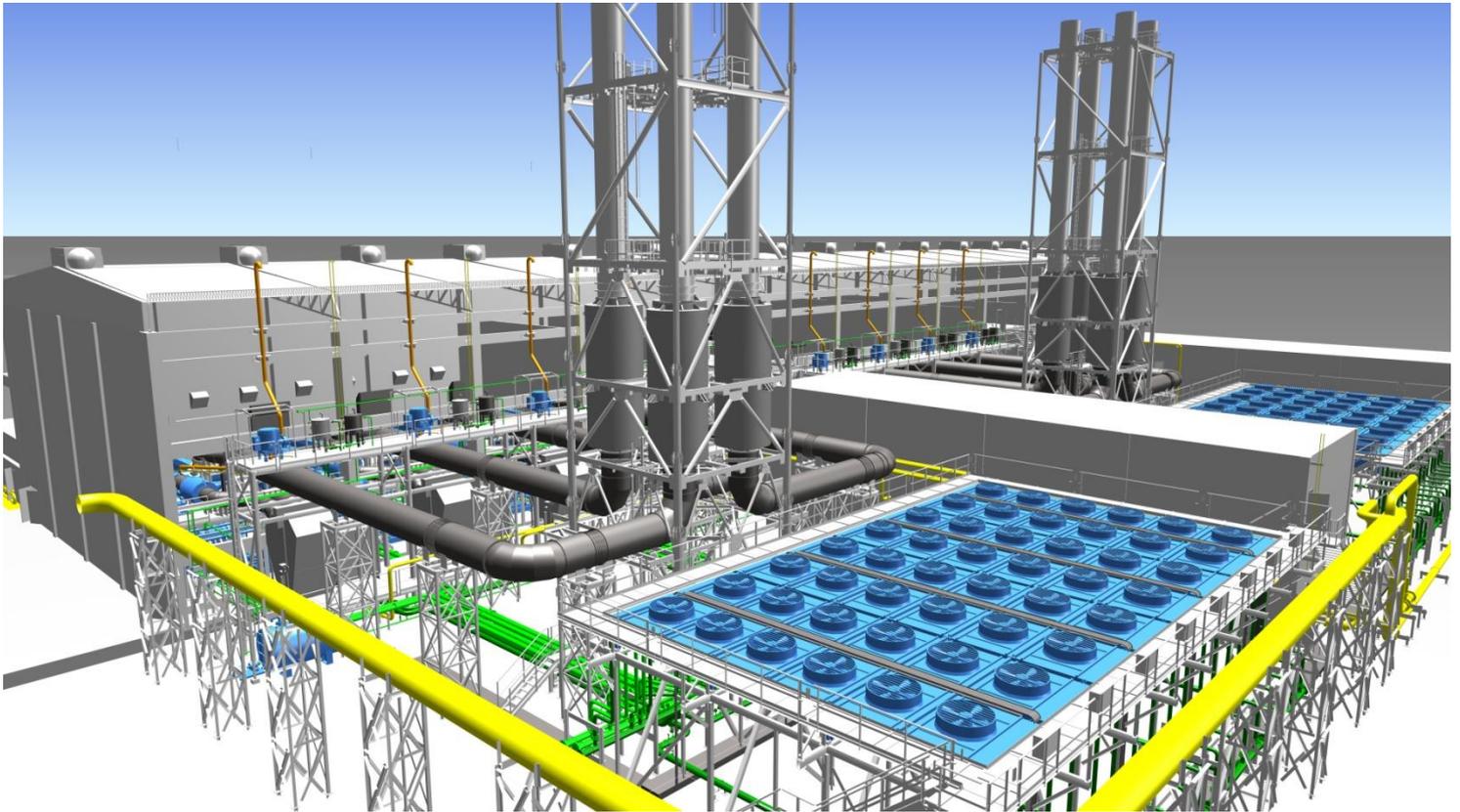


# Modularisation- A New trend

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Digital Engineering and its visual simulation capabilities make it possible to look, see, experience and construct. However, this is just scratching the surface when it comes to application of these tools to engineering design. New business models and service delivery options are being discovered from plant engineering for power plants to steel and metal process industries and more. The challenge of the day is reducing cost and project time overruns. These two aspects are key for profitability. Bringing in business process efficiency and using digital engineering tools to implement these processes is the new business model that is being fast adopted by visionary organizations. The automotive industry and manufacturing plants have used standardization and modularization to bring about efficiencies in production. Applying this concept to plant engineering, can design solutions be modularized and put up on the shop window? The answer apparently is YES, Indeed!

Plant facilities such as power plants for single cycle and combined cycle have certain standard elements and certain site specific requirements in design engineering. The standard elements for various disciplines of plant engineering can be mapped and standardised for re-use and the rest of the plant can be designed as per specifications so that turnaround time and costs can be drastically

reduced. Essentially this approach entails dividing a plant into modules that are standardized and then replicated multiple times.

## **Modularisation scenario**

In the case of power plants, the modularisation concept involves developing a Power Island detail design with modular concept for the most competitive combined cycle plants, which can be replicated to reduce plant installed cost and schedule. The modularisation strategy considers all disciplines such as Civil, Structural, Mechanical, Electrical, Instrumentation etc. The market differentiator is set with goals to fast track commissioning time. Even as the Power Island is designed, the sales process is pipelined such that fast tracking in sales process, design and build is fully realized through cost savings, power output efficiencies and super-fast project commissioning. Overall operational flexibility, fast ramp-up to full load, compact footprint, reduction in installation and construction costs, lower project risks, reduced operation & maintenance costs, enhanced reliability & availability and ultimately lower cost of electricity can be achieved.

Modularization approach is initiated right from design, procurement, contracting, going all the way till construction of plant equipment and systems; these enable reduction of site construction hours and manage shorter project timelines. It includes skids, pre-assemblies, main equipment and process structures such as but not limited to HRSG, Pumps, IDCT, equipment and other structures like pipe racks & sleepers. For instance, design engineering and detailed engineering of Gas Turbine & Auxiliaries, Bypass Stack, Fuel Gas System, Liquid Fuel System, Plant Water System (SC), Fire Protection System, PCM, Electrical Switchyard, Civil Construction: GT/ Skids & Electrical Equipment Foundations, Fuel Tank Dyke / Plant Roads, Sleepers, etc. may be modularized, standardized and reused in the case of a simple cycle plant with almost zero design changes or clashes.

The key to the success of the modularization principle is the appropriate plot plan and summary with relevant standardization for each module. Clear guidelines and a well defined business case for each module, drawing clear lines on the extent of standardization, customization and re-use of designed modules make for a successful fast-tracking of standard power plants for a given capacity.

This novel business process involves creating a library of pre-designed modules using multiple disciplines (engineering, commercial, and procurement). Engineering design tools are used to access finalised modules and equipment lists complete with purchasing agreements for replication. Based on requirements, customization specific to a particular site is planned and integrated. Additionally, toll-gate processes are introduced in project management such that at each toll-gate stage, there is a parallel alignment of sales process. This speeds up the entire design-execution-production-sales cycle by up to 50% when compared to the traditional process.

## **Integrated engineering design with digital tools**

Efficiencies in engineering are brought about by the synergy of business process, engineering, digital simulation and final construction, installation and commissioning.

Standardisation and modularisation have been possible with the aid of integrated engineering design tools that integrate various disciplines, planning, design, modelling and simulation tools. Most relevant at this stage in project management is one key concern that organisations must necessarily consider. The advantages of fast-tracking such projects need to be sustained and not lost to delays in construction due to constructability issues and clashes. The support of advanced digital engineering solutions such as 4D tools will make the fast tracking goal meet its logical finish line. Yet another factor is the selection of appropriate digital engineering tools and integrating every discipline within the various applications. The entire cycle of plant design planning, modelling, migrating modules to integrated plant engineering suites, progressing to construction planning/scheduling and finally construction simulation for better predictability and study of what-if scenarios before one actually goes to site, comprise the integrated engineering design system workflow. This is critical in accurate creation of standardised modules and replication success rate.

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