Superior Energy Performance®
U.S. DEPARTMENT OF ENERGY

SEP Measurement & Verification Case Study Webinar

MedImmune
A member of the AstraZeneca Group

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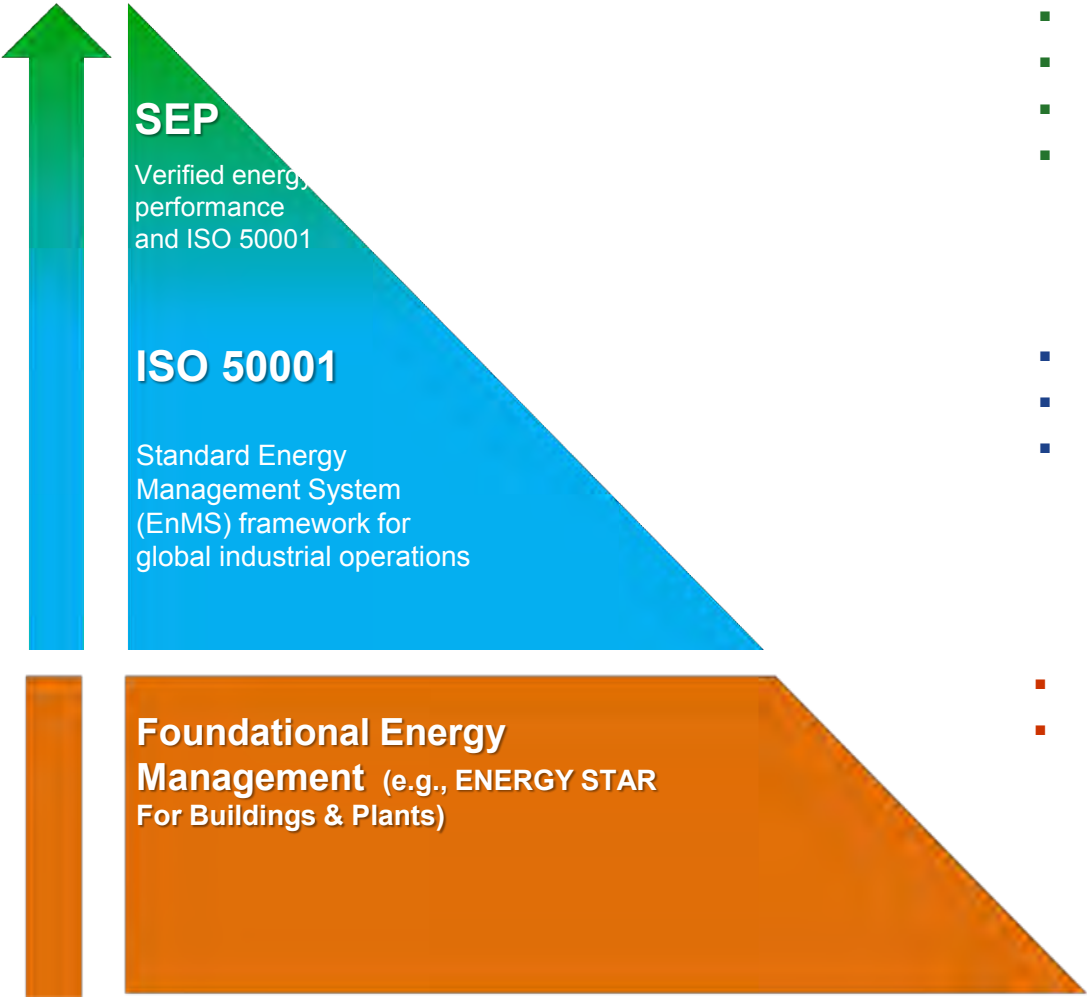
U.S. DEPARTMENT OF ENERGY

Strategic Energy Management Continuum



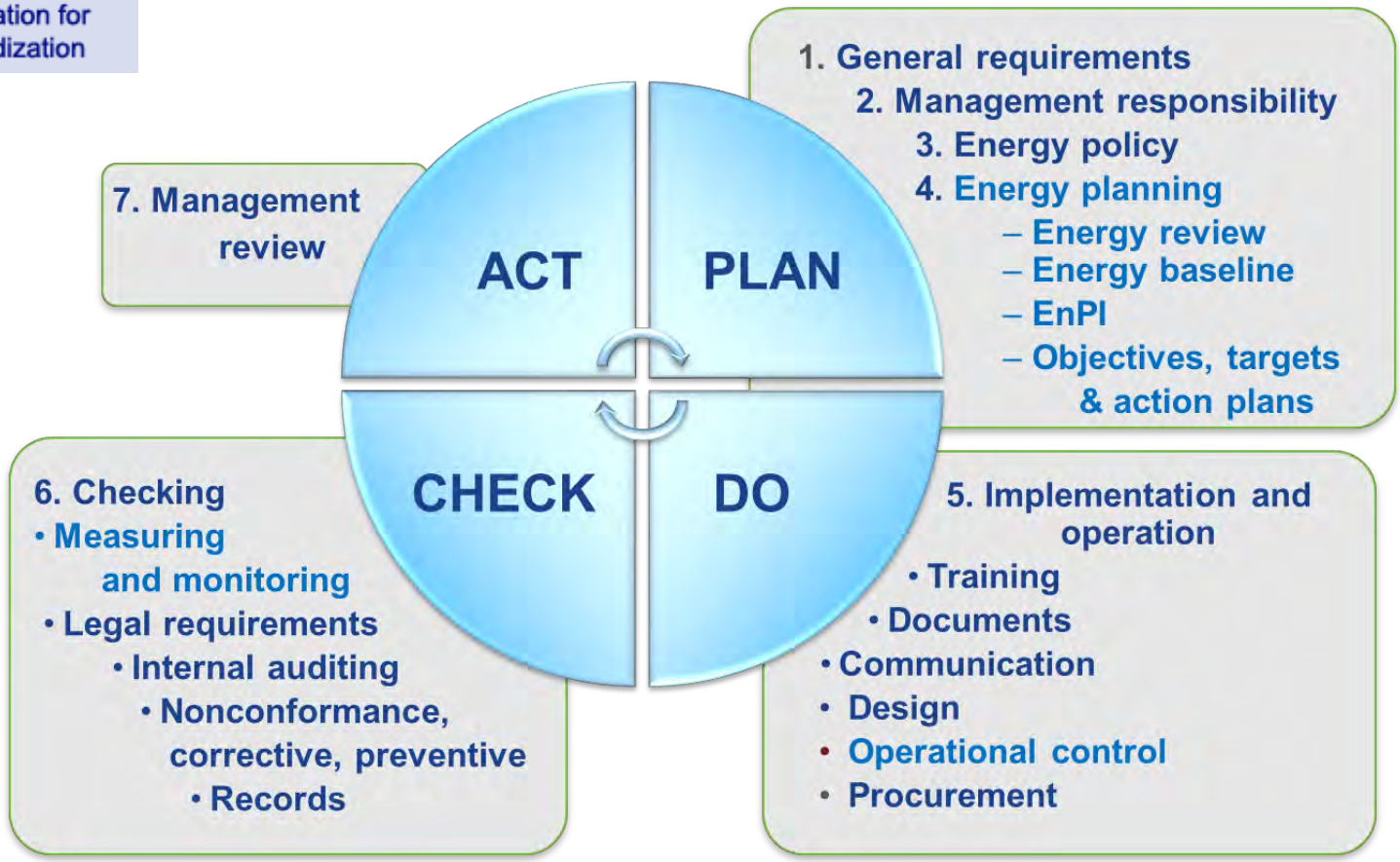
- Verifies measured results – internal credibility
- Rigorous third-party measurement and verification
- External stakeholder recognition of achievement
- **Marginal effort beyond ISO 50001**

- ISO standard for Energy Management Systems - EnMS
- Similar framework to ISO 9001 and ISO 14001
- Certifiable EnMS, SEM program

- Transition from project to systematic approach
- Many utility SEM programs operate at this level

ISO 50001: an ISO management system standard

International Organization for Standardization



Light blue text represents new data-driven sections in ISO 50001 that are not in ISO 9001 & ISO 14001

ISO 50001 & Superior Energy Performance®

ISO 50001

- Proven, **internationally recognized**, best practice in energy management **building upon other ISO standards**
- Requires energy performance improvement with **energy data & metrics**
- **Relevance** for global corporation deploying energy management & sustainability programs

- Builds on ISO 50001 with **specific energy performance improvement criteria**
- National program **accommodating diverse facilities**: sector, size, program maturity, etc.
- **Transparency: Rigorous 3rd party verification** that market can reward: supply chains, utilities, carbon trading

Superior Energy Performance® Certified Facilties
16 companies with 28 certified facilities

HARBEC
Technical Innovation with Environmental Responsibility

Schneider Electric

NISSAN

BRIDGESTONE

OLAM

CCP COMPOSITES

VOLVO

Cummins

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CURTISS WRIGHT

Coca-Cola

LAND O'LAKES

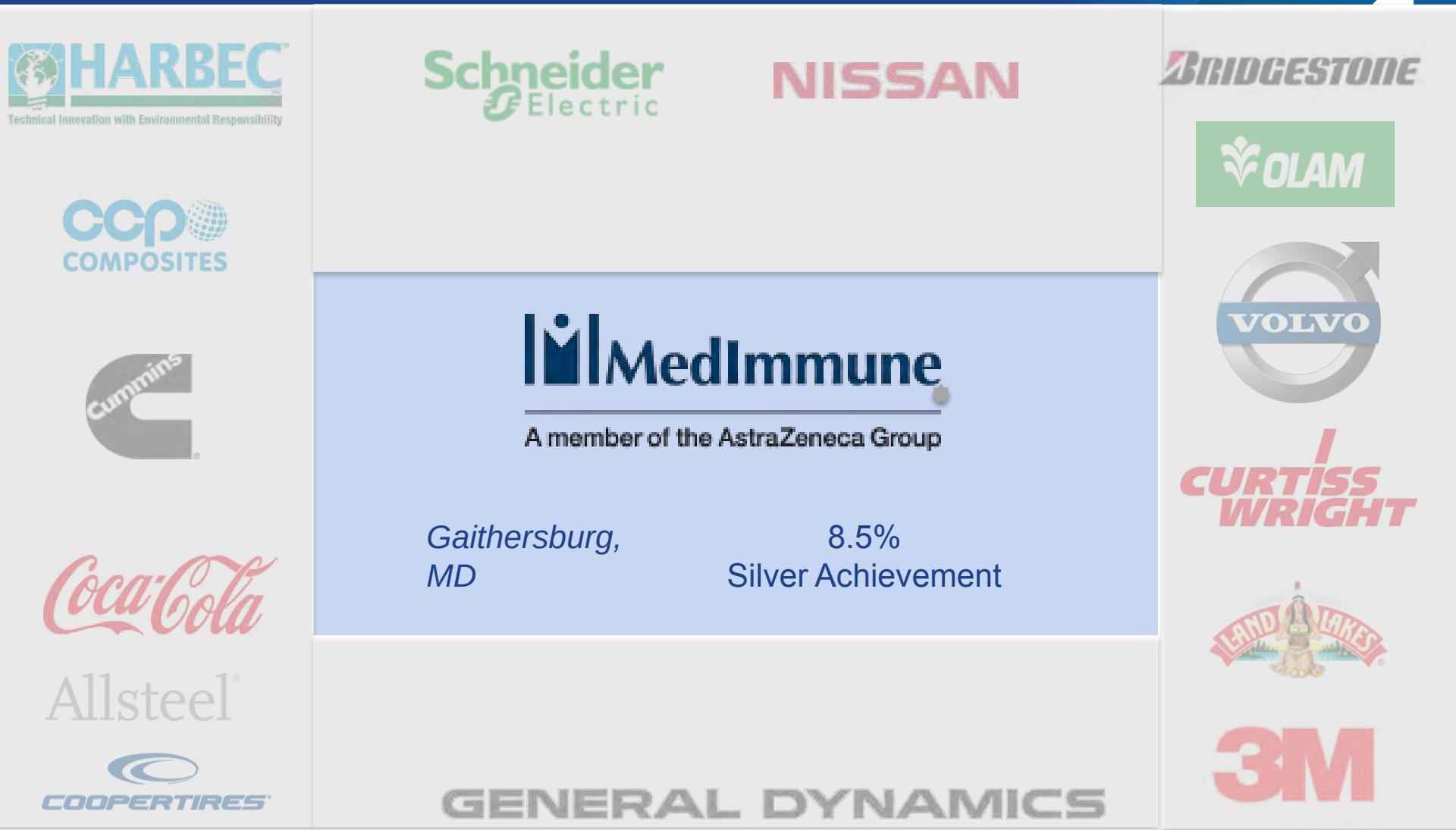
Allsteel

3M

COOPERTIRES

GENERAL DYNAMICS

Case Study Focused on Medimmune



Webinar and Case Study Purpose

- Share learnings from SEP pilots and provide continual education on measurement & verification (M&V) for SEP community – end users, utilities, auditors and others
- Communicate experience with handling non-routine M&V situations
- Bring “consistency” to SEP verification of energy performance
- Develop reference case studies
- Hear from SEP community on their M&V experiences

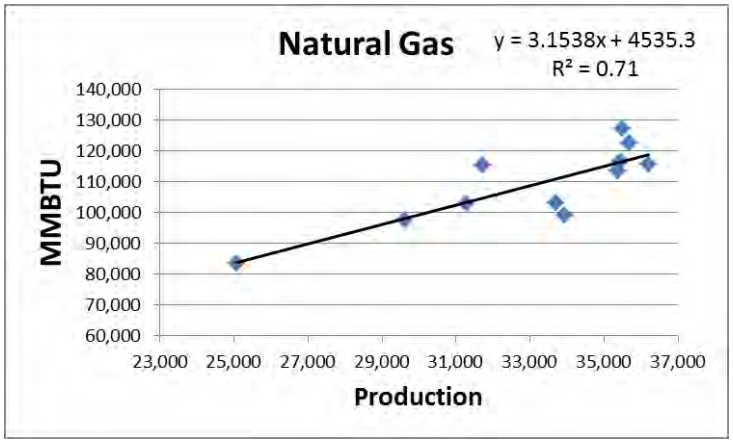
SEP Measurement & Verification

SEP energy performance is demonstrated by,

1. Top-down, whole facility EnPI ("SEnPI")

$$SEnPI = \frac{BTU_{Tot\ actual}}{BTU_{Tot\ expected}}$$

Where $BTU_{Tot\ expected} = f(X1, X2, \ldots Xn)$



2. Bottom-up sanity check

MedImmune Background

- Gaithersburg, MD is MedImmune HQ and primary R&D Facility
- Products: known for Synagis and FluMist
- Employment: 2,500 world-wide
- For the purpose of ISO/SEP Certification the boundary was traced around the One MedImmune Way address

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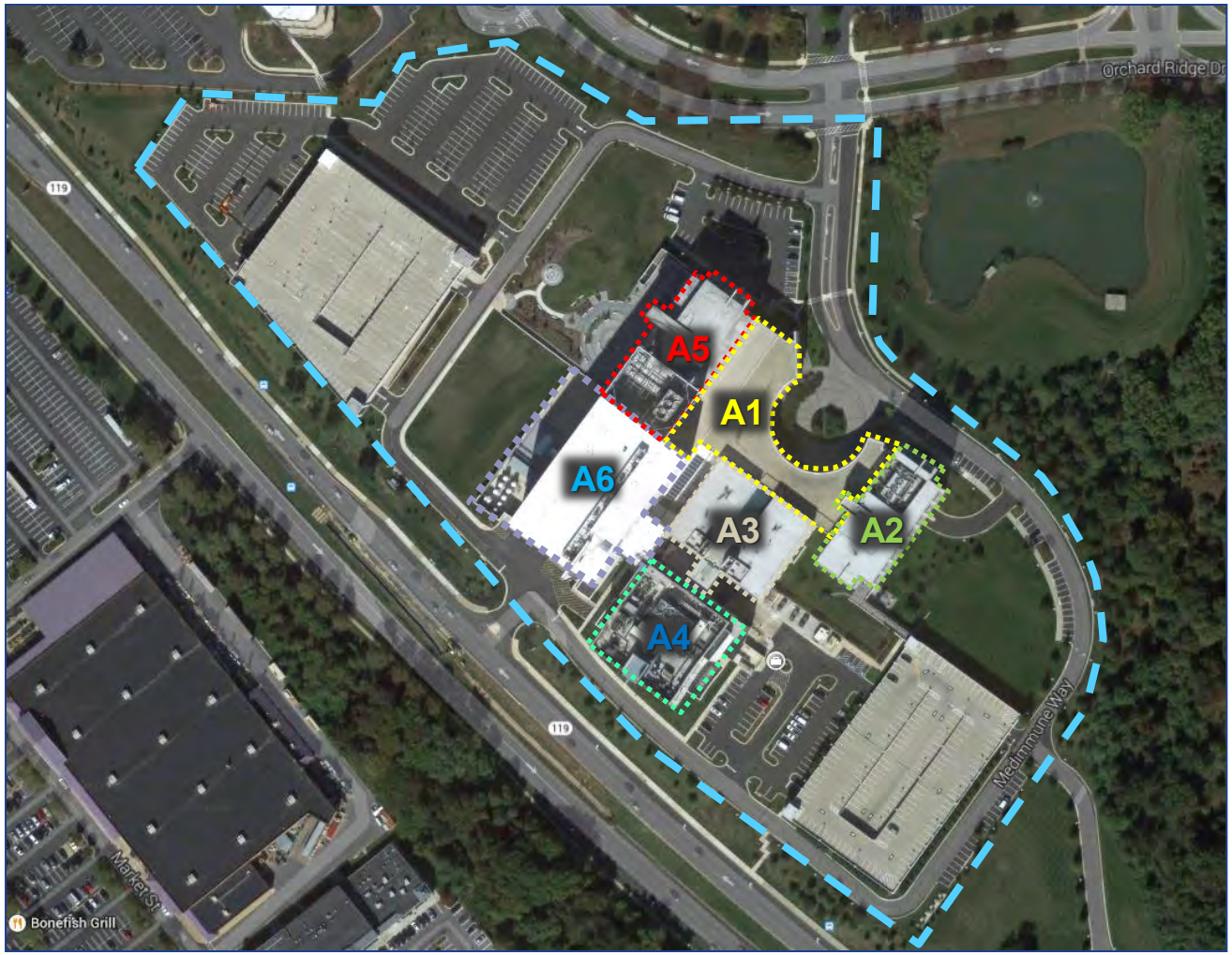
Gaithersburg Campus - EnMS Scope and Boundary



- GBC has a total of nine (9) Buildings
- For the purpose of SEP and ISO 50001, the One MedImmune Way address will be defined as **"The Scope"**
- This address contains:
  - One (1) Building with 6 Areas known as OMW
  - Two (2) Parking Garages
  - Several Parking Lots
  - Loop Road
  - Open Spaces

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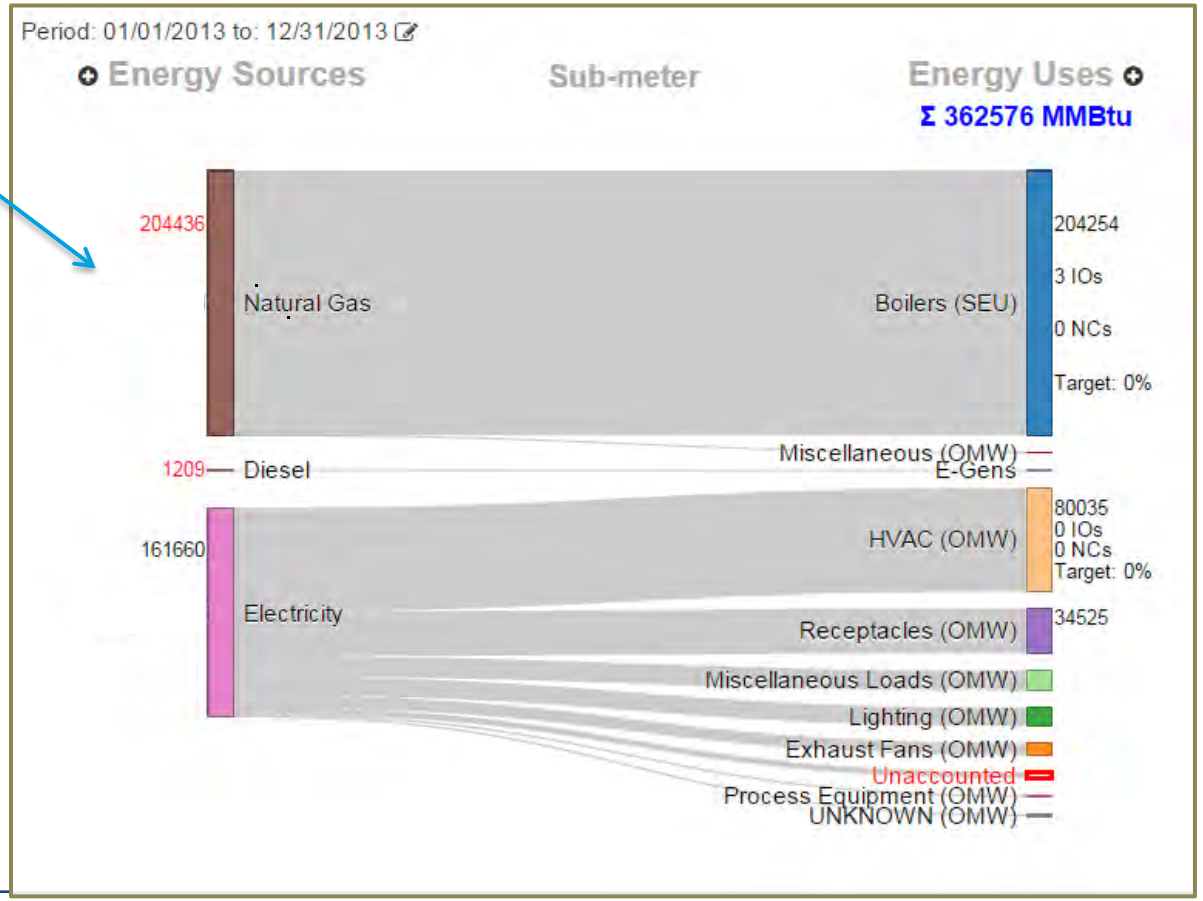
MedImmune energy profile

- Production and Related Equipment
  - Phase 1 and 2 Investigational bio pharmaceutical products (lab equipment)
  - Phase 3 Human Clinical Trial products (Small Scale Manufacturing)

Energy Review Results



- SEU selected was the boilers
- ISO 50001 and SEP Certified "Silver" with 8.5% Improvement over CY2010 baseline.
- Reporting Period is CY2013
- Certification date: September 2014
- SEP Verification Body is Advanced Waste Management Systems, Inc. (AWM)

Facility Changes and Energy Impacts

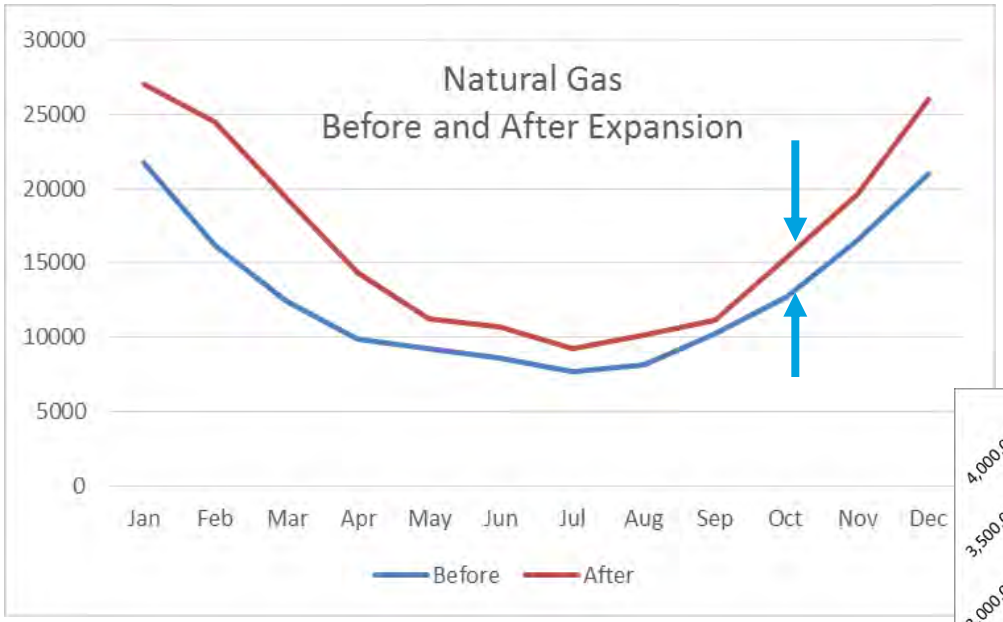
- Baseline year, 2010, scope was 571,000 sq. ft.
- Mid 2011 occupied an additional 224,000 sq. ft. of production and laboratory space (LEED Gold)
  - Total scope now (2015) is 817,000 sq. ft.
  - Fully online September 2011
    - Electricity sub metered
    - Natural gas not sub metered
- 2013, SEP Reporting Period
  - +39% more area
  - Total net energy consumption increased +49%
  - Production increased, weather
- How can we compare energy performance in 2013 with 2010?

Non-routine Adjustments

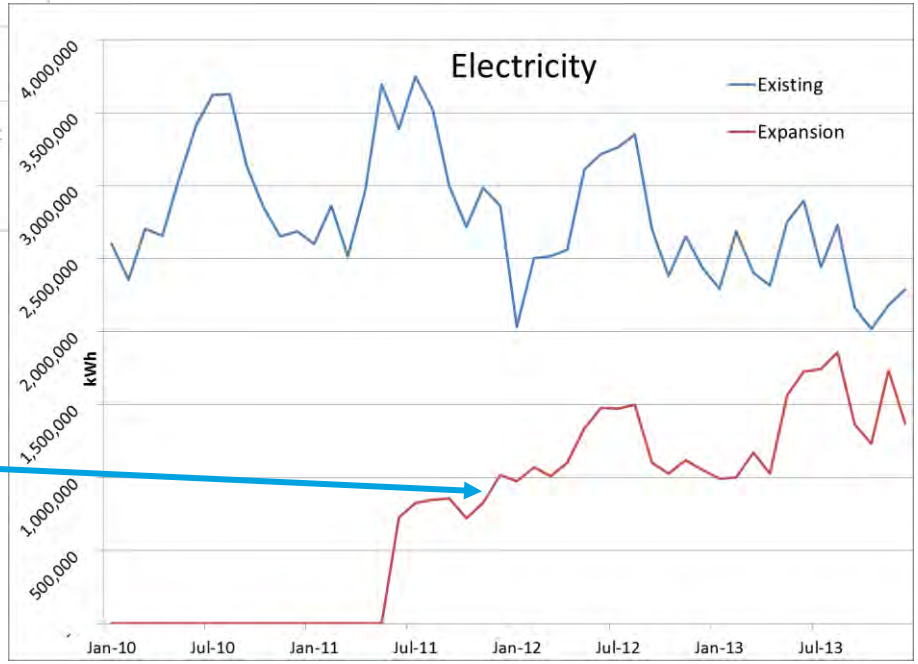
Non-routine adjustments (SEP Measurement & Verification Protocol - Section 2.6.7)

- Used for one-time changes between baseline and reporting period to,
  - Otherwise constant conditions (e.g. production levels), or
  - Static factors (e.g. building area)
- Require “estimates” of adjustments for one-time affects or step changes
- Typically based on engineering analysis and calculations from observed, measured, or metered data
- Apply adjustment to either baseline or reporting period, as if the conditions or static factors were same in both periods
- Document method and rationale
- Included in the application to the SEP Administrator

The Case for a Non Routine Adjustment



Non routine adjustment to account for this shift in natural gas



Non routine adjustment to account for this addition of electricity consumption (new building electricity separately metered)

Adjustment Considerations

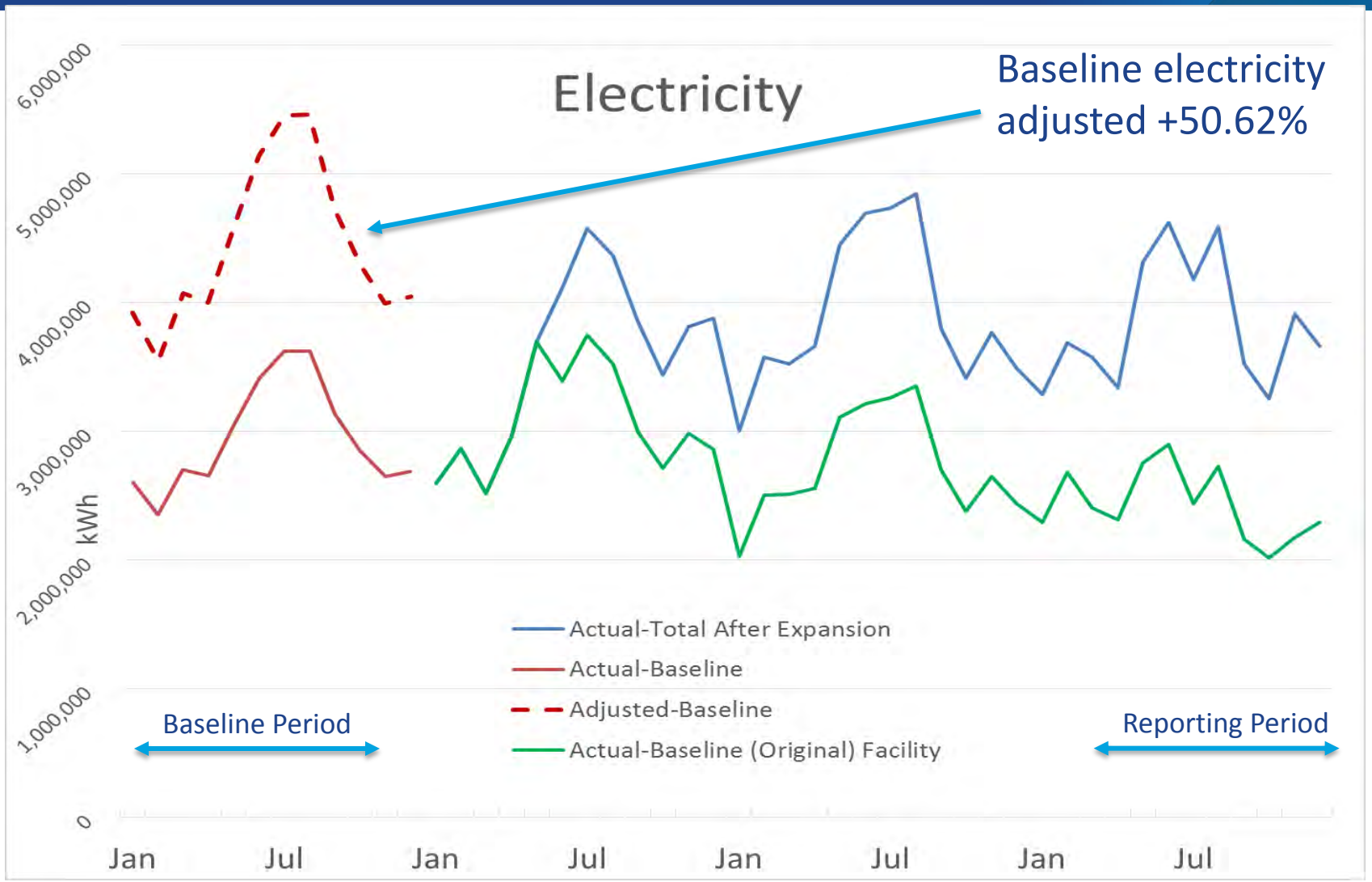
Two Considerations for applying the non-routine adjustment:

1. Adjust the Reporting Period to discount for the added facility
   - Added electricity is metered, natural gas is not
   - Would only require a calculated adjustment for natural gas
   - Issues with the Bottom Up Sanity Check
2. Adjust the Baseline Period to account for the facility addition
   - Required adjusting for both electricity and natural gas
   - Chosen largely due to the issues with the Bottom Up Sanity Check

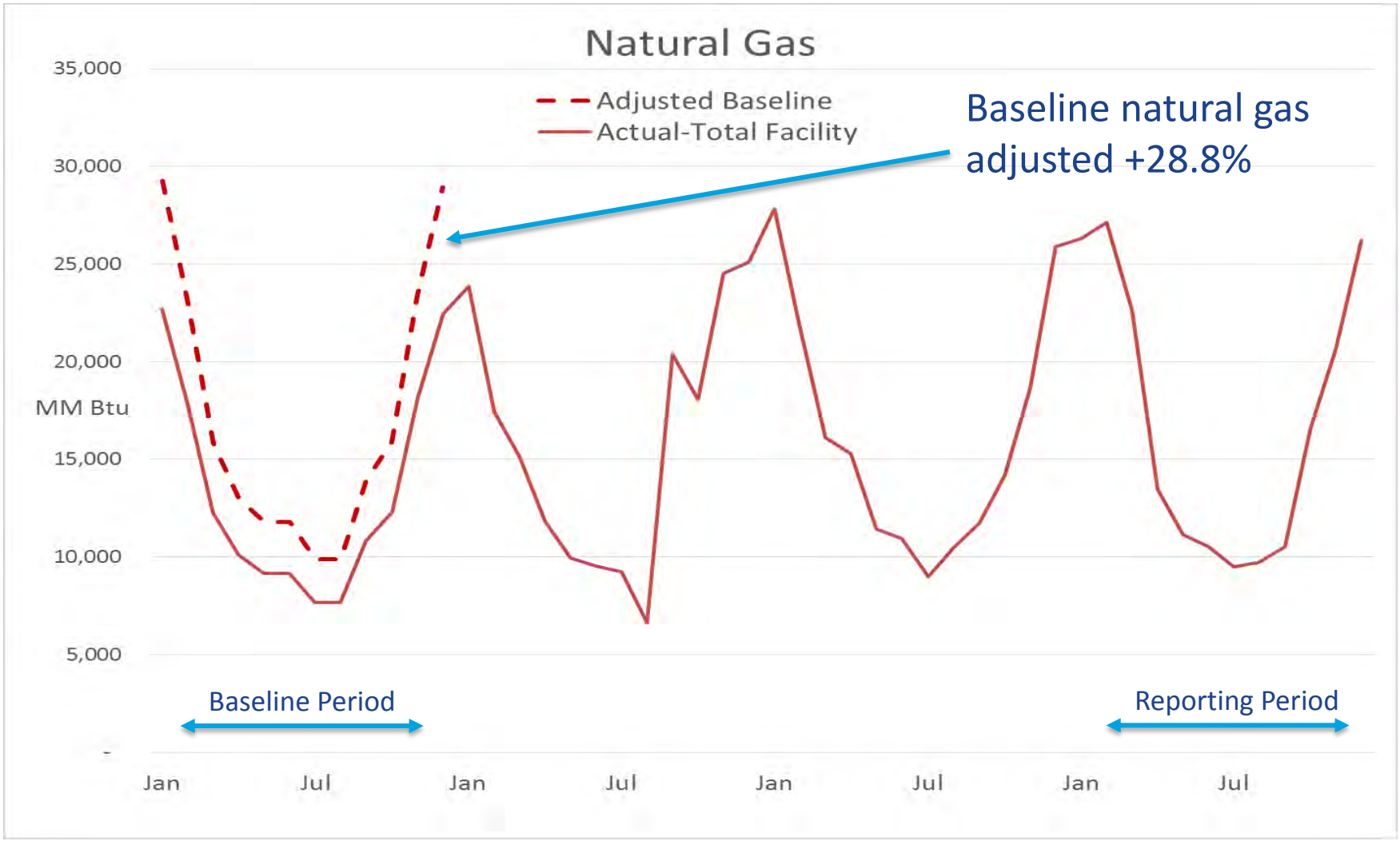
Adjustment Calculation

- For electricity
  - 2 years of metered data for the new facility
  - Used to develop a ratio for the added electricity
  - Baseline electricity consumption was adjusted +50.62%
- For natural gas
  - Used the 2 years of data prior to the expansion
  - Developed a ratio based on the 2 years after the expansion
  - Baseline natural gas consumption was adjusted +28.8%
- Production variables
  - Baseline production variables were adjusted to account for added capacity

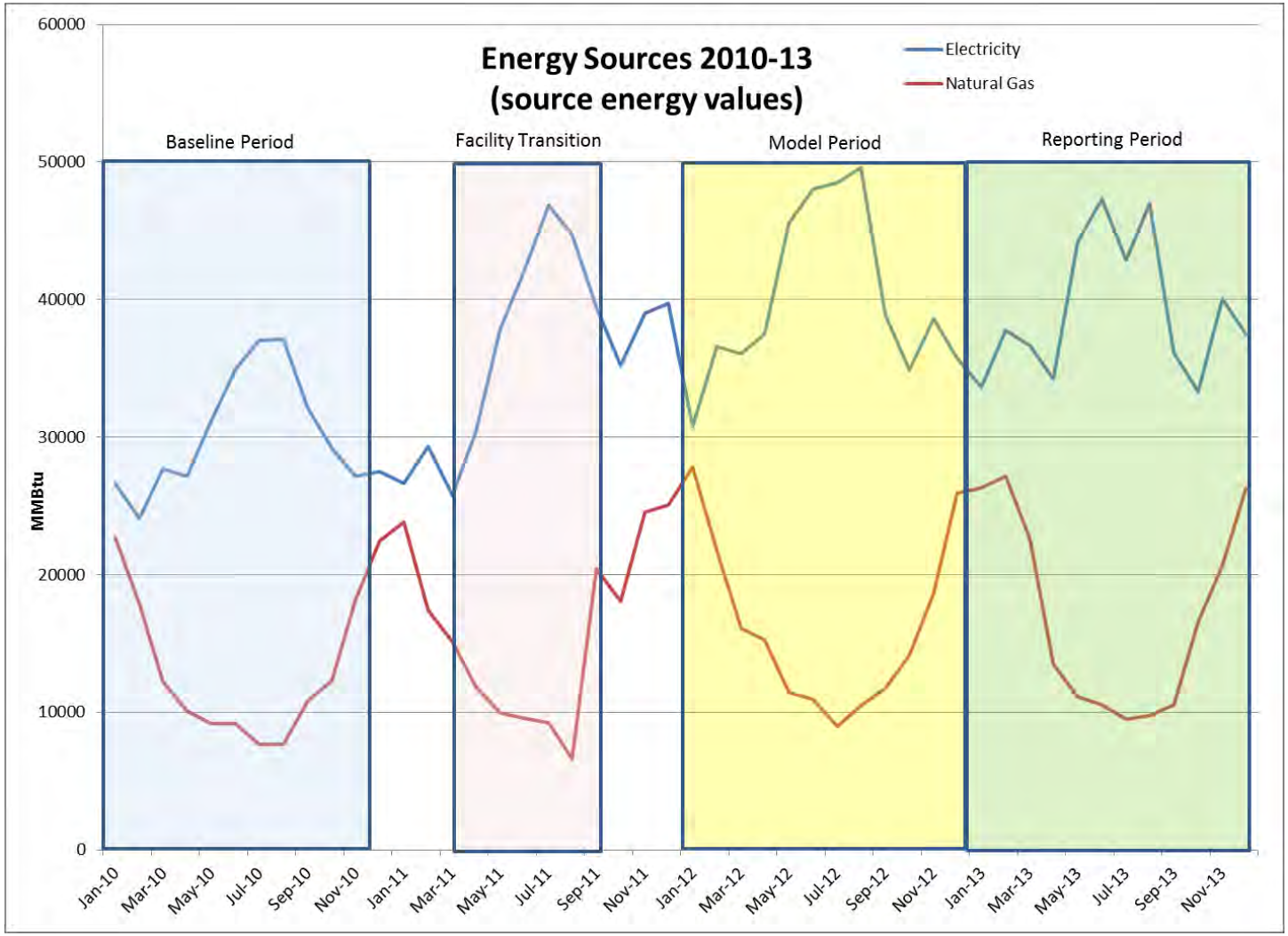
Non Routine Adjustment



Non Routine Adjustment



SEnPI Modeling & Non Routine Adjustment



Model Results with Adjustment

SEnPI Chaining Model (Model Year 2012)

	2010	2011	2012	2013
elec mmbtu	545,107	512,914	480,825	470,538
ng mmbtu	206,564	214,134	193,224	204,436
TOTAL (MMBtu)	751,671	727,049	674,049	674,974
Adjustment Method	Chaining	Chaining	Model Year Chaining	
Modeled elec mmbtu	487,206	482,260	480,825	472,367
Modeled ng mmbtu	204,261	200,371	193,224	206,532
Total of Modeled Values	691,467	682,630	674,049	678,899
SEnPI Cumulative	0.920	0.939	1.000	0.915
Cumulative Improvement (%)	0.00%	1.90%	8.01%	8.54%
Annual Improvement (%)	0.00%	1.90%	6.11%	0.53%
Annual Savings (MMBtu/year)	0	15,785	60,204	3,925

From DOE EnPI Tool ver 4.1.19

Electricity

Model Number	Model is Appropriate for SEP	Variables	Variable p-Values	R2	Adjusted R2	Model p-Value
5	TRUE	HDD	0.1104	0.8228	0.7835	0.0004
		CDD	0.0158			

Formula: Electricity = (-6.63 * [HDD]) + (26.32* [CDD]) + 39796

Natural gas

Model Number	Model is Appropriate for SEP	Variables	Variable p-Values	R2	Adjusted R2	Model p-Value
1	TRUE	HDD	0.0000	0.9254	0.9180	0.0000

Formula: Natural gas = (17.6 * [HDD]) + 9989

Other Performance considerations

Bottom-up sanity check showed 9.24% improvement

	Project Title	Implementation Date (Q#/Yr)	Bottom Up Check		
			Electric (Source) MMBTU	N.Gas MMBTU	Total MMBTU
Savings Expected by 2011	OMW Exterior Lighting Retrofit	Q1/2011	2,778	0	2,778
	OMW Interior Lighting Replacement to LED	Q1/2011	4,451	0	4,451
Savings Expected by 2012	Lab CFH Face Velocity Reduction	Q3/2012	0	0	0
	Area 6 LEED Building Design Elements	Q4/2011	19,567	25,738	45,305
	Drive Belt Replacement Strategy	Q1/2012	1,290	0	1,290
	Compressor Sequencer Install	Q1/2012	519	0	519
	Area 4 High-bay Lighting Retrofit	Q3/2012	710	0	710
Savings Expected by 2013	Area 4 Condensate Tie-In	Q2/2013	0	0	0
	Vivarium Lighting Controls	31/2013	339	0	339
	Boiler Operation Optimization	Q1/2013	0	14,059	14,059
		TOTALS	29,654	39,797	69,451

Other Performance considerations

- LEED Design construction impact
- Bottom-up sanity check provides validation for the SEnPI performance calculation
- Not uncommon for SEP certified organizations to use non-routine adjustments to handle changes over the 3 year achievement period
- Two week offset between utility data and weather data calendar periods
- Better to use point source for weather data than regional averages – more granularity the better

Closing Comments

- SEP M&V protocol properly applied is robust enough to handle the variation that occurs in manufacturing environment
- EnPI Tool facilitates linear regression analysis
- Non-routine adjustments have been successfully applied for several SEP certified facilities

- Next webinar in two months – week of August 31
- MedImmune case study will be on SEP website soon
- Further training is included in CP EnMS and SEP PV Training

  http://energy.gov/eere/amo/become-energy-management-professional

SEP info

energy.gov/isosep

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