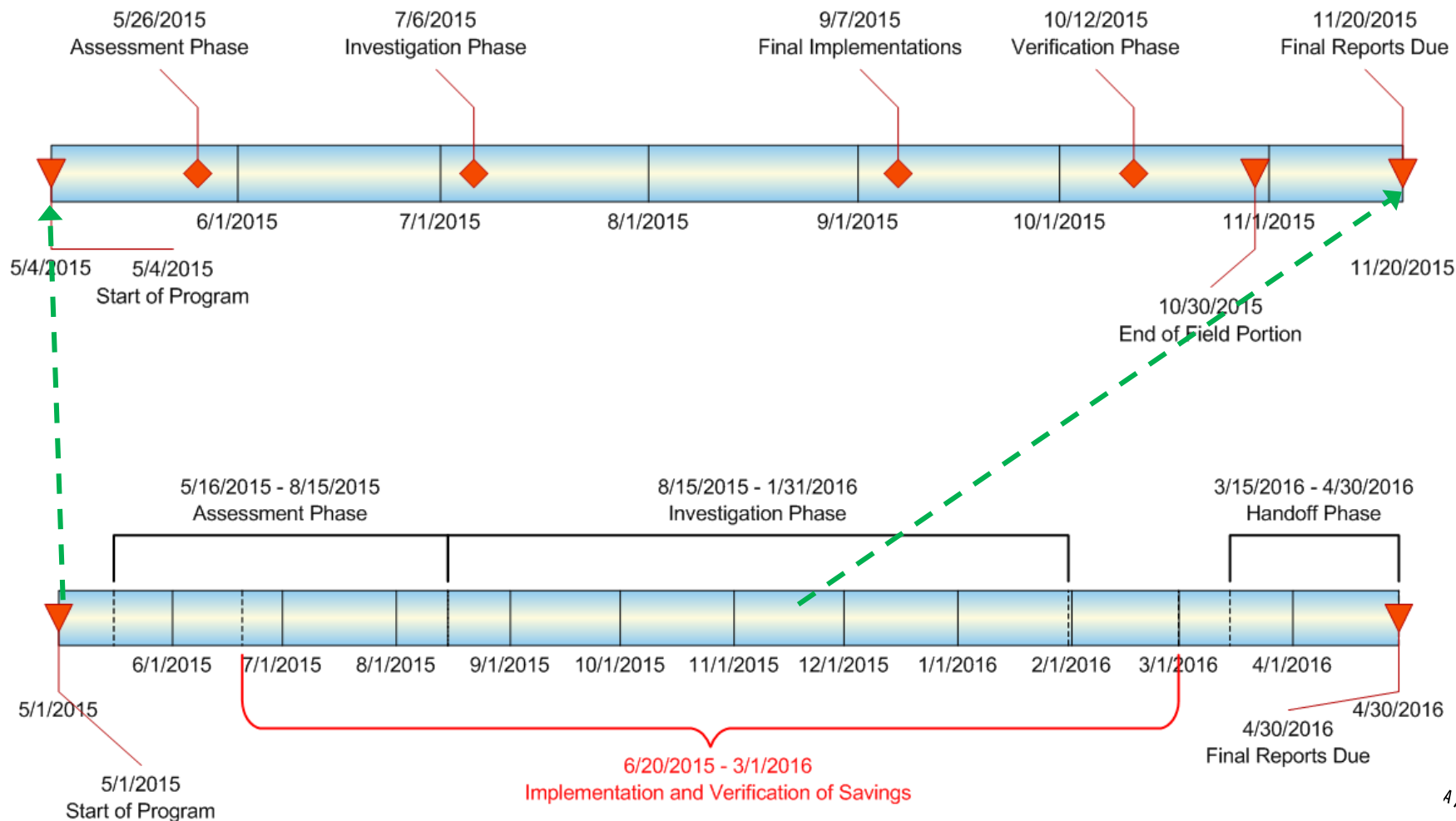
Procedural

- M&V processes
- Ensure persistence of savings

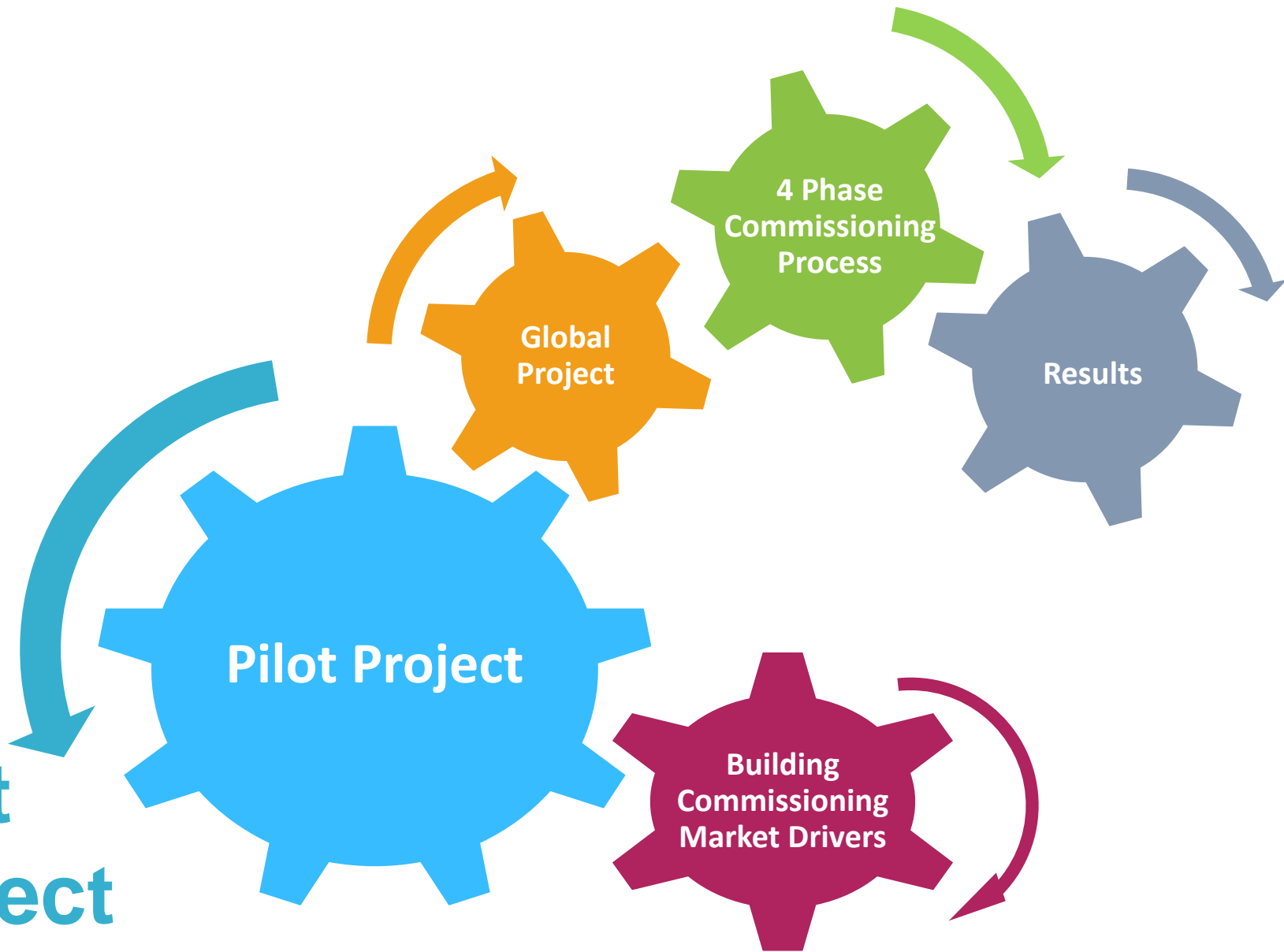
Organizational

- Organizational challenges
- Consistent delivery
- Implementation procedures

This is not your standard commissioning process...



Pilot Project



Goals for the pilot project

Project Goal

- Complete all assessment, investigation and implement approved corrective actions by *April 30, 2014*.
- Support the target of *reducing GHG emissions to 20 percent* below 2005 levels. (Energy use accounts for 98 percent of the greenhouse gas (GHG) emissions generated)
- Identify *corrective actions and measures* through the project.
- Achieve a *simple payback of 2.5* years for the overall project through energy improvement measures executed during the project.
- Review and document HVAC systems performance

Challenges:

**Work Within the
Customer's
Expedited Timeline**

**Support
Sustainability
Target**

**Find and Achieve
Energy Savings**

**Document
Performance**

Key results of the pilot EBCx project

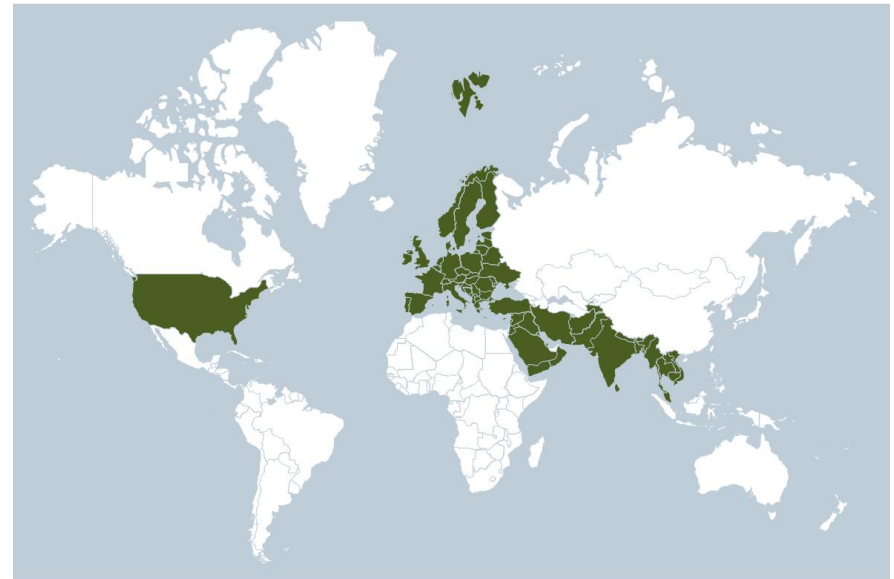
- 1** Saved 940,000 kWh, 17,000 therms and **over \$96,000 in the first year.** Achieved by identifying and executing 11 facility improvement measures.
- 2** **79 sensors verified/OAT sensor replaced and relocated:** Completed by using NIST traceable calibrated devices and functional testing of major HVAC systems.
- 3** **New sequence of operations:** Documented existing sequence of operations and created new sequences based on current facility requirements.
- 4** **BAS programming updates:** Implemented building automation system programming updates based on the new sequence of operations.
- 5** **Failed device replacement:** Identified and replaced failed devices including sensors (28% of all sensors), control modules, thermostats and terminal box controllers.
- 6** **Performance recommendations:** Generated actions to preserve and enhance value achieved through the existing building commissioning process.

Global Project



Global EBCx project overview

- Commission 6.3MSF of mixed use buildings located in 8 countries (4 continents) in 6 months or less!
- Reduce energy consumption by 10-20% per site
- Save a minimum of \$2.5M across the portfolio
- Building managed by separate facility managers
- Submit proposal (RFP) in less than one month



Siemens challenges

- Minimal response time (proposal)
- Incomplete/inaccurate RFP data
- Limited resource availability internally and externally
- Contracting
- Cost conversions with fluctuations in rate exchange
- Site visits to 11 campuses in 8 countries and 9 time zones
- Project paid by corporate but executed by local site management
- Limited execution timeline



Walkthrough findings:

Variance from specs in RFP

- 23% more equipment than listed
- Over 30 central plants and over 70 chillers
- 1000's of terminal units
- 100's of miscellaneous unique pieces of HVAC equipment

Technical complexities

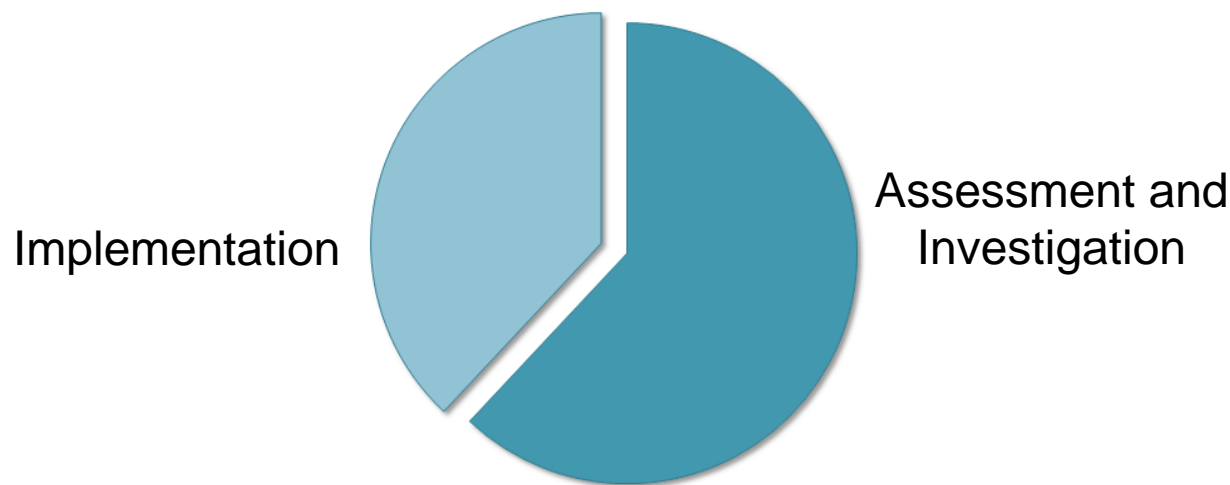
- Load disaggregation estimates understated total manufacturing load
- Eight different BAS systems of varying age and complexity

Organizational challenges

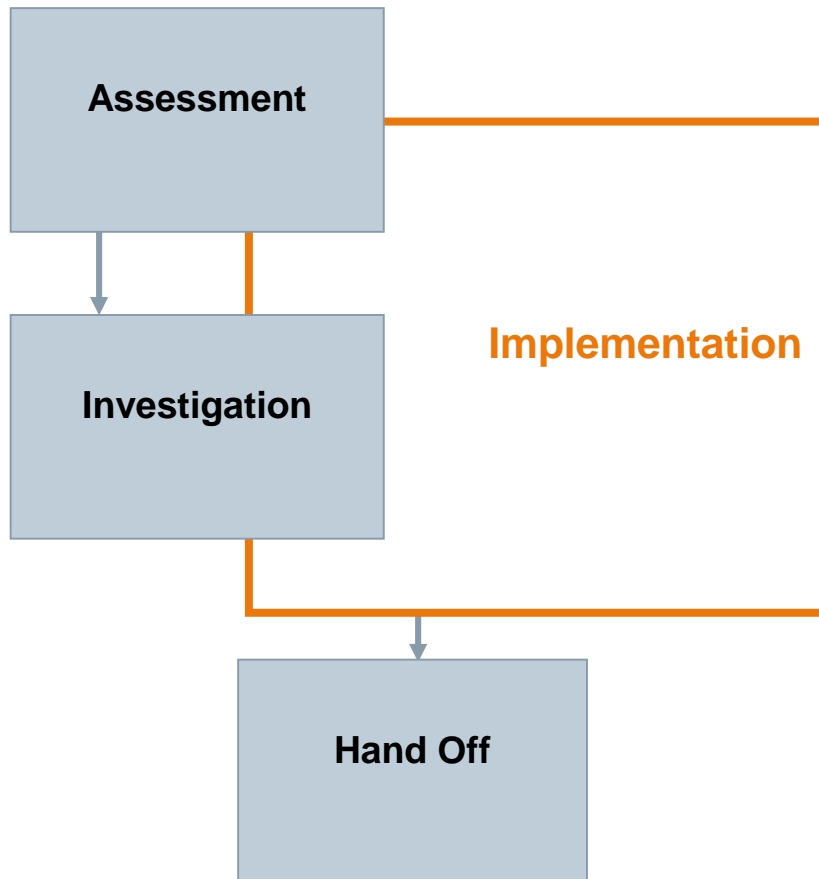
- Difficult to gain access to sites from local site managers
- Lack of data transparency made it difficult to communicate level of inefficiency

Project Budget Breakdown

- Two commissioning components
 1. Planning, finding, quantifying, reporting
 2. Implementing, verifying
- Approximately 60-65% of the budget was allocated to component #1
- The remaining 35-40% of the budget was set aside to implement low cost corrective actions and conservation measures



Program Process Flow



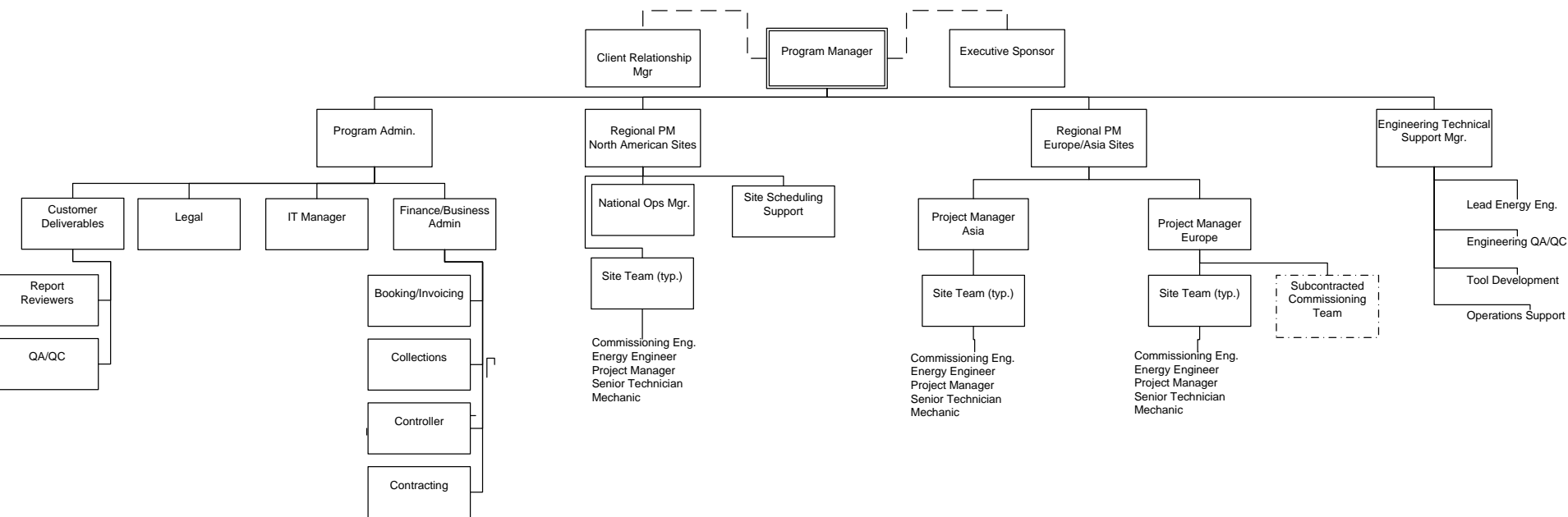
A journey of one thousand miles...

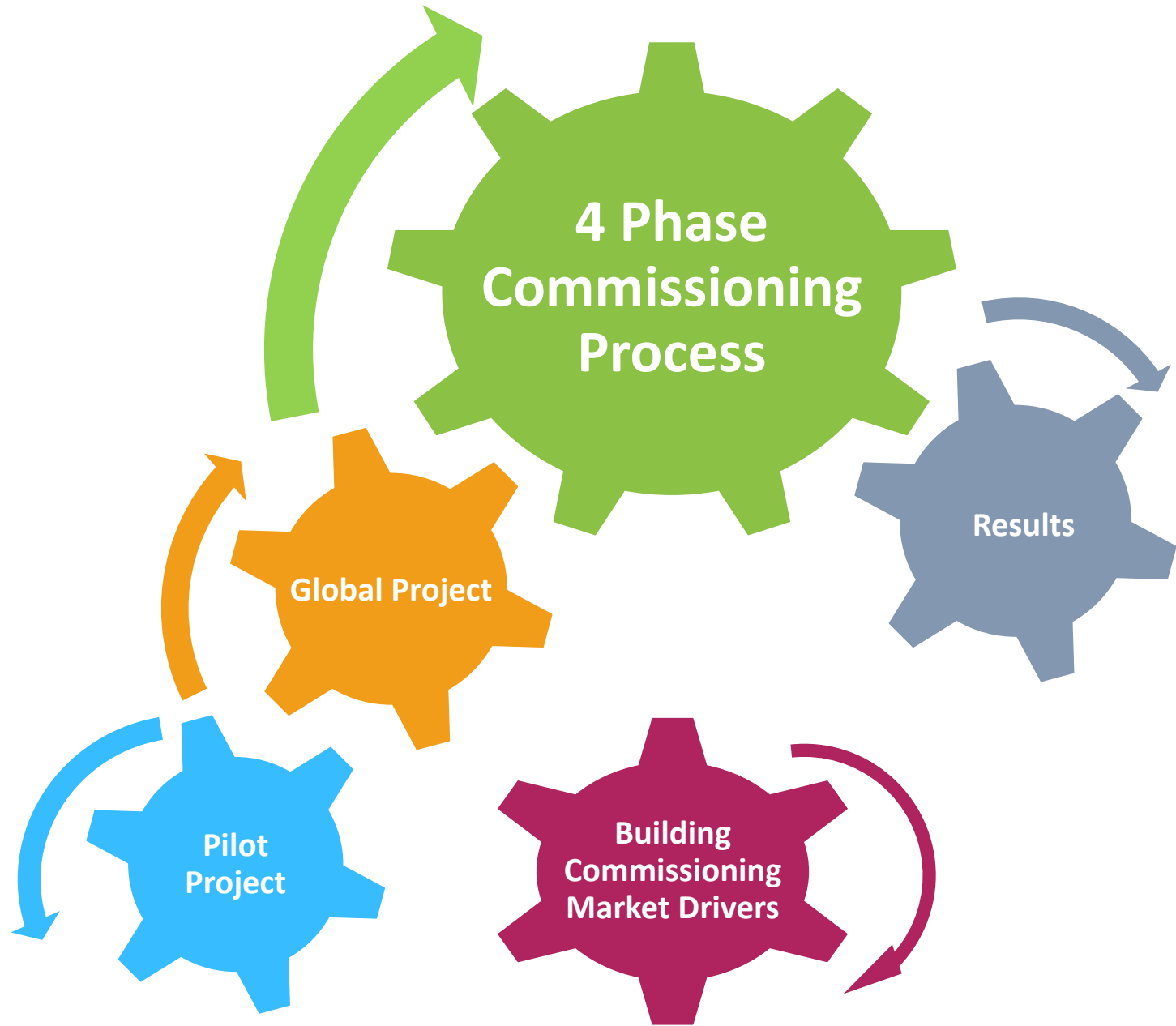
Starter pistol fired, only a few started running (immediate challenges)

- Assembling and deploying our teams
- Contracting and getting POs
- Scheduling and access
- Lots of deferred maintenance items

The Siemens Team

Global Commissioning Program Team





4 Phase Commissioning Process

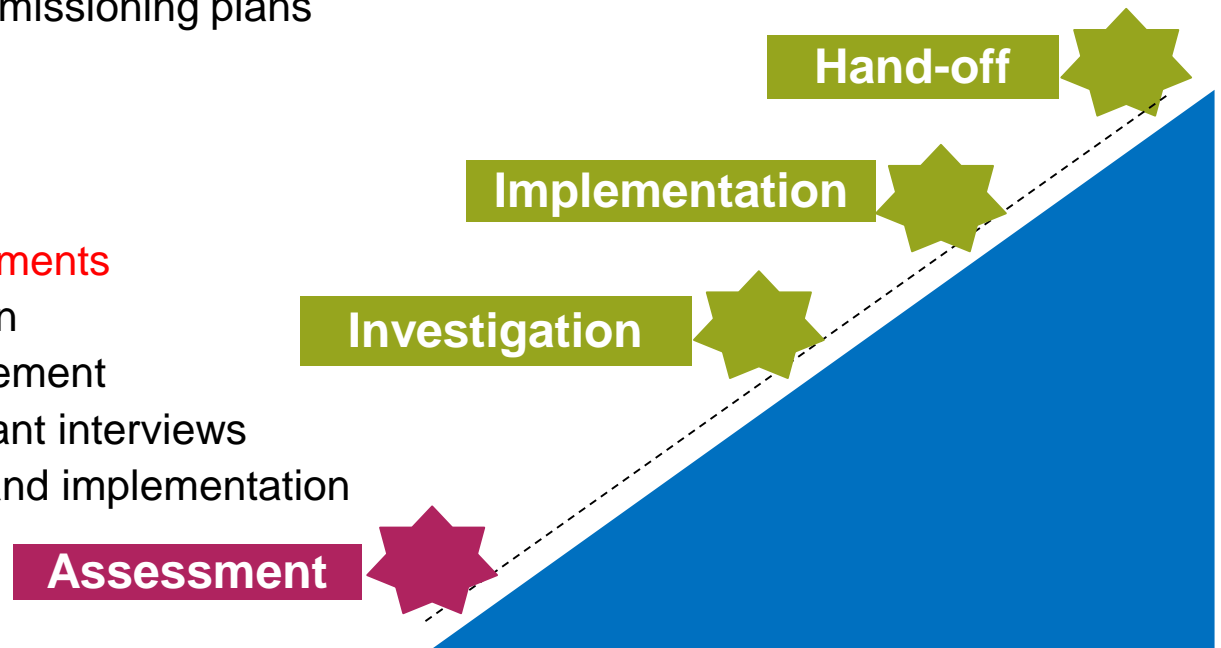
Assessment Phase

Tasks:

- Kick-off of projects/schedule weekly meetings
- Align teams
- **ID Current Facility Requirements**
- Develop and execute commissioning plans
- ID corrective actions

Challenges:

- **ID Current Facility Requirements**
- Goal misalignment between corporate and field management
- Scheduling building occupant interviews
- Vetting corrective actions and implementation



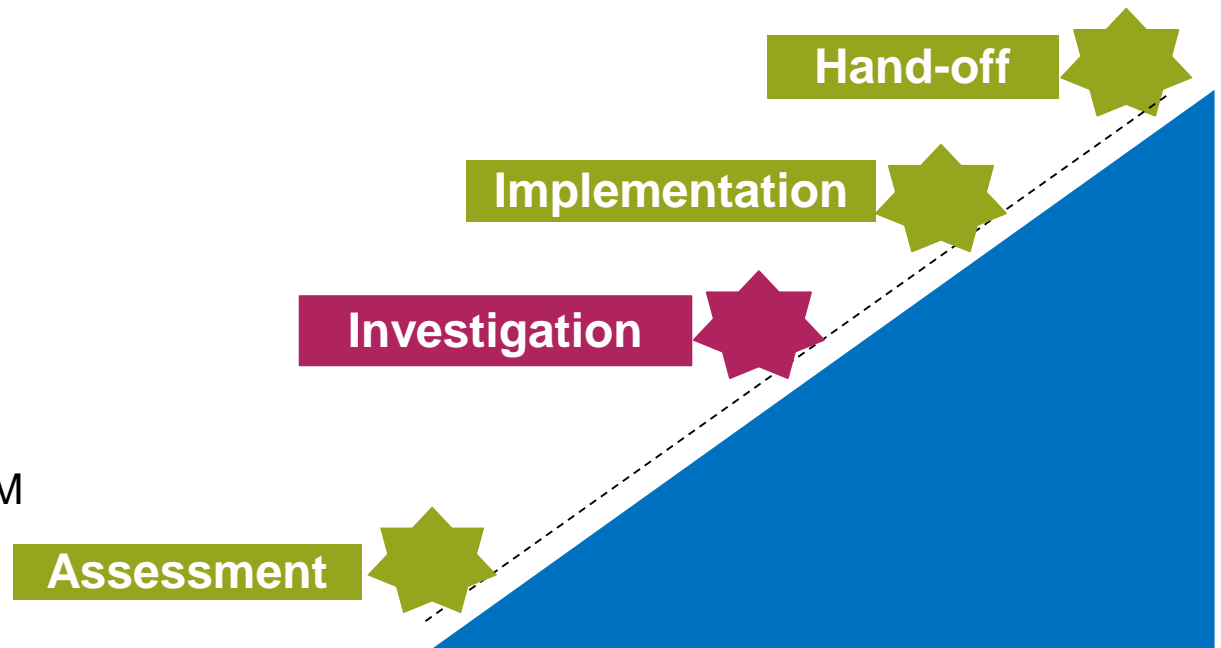
Investigation Phase

Tasks:

- Manage teams (weekly updates)
 - Internal
 - External site team
 - Corporate
- ID conservation measures
- Update commissioning plans
- Prioritize and present conservation measures

Challenges:

- Managing timeline
- Quality of analysis (master CM tool)
- Implementation Plan



Global project initial improvements

Corrective Actions

- Sensor verification/replacement
- AHU maintenance
 - Damper seals
 - Damper actuation
- Air filters
 - Leaking valves
- VAV box functionality
- Minor programming modifications

Conservation Measures

- Temperature setpoint and over-ventilating
- V in VFD means variable
- Night setback
- OA, MA, RA damper modulation
- Air and water balancing
- Major sequence of operation modifications

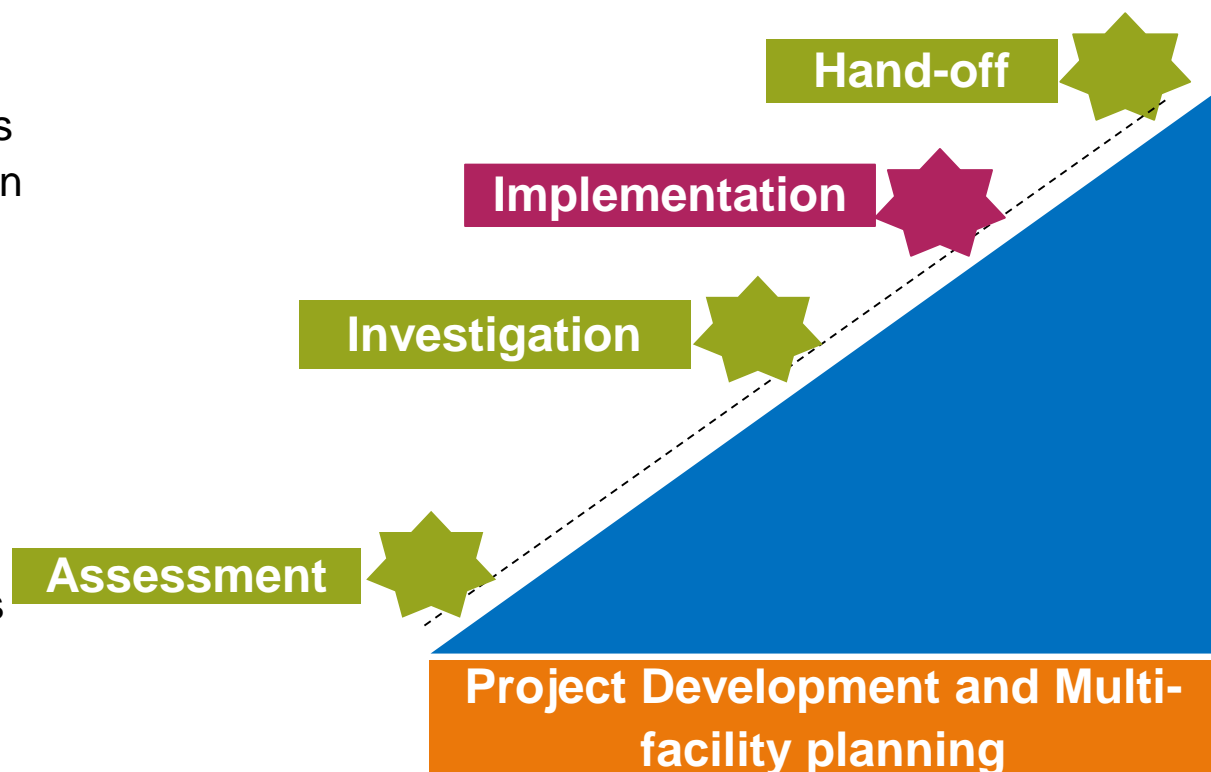
Implementation Phase

Tasks:

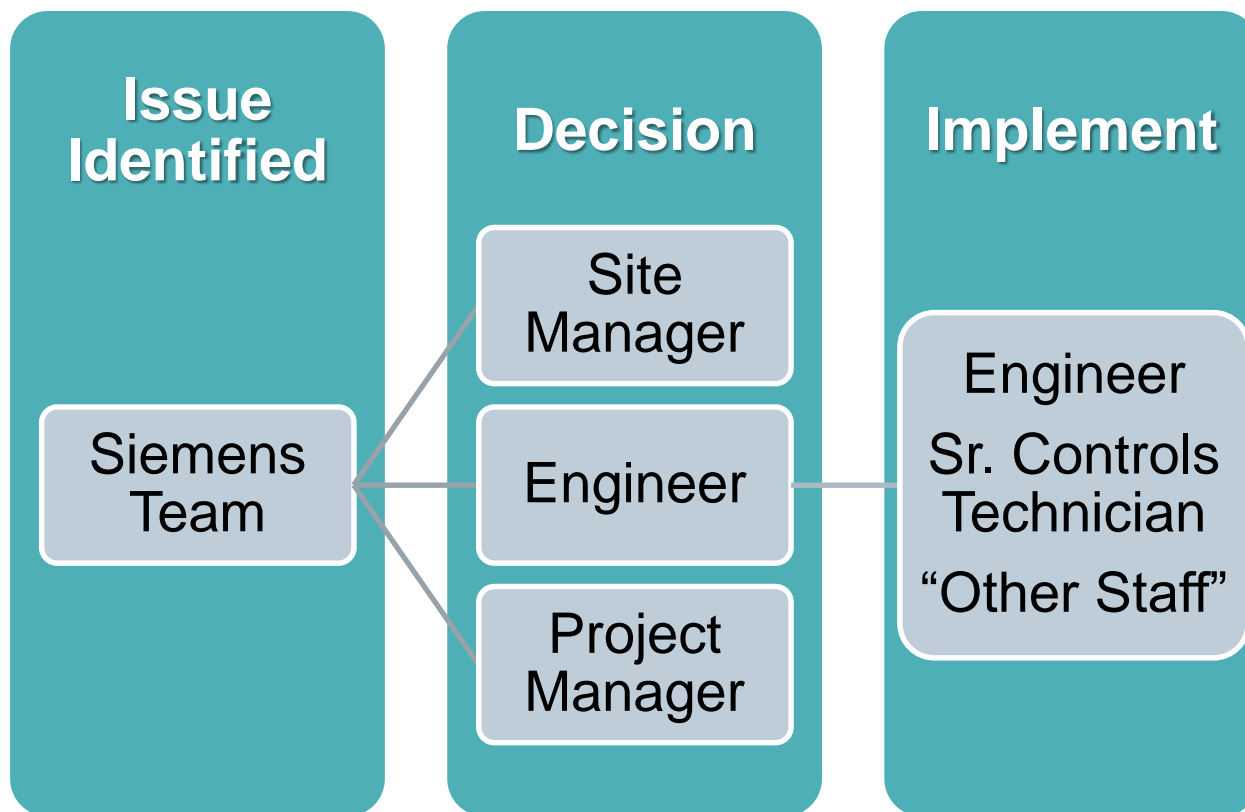
- Implementing corrective actions and conservation measures
- Verifying savings and performance
- Updating commissioning plans
- Create Persistence Phase plan

Challenges:

- Managing timeline
- Spending all the budget in the allotted timeframe
- Coordinating with subcontractors and site teams



Global project initial improvements

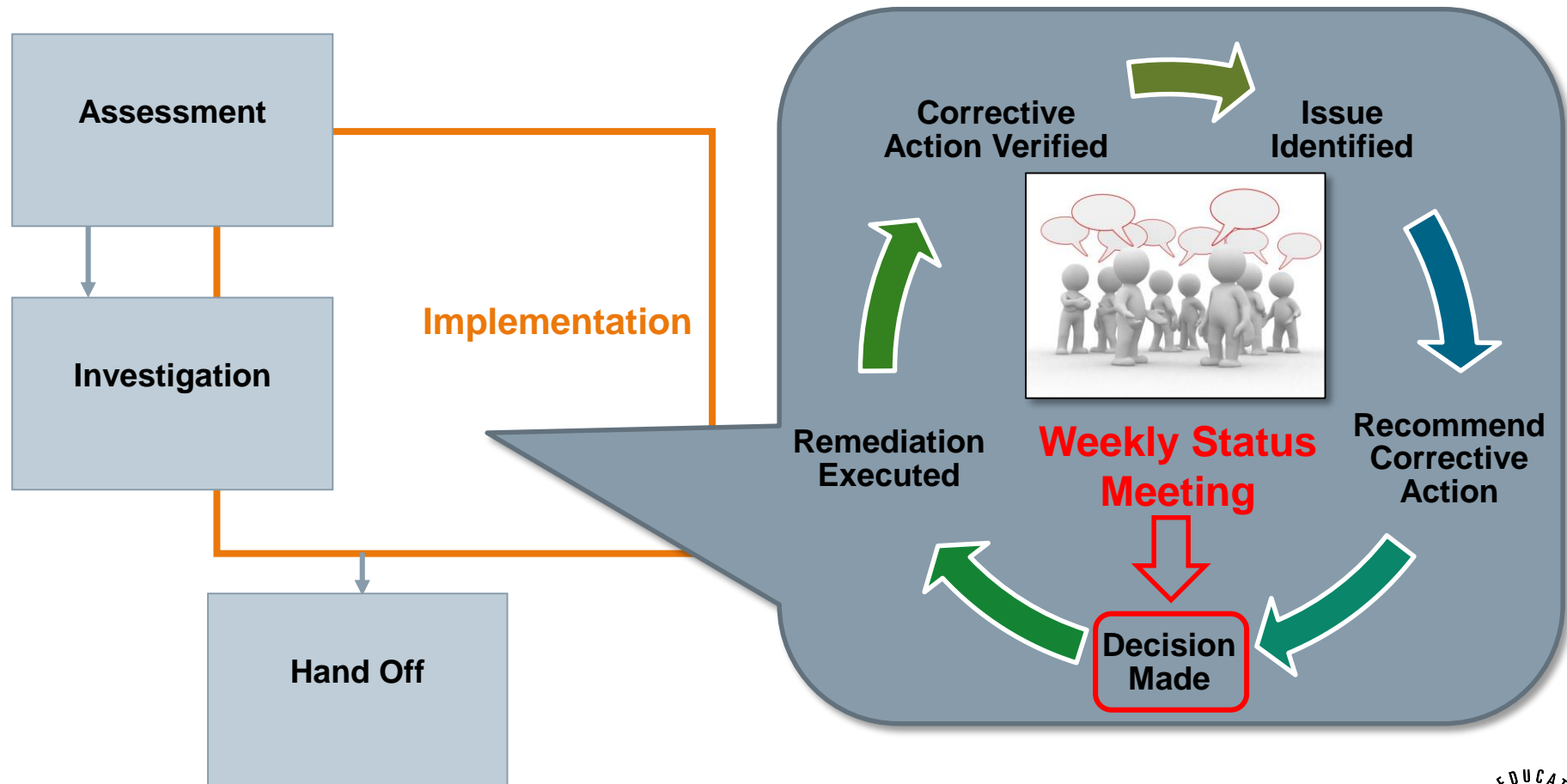


Project Team and Meeting Structure created to support a Fast Track Workflow

Informed Advisors:

- VP Energy (portfolio)
- Portfolio Program Manager
- Regional Project Managers

Global project initial improvements



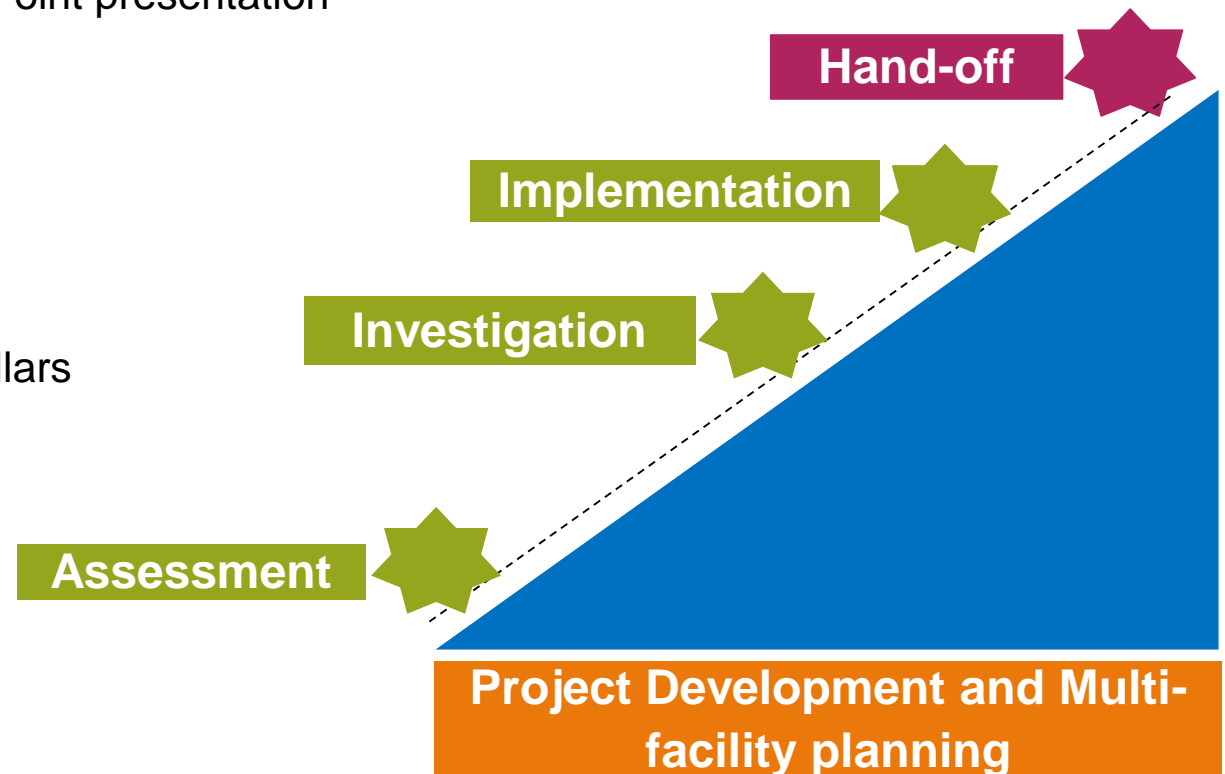
Hand-off Phase

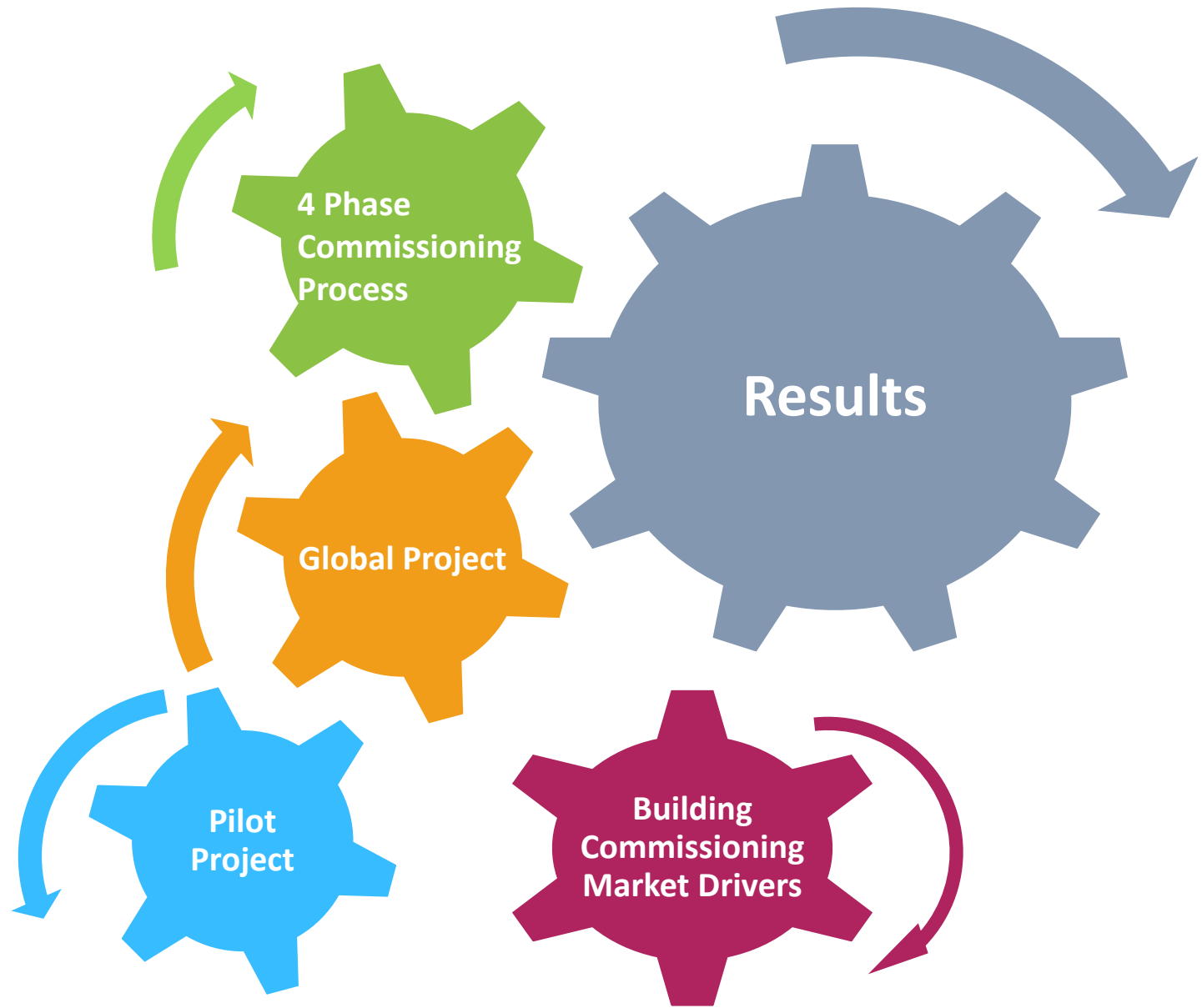
Tasks:

- Preparing final reports
- Preparing site trainings
- Preparing corporate PowerPoint presentation

Challenges:

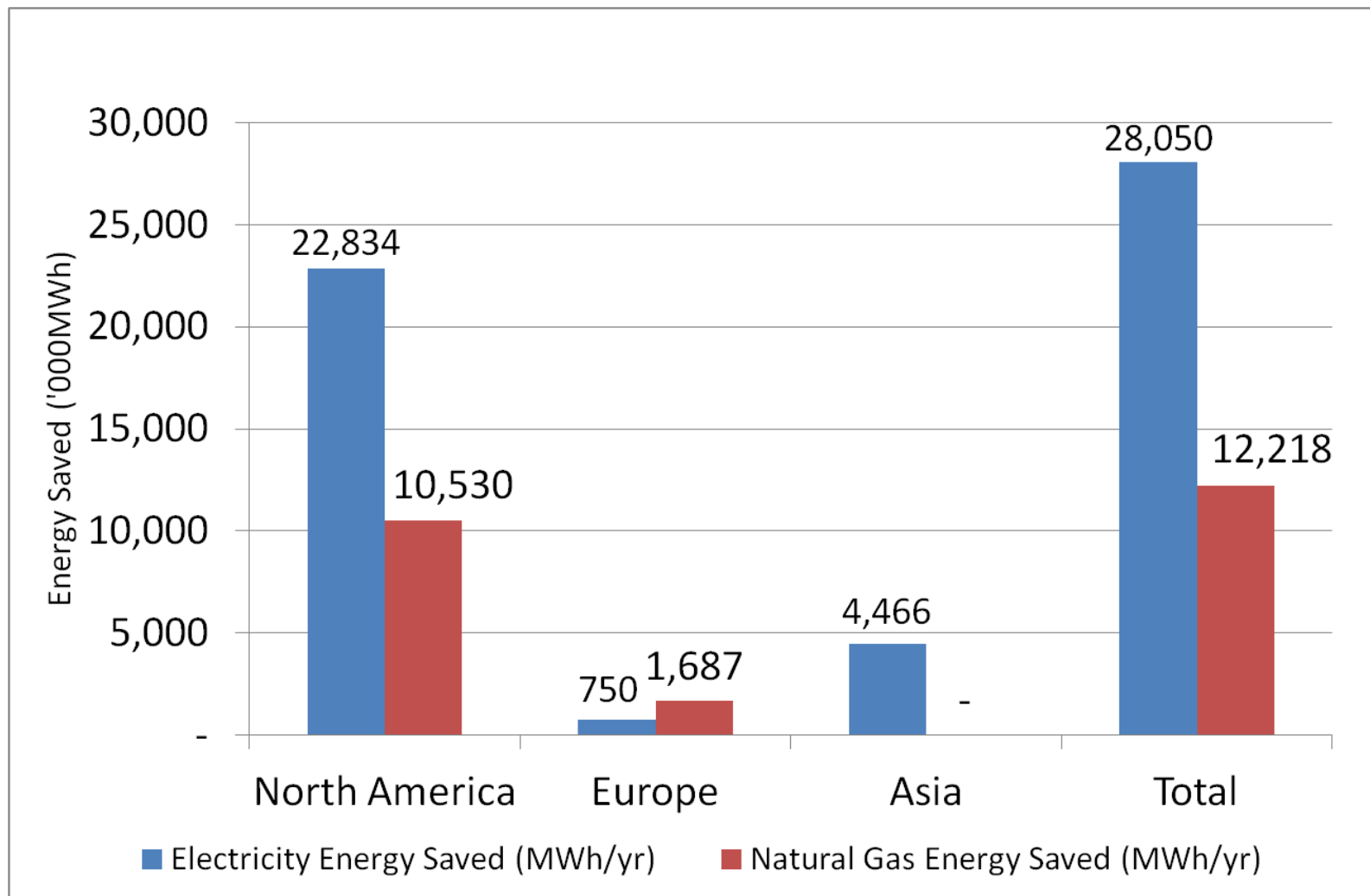
- Running out of TIME
- QA/QC of final reports
- Sharing implementation dollars





Results

Energy Savings Results



Environmental Metrics

Key Performance Metric	Result
Emissions Reduction	20,103 Mt CO _{2e}
Criteria Pollutant Reduction	MT NO _x
Area preserved from Deforestation	161 acres
Cars taken off of the road	4,384 cars



Lessons learned (Internal)

- 1 Are your teams ready? Is management ready?
- 2 Contracting globally – many issues
- 3 Make sure all internal stakeholders are identified early
- 4 Weekly meetings with PM and site decision maker
- 5 Intangibles



Lessons learned (External-site and corporate)

- 1 Corporations and their internal teams must be aligned prior to the start
- 2 Full transparency of savings / cost data
- 3 Weekly meetings with PM and site decision maker
- 4 Building commissioning is a great investment





NEXT STEPS

- **Post project pull-through implementations**
- **CAPEX Planning**
- **Leverage Technology**
- **Commissioning of additional sites**

Thank you!

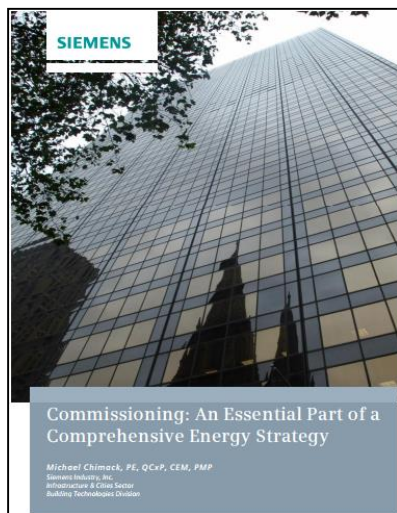


Mike Chimack
Director, Energy Services, Building Technologies Division,
Siemens Industry, Inc.
Phone: (847) 941-6191
Email: Michael.chimack@siemens.com

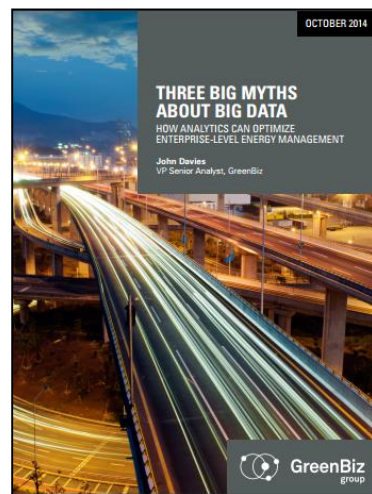


Steven Dodd, Senior National Sales Manager, EMP, LEED
Green, Building Technologies Division, Siemens Industry, Inc.
Phone: (804) 925-7656
Email: Steven_dodd@siemens.com

Additional resources



Commissioning: An essential Part of a Comprehensive Energy Strategy



Three Big Myths about Big Data



Consulting-Specifying Engineer Magazine,
March 2016
<http://www.csemag.com/magazine.html>

Learn more about Commissioning

<http://usa.siemens.com/commissioning>

This concludes The American Institute of Architects
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