



HOW TO...

How to Build Your Data Center Facilities Cost Model

A step-by-step guide for building a model to determine data center costs and communicate them to business stakeholders on an ongoing basis.

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Determining what your data center is costing your organization exactly is challenging. Understanding all the cost components enables accurate, fact-based decision making. Often costs are compartmentalized among different departments. Some costs are simply not recognized at all.

We cannot make informed strategic decisions without the right data. Many of us are asked the following questions and expected to provide accurate answers:

- What are the all-in costs of operating this data center?
- What are our projected data center costs in the future?
- How does our investment in data center compare with our peers?
- How does our data center compare with other delivery options from a cost perspective?
- What cost metrics should our organization be tracking?
- How might we structure our reporting to gain further insights into our costs?
- How can we use accurate information to make better short-term and long-term decisions?

This article will provide you with step-by-step guidance for a practical approach to creating a Data Center (DC) Cost Model. Just keep in mind, you will still have to do the homework.

Approach

First, here are some suggestions regarding your approach. It's important that you get it right from the start, or your final cost model may be inaccurate. That said, start here.

Decide what you will be measuring. This is largely a function of what provides the most value and what answers management seeks. You will want to group costs by category and determine in advance how extensive an effort will be required. Most begin with the facility as the starting point. The categories in the table below are listed in order of relative ease of creating a cost model and include:

Category	Information Uses
Facility	Benchmark against: a) other data centers in your <u>organization</u> ; b) other enterprise data centers; c) colocation offerings
People	Benchmark <u>against</u> : a) other enterprise data centers; b) Managed Service Providers (MSPs)
IT infrastructure	
Communications	
Applications	Same as above, plus SaaS providers

For this discussion, we will focus on facilities.

Determine timeframe. The useful life of a data center is typically 15 years. While a great many of them are older, statistically will find that after 15 years the physical infrastructure needs to undergo multiple aspects of equipment replacement. As you think about data center cost modeling, a longer view provides better perspective. Therefore, document annual costs along with at least 5-year and 10-year perspectives. This will be helpful if you are using this data to compare against a colocation model.

Leverage existing available talent. Make things easy on yourself. Chances are because you are in IT, you don't have much finance experience. Maybe it's limited to assembling your data center budget or submitting line items for it (more about that shortly). The first thing you need to do is enlist someone from your finance team to help you with this endeavor. That person not only knows a lot more than you, but they know how best to package and present the data!

This person can:

- Recommend, or better yet, produce the information in a format that stakeholders inherently understand. Ever get a report that is difficult to read? The data is correct, but it is not organized in a way that your organization consumes data. The initial response is often to discount, ignore, or possibly reject it. Or maybe, at best, the executives tell you to reformat it.
- Provide guidance in what matters to your organization. As financial priorities or interests change over the years, the finance person is most likely attuned to the latest thinking by management.
- Save you hours of work, especially if they help with doing the homework!

For those organizations without much bandwidth in their finance departments, this is a great exercise for an intern.

Leverage existing available data. Much of the data you need you already have. A key source is the budget for the data center. This will provide you with costs currently being applied and how they are categorized as well as tracking codes for each category. However, some of it will come from other sources, particularly if you are not in a freestanding data center. Sources include facilities (e.g. utilities) and finance groups (e.g. actual costs vs. estimated costs from your budget) as well as third parties, such as your equipment maintenance providers.

Whatever source or methodology you use, document from where it was generated! Use actual costs from finance/accounting. It helps if you use the same nomenclature for cost line items. Accounting-assigned cost codes are a valuable reference. Most of the lines in your model should have this reference, and since your model will be more granular than a budget, the accounting reference number will appear on more than one line item in the data center cost model.

If the cost item is being calculated, provide the formula/methodology you used. The goal is to develop a transparent model that can be improved as additional/better data sources become available. Additionally, include all possible relevant line items, not just those for which you have numbers. If the data does not exist, enter it as a zero cost. That prompts the discussion of whether this category should be included.

Leverage a cost modeling tool that's easy to understand. Excel. Enough said.

Working Through the Process

Let's review and address some of the cost categories.

General Cost Items. These are costs that apply across the board.

Escalation. Since your model will encompass multiple years, you will need to decide how to apply cost escalation or inflation. The simplest method is to provide an annual escalation value across the board. The other extreme is to apply it by line item. A happy medium is to apply escalation across the board and alter those in which you have the most knowledge.

Depreciation. When including equipment replacement in the cost model, you'll also need to consider how your organization depreciates assets.

Utilities. If you do not already have this information, check with your facilities or finance departments.

Electrical. From an electrical perspective, not having your data center metered separately will be challenging. If this is the case, consider this methodology: use PUE (Power Usage Effectiveness) to determine total data center electrical costs.

What is PUE, and how do I calculate it?

Power usage effectiveness (PUE) is a ratio that describes how efficiently a computer data center uses energy, specifically, how much energy is used by the computing equipment (in contrast to cooling and other overhead). Anything that isn't considered a computing device in a data center (i.e. lighting, cooling, etc.) falls into the category of facility energy consumption. $PUE = \text{Total Facility Power} / \text{IT Equipment Power}$.

For the facility load, take the power reading from the ATS(s) (Automatic Transfer Switch) serving the data center. Here, we assume that the ATS serves just your data center. If additional areas/equipment are supported outside the data center, you will have to factor them out (and remember to document your assumptions). The ATS may have a meter to access the data. If not, look on the generator inspection reports to see the reported load when tests were done. In either case, it is best to have several data points mapped out monthly for an entire year. This way, seasonal fluctuations can be considered. For IT load, use the UPS load that corresponds with the load data from the ATS or Generator Inspection Report. Once you have the data, use $\text{UPS load} \times PUE \times \text{Utility Rate} (\$/\text{kWh}) \times 8,760$ (hours in a year).

Here's an example for calculating with the above methodology:

<u>Electrical Usage Calculation</u>		
IT Power Usage (kW)	300	<i>from UPS</i>
PUE (Power Usage Efficiency)	x 1.65	<i>calculated per above</i>
	x 8,760	<i>hours in a year</i>
Total Annual Power Usage	4,336,200	
Power Cost/kWh	<u>\$0.065</u>	<i>your power rate</i>
Annual Power Cost	<u>\$ 281,853</u>	

Diesel fuel. You may have a third-party fuel distributor, or your generator service contractor may serve as one. They should know and be able to tell you:

1. The typical annual consumption based on testing (regularly scheduled testing + minor and major PMs + load bank)
2. The consumption associated with unplanned run-time. You'll want to review a five-year period to determine an average annual cost. The year-over-year values could fluctuate significantly if you have experienced an extended outage in one year. Again, state your assumptions!

Facilities staff. With freestanding data centers, accounting for facilities staff is straightforward. In a shared real estate model, it can become more difficult. If your facilities department is charging you for work performed, then this is simply an exercise in obtaining that data just as you would for a third-party contractor. At some organizations, facilities support might not be charged, but this remains a cost it bears to service the data center. Under this scenario, request data on hours worked annually and average labor rates.

Building. Freestanding data centers also have direct costs such as general building maintenance (e.g. lighting, HVAC, custodial services). Consider exterior costs such as land care and snow removal. Other directly related services, like security, may be included. Your organization may use a per-square foot metric that reflects an all-in cost covering a myriad of building services including a rent allocation for your data center.

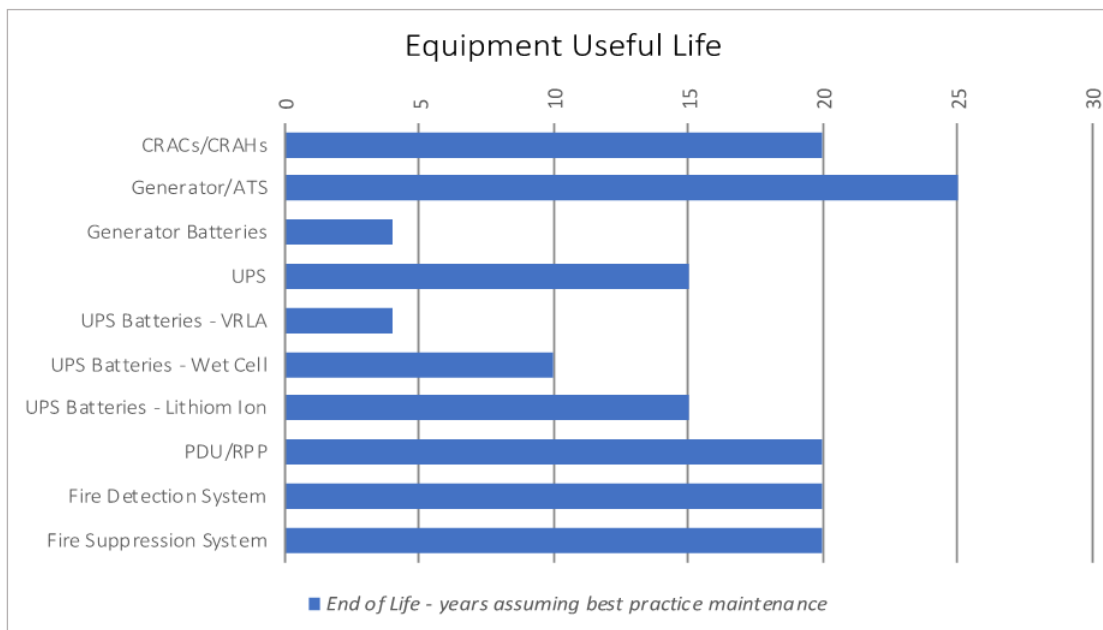
Organizing Costs by Facility-Centric Category and Major Asset

Stakeholders are most familiar with organizing cost by facility-centric disciplines and/or major facility asset items. To get the required granularity, consider using both in a hierarchical format. Invest time setting up and reviewing the structure among stakeholders to ensure that all concur and, most importantly, understand it. The team will be using this tool for a long time.

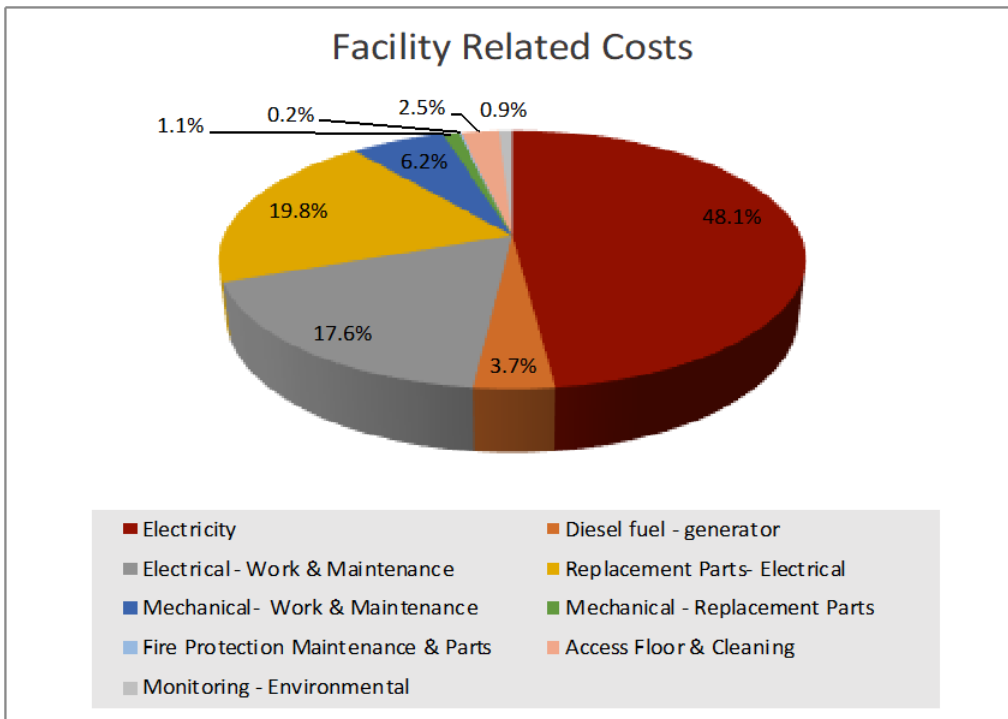
Major Category	Minor Categories	Sub-categories	Sub-sub-categories
Architectural	Work & Maintenance, Replacement Parts/Equipment	Access floor, cleaning, room integrity	Parts
Mechanical (including Plumbing)	Work & Maintenance, Replacement Parts/Equipment	CRAC/CRAH, heat rejection, CFD modeling, PM, major repairs	Parts, compressors, fans
Electrical	Work & Maintenance, Replacement Parts/Equipment	Switchgear, generator, ATS, UPS, PDU/RPP, IR scanning, PM, major repairs	Batteries, UPS fans/capacitors
Fire Protection	Work & Maintenance, Replacement Parts/Equipment	Detection system, suppression system, PM	Pre-action, air sampling, gaseous agent
Systems	Work & Maintenance, Replacement Parts/Equipment	Equipment monitoring, BMS, access control, cameras, PM	Licensing, testing

Asset Changes and End of Life

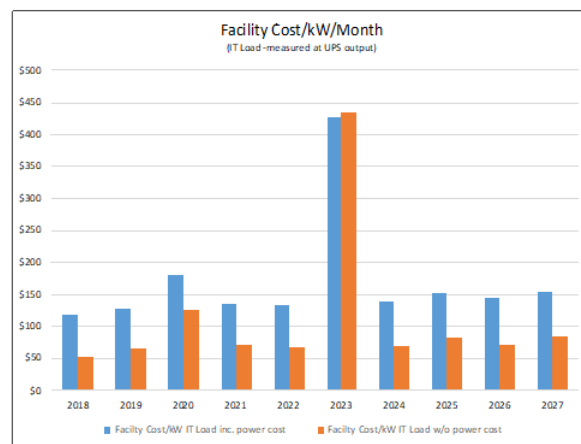
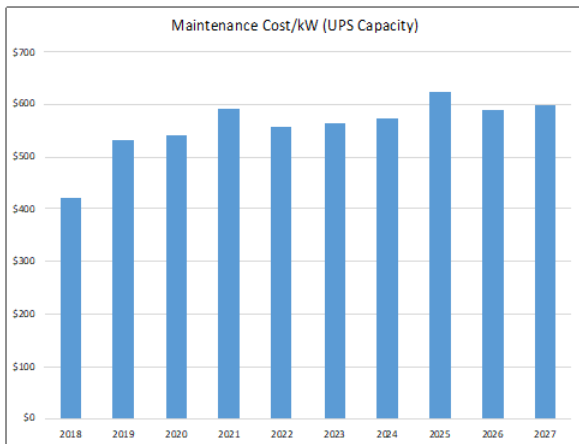
Are you compiling the total data center costs over the next 10 years or so? If so, you should factor in major repairs and large-ticket replacement items. Your vendors and contractors can provide that information. You'll also need to include equipment that will reach end of life. Here are some rules of thumb to follow with respect to the useful life span of equipment. Keep in mind, however, that you will need to verify relative to your specific situation or your accounting policy.



Assembling the Data



Power is a significant cost factor



Consider developing metrics for benchmarking

Review, Improve, and Master

Once completed, review your tool with management to ensure they understand it and they appreciate its value. Be prepared to make changes to better suit their ability to absorb the information. Invest effort to continually improve accuracy of data and data capture methodologies. Keep management informed of improvements, as it will keep them engaged and it will reinforce the tool's value (and yours!). Keep up with new industry metrics, both data center-centric and ones specific for your industry, so you can include them in your reporting. Master the data so you can have a seat at the table and influence the outcomes! Good luck!

About the author: Tad Davies is president of Fodere Consulting. He has been focused on data center strategies since 1987 and consults regularly with data center and executive teams. He advises clients on business centric strategy issues such as consolidation, colocation selection, build vs. buy, cost modeling and facility centric strategy issues such as risk assessment, new data center programming, owner's representation, and energy improvement. Tad is a board member of AFCOM's Data Center Institute. He graduated from Tulane University's School of Business with a Bachelor of Science in Management.

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