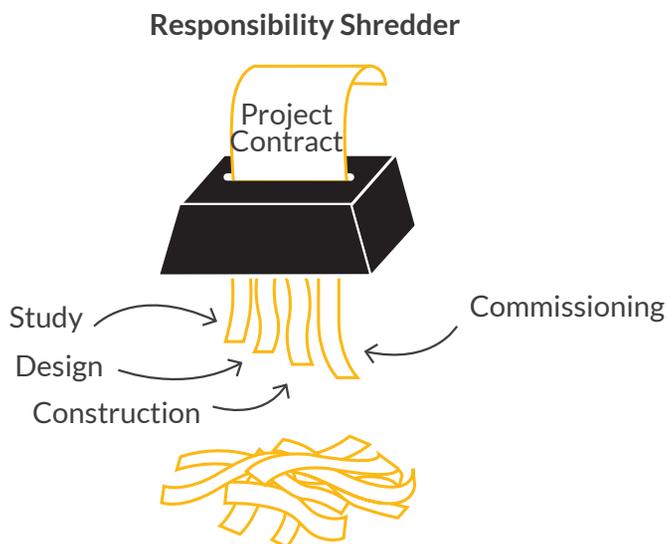


# Shortcomings of a Fragmented Approach to Design and Construction

The traditional Design-Bid-Build model for procuring construction projects splits the project into phases. The owner puts each phase out for tender and typically the lowest cost bid wins. Usually, each phase is performed by a different contractor.

In essence, the traditional model acts to shred responsibility into strips, with each strip handed to a different contractor: Scoping Study, Design, Construction, Commissioning, and Measurement of outcomes. The advantage of separating the project into strips allows for comparisons between smaller bits.

When applied to electro-mechanical asset renewal projects, this model may be effective for simple equipment replacement. However, when it comes to electro-mechanical modernization projects with transformative goals, complexity is “built-in.” As a result, the negative impact of these main side effects amplifies:



## Side Effect 1 Fractured Responsibility:

Project phases are split between multiple parties and none are accountable for overall project outcomes. The owner is left on their own to address issues with the energy system after project completion.

## Side Effect 2 Misalignment of Interests:

The system of payment turns contractors' motivations against each other. The interests of the contractors are misaligned with the goals of the owner.

## Side Effect 3 Drawn-out Project Timelines:

The sequential nature of the traditional model typically results in longer schedules and delays.

To address these issues with the traditional approach for procuring electro-mechanical modernization projects, a different contractual model has emerged. An integrated procurement model puts the focus back on meeting the owner's desired outcomes. Contractors are held contractually accountable to and rewarded for meeting project goals.



## Side Effect 2

# Misalignment of Interests

### Scenario B:

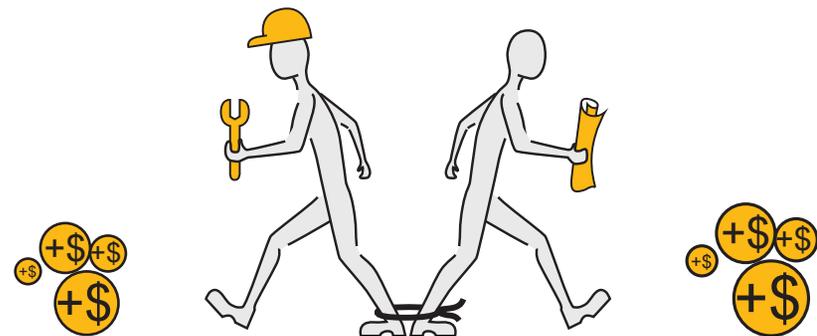
The design firm is motivated to rush as quickly as possible towards handing off the design, at which point their responsibility ends. The construction contractor is motivated to find errors and omissions in the design, so they can submit change orders and charge extra.

Each contractor's motivation directly counters that of the other. Neither set of interests is aligned with the owner's goals. Furthermore, to reduce their costs, design firms are often motivated to assign projects to their lowest paid employees, juniors with less experience. Sometimes, design firms are paid based on overall project cost. In this case, they are motivated to produce designs that are expensive to implement, which increases the projects' overall cost.

Another fallout of goals misalignment is that many engineers overdesign plant equipment, valves and pipes to account for uncertainty. It is the mentality of bigger is better: "If it is oversized, it will work. If it is undersized, it will not work" and nobody wants to be in the latter position. However, oversizing equipment may affect safety, interrupt operations, increase operating costs and consequently reduce profitability.

Similarly, construction contractors are frequently selected based on price and make their money from change orders. They will often bid low to secure a contract, knowing changes will be made during construction for which they will charge extra. To be selected, contractors are motivated to bid low with the intention of increasing the price over the life of the project, which again, increases the overall project cost. In addition, construction contractors are motivated to use the cheapest suppliers or tradespeople.

This misalignment of interests hampers collaboration and knowledge-sharing among contractors. Goals are left unaddressed. The owner is at risk of ending up with a less effective energy system, plus increased costs, delays and needless aggravation.



## Side Effect 3

# Drawn-out Project Timelines

### Scenario C:

In a complex project, phases are executed sequentially. This creates artificial prerequisites, as usually many tasks can be performed in parallel.

Since the design firm is not responsible for construction, they do not automatically consider constructability while drafting designs. Such designs may be difficult to implement, which means the construction phase will cost more and take longer. As mentioned above, the design firm may even have incentive to do this, depending on the method of payment.

The process of soliciting contracts for each phase is often itself time consuming. This process cannot begin until the previous phase is completely finished. Construction contractors are unlikely to give quotes without seeing a finalized design.

Again, as mentioned, the traditional model assumes no surprises during a project. Yet unforeseen challenges are inevitable. Old design drawings of the facility and its existing HVAC system may not accurately reflect reality. Parts arrive with unexpected fittings, so that elements of the system don't connect properly.

In the traditional model, for these unforeseen challenges to be addressed, the construction contractor issues a change order to the owner, who sends it back to the design firm. This results in delays. These changes and delays increase the cost to the construction contractor, who then transfers it onto the owner.



# An Integrated Model

For electro-mechanical modernization projects to succeed, owners need a solid method for holding contractors accountable and aligning contractor interests with their own goals.

Whether the owner chooses a sole accountable partner or a consortium, the main purpose is to have a single entity responsible for achieving project outcomes. This partner is responsible for managing all phases of the project: Scoping Study, Design, Construction, Commissioning, Training, Measurement of Outcomes, Etc.

Now, if the owner is unhappy about any aspect of the project, it's clear who is responsible. The project partner takes on project liabilities that would otherwise fall to the owner and is accountable to their desired outcomes. The project partner offers a fixed price, with no extras, and takes on the exposure to increased costs related to unexpected discoveries. Surprises can then be addressed quickly and efficiently, because design and construction are completely integrated.

Since the project partner's profits are directly linked to owner goals, their interests are aligned. Greater trust and cooperation are developed. Trust and transparency can also be promoted by providing leading indicators for each project milestone and close collaboration with the owners to give them the confidence they need and ability to monitor progress towards outcomes.

With the project partner responsible for both design and construction costs, they have incentive to think about constructability during the design phase. In addition, through knowledge-sharing and by being involved in all phases of the project, the project partner gains a deep understanding of the facility. This greater understanding also aids in reducing errors and producing superior designs. Since design and construction are linked, additional improvements can be made as knowledge is gained throughout the project.

Being paid based on successful completion of outcomes means the project partner must follow up and may have to address issues long after the project is completed. Results are verified yearly during the guarantee period. Because the project partner remains responsible for outcomes after project completion, the owner isn't left on their own to face challenges. If the owner's operations and maintenance staff have questions or are facing a difficult challenge, they know whom to contact.

Ultimately, the solution is to refocus on outcomes. Make contractors accountable to them. Align contractors' interests towards project goals to re-establish trust and collaboration.

