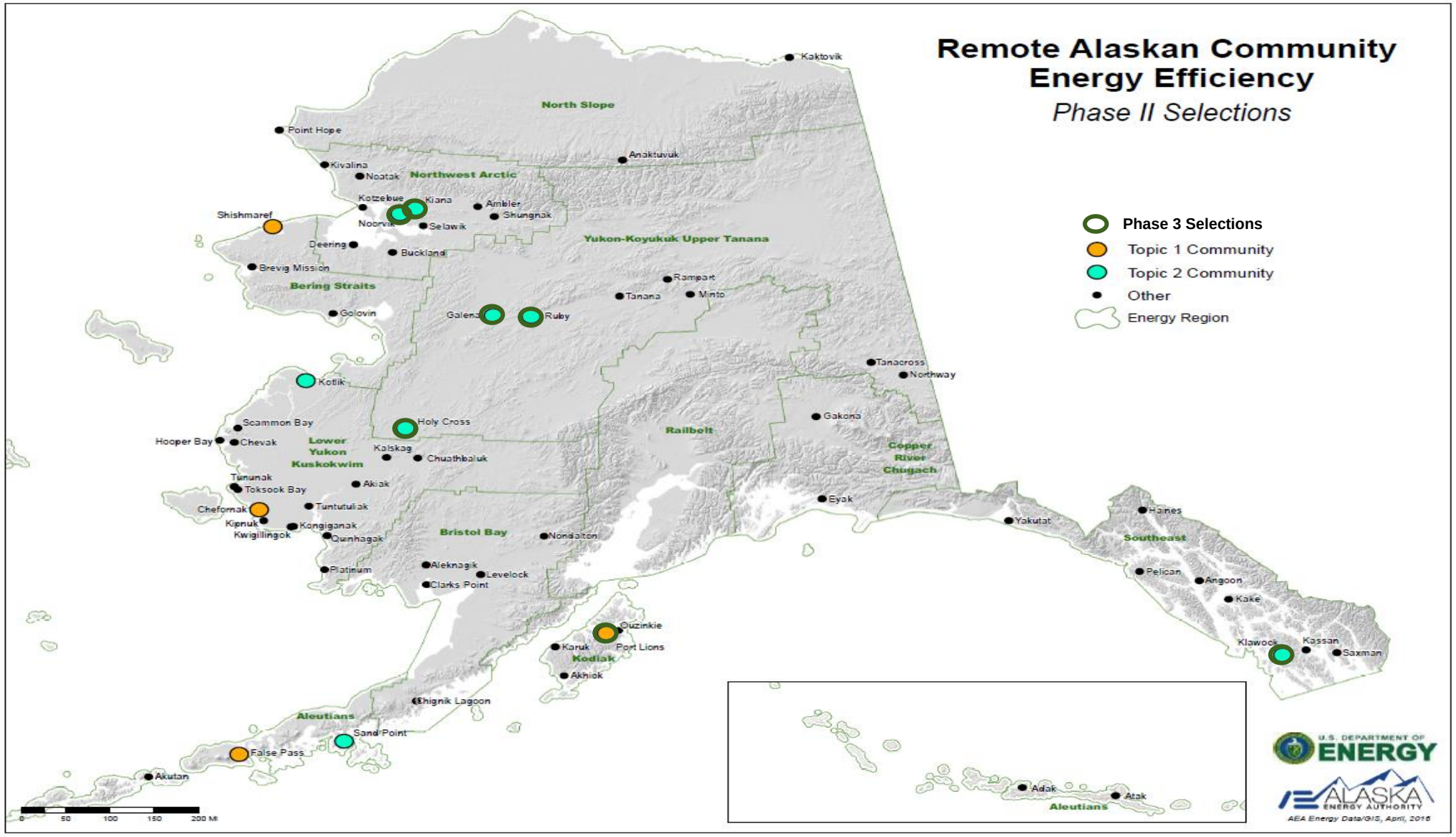
Remote Alaska Communities Energy Efficiency Peer Network



Webinar Operations

- All participants have been automatically muted.
- If you have a question during the presentation, please type it into the Question panel on the right side of your computer screen, so we can read it out loud at the end.
- Please check the RACEE website mid-February for a link to the recording and transcription of this webinar.

http://energy.gov/eere/racee-competition-peer-exchange-network

- DOE plans to collect information for announcement on the next Peer Network call.
  - This can include useful information on funding and project ideas and opportunities
  - Email your input to Fletcher.Souba@ee.doe.gov for future webinars.

Welcome to the RACEE Peer Network

- The RACEE Peer Exchange Network is intended to provide a fundamental benefit to the 64 communities that pledged to reduce per capita energy usage by 15% by 2020.
- It will consist of three components:
  - RACEE website
  - Monthly technical webinars
  - In-person meetings
    - For, example, the RACEE Competition Summit at end of RACEE Phase 3
- For more details, see the RACEE Website:

http://energy.gov/eere/racee-competition-peer-exchange-network

RACEE Peer Exchange

- The goal of the network is to empower Alaskan communities and native Alaskan villages to develop effective tools to advance the use of reliable, affordable, and energy efficient solutions that are replicable throughout Alaska and other Arctic regions.

- The Department will leverage the existing convening power of the AEA and other regional energy efficiency organizations to form the Peer Exchange Network to build a community of energy efficiency information sharing and action by peer exchange through webinars, and events.

Future Webinar Topics

- Level 2 building audits & benchmarking (Part II)
- Community Experiences with Air Source Heat Pumps:
- Indoor Air Quality Issues and How to Avoid Problems
- Biomass Heat Recovery Systems
- Water/sanitation efficiency in Alaska Communities
- Heat Recovery Systems and Benefits
- Diesel Part 1- Efficiency
- Diesel Part 2 - Transition from 2-stroke to 4-stroke Engines
- Line Loss Mitigation
- AKEnergySmart - More about Renewable Energy in Alaska

Efficiency – Your First Tool to Reduce Energy Costs
Part 1

Jim Fowler, PE, CEM, CEA, CBCP, GBE
Principal
Lee Bolling, PE, CEM, CEA
Mechanical Engineer

Energy Audits of Alaska

COFFMAN ENGINEERS

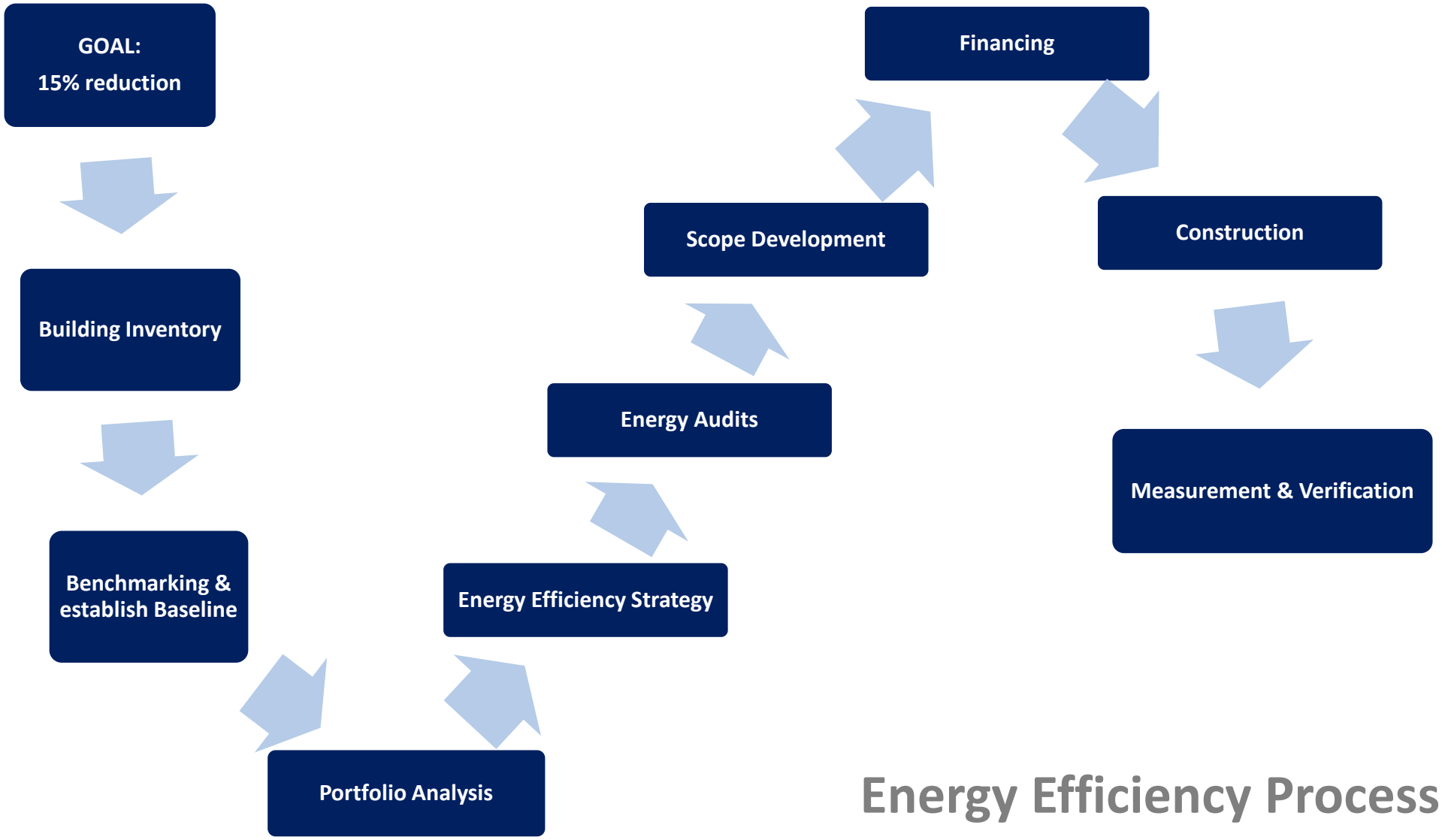
Energy Efficiency First

PART 1 – Today

- Overall Energy Efficiency Process
- Why Efficiency First
  - Potential savings
  - Compared to…
- The Steps…how to…
  - Portfolio Analysis, benchmarking, baselines
  - Strategy
  - Project Development

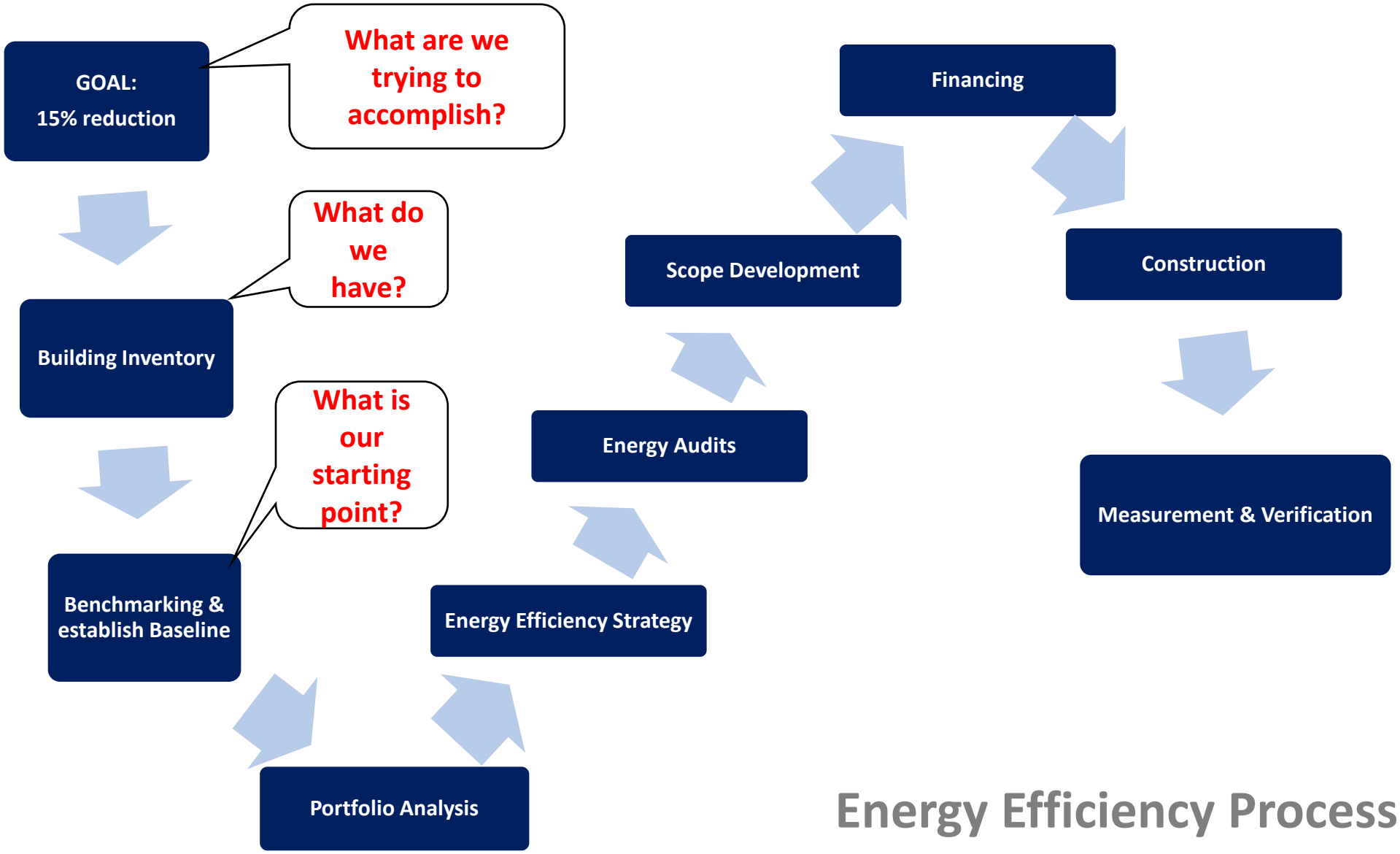
PART 2 – Next month:

- The Steps…how to…continued…
  - Financing
  - Construction
  - Measurement and Verification



Energy Efficiency Process

Energy Audits of Alaska



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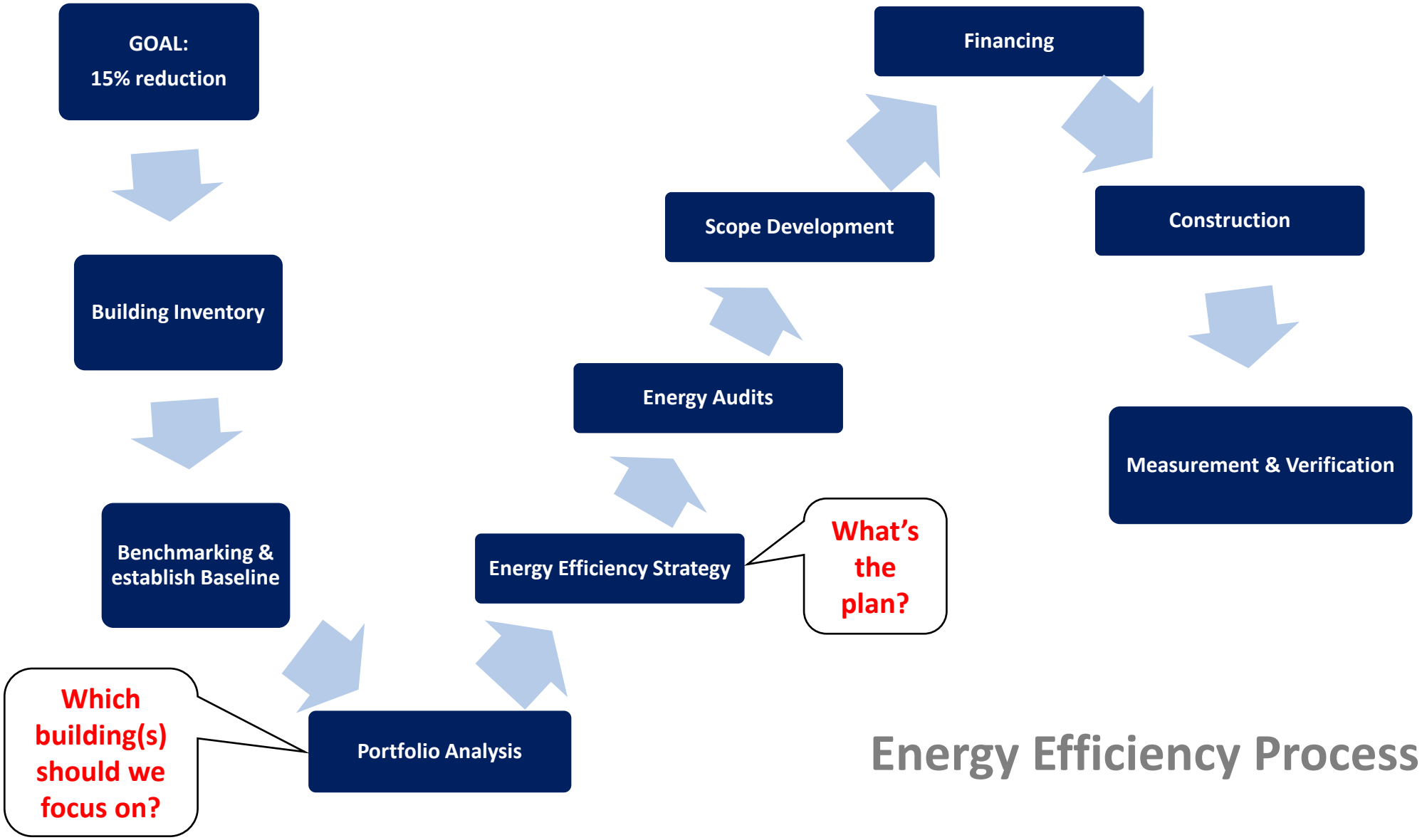

Energy Efficiency Process

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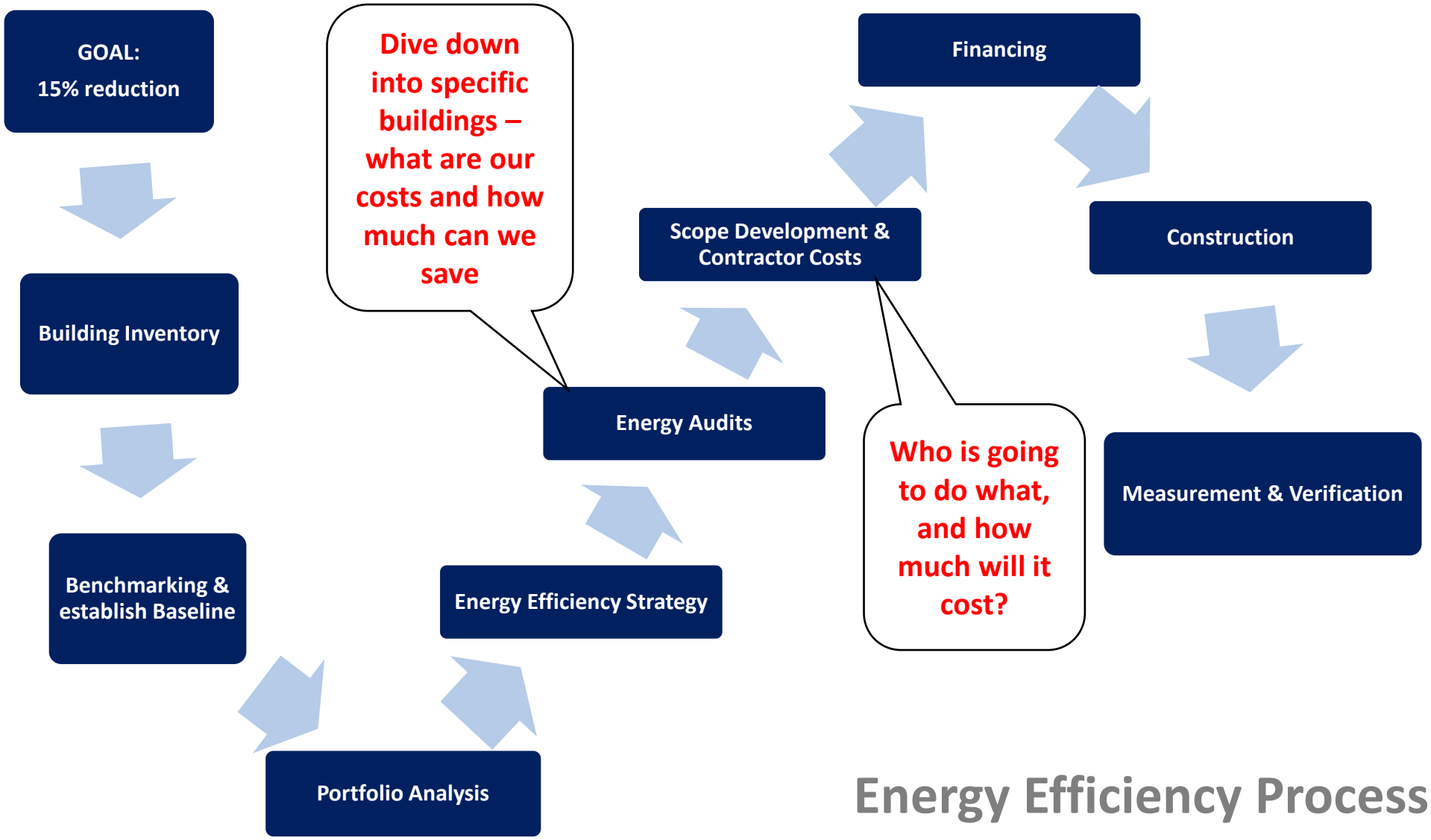

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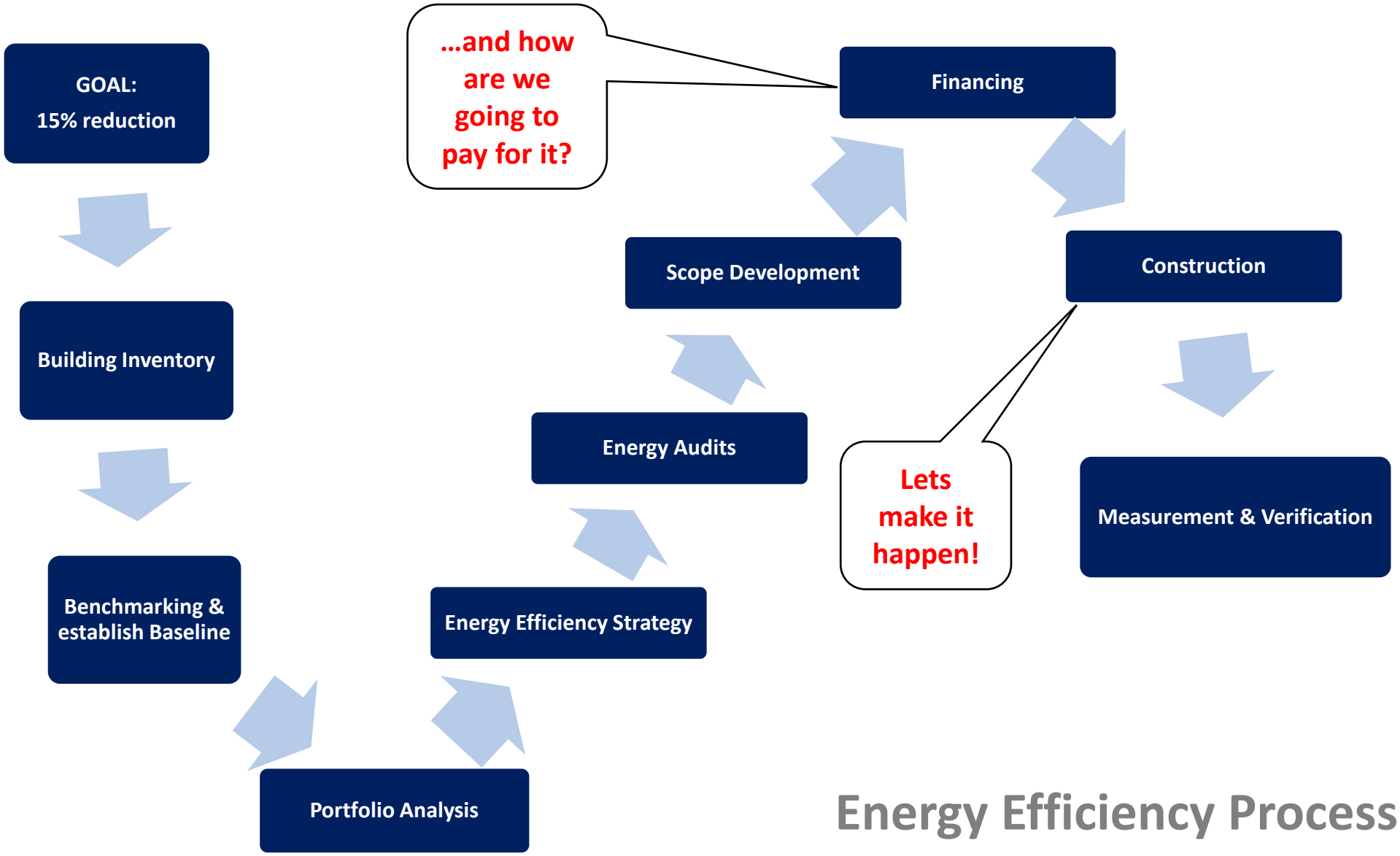

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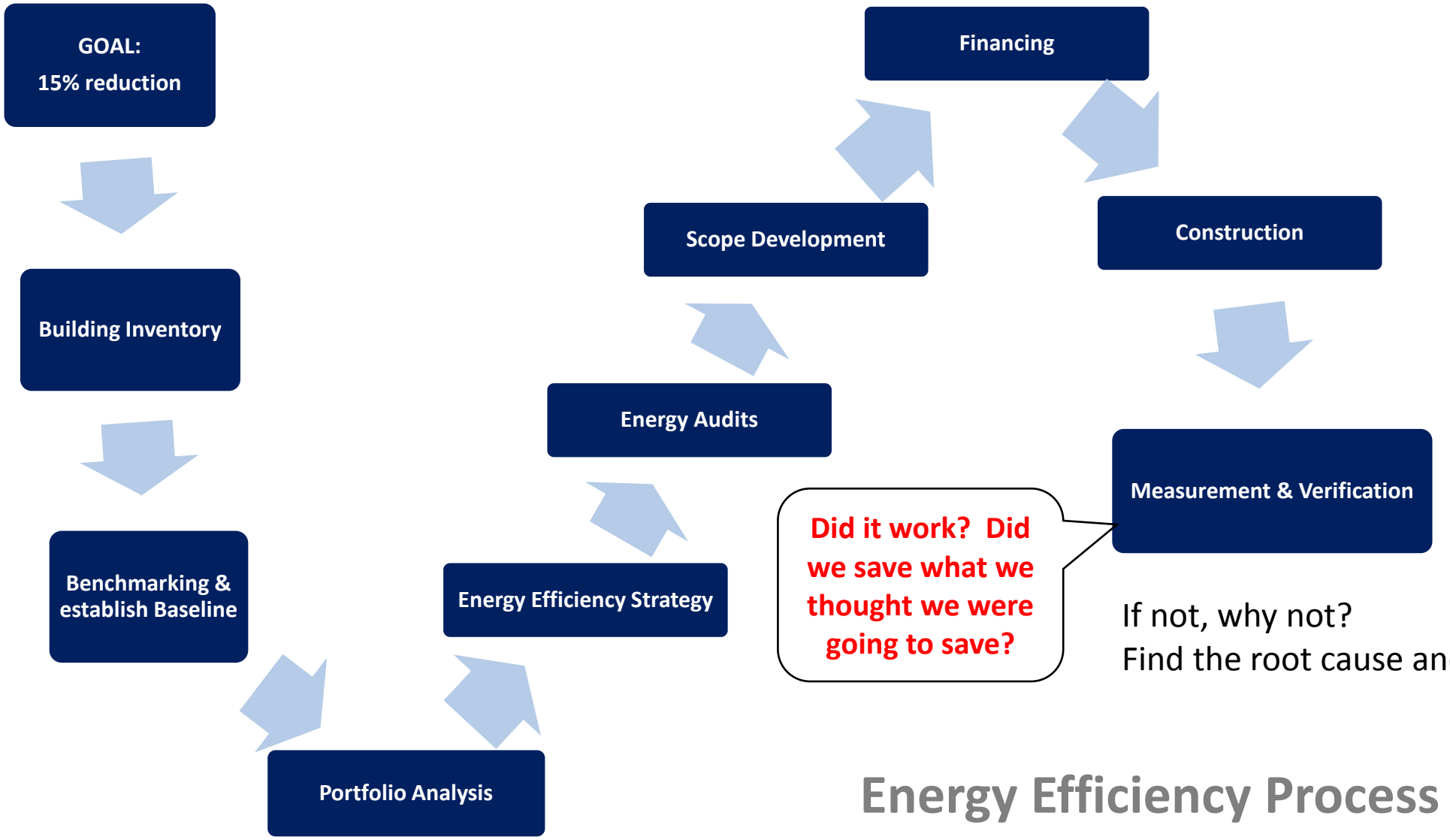

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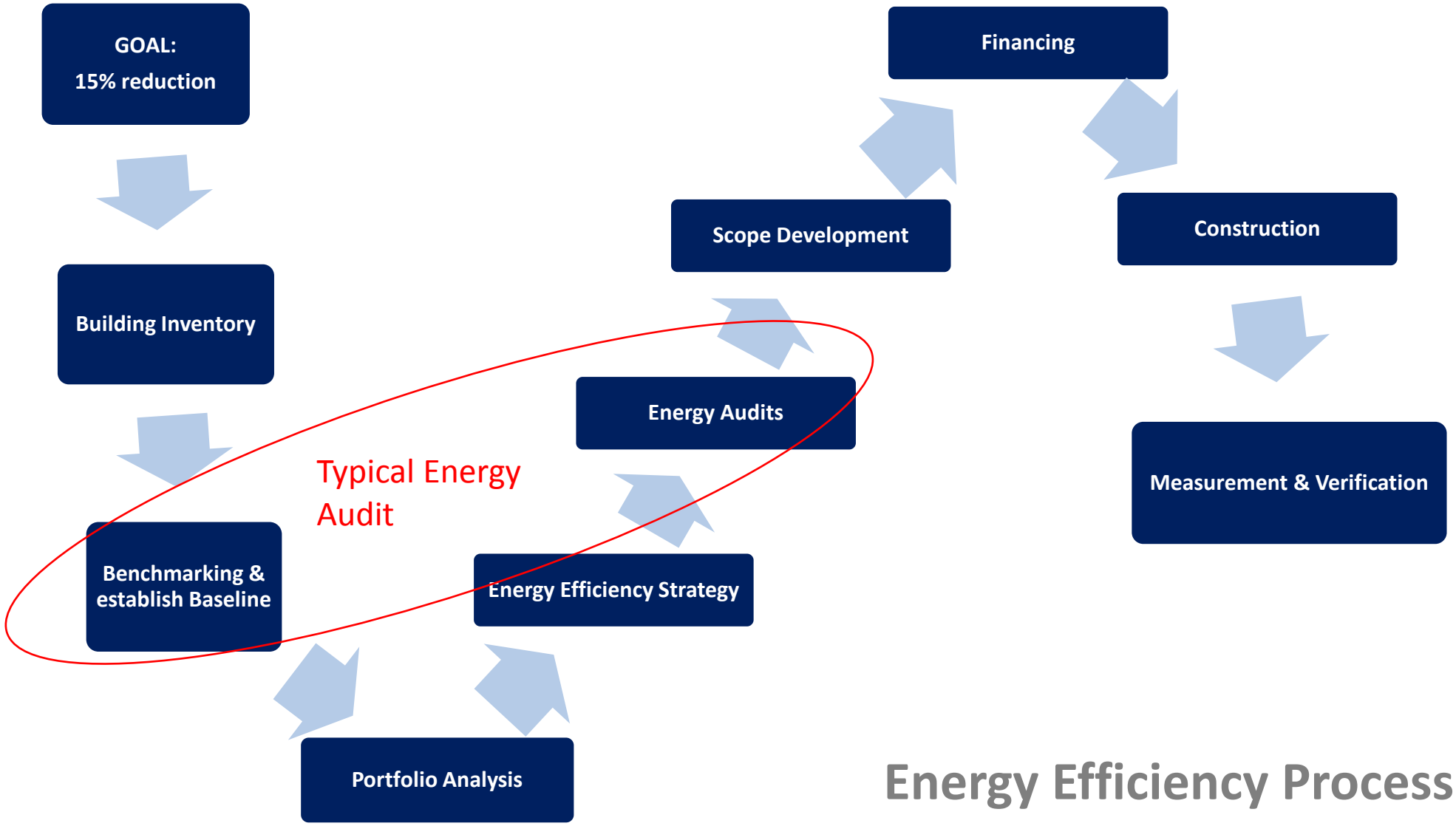

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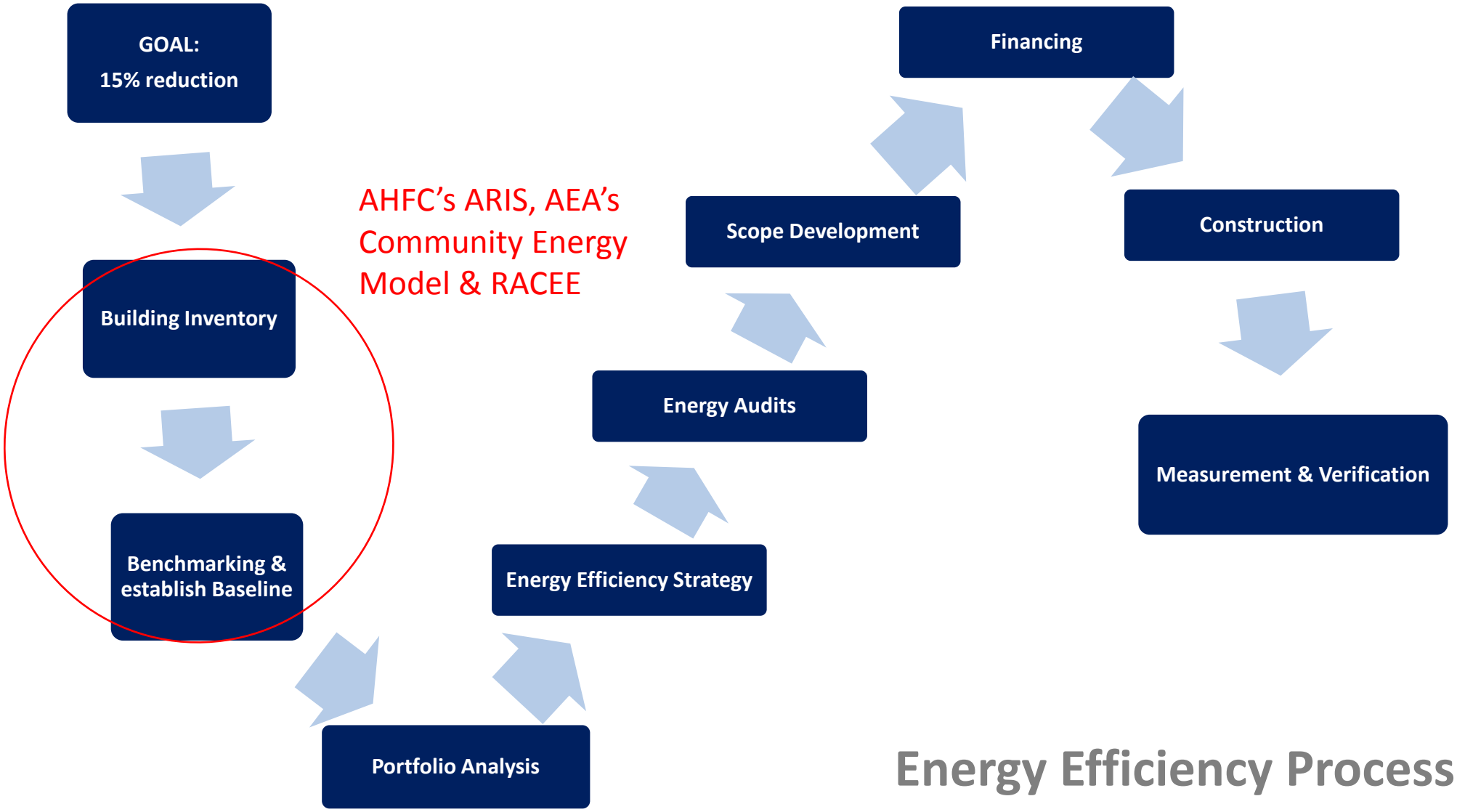

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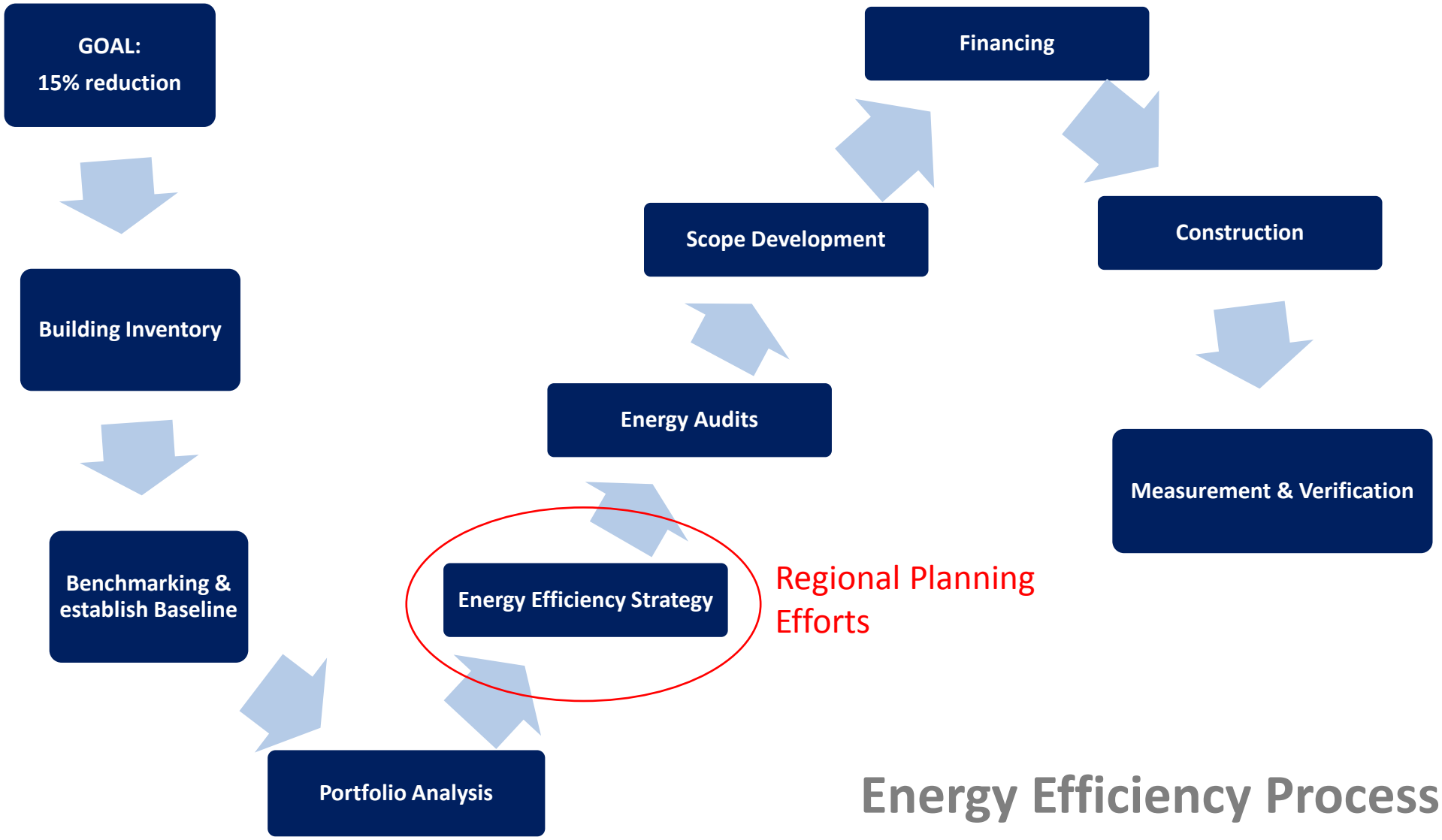

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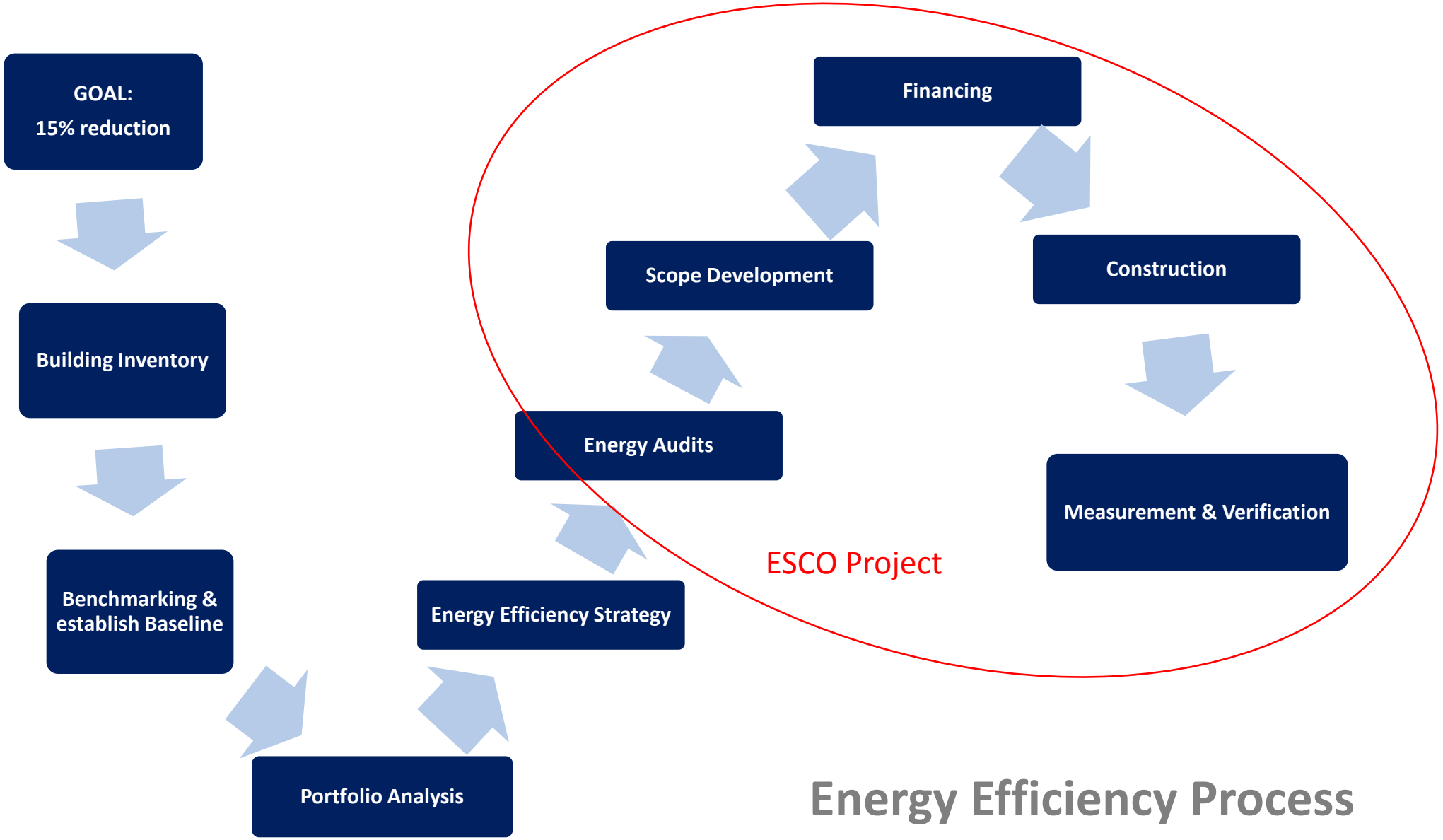

Energy Efficiency Process

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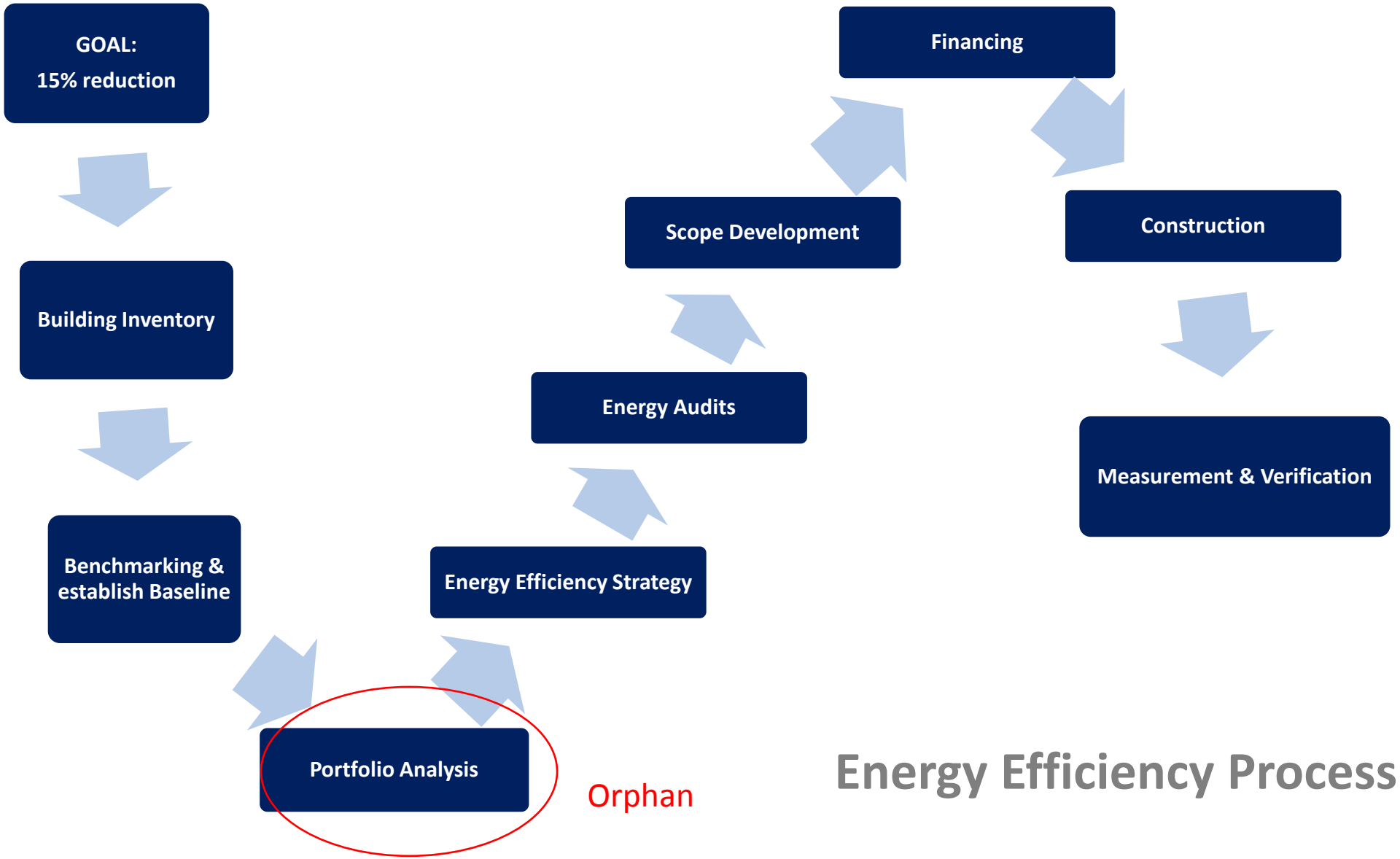

Energy Efficiency Process

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Energy Efficiency First

Why?

How much will it cost?

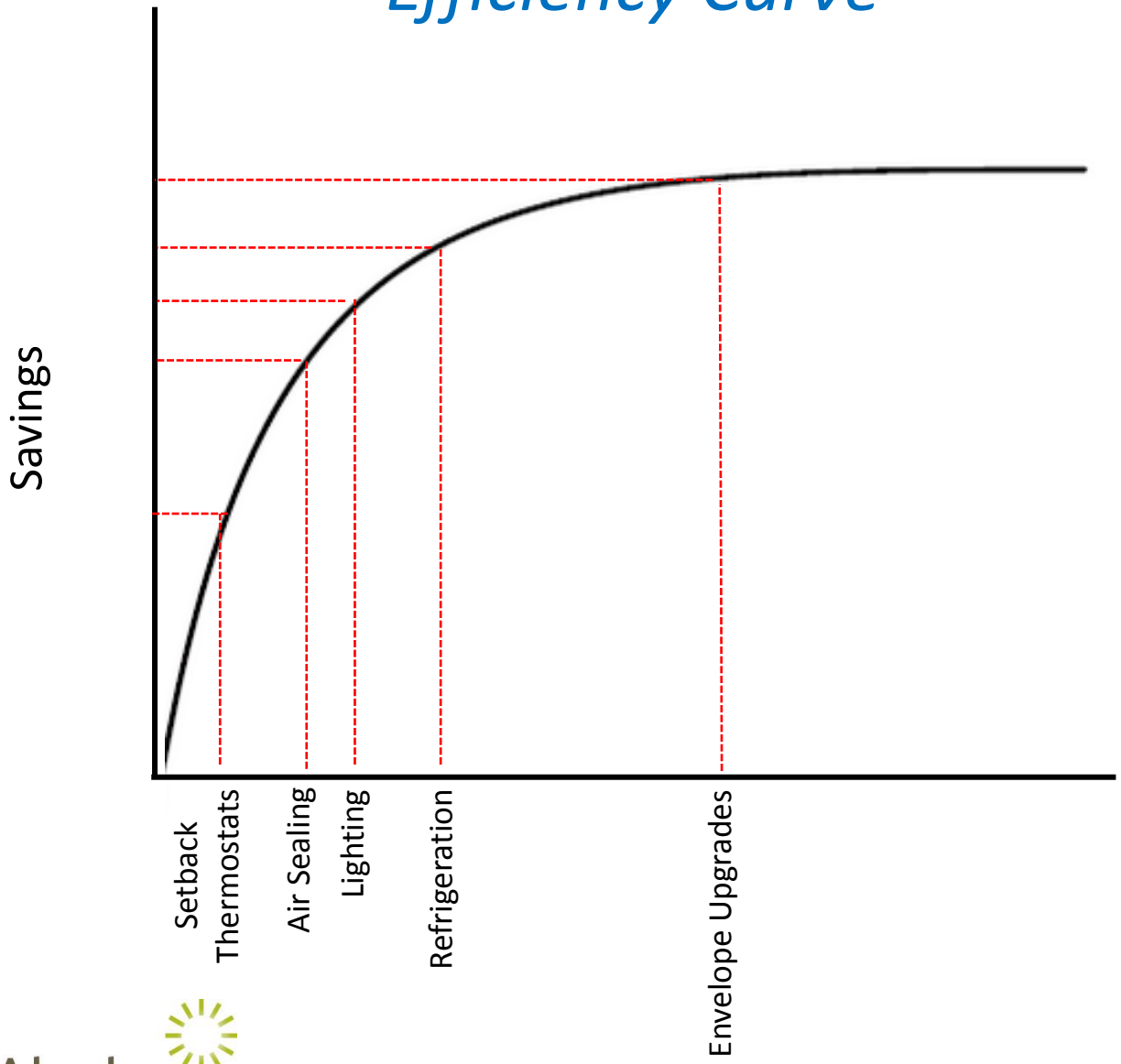
How much can I save?

What happens if I do nothing?

Energy Audits of Alaska

Energy Efficiency First

Efficiency Curve



Energy Audits of Alaska

Energy Efficiency First

Kwethluk

188 residences, 25 commercial buildings:

ENERGY COSTS

Average homeowner electric cost	$ 1,214
Average homeowner fuel oil cost	$ 4,062
Total residential electric costs	$ 228,232
Total residential fuel oil costs	$ 763,656
Total Residential energy costs	**$ 991,888**
Total non-residential energy cost	**$ 515,816**
COMMUNITY-WIDE ENERGY COST	**$1,507,704**

Energy Audits of Alaska

Energy Efficiency First

Kwethluk

188 residences, 25 commercial buildings:

- Setback thermostats in every building
- Air sealing every building
- LED lighting throughout entire community
- Attic insulation up to R-60

Energy Audits of Alaska

Energy Efficiency First

Kwethluk, Potential Savings

188 residences, 25 commercial buildings:

Savings breakout:

LED's, **$39,679**

Programmable thermostats, **$62,191**

Attic insulation to R-60, **$27,539**

Air-seal every building: **$63,843**

Total Community-Wide Upgrade Costs, $764,805

Residential:

Total Savings $96,744/year

Average homeowner saves $515/year

Average residential upgrade cost $2,038

Payback in 4 years

Non-residential:

Total Savings $96,508/year

Average building savings $3,860/year

Average building upgrade cost $15,265

Payback in 4 years

Energy Audits of Alaska

Energy Efficiency First

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12.8% Community Savings

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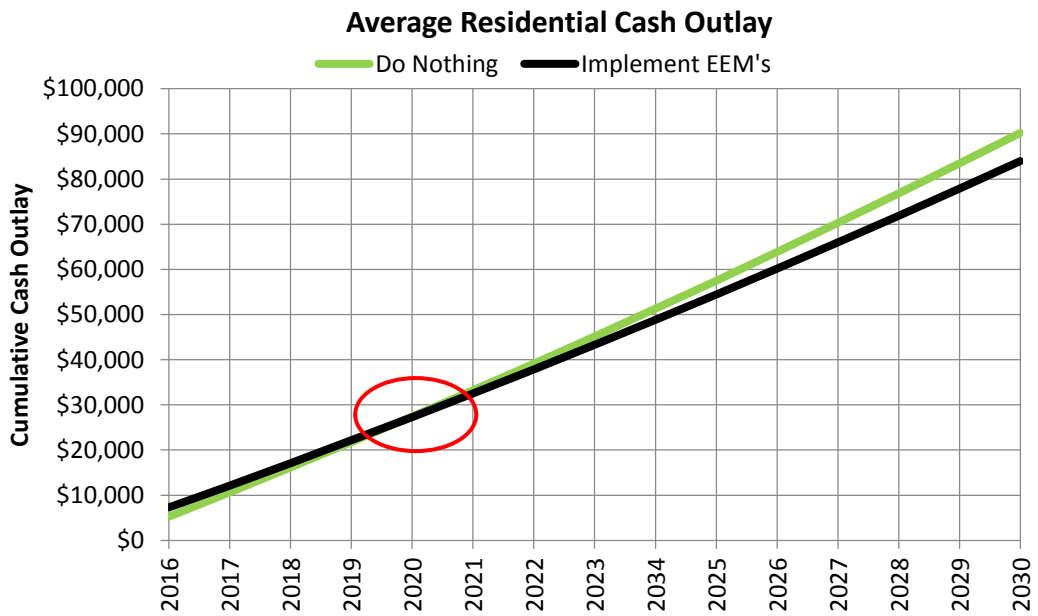
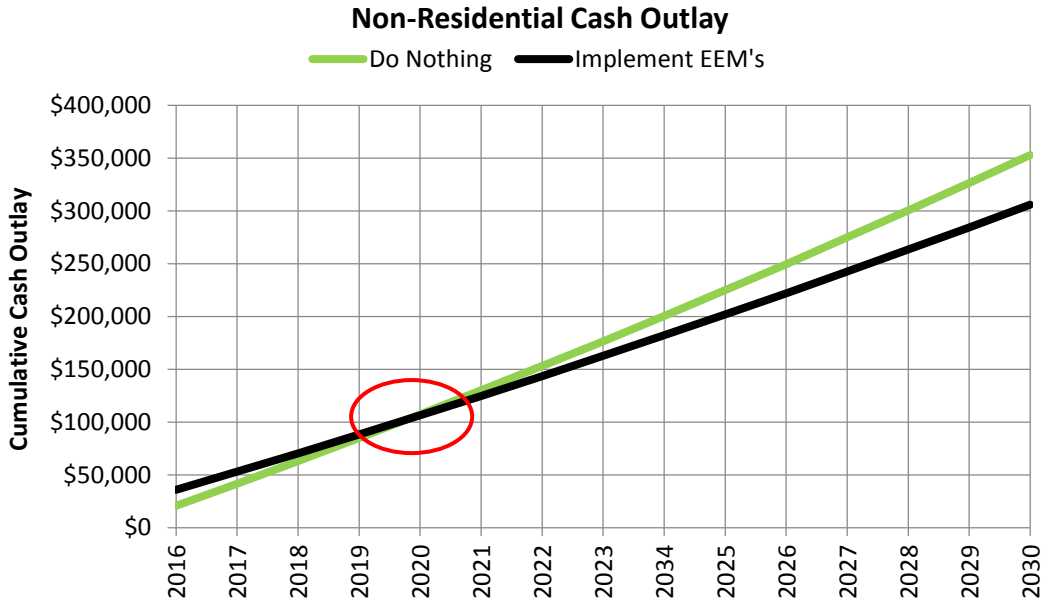
Energy Audits of Alaska

Energy Efficiency First

Do Nothing Case





Energy Audits of Alaska

Energy Efficiency First

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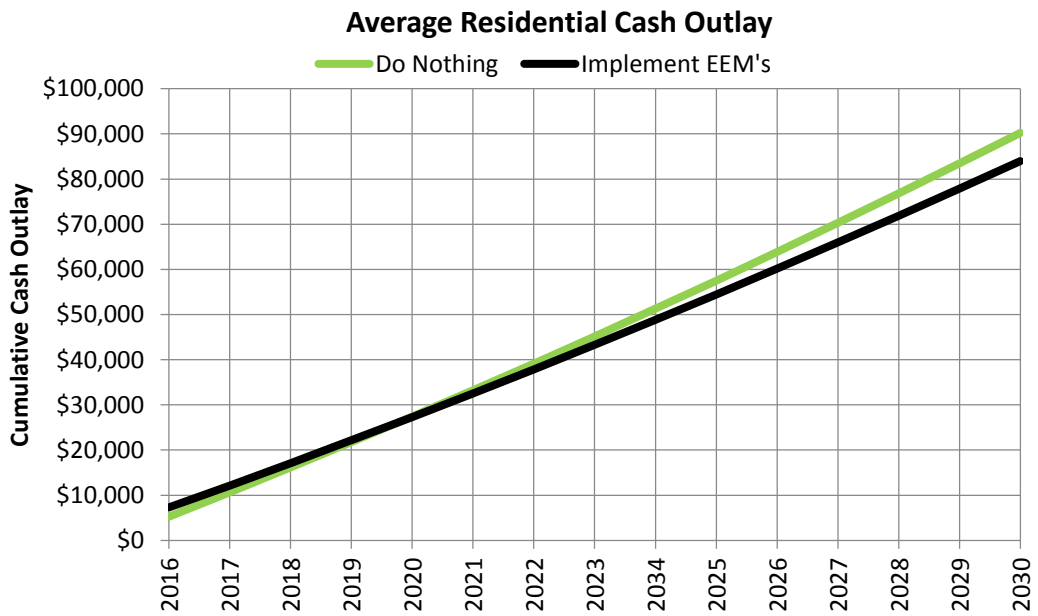
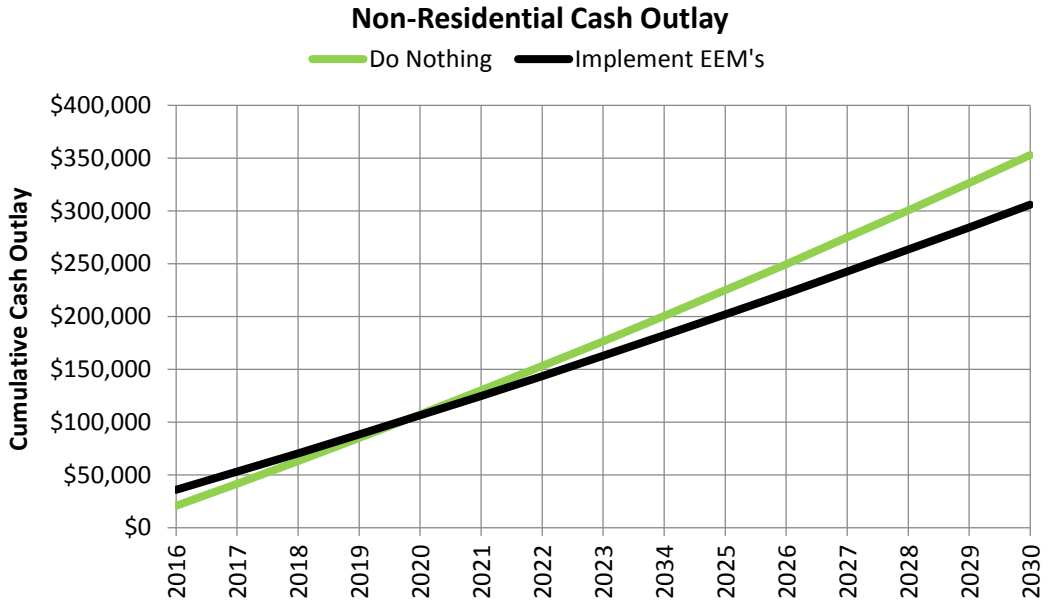




12 years later…

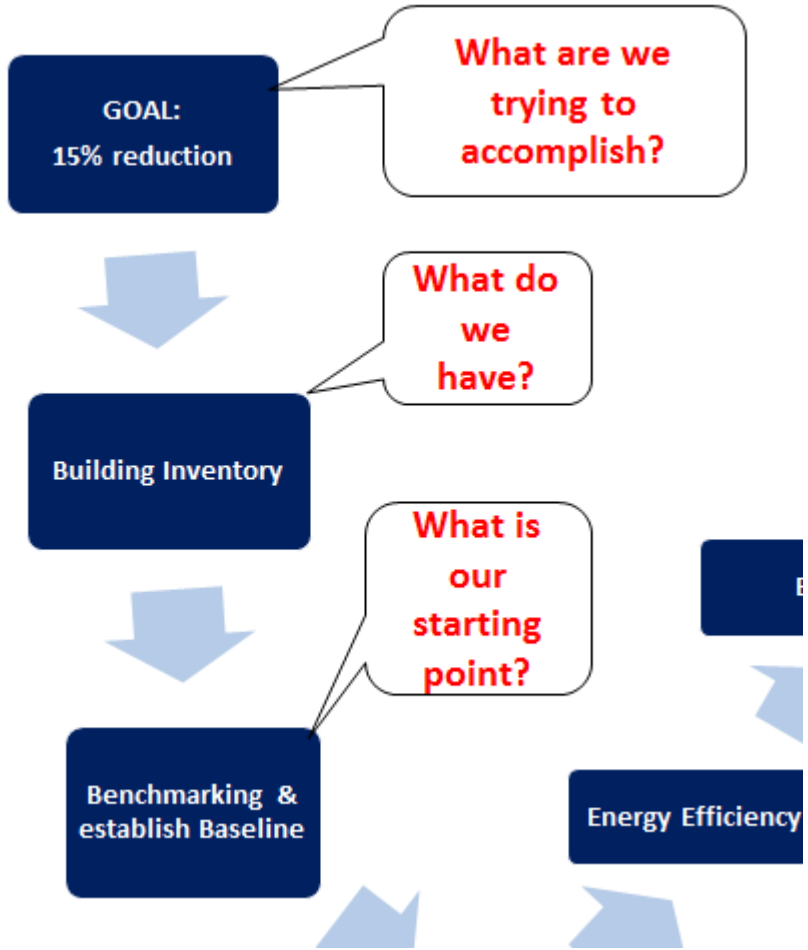
$6,253 thrown away

$46,881 thrown away

Energy Audits of Alaska

Energy Efficiency First

The Steps



Energy Audits of Alaska

Energy Efficiency First

Inventory and Baseline

1. Building Inventory
   - Name of building
   - Address
   - Size (square feet of conditioned space)
   - Use and Occupancy
   - Electric meters/accounts
2. Establish a Baseline
   - 2 years (ideally, 3 years) of electric consumption
     - Sum of all electric meters if more than 1
   - 2 years (ideally, 3 years) of fuel oil (or natural gas) consumption
   - Use spreadsheet, ARIS or EPA Portfolio Manager

Energy Efficiency First

Inventory and Baseline

Ownership	Native Village of Kwinhagak												City				Qanirtuuq							
Building	Admin/Comm Center - NVK		PSO Building - City		*Bingo Hall - NVK*		*Bingo Apt*		Head Start - NVK		Washeteria - NVK		*Water Treatment Plant - City*		Moravian Church		*Red Building - Qanirtuuq*		Store - Qanirtuuq		*Hardware Store - Qanirtuuq*		Old Pre-school - Qanirtuuq	
Fuel	Fuel Oil	Electric meter 12 231 348	Fuel Oil	Electric	Fuel Oil	Electric meters 12 231 415/416	Fuel Oil	Electric meters 12 231	Fuel Oil	Electric meter 12 231 410	Fuel Oil	Electric	Fuel Oil	Electric meter 05 414 610	Fuel Oil	Electric meter 12 231 398	Fuel Oil	Electric meter 12 231 413	Fuel Oil	Electric	Fuel Oil	Electric meter 12 231 404	Fuel Oil	Electric meter 12 231 405
Jul-13		976				300				454				4038		308	360	1395	716			941		150
Aug-13		1105				286				391				3912		310	200	3061				989		166
Sep-13	181.3	1074	67.2		44.8	346				665			455.4	5101		343		2122				1001		96
Oct-13		1253			38.1	298	46.7	774		839			400	7392		466	140	1651				1091		197
Nov-13	301.8	1858	57		67.3	871		958		863			300	9461		743		1635				1140		207
Dec-13	215.4	2331			66.4	827		875		793			702.4	10716		1196	155	1613	150		78.3	942		366
Jan-14	215	2305			68.9	769		782		832	348.9		489	8550		866		1525			40	974		329
Feb-14	200	2297			58.8	1002		764		838	2688.2		747	9864		857	350	1238	400			829		312
Mar-14	166.3	2650	65		34	1507		997		734	2000		390	11436		738		1472				769		325
Apr-14		1669	50		73.1	1563		700		856	2280.9		400	7519		681	415	1157	243.7			973		334
May-14	140	1169	48.8		14.6	642		891		792	6831.3		304	4911		353		1092	1122.4			932		121
Jun-14		1162				775		847		324				4686		323	113.7	1331				926		109
Jul-14		1177				613		671		290				4577		337		2013				963		93
Aug-14	71	1158				678		641		300	487		446.6	4177		262		3572				947		119
Sep-14		1319				616		731		493				5495		409		2136				950		79
Oct-14	125	1702	55.3		58.4	675		885		543			640	9982		720	150	1697			68	966		257
Nov-14	151.1	1833			40	834		802		733			560	10301		706	479.7	1527				1050		374
Dec-14	185	2249	55		37	962	30.4	911		812			650	11295		878	80	1532	200			1047		360
Jan-15		2518	62		45.5	1416		849		945			525	12382		1027		2139				1081		365
Feb-15	275	2226	55		57	1205		831		841			666	11203		893		1326				984		294
Mar-15	117	1906	80		71	1030		919		870	3437		800	10681		778		1681				1102		507
Apr-15	118	1313	60		59.5	895		762		850	530		446	9962		707		1616				949		492
May-15		1002				861		727		741	6800		657	6564		366		979				933		63
Jun-15		1013				765		560		255				4404		354		1227				1036		155
Jul-15		1040				599		560		241				3621		338		3022				960		168
Aug-15		1060	26			670		519		255				4390		339		3559				993		121
Sep-15		995	93		37	718		742		717			445.8	5027		306		2357				1003		92
Oct-15		1094				785		711		789				5065		449		1727				1020		51
Nov-15		1207				1085		794		793				8002		760		1613				1021		269

Energy Audits of Alaska

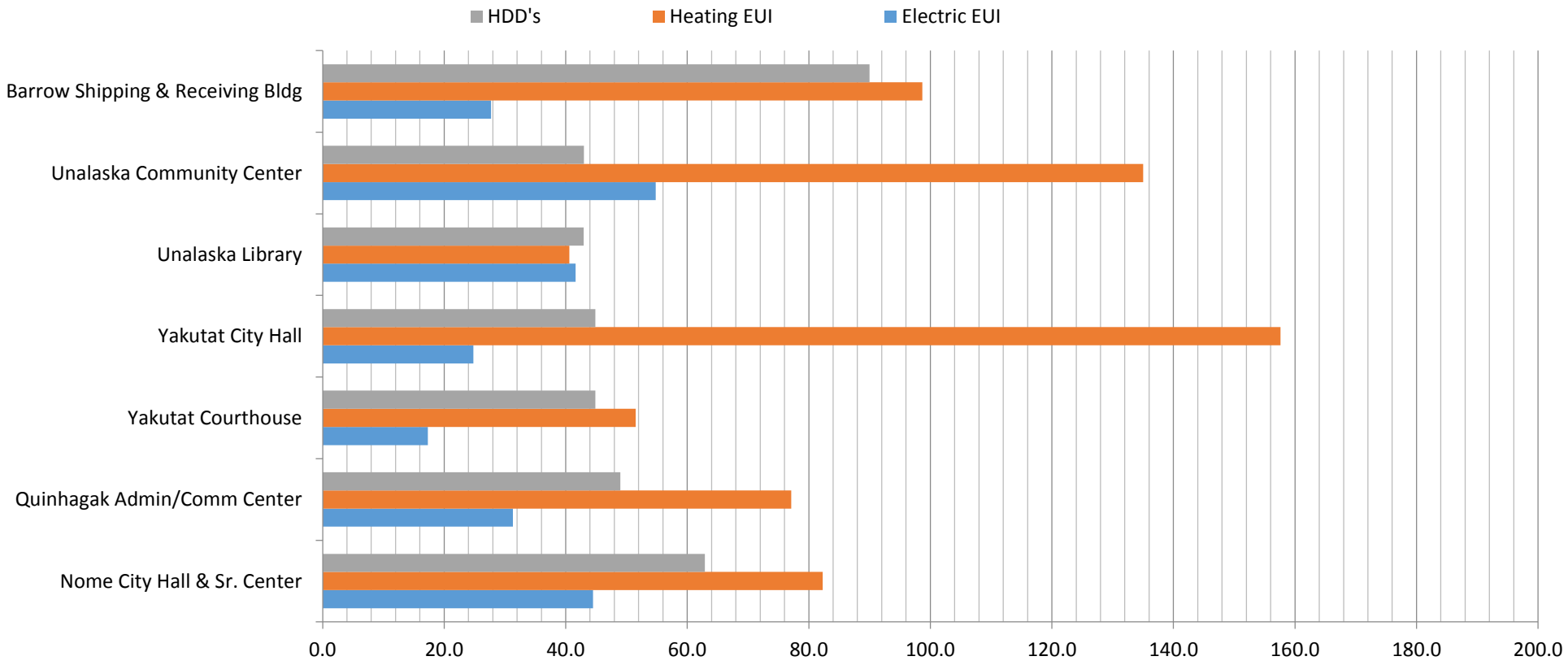
Energy Efficiency First

Benchmark & Portfolio Analysis

3. Benchmarking
   - Compare to other buildings in community
   - Compare to other similar use and occupancy buildings in the region
   - Compare to similar use and occupancy, use Heating Degree Days (HDD's)
   - Energy Utilization Index (EUI) and Energy Cost Index (ECI)
   - ECI not valuable across regions due to variations in cost
4. Portfolio Analysis
   - Look at cost AND efficiency
   - Include political, financial and other considerations
   - Informs decisions regarding energy audits and deeper assessments (including maintenance, capital expenses, etc.)
   - Leads directly into Strategy

Energy Efficiency First

Benchmark & Portfolio Analysis



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Energy Efficiency First

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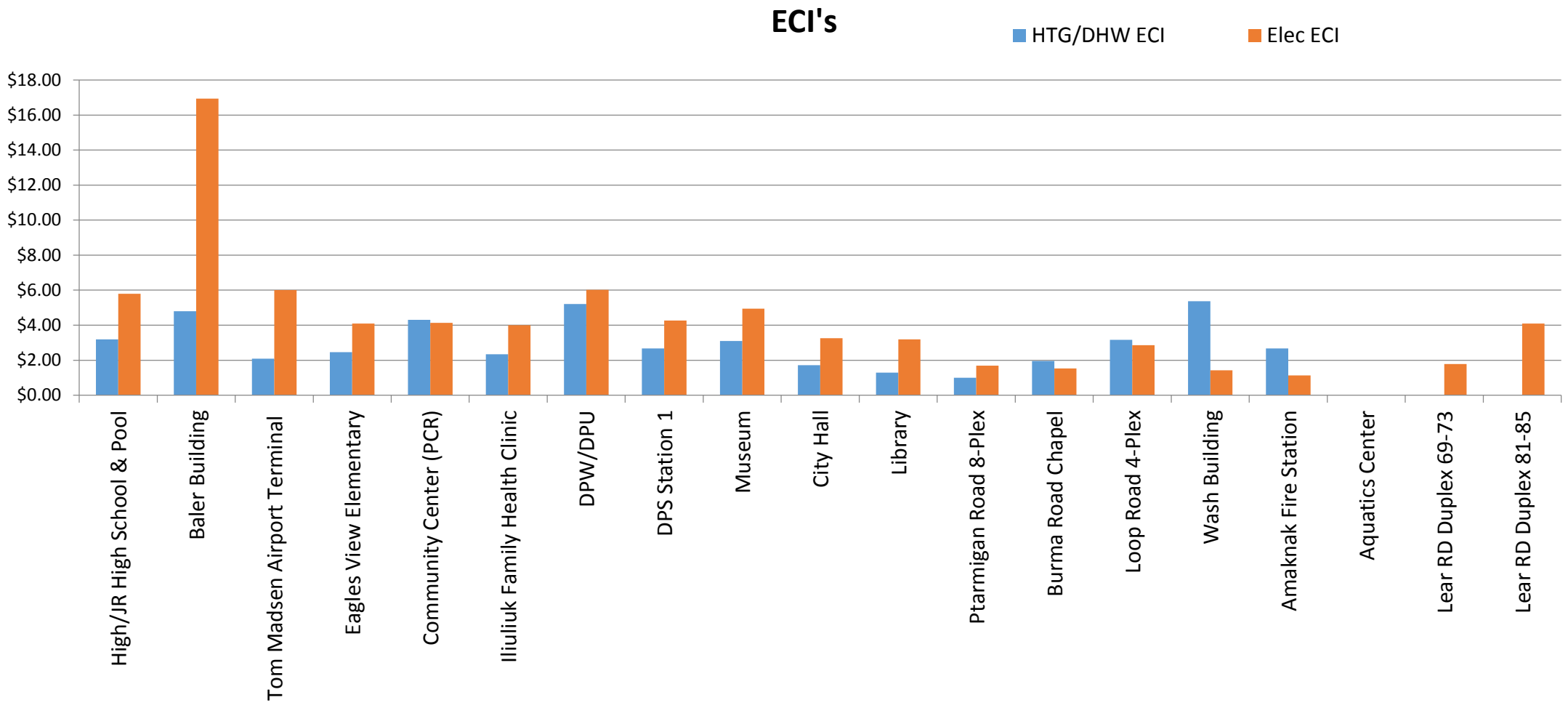

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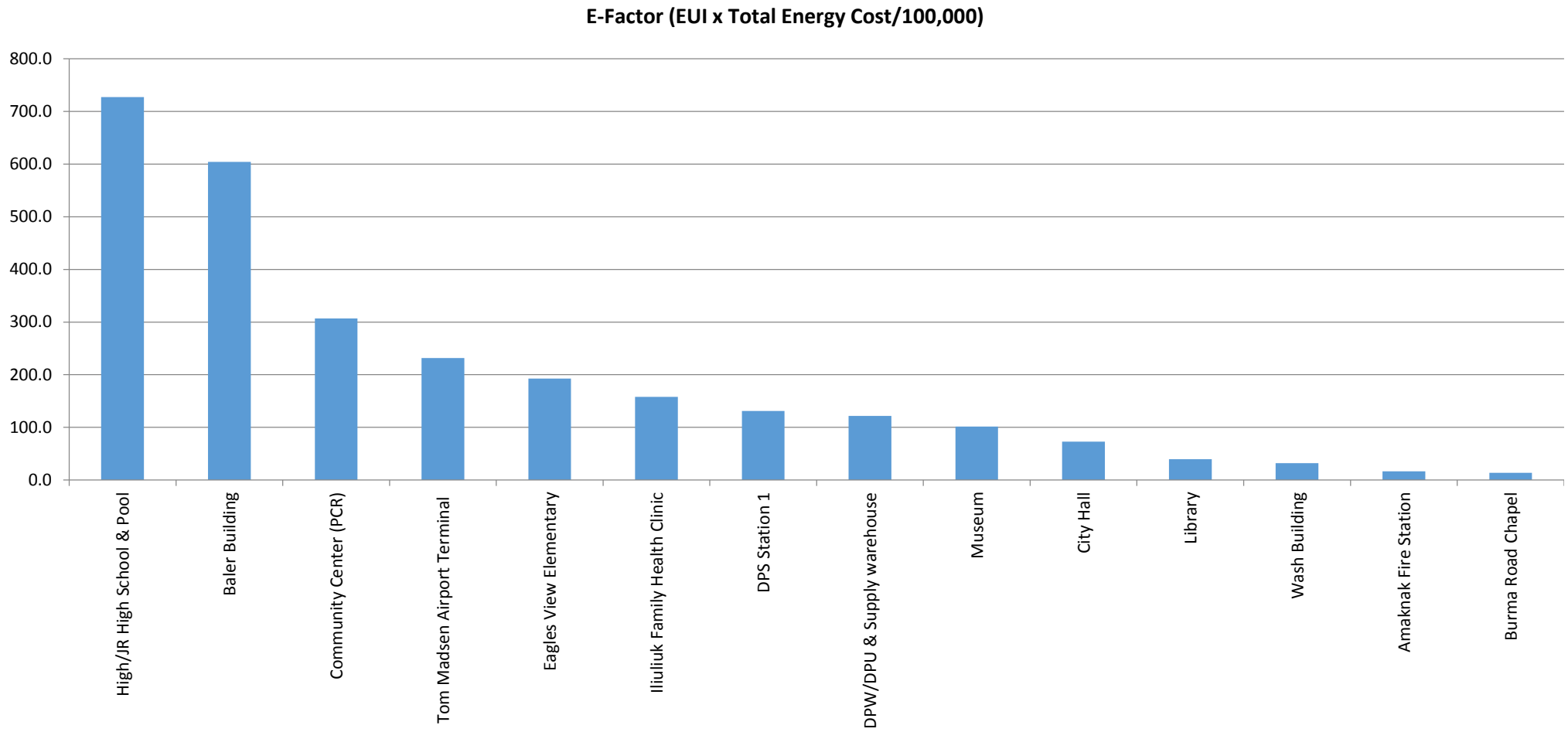

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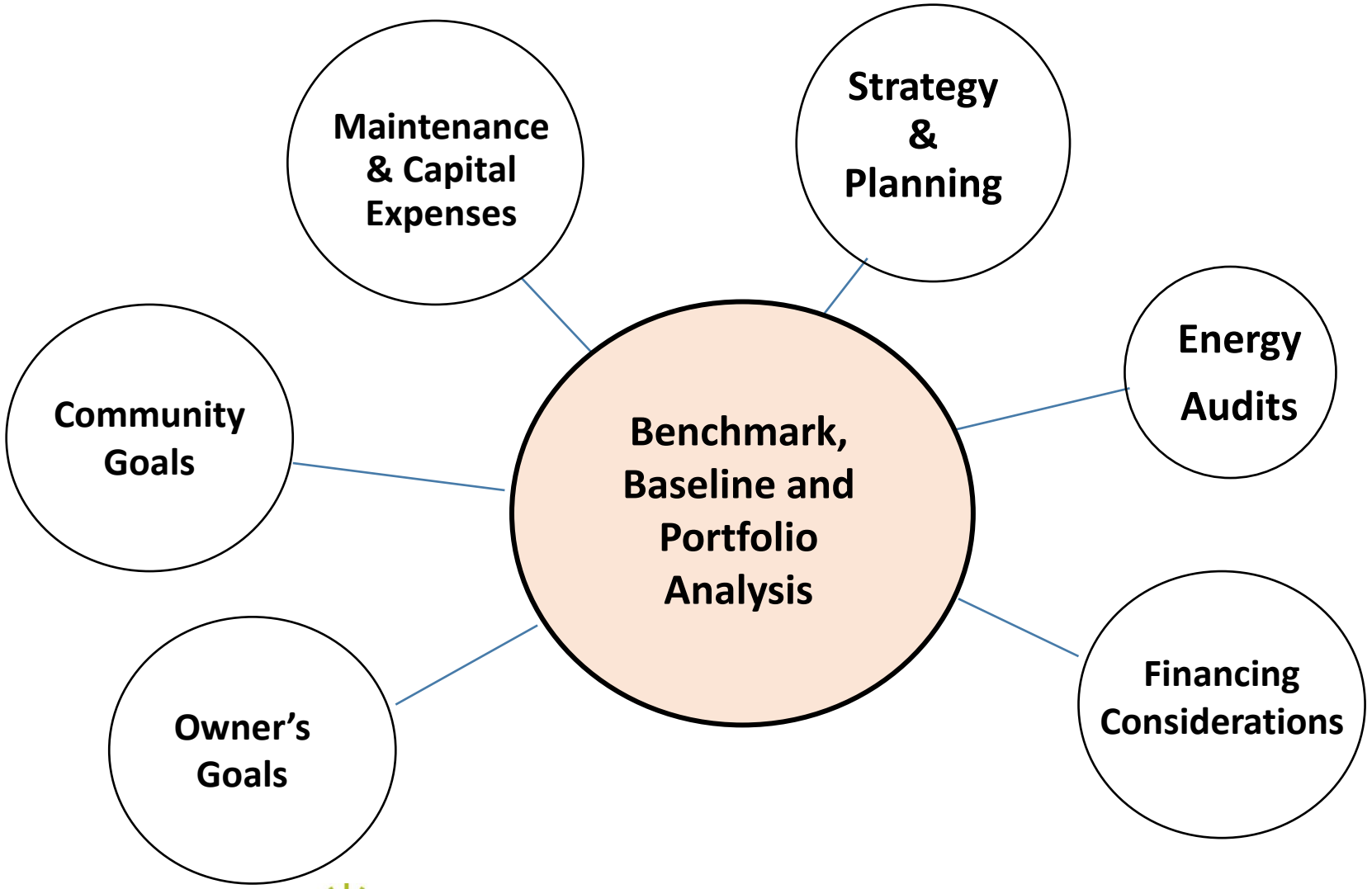

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COFFMAN ENGINEERS

Energy Audits

Lee Bolling, PE, CEM, CEA
Mechanical Engineer

COFFMAN ENGINEERS

Coffman Engineers

Alternative Energy & Sustainability

Civil

Commissioning

Electrical

Fire Protection

Mechanical

Structural

Survey

Project Management

Corrosion Control

Pipeline Integrity Management

Commissioning and Energy Efficiency Group

- Certified Commissioning Professionals (CCP)
- Certified Energy Auditors (CEA)
- Certified Energy Managers (CEM)
- Lighting Certified Professionals (LC)
- Certified Lighting Energy Professionals (CLEP)
- Leadership in Energy and Environmental Design Accredited Professionals (LEED AP)
- Certified Management & Verification Professionals (CMVP)
- Building Energy Modeling Professional (BEMP)

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What is your goal?

COFFMAN ENGINEERS

What is your goal?

All about
the Benjamins

What is your goal?

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the Benjamins

Tenants are
number one

COFFMAN ENGINEERS

What is your goal?

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Long-term
Spaceship

COFFMAN ENGINEERS

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Spaceship

Just
STOKED!!!

COFFMAN ENGINEERS

Client's Goal

Level 1
Energy Audit

- **Walk Through Audit**
- **"Low Hanging Fruit"**
- **Lowest Cost Audit**

COFFMAN ENGINEERS

Client's Goal

Level 1
Energy Audit

- **Walk Through Audit**
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Action

Goal!!!

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Client's Goal

Level 1
Energy Audit

Level 2

Action

Goal!!!

- **In-Depth Site Visit**
- **Energy Engineering Analysis**
- **Cost Estimating**

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Client's Goal

Level 1
Energy Audit

Level 2

Level 3

Action

Goal!!!

- **Detailed Analysis of Capital Improvements**
- **Computer Modeling**
- **Refined Cost Estimate**
- **Most Time Intensive Audit**

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Client's Goal

Retro-Commissioning

- Optimizing a Building
- "Tune-up"
- For Buildings with more complex controls or larger mechanical equipment.

Level 1
Energy Audit

Level 2

Level 3

Action

Goal!!!

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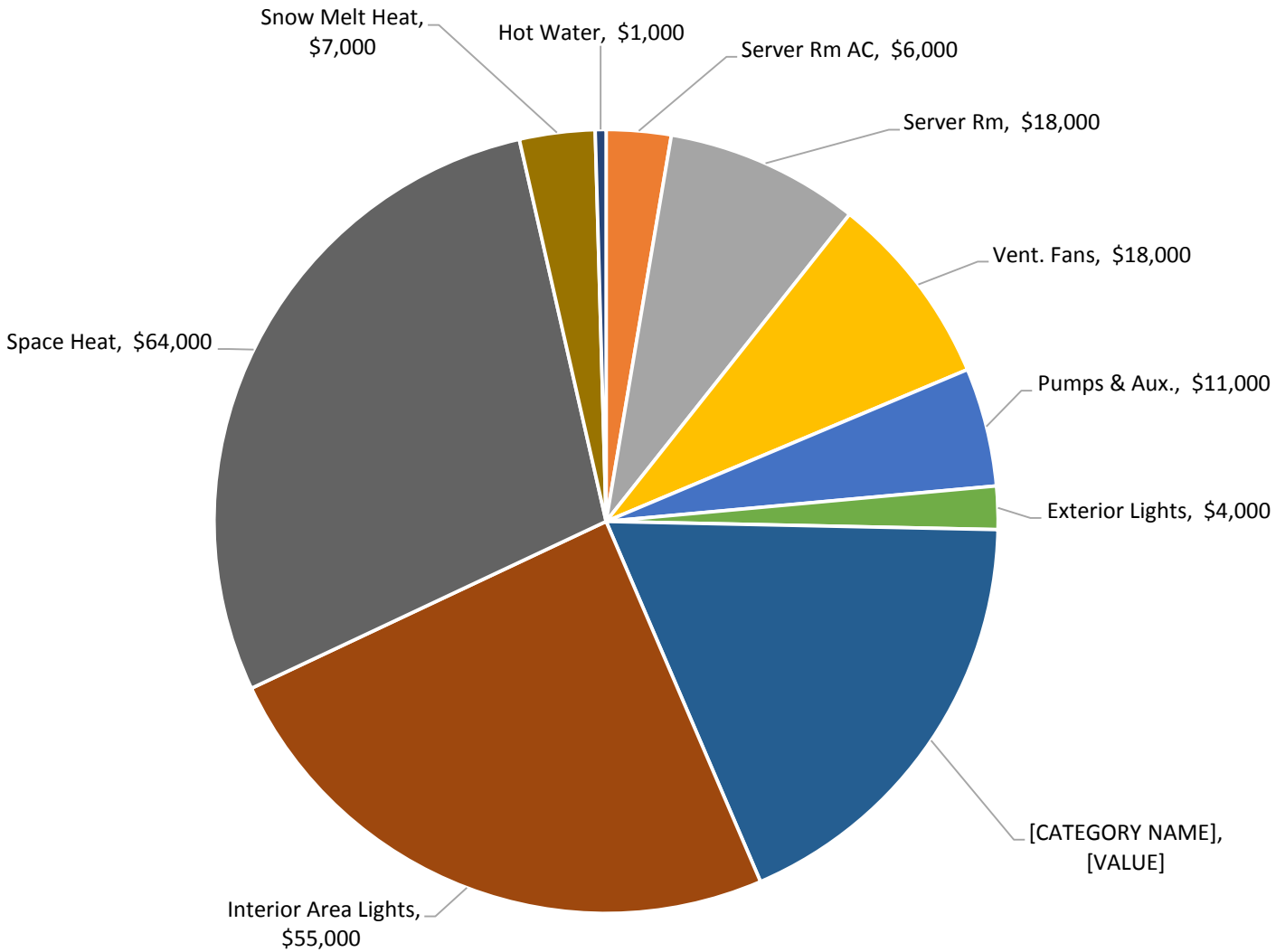
Break it down…



Name: Building X
Where: Fairbanks
Age: 25 years old
Size: 50,000 SF

Electricity:	**$153,000 /yr**
Heating Oil:	**$72,000 /yr**
Grand Total:	**$225,000 /yr**

ECI: **$4.50/SF**

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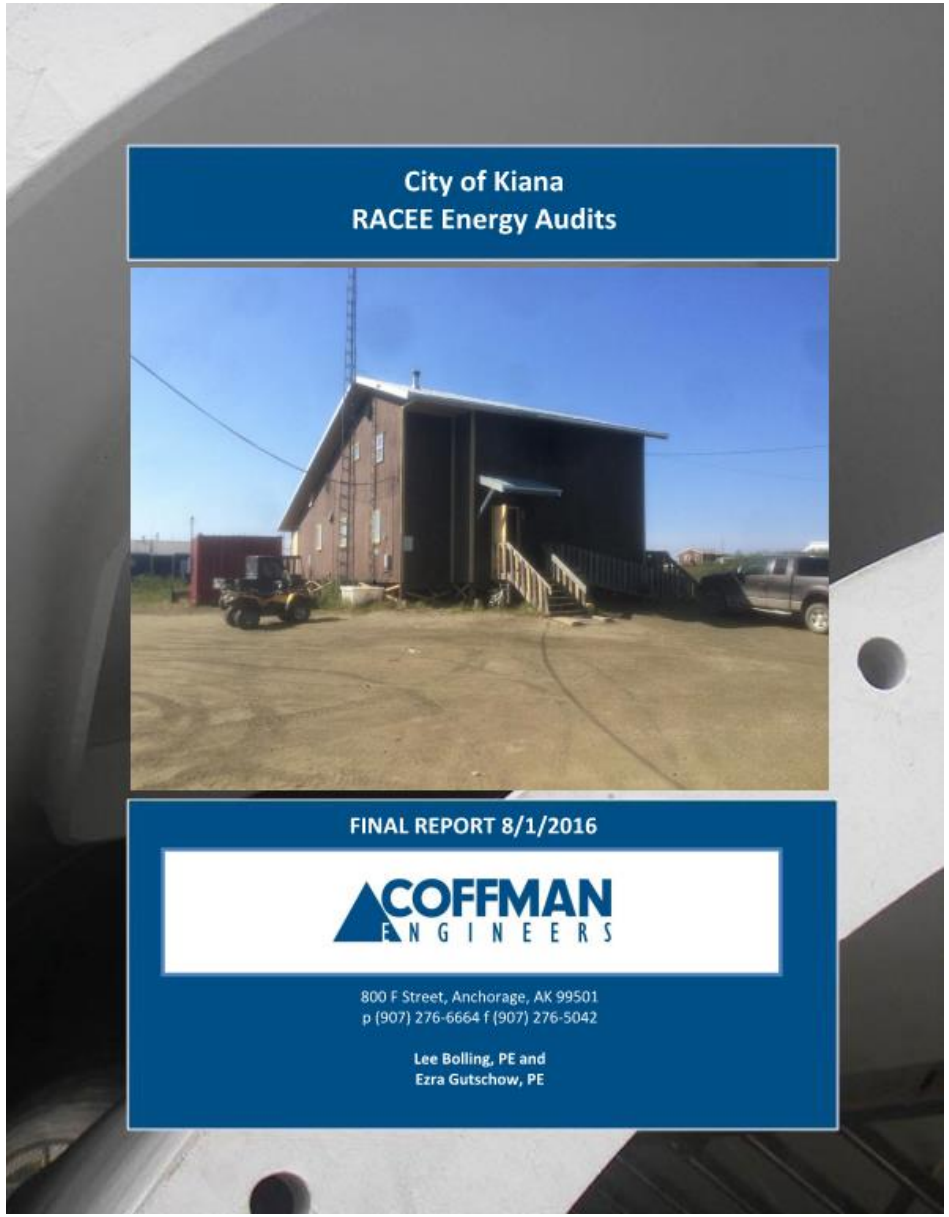

I. Executive Summary

ASHRAE Level 1 Energy Audits for nine community buildings in Kiana, Alaska were completed as part of the Remote Alaska Communities Energy Efficiency (RACEE) program. A site visit was completed, energy data was analyzed and energy conservation measures (ECMs) were identified. The recommended ECMs are shown in the table below.

Table 1 – Executive Summary of ECMs

ECM #	Energy Conservation Measure	Building	Annual Energy Savings	Total Project Cost	Payback (Years)
1	Adjust Night Setback Thermostats	• City Office • Community Building • Tribal Office	$850 to $1,700 (20.7 to 41.4 MMBTU)	No Cost	Immediate
2	Replace Incandescent Lights	• City Office	-	-	<1
3	Replace CFL Lights at End of Useful Life	• City Office • Community Building • Fire Hall	-	-	1 to 2
4	Lighting Study for School	• School and Industrial Arts Classroom	~10% to 40% savings in lighting electricity	-	-
5	Install Programmable Thermostats	• Fire Hall • Clinic • City Warm Storage Building	$1,500 to $3,000 (36.5 to 73.1 MMBTU)	$3,000	1 to 2
6	Retro-Commissioning of School	• School and Industrial Arts Classroom	~15% savings in electricity and heating oil	$35,000	1 to 3
7	LED Light Retrofit	• City Office, Youth Center, Tribal Office, Clinic	$5,400 (30.7 MMBTU)	$30,000	5.6
8	Add occupancy sensors	• City Office • Community Building • Clinic • Youth Center • Tribal Office	$1,660 (9.4 MMBTU)	$10,000	6
9	Perform Air Sealing to Reduce Air Leakage	• City Office Building • Tribal Office • Fire Hall • Warm Storage Building • Community Building	$1,250 to $2,500 (30.5 to 60.9 MMBTU)	$10,000 to $20,000	8

Top Five Low Hanging Fruit:

1. Controls Adjustments in simple buildings (turn equipment down or off, especially lights and thermostats and seasonal items, like boilers)
2. LED Lighting
3. Weatherization (especially crack filling, etc.)
4. ECM motors and self adjusting VFDs on pumps
5. Excess outside air (Fans running unnecessarily, Dampers stuck open)

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Client's Goal

Energy Audit

Project Development

Action

Goal!!!

- **Create Scope of Work**
- **Obtain Design/Engineering Costs**
- **Refining Contractor Costs**
- **Economies of Scale**
- **Financing**

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Hurdles…

Waiting for someone else to pay for it

Pay for waste

Pay for improvement

It’s an investment
(Internal Rate of Return)
(Net Present Value)

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Questions?

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Principal

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