

September 23 - 26, 2019 | Washington, DC



# APPA 1000™ TOTAL COST OF OWNERSHIP A NEW ANSI RECOGNIZED STANDARD

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# **Agenda**

- Relationship with Other Standards
- The ANSI Recognized APPA 1000™
   TCO Standard
- Scope of <u>Total</u> <u>Cost of</u> <u>Ownership</u>
- What is in the Standard
- Benefits of Total Cost of Ownership



### Institute of Asset Management Conceptual Model



# TCO Supports most aspects of Asset & Facility Management by...

...supporting customers and investors

...supporting strategic planning

...spanning the entire facility life cycle

...supporting decision making

...including organization and people in the costs

...helping to quantify risk

...using BIM as a common knowledge base for an asset



**TCO Provides the Metrics to Support Asset Management Decisions** 

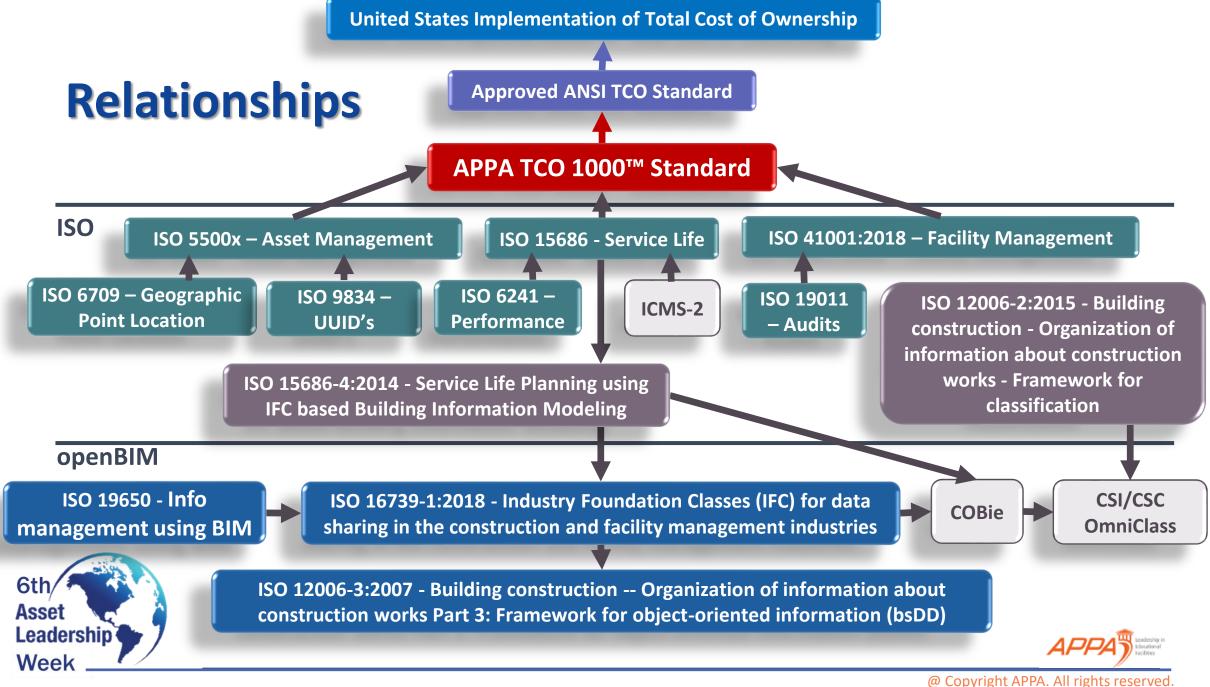
# **Scope of TCO Related Strategies**

- Asset Management (AM)
- Facility Management (FM)
- Building Information Modeling (BIM)
- Geospatial Information Systems (GIS)
- Smart Buildings
- Internet of Things (IoT)
- Many others applying to asset life cycles...









# Relationships

- Table Tracks TCO **Principles to Consensus Standards**
- Supporting **Foundational**, **Information Gathering** and **Integrity** Principles
- No consensus standards for **Decision** Making Principles other than this standard
- We are still not formalizing decision making but providing the basis for good fact-based decision making.





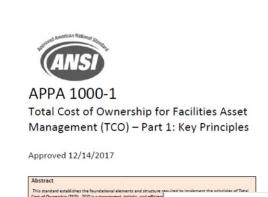
#### **Two Part Standard**

#### Part 1 – Principles

- Currently available from APPA Bookstore or ANSI Bookstore
- Completed December 2017

#### Part 2 – Implementation & **Data Elements**

- Currently out for Public Review – Copies available from APPA.
- To be completed Q1 2020



Cost of Ownership (TCO). TCO is a transparent, holistic, and efficie allocation. This standard outlines the process for owners and manpossible return on investment and allows for effective use of limit investment needs, and simplify data decision requirements by supp set, for purposes of maintaining a financially sustainable future for comprised of two parts: (1) Key Principles (this document), and (2) standard a part of the way your business and management process

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#### APPA 1000-2

Total Cost of Ownership for Facilities Asset Management (TCO) - Part 2: Implementation and Data Elements

equirements of increasingly more diverse consumers, escalating budgetary realities, and the threat of failure from aging assets require an asset management professional's response to be

vestment: how the investment is operating, how the investment is performing, how much additional financial commitment will be needed throughout the life-cycle of the investment and when to best recapitalize the investment in the asset. The impacts of consistent of

#### **Available for Public Review**

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# **TCO Strategy - Scope**

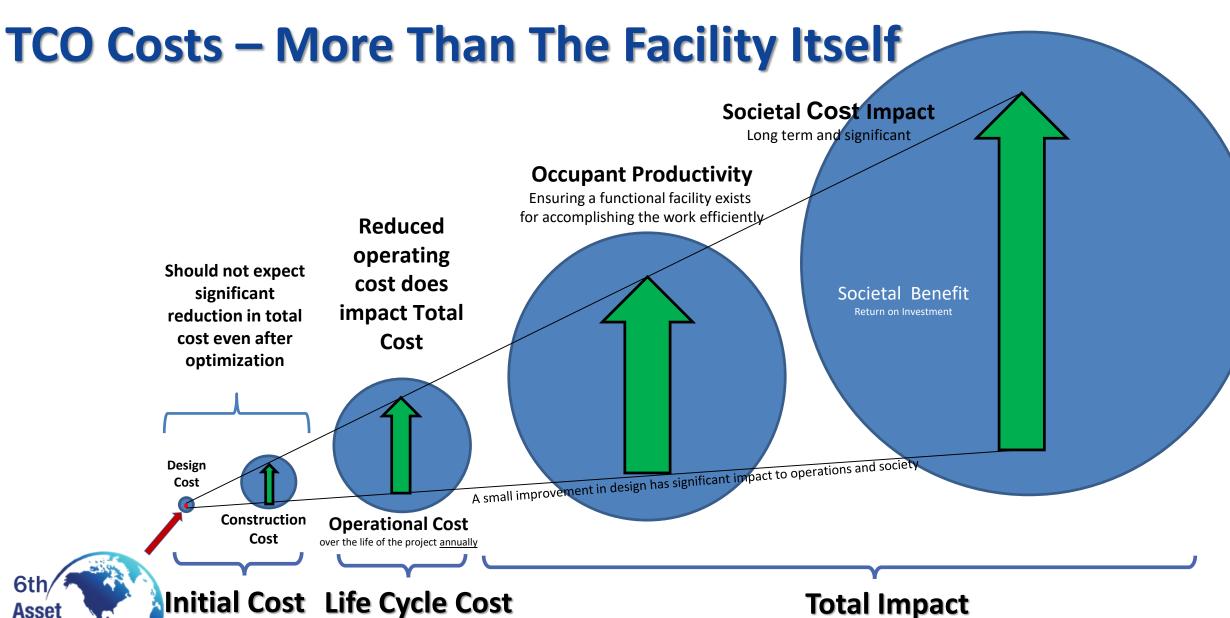
Leadership

- New products, facilities, and infrastructure asset selection decisions
- Existing facilities and infrastructure asset renovation or removal decisions
- Short- and Long-term financial planning, budget analysis, and reporting.

### **TCO Strategy - Scope**

- Applicable to owner occupied as well as leased facilities
- Independent of contracting methods in fact may help determine optimum contracting method
- Extremely scalable works for a single asset such as a piece of equipment up to an entire portfolio
- Works best when all assets and resources are considered, people, dollars, and things.
- It is a decision-making tool.





Initial Cost Life Cycle Cost

**Total Impact** 

**Total Cost of Ownership** 

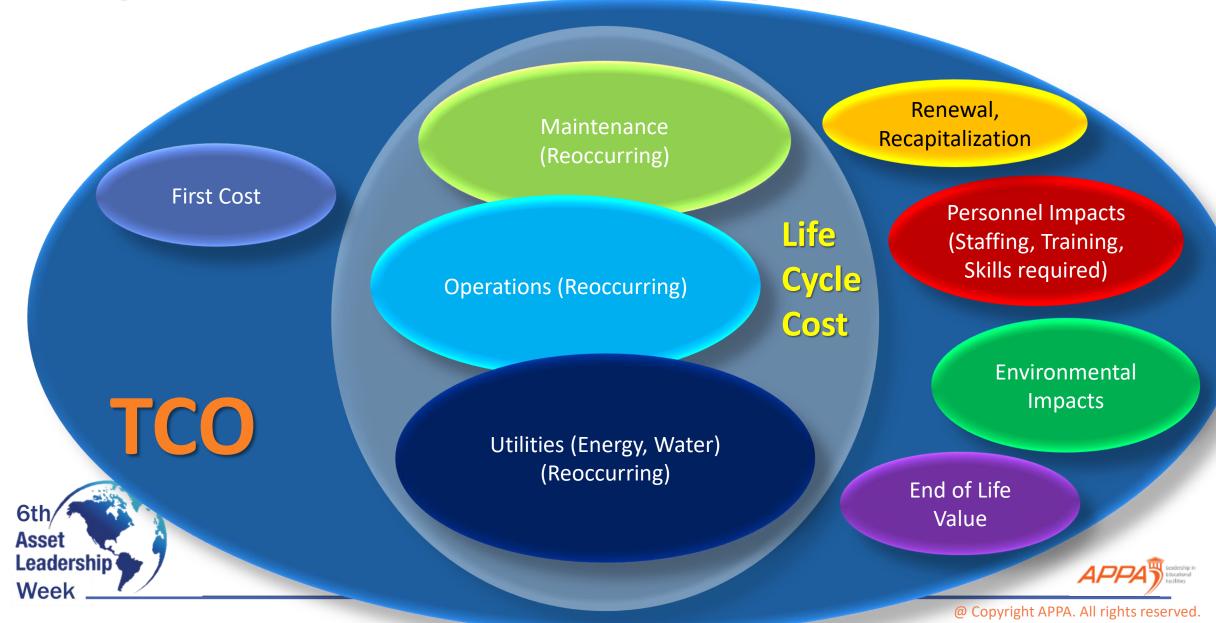




**Leadership** 

Week

# **Scope of Total Cost Of Ownership**



# **Awareness of APPA TCO Strategy - Formula**

$$TCO = \sum_{C_a} + \sum_{C_b} + \sum_{C_c} + \sum_{C_d} + \sum_{C_e}$$

#### Where:

C<sub>a</sub> = Initial Asset Costs / First Cost (one Time)

C<sub>b</sub> = Cost of **Operations and Maintenance** (Annual Recurring)

C<sub>c</sub> = Cost of **Utilities** (Annual Recurring)

C<sub>d</sub> = Cost of **Renewal** (Periodic Recurring)

Ce = Cost at End of Useful / Functional Life (One Time)





# **Awareness of TCO Strategy – APPA TCO Framework**

#### **Total Cost of Ownership Framework**

Initial Asset Costs / First Costs (One Time)
Planning and Programming
Acquisition
Design
Construction/Site Development
Commissioning
Operations and Maintenance (Recurring)
Lease or Rental
Maintenance
Operations
Overhead and Administration
Utilities (Recurring)
Renewal
Replacement
Programmatic Upgrades
Improvements/Enhancements
End of Useful / Functional Life (One Time)
Sale/Adaptive Reuse
Re-sale Value/Salvage Value
Removal
Site Restoration/Remediation

B.3	Operations						
B.3.01	Building Systems Operations						
B.3.02	Energy Management						
B.3.03	Moves/Setups						
B.3.04	Event Support						
B.3.05	Service Requests (Reimbursable)						
B.3.06	Custodial						
B.3.07	Grounds						
B.3.08	Snow Removal/Storm Events						
B.3.09	Pest Control						
B.3.10	Waste Management						
B.3.11	Recycling						
B.3.12	Fault Detection Diagnostics (FDD)						
B.4	Overhead and Administration						
B.4.01	Personnel and Training Costs						
B.4.02	Information Technology						
B.4.03	Technology (BIM, BAS/EMS, IWMS)						
B.4.04	Incentives						





# **Awareness of TCO Strategy – APPA Data Elements**

The actual location of the asset. This is important in differentiating onne asset from another. A **Sec Common Name** 

ne title used to identify the class. Usi

Seq	Common Name	Data Element	Level	Uni Type		Purpose	Dat	ta Element De	efinition	Key Principle Associated		1			
1	Project Title	PROJ_TITLE	1	NA		Analysis metadata	Title of TO	O project		05. Ass	et Cost	ing			
2	Status of Report	PROJ_STATUS		NA		Analysis metadata	pre-const	ruction forec	ast   at tender	05. Ass	et Cost	ing			
							during c	onstruction	actual costs of						
							constructi	on post-com	pletion						
							renewal f	orecast durin	g use   end of						
							life foreca	est							
3	Date of Project	PROJ_DATE	2	DATE		Analysis metadata	Date estir	nate prepare	d	05. Ass	et Cost	ing			
4	Revision number	PROJ_REV	2	NA		Analysis metadata	Version n	umber of esti	imate	05. Ass	et Cost	ing		_	_
5	Client Name	PROJ_CN	2	NA		Analysis metadata	Name of o	lient		05. Ass	et Cost	ing		Accet Delai	-
6	Main Project Type	PROJ_TYPE	2	NA				ne overal prje	ct type	05. Ass	et Cost	ing		Asset Relat	LEU
	Scope of Study	PROJ_SCOPE	2	NA	Seq	Common Name	Single acc	Appendix A Reference	Data Element	OF Acc	Level	Unit Type	Purpose	Data Element Definition	Key Princ
_	Address	PROJ_ADDR	2	NA	1	Asset Name		N/A	ASSET NAME		1	N/A	Identification	The name of the asset	01. Mar
	City	PROJ_CITY	2	NA			- 4				_		Unique	A brief passage used to describe the scope and typical	
10	State / Province	PROJ_STA	2	NA	2	Asset Description/[	Definition	N/A	ASSET_DESCR		2	N/A	identification	contents of the class in question. Usually not normative.	01. Ma
11	Zip / Postal Code	PROJ_ZIP	2	NA										Abbreviations and acronyms that are often referenced with	
12	Country	PROJ_CNTRY	2	NA										respect to the subject matter of a specific classification. In	
13	Currency Type	PROJ_CUR	2	NA	. 2	Asset Abbreviation		N/A	ASSET_ABREV		2	N/A	Short descrition or	some cases, the Classification Title may be commonly	01. Ma
14	Base date of costs	PROJ_BASE_DATE	2	DATE		A33Ct Abbicviation		nyn roseigionet			-	111/7	common reference	referred to with an abbreviation or acronym, which is	01. 1410
15	Price Basis	PROJ_PRI	2	NA										typically cited as an informative cross reference to assist users.	
16	Conversion Date	PROJ_CON	2	DATE	4	Asset Type		N/A	ASSET_TYPE		2	N/A	Туре	Indicator of asset type - Object, O&M (Service Contract), Custodial, Faciliy, Grounds, or Parcel	01. Ma
17	Exchange Rate	PROJ EXC	2	NA	5	Asset Status		N/A	ASSET_STATUS		2	Each		The current contition of the asset	02. Ass
1/	Exchange Nate	FROJ_EXC		INA.	6	Asset Criticality		N/A	ASSET_CRITICA	L	2	N/A		The criticality of the asset to the organization	02. Ass
18	Project Status	PROJ_PRO	2	NA	7	Asset Current Repla Value	acement	N/A	ASSET_CRV		2	\$ USD	For Cost Principle	The eplacement cost of the asset	02. Ass
					8	Asset Installation D	ate	N/A	ASSET_INSTALL	ED	2	Date		The date the asset was installed	02. Ass
					9	Asset Age		N/A	ASSET_AGE		2	Years	Life Cycle	The age of the asset	02. Ass
19	Construction Period	PROJ_CON	2	MO		Asset Life Expectan	icy	N/A	ASSET_LIFE_EXE		2	Years	Manufacturer	The life expentency of the asset	02. Ass
20	Construction Start Date	PROJ_START_DATE	2	DATE	11	Risk Level		N/A	ASSET_RISK_LE	/EL	2	Each	Reliability	The level of risk of failure	02. Ass
D	roject [	Polate	~	1	12	Bar Coding		N/A	ASSET_BAR		1	Each		Labeling and location each building component for reliable tracking and cross referencing equipment to the CMMS systems PM programs, Manuals, Parts lists and history.	03. Global L

N/A

N/A

ASSET\_LOC

CLASS\_TITLE

CLASS\_ID

ASSET\_VISABILITY

N/A

N/A

1 N/A

Location

Common Data
Elements allow for improved data verification and confidence when sharing data

#### **Project Related**

13 Asset location

4 Underground Utilizes / Assets

Classification Title

lassification Identifier



#### Metadata – Data about the data

				Type		
1	Metadata -	MET_KEY	1	N/A	Identification	Key for Metadata
	Metadata - Purpose of entry	MET_PUR	2	N/A	Identification	Reason for metadata such as new entry, update, deletion
2	Metadata - Authorative Source	MET_AS	2	N/A	Identification	Name of authorative Source
3	Metadata - Role of Authoratitive Source	MET_AS_ROLE	3	N/A	Identification	Role of of authroative source
5	Metadata - Contact information - Email	MET_AS_EM	3	N/A	Identification	Contact information for authoratititve source - email
6	Metadata - Contact information - Phone	MET_AS_PH	3	N/A	Identification	Contact information for authoratititve source - phone
7	Metadata - Contact information - Address 1	MET_AS_ADD1	3	N/A	Identification	Contact information for authoratititve source - address 1
8	Metadata - Contact information - Address 2	MET_AS_ADD2	3	N/A	Identification	Contact information for authoratititve source - address 2
9	Metadata - Contact information - City	MET_AS_CITY	3	N/A	Identification	Contact information for authoratititve source - City
10	Metadata - Contact information - State	MET_AS_ST	3	N/A	Identification	Contact information for authoratititve source - State
11	Metadata - Contact information - Postal Code	MET_AS_ZIP	3	N/A	Identification	Contact information for authoratititve source - Postal Code
12	Metadata - Contact information - Country	MET_AS_COUNTRY	3	N/A	Identification	Contact information for authoratititve source - Country
	4 2 3 5 6 7 8 9 10 11	4 Metadata - Purpose of entry 2 Metadata - Authorative Source 3 Metadata - Role of Authoratitive Source 5 Metadata - Contact information - Email 6 Metadata - Contact information - Phone 7 Metadata - Contact information - Address 1 8 Metadata - Contact information - Address 2 9 Metadata - Contact information - City 10 Metadata - Contact information - State 11 Metadata - Contact information - Postal Code	4         Metadata - Purpose of entry         MET_PUR           2         Metadata - Authorative Source         MET_AS           3         Metadata - Role of Authoratitive Source         MET_AS_ROLE           5         Metadata - Contact information - Email         MET_AS_EM           6         Metadata - Contact information - Phone         MET_AS_PH           7         Metadata - Contact information - Address 1         MET_AS_ADD1           8         Metadata - Contact information - Address 2         MET_AS_ADD2           9         Metadata - Contact information - City         MET_AS_CITY           10         Metadata - Contact information - State         MET_AS_ST           11         Metadata - Contact information - Postal Code         MET_AS_ZIP	1         Metadata -         MET_KEY         1           4         Metadata - Purpose of entry         MET_PUR         2           2         Metadata - Authorative Source         MET_AS         2           3         Metadata - Role of Authoratitive Source         MET_AS_ROLE         3           5         Metadata - Contact information - Email         MET_AS_EM         3           6         Metadata - Contact information - Phone         MET_AS_PH         3           7         Metadata - Contact information - Address 1         MET_AS_ADD1         3           8         Metadata - Contact information - Address 2         MET_AS_ADD2         3           9         Metadata - Contact information - City         MET_AS_CITY         3           10         Metadata - Contact information - State         MET_AS_ZIP         3           11         Metadata - Contact information - Postal Code         MET_AS_ZIP         3	1         Metadata -         MET_KEY         1         N/A           4         Metadata - Purpose of entry         MET_PUR         2         N/A           2         Metadata - Authorative Source         MET_AS         2         N/A           3         Metadata - Role of Authoratitive Source         MET_AS_ROLE         3         N/A           5         Metadata - Contact information - Email         MET_AS_EM         3         N/A           6         Metadata - Contact information - Phone         MET_AS_PH         3         N/A           7         Metadata - Contact information - Address 1         MET_AS_ADD1         3         N/A           8         Metadata - Contact information - Address 2         MET_AS_CITY         3         N/A           9         Metadata - Contact information - City         MET_AS_CITY         3         N/A           10         Metadata - Contact information - State         MET_AS_ST         3         N/A           11         Metadata - Contact information - Postal Code         MET_AS_ZIP         3         N/A	1 Metadata - MET KEY 1 N/A Identification 4 Metadata - Purpose of entry MET PUR 2 N/A Identification 2 Metadata - Authorative Source MET AS 2 N/A Identification 3 Metadata - Role of Authoratitive Source MET_AS_ROLE 3 N/A Identification 5 Metadata - Contact information - Email MET_AS_EM 3 N/A Identification 6 Metadata - Contact information - Phone MET_AS_PH 3 N/A Identification 7 Metadata - Contact information - Address 1 MET_AS_ADD1 3 N/A Identification 8 Metadata - Contact information - Address 2 MET_AS_ADD2 3 N/A Identification 9 Metadata - Contact information - City MET_AS_CITY 3 N/A Identification 10 Metadata - Contact information - State MET_AS_ZIP 3 N/A Identification 11 Metadata - Contact information - Postal Code MET_AS_ZIP 3 N/A Identification

# **Awareness of TCO Strategy – Principle Relationship**

C-3.1.5 Asset

Costing

C-3.1.6 Asset

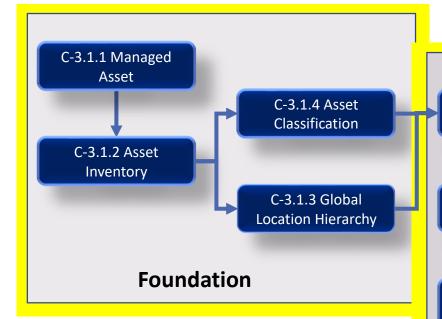
Inspection

C-3.1.7 Asset

Performance

**Information** 

**Gathering** 



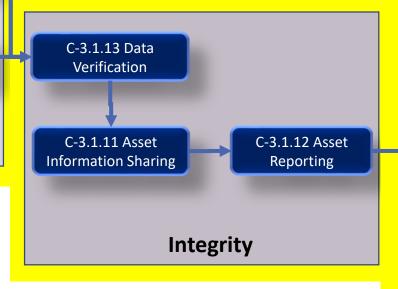
Strong asset management.



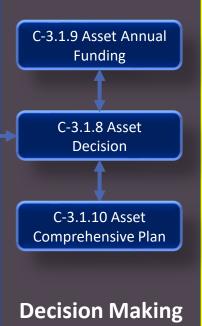


Information gathering from the authoritative source

**Ensure information visibility** 

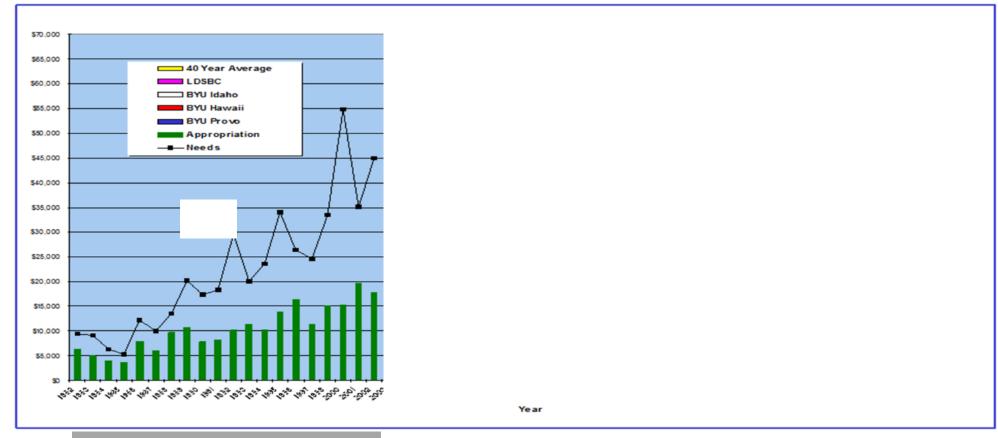


**Yields strong decision making** 



#### **Case Study - Recapitalization**

The number of years required to replace or renovate facilities at a given level of investment. The recapitalization rate is computed by dividing recapitalizable plant replacement value by total restoration and modernization investments.





Sample from a multi-campus university



# Why TCO and Why Now?

- The Information Age is maturing, and the Connected Age is rising
  - Internet of Things (IoT)
  - Digital Twins
  - Building Information Modeling (BIM) and Geospatial Information Systems (GIS)
  - <u>Total Cost of Ownership (TCO)</u> provides the metrics for assets
- Information is available throughout the asset life cycle
- New standards are in place to make information interoperable
- Key has always been collecting information one time from the original source and reusing it – not re-collecting it and not reentering it!
  - Manufacturer
  - Designer
  - Authoritative Source
- Virtually all information is now available electronically

We need a
Common
Operating
Picture for
all assets



**Digital Twin in Facilities** 

- BIM based concept information rich model
- Can be implemented for any level of assets – equipment, space, facility, infrastructure or entire portfolio
- Use total cost to help make decisions

#### **Real Life**

Provides current day telemetry

 Has associated information that must be kept with the object



- Allows for simulation of past and future conditions
- Try out strategies and fast forward to predict results





#### **APPA Certified TCO Education**

The Standard is but the first Step....

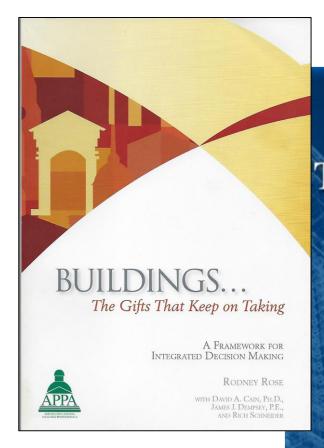




...APPA is committed to helping users implement the APPA 1000 standard!

Watch for a series of educational tools to support this effort beginning early 2020!

# For More Background Information...



BUILDING

Total

**E**nterprise

Asset

Management
Solutions

A Guide to Capital Needs Analysis

Douglas K. Christensen Cameron R. Christensen

Foreword by
E. Lander Medlin
Executive Vice President, APPA



Cameron





The APPA 1000™ TCO standard is available from ANSI and APPA. Part 1 – Principles is currently available. Part 2 – Implementation and data elements is expected to be available Q1 of 2020. Please visit the ANSI or APPA web sites to procure your copy.



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