The case study here concerns small projects. The common tendency is to neglect small projects since their contribution to the bottomline is very minor. However, small projects have their share of problems and risks as do large projects. Prioritizing and allocating resources amongst a portfolio of small projects is a daunting task by itself. Geographically dispersed projects, as in the case of Enercon, accentuate the problems further.

Siting of wind energy plants needs to be in specific areas having high potential wind energy — they are limited to remote areas far from human habitation. Transporting, setting up, and running project teams in such remote areas is a challenge by itself — keeping the channels open for control and monitoring, communication, and logistic support for such teams is another major managerial challenge.

Wind energy production is likely to be a sunrise industry of the future not only in the domestic market but also has potential for the export of expertise. Only 10 per cent of the potential wind energy has been tapped so far in India. Wind energy installations are likely to grow very fast in the near future, to reduce the dependence on energy imports and also reduce carbon emissions. EIL having ventured and established in the field will reap dividends of being an early player. However, there is also a caveat — the ability to sustain performance and maintain quality will determine whether the company will be able to retain its reputation and market share in the near future.

EIL has a few significant advantages on its side. It has a reasonably good share...
of installed indigenous capacity, thus providing sufficient proof of its capabilities. It has technical support in terms of the latest technology from its German partner. It has sufficient vertical integration in manufacturing vital components in its factories in Daman. That it is able to export its products and is ISO certified points towards its strength in terms of quality of products. That it has survived the shakeout of the industry is a confirmation of its technical and financial strength and perception in the market.

The case however indicates several weaknesses and flaws in the manner the project was planned and implemented, which are discussed here. These deficiencies have serious repercussions for the company in the short and the long run. Correction of these deficiencies requires redesigning of the systems and the processes; else, the short-term fire-fighting will only wear out and demoralize the line managers while bringing disrepute and eventual downfall of the company in the long run.

**Weak Project Control Structure**

A comparison of the bar chart of the Installation Head (Exhibit 13), BDO (Exhibit 14), along with the actual progress in the Nawapur Project Progress Report (Exhibit 18) reveals interesting information as given in Table 1.

It is observed from Table 1 that there are substantial differences in information being maintained in the Head Office (Installation Head), the Division Office (BDO, Vadodara) and the Project Office at Nawapur, which is a pointer to the manner in which the project is controlled and monitored. These differences should not have occurred given that an ERP system is in operation and networked between all the offices. This means that the information is rarely updated or validated on field. It appears that the reporting and controlling systems have not been designed to support the multi-project teams, where each project has a very short lifecycle.

As is evident from Exhibit 5, the number of WECs installed each year has registered a cumulative growth of 28 per cent over the last eight years and 23 per cent over the last four years. It is possible that the high growth rate has not been complemented by the changes in the reporting mechanisms or organizational structure to ensure that the project delivery mechanisms do not suffer due to want of proper control structures. An organizational structure designed for handling 30 to 70 projects annually cannot effectively handle 200 to 300 projects. Simple addition of ERP facilities will not augment the control structures unless the ERP has been designed to handle and report 200-300 projects.

Poor project monitoring mechanisms tell upon the top management’s inability to foresee an impending

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Activity</th>
<th>Installation Head Bar Chart (Exhibit 13)</th>
<th>BDO Bar Chart (Exhibit 14)</th>
<th>Nawapur Project Targets (Exhibit 18)</th>
<th>Nawapur Project Progress as on August, 23 (Exhibit 18)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Land acquisition process</td>
<td>No indication</td>
<td>July, 12 to 18</td>
<td>By September, 15</td>
<td>No indication</td>
</tr>
<tr>
<td>2</td>
<td>Micrositing and planning</td>
<td>July, 15 to 17</td>
<td>No indication</td>
<td>April, 14 to August, 30</td>
<td>No indication</td>
</tr>
<tr>
<td>3</td>
<td>Approach road formation</td>
<td>July, 15 to 31</td>
<td>July, 24 to August, 13</td>
<td>July, 20 to August, 27</td>
<td>6 of 14 completed, rest under progress</td>
</tr>
<tr>
<td>4</td>
<td>Foundation casting</td>
<td>July, 15 to 31</td>
<td>July, 28 to August, 23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>WEC delivery</td>
<td>No indication</td>
<td>July, 12 to August, 10</td>
<td>No indication</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Tower delivery</td>
<td>No indication</td>
<td>July, 12 to August, 10</td>
<td>No indication</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Blades delivery</td>
<td>No indication</td>
<td>July, 12 to August, 10</td>
<td>No indication</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Machine erection</td>
<td>August, 1 to September, 24</td>
<td>August, 3 to September, 7</td>
<td>August, 18 to September, 7</td>
<td>3 of 14 machines under erection since 17 August</td>
</tr>
<tr>
<td>9</td>
<td>11 KV Overhead line</td>
<td>August, 1 to September, 26</td>
<td>August, 1 to September, 7</td>
<td>July, 28 to September, 9</td>
<td>Completed except DCOH line under progress</td>
</tr>
<tr>
<td>10</td>
<td>Pre-commissioning of WEC</td>
<td>August, 1 to September, 26</td>
<td>August, 5 to September, 9</td>
<td>No indication</td>
<td>No indication</td>
</tr>
<tr>
<td>11</td>
<td>VCB and metering yard construction</td>
<td>August, 1 to September, 26</td>
<td>August, 18 to September, 2</td>
<td>August, 25 to September, 14</td>
<td>Not yet started</td>
</tr>
<tr>
<td>12</td>
<td>VCB and 11KV line charging</td>
<td>August, 1 to September, 26</td>
<td>August, 16 to September, 4</td>
<td>No indication</td>
<td>No indication</td>
</tr>
<tr>
<td>13</td>
<td>Commissioning</td>
<td>August, 5 to September, 28</td>
<td>September, 2 to 14</td>
<td>August, 21 to September, 13</td>
<td>No indication</td>
</tr>
</tbody>
</table>
crisis and thereby resulting in inadequate responses. The top management may gradually lose their ability to appreciate the gravity of problems brought to them by field offices and consider them unworthy of attention. In such situations, there is every possibility that the top management will remain unaware of potential disasters till they happen, in view of the reluctance of the field offices to inform them of the problems. For example, the Daman project office did not consider it necessary to bring the problem of the crane at Nawapur project to the notice of the Installation Head or VP (Projects). In the event of the PCB not being available in the market for the next two weeks, the situation would become worse resulting in the Head Office ultimately deciding to move another crane from another site to Nawapur. This decision would be taken after three weeks of the actual event (considering that the time taken for communicating to the Head Office and the Head Office reacting to the event would take another week), resulting in five weeks of work loss at the Nawapur site. Had the Daman Office kept the Head Office informed on time, there was a possibility that the Head Office would have worked out the alternate methods of sourcing PCB or another crane within two weeks — resulting in only two weeks of work-loss at the Nawapur site.

There is probably another problem inherent in the organizational structure. The VP (Projects) is the only manager in charge of project installation amongst the 11 top managers reporting to the CEO. On the other hand, the five top managers reporting to the CEO are in charge of the production activities in Daman. This is possibly due to the larger share in turnover from the production activities, compared to installation and maintenance activities. It appears that project delivery is not yet an area of strategic concern to the company.

While the business growth rate has possibly been sustained by the positive economic advantages of investment in wind power, superior technological advantage over peers, low competition, and poor delivery of projects are likely to tell upon the perception and goodwill and thereby on the prospects of the company in the long run.

Slippages in project management would cost the company dearly. The particular Nawapur project discussed in the case has clauses providing for making good the financial loss, if any suffered by client for a delay in project delivery. In this case, the project delay would result in a loss of substantial depreciation benefits for the client. Given the high costs incurred (30-35% higher than normal rates) for the procurement of land at Nawapur and the additional cost of transportation of components from Jangpura site, the profit margins of the Nawapur project might be seriously affected in case of penalty payouts to the client.

### Land Acquisition Problem

Calculating the earliest and the latest start and completion times in Table 2, using the data in Exhibit 15 and 16, we find that activities 1 (land acquisition process), 2 (micro siting and planning), 6 (tower delivery), 8 (machine erection), 10 (pre-commissioning of WEC), 12 (VCB and 11 KV line charging), and 13 (commissioning) lie on the critical path.

It is evident from above that the land acquisition process holds a vital key to the entire project delivery.

### Table 2: Network Critical Path Calculation

<table>
<thead>
<tr>
<th>No</th>
<th>Activity</th>
<th>Precedence</th>
<th>Days Required</th>
<th>ES</th>
<th>EF</th>
<th>LS</th>
<th>LF</th>
<th>Slack</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Land acquisition process</td>
<td>-</td>
<td>428</td>
<td>0</td>
<td>428</td>
<td>0</td>
<td>428</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>Micrositing and planning</td>
<td>1</td>
<td>7</td>
<td>428</td>
<td>435</td>
<td>428</td>
<td>435</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>Approach road formation</td>
<td>2</td>
<td>20</td>
<td>435</td>
<td>455</td>
<td>576</td>
<td>596</td>
<td>141</td>
</tr>
<tr>
<td>4</td>
<td>Foundation casting</td>
<td>3</td>
<td>49</td>
<td>455</td>
<td>504</td>
<td>596</td>
<td>645</td>
<td>141</td>
</tr>
<tr>
<td>5</td>
<td>WEC delivery</td>
<td>2</td>
<td>140</td>
<td>435</td>
<td>575</td>
<td>505</td>
<td>645</td>
<td>70</td>
</tr>
<tr>
<td>6</td>
<td>Tower delivery</td>
<td>2</td>
<td>210</td>
<td>435</td>
<td>645</td>
<td>435</td>
<td>645</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>Blades delivery</td>
<td>2</td>
<td>53</td>
<td>435</td>
<td>488</td>
<td>592</td>
<td>645</td>
<td>157</td>
</tr>
<tr>
<td>8</td>
<td>Machine erection</td>
<td>4,5,6,7</td>
<td>28</td>
<td>645</td>
<td>673</td>
<td>645</td>
<td>673</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>11KV Overhead line</td>
<td>4,5,6,7</td>
<td>30</td>
<td>504</td>
<td>534</td>
<td>657</td>
<td>687</td>
<td>153</td>
</tr>
<tr>
<td>10</td>
<td>Pre-commissioning of WEC(diesel</td>
<td>8</td>
<td>14</td>
<td>673</td>
<td>687</td>
<td>673</td>
<td>687</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>generator)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>VCB and metering yard construction</td>
<td>2</td>
<td>7</td>
<td>435</td>
<td>442</td>
<td>680</td>
<td>687</td>
<td>245</td>
</tr>
<tr>
<td>12</td>
<td>VCB and 11KV line charging</td>
<td>9,10,11</td>
<td>1</td>
<td>687</td>
<td>688</td>
<td>687</td>
<td>688</td>
<td>0</td>
</tr>
<tr>
<td>13</td>
<td>Commissioning</td>
<td>12</td>
<td>2</td>
<td>688</td>
<td>690</td>
<td>688</td>
<td>690</td>
<td>0</td>
</tr>
</tbody>
</table>
Land acquisition is a classic chicken-and-egg situation. Does the company acquire land in advance before scouting for investors or does it commence the process after a suitable investor has been found? While GEDA regulations seem quite simple in the case of acquisition of revenue tracts, the case of Jangpura where the local farmers obtained a stay order from the Court illustrates that acquisition of revenue tracts also pose as much a problem as private lands. Sourcing land from private source is admittedly a difficult affair, since obtaining consent from all contiguous landowners is itself a tough feat, not to speak of obtaining the District Collector’s permission and GEDA’s approval later within a short time frame. It would not be financially advisable for the company to acquire land tracts in advance, since there is likelihood of the financial incentives for wind power being withdrawn or reduced or the eventuality of more financially attractive schemes emerging in the near future that would drive away investors from wind power. The company, while seeking investment, should highlight the risks associated with land acquisition and offer different risk management options to the investors for different categories of land.

**Transportation Problem**

Other than land acquisition, the other critical components of the project are transportation of components and erection of WECs. Transportation of over-dimensional consignment components, such as WECs, involves coordination with the State Road Department, which might involve strengthening of bridges or even construction of diversions at times. Here again, a detailed planning is required in advance to survey the condition of roads, bridges, culverts, under-bridges, etc., to determine the route to be taken or the type of trucks that can be used. This might also require transportation of components in dismantled condition which in turn would require setting up of component assembly works at the site itself. These aspects become all the more important since most of the high potential wind energy sites are located at remote and inaccessible areas far from human habitation.

Further, it is seen from the case that transportation of components was scheduled during July-August. The monsoon season in Gujarat being mainly around the months of July and early August, it is obvious that the scheduling of transportation of equipments was done at a wrong time. Given the bad condition of rural roads and roads at site, the transportation of heavy equipment would cause problems during monsoons. The trucks are likely to be bogged down on the slushy roads, speed would be low, and the risk of accidents and consequential damage to equipment are usually very high. It should have been scheduled before the monsoon, in which case, appropriate measures for the protection of equipment from rainwater was required especially for electrical equipment susceptible to failure and deterioration in wet conditions. Otherwise, the project should have been scheduled in such a manner that transportation of equipment was done in late August and early September, when the fury of monsoon would have subsided.

**Erection Problems**

The erection of WECs requires the services of 220 tonne crane. The company has hired four cranes for its project teams. Each WEC requires two days for erection by a 220 tonne crane. Considering that 117 WECs were to be erected during April-September, 2003 (Exhibit 7), the net requirement (excluding transit time of cranes between sites) was 234 crane-days over 6 months. Considering the availability of 720 crane-days (4 cranes for a period of 6 months), EIL apparently seems to be in a comfortable situation. However, the situation may not be very favourable in case the scheduling of crane requirement at all the seven sites is more or less around the same time. This is an issue, which needs the attention of the BDO and the Installation Head for appropriate scheduling of projects. In such scenarios as the one in Nawapur, another crane could have been diverted without much loss of scheduling margin for other projects. In such a situation with a wide portfolio of projects being implemented within a specific time frame, the BDO of Vadodara and the Installation Head need to prepare and monitor a schedule of critical resource requirements and availability at different sites under their control.

Given the growth in project order books, at this juncture it would be prudent to invest in procurement of crane to partially reduce the hiring costs of cranes. This would allow the company certain leverage in negotiating hire charges with crane renting agencies, besides reducing its outflow on rent charges. Further, given that the company is involved in the maintenance and operation activities of more than 1,000 installations, it is essential that crane facilities are available with the company to attend to the scheduled and the unscheduled maintenance of its installations.
The case highlights a scenario of non-availability of crane on account of failure of the PCB. Failure of a component in a machine under hire presents a peculiar situation, since the hirer would not be aware of the aspects of reliability of the machine. The hirer would not necessarily have any spare components readily available for replacement nor would he be able to diagnose the fault. The situation becomes all the more critical since the crane is necessarily located at remote places, where technicians or spares are not available. Further the crane is required at the crucial stages of work, when any slippages would result in delivery problems for the client.

While the immediate solution is to make a few PCBs available to the project teams, the long-term solution would be to incorporate heavy financial penalty clauses in the hiring agreement for outages of such critical equipment. Contractual stipulations could be built in requiring the hiring agency to deploy full-time technical support with spares inventory support at site. Of course, this would render the hiring services more expensive, but that is a low price to pay to cover such risks. However, the question remains that given that only 6-7 cranes are available for hire throughout the country, would EIL be able to dictate terms for ensuring reliability from the hiring agency?

Conclusion
Poor project management could prove an Achilles’ heel for a fast growing company like Enercon, if it is perceived largely as a manufacturing company with inadequate project delivery skills. The loss of installation business would jeopardize the production business since competitors are likely to source WEC components from elsewhere. Further, the company could suffer a loss of the steady business of the maintenance of the installed equipment. The reasons underlying the Nawapur project delays should thus serve as a wake up call to improve its design of project management systems.

Case Analysis II

Suresh Mony
Professor
S P Jain Institute of Management & Research
Mumbai
e-mail : monys@spjimr.org

Gautam Desai
Professor
S P Jain Institute of Management & Research
Mumbai

t This case describes a very challenging situation faced by a project manager during the execution of a turnkey non-conventional energy project in a remote part of rural India. The case illustrates:
• How the deficiencies in the planning of key issues in project management particularly risk, time, and procurement can mar project execution and how taken care of at the outset, these aspects together with proper monitoring and control, can help in achieving the desired project outcomes
• How, an organization, through an innovative business strategy, successfully creates a competitive advantage for itself, and when not backed up by a sound implementation (in this case by project integration techniques), the strategy can be brought to nought;

Project management is a highly systematic discipline and an effective implementation of a projects calls for considerable process orientation. Every project has certain risk element but, once the project is taken up, the objectives of time, quality, cost, and performance need to be met regardless of the risks.

Shortcomings of Enercon’s Project Management Approach

The shortcomings in the planning, execution, and monitoring and control processes at Enercon’s Nawapur project are mapped with respect to the knowledge areas (Exhibit 1) and the inadequacies categorized as follows:

MAJOR INADEQUACIES
a) Risk management
b) Time management
c) Procurement management
d) Project integration.

OTHER INADEQUACIES

e) Scope management
f) HR management
g) Communications management with respect to information distribution.

There appears to be no data indicating the unsatisfactory handling of quality management and cost management. Since Enercon has hitherto been successful in implementing projects, it may be reasonably assumed that on the quality and cost fronts, they have well-defined and effective processes.

MAJOR INADEQUACIES

Risk Management

Risk management being a young discipline, project managers are not exposed to it. While viewing risks, the normal mindset is usually reactive as was the case with Prithwiraj Rathore. In order to do a systematic risk analysis, it is expedient to first identify the possible risk events and the causative factors or driver/s for each of the risk event followed by the impact of the risk event and the impact drivers. Based on the drivers identified, risk mitigators and impact mitigators can then be determined. It is also important to understand that risks are maximum at the start of the project and gradually decline with progress in completion. At the same time, the cost of addressing the risk follows an inverse slope and increases at later stages; hence, monitoring of risks has to be done throughout the project; otherwise, there will be only fire-fighting and crisis management.

Exhibit-2 presents risk analysis at the project conception stage revealing five potential major risk events:

- Delayed land acquisition
- Delayed financial closure
- Non-availability of hired 220 tonne crane
- Breakdown of 220 tonne crane during construction
- Delayed arrival of WEC equipment

In a project, there could be a number of risks that call for identification, analysis, prioritization, and handling. At the macro level, the above risk events are considered for planning purpose. Of these, delayed financial closure is a possible risk event relevant to most projects, while the other four risks are relevant to the Enercon project, in particular, the WEC project at Nawapur. Planning for risk mitigation and impact mitigation for the above risks are discussed below.

Risk Mitigation

Delayed land acquisition: Land acquisition is an activity that is often inordinately time-consuming and is subject to pulls and pressures from all sides including the society at large, political parties, government, and cumbersome procedures. Especially in a country like India, it is very difficult to quote a definite time for land acquisition. Hence, it makes sense to take care of the impact of this risk by taking the completion of land acquisition activity as the ‘go ahead’ date for the project and then quoting for project duration. In fact, land acquisition should be made a ‘stage gate,’ the completion of which will give a green signal for the next phase of the project.

Enercon has implemented a number of projects in the past which were possibly successfully completed without a risk management exercise; yet, this does not mean that a delay in achieving land acquisition is not a risk. As it turned out, acquisition of land at the original site became a problem. If land acquisition is not a stage gate, the risk mitigation measure is obviously to have another substitute site ready or to arrange to be made available in a short period of time. Enercon had not planned for this eventuality at Jangpura; however, they were fortunate to be conducting land acquisition proceedings for a potential project venture and thus mitigated the risk by releasing the Nawapur site for the project. This turned out to be a risk mitigation measure more by default than design. However, this being more of a crisis management step, led to a secondary risk, namely, increase in the cost of land and the project because of the hurried negotiations with the villagers. On the contrary, if Enercon had planned for the risk, they might have had one site always in reserve to combat the delay in land acquisition proceedings and that in fact, would have been a sound risk mitigation measure.

Delayed financial closure: A large number of projects get stalled midway because of inadequate funding. Hence, Enercon should ideally have alternate sourcing options for loans lined up to counter possible hurdles that might come up, such as backing out by a bank that has sanctioned or reduction of the loan amount; or an increase in the cost of project, etc. This is especially important considering that Enercon is doing turnkey project implementation and taking on the responsibility of arranging funds for the client. In many projects, such as the highly capital-intensive and complex infrastructure projects, financial closure is also a stage gate;
however, in this case, since Enercon has taken a total turnkey project responsibility, the contract may not permit this.  

**Non-availability of hired 220 tonne crane:** Considering that there are only seven 220 tonne cranes in the country, there is always a distinct possibility that such a crane is not available when a project order is secured. The dependence on hired crane is a risk and can be mitigated by purchasing more cranes. Enercon therefore should have at the outset examined the following options:

- Entering into a long-term contract of hiring requisite 220 tonne cranes
- Buying one or more 220 tonne crane

The above options may lead to secondary risks of higher operating costs, because of the idle costs of crane when not in use. A trade-off analysis is given in Exhibit 3 from which it may be deduced that:

a) considering Enercon’s contractual obligation of making good the financial losses suffered by the client as a result of a delay beyond September 30 (of which the loss due to non-availability of depreciation benefit itself runs close to Rs 7.2 crores) the higher operating costs are insignificant

b) if the contract was more prudently entered into and Enercon’s liability through liquidated damages was a maximum of 10 per cent of the contract value (i.e., Rs 60 million); whether the higher operating costs were worth bearing would depend on the profit margins of Enercon.

**Breakdown of 220 tonne crane during construction:**
Keeping spare printed circuit boards (PCBs) is an obvious risk mitigation measure to counter the breakdown of the 220 tonne crane during construction. Maintaining six months to one year’s spares of critical items as inventory is normal and one does not have to know risk management for this; hence, it is surprising that the project manager never planned for PCB spares. In addition, having one consultant/technician at site during the critical erection period of 41 days would be a sound and comprehensive risk mitigation measure. If this was done, the dilemma that Prithviraj faced on August 23, would not have seemed such a major problem as it turned out to be.

**Delayed arrival of WEC equipment:** The risk drivers are (a) delayed arrival of equipment on Indian shores from the overseas vendor, (b) delayed clearance at port, and (c) subsequent transportation to site. The first risk is presumably taken care of since the vendor is also Enercon’s technical collaborator and has a track record of honouring time and contract commitments. Similarly, it is presumed that Enercon has a proven port clearance agent and transporter with proven capability and a record of transporting heavy equipment.

The problem is really with the bad road condition which Enercon may not have encountered in the past. If this is identified as a possible risk, it is then incumbent on the project manager to initiate action in advance with the road authorities such as PWD to ensure that the road is in good condition before monsoon sets in.

**Impact Mitigation**
Risk mitigation measures will reduce the probability of the risk event occurring. However, despite all the planning, the risk event/s could occur leading to an impact. The impact is almost always on time or cost or quality. In this particular project, as mentioned earlier, there is no impact on quality; the main impact would be delay in the project commissioning, that is the date extending beyond September 30, 2007, leading Enercon to offset the losses suffered by the client. Besides, there may be cost increases as a result of the risk mitigation measures employed.

The overarching mitigation measure is to have a project buffer to take care of such exigencies. This is explained in detail under the critical chain approach to time management. The other impacts and corresponding mitigation measures are:

- Delay in arrival of equipment at site
  - penalty and liquidated damages clause in contracts for supply, port
  - clearance, and transport of WEC equipment

- Breakdown of 220 tonne crane
  - Transfer crane from another site

- Secondary risk of idle costs of 220 tonne crane if surplus cranes are engaged as risk mitigation measure
  - take up contracting jobs requiring 220 tonne crane when not remotely required by the project
  - rehire to third party when not in use.

**Time Management**
To start with, the time plan is confined to two versions of the Gantt Chart – one version being the schedule prepared by the BDO at Vadodara and the other being
the schedule prepared by the Installation Head at Daman. These Gantt Charts, prepared by two offices of the same organization appear to be arbitrarily drawn up with neither based on a common activity list, common activity duration estimates, or the mandatory dependency relationships between the activities. In addition, both charts are prepared without any margin for delays, and above all, both the charts do not tally. Gantt Charts are useful in presenting an overall plan or status chart to management; however, for accurate time planning and to facilitate monitoring, Gantt Chart should be based on the critical path method (CPM) of developing a network of activities prepared, after taking into account the proper dependency relationship between the activities and determination of the critical path(s).

The shortcomings of the time planning process are:

- **Activity definition** — not accurate as important activities like crane hiring and movement of crane between locations are omitted.
- **Duration estimation** — not correct for machine erection as 220 tonne crane movement activity between WEC locations are not considered.
- **Schedule development** — Enercon’s time estimate appears to be incorrect.

Exhibit 4 shows the CPM network for the project drawn based on the activity durations and dependency relationships indicated in the case and it would be seen that the critical path is 85 days from the start of location marking whereas as per the Gantt Chart, Prithviraj and his team believe that the project duration is 78 days (July 13 to September 30). The duration of 94 days is based on the activity time of 41 days for machine erection. In this context, the Bar Chart of the project office at Vadodra indicates 36 days for machine erection and that of the Installation Head indicates 54 days. However, based on the data furnished, the actual erection time at 2 days per WEC would be 28 days and the inter-location movements at 1 day between locations would be 13 days giving a total erection duration of 41 days.

**Critical Chain Approach to Time Planning**

The schedule does not have any buffer which is amateurish. The well-known author of the Theory of Constraints (TOC), Eliyahu Goldratt, says that in the normal course, every activity has a certain in-built cushion arising out of:

- a) the student syndrome of doing things at the last moment
- b) the Parkinson’s law that work expands into time
- c) the activities that finish early but are not reported.

Hence, as per Goldratt, the best way to approach project time management is to get aggressive time estimates from all concerned for all the activities. Based on the beta distribution curve, they would be around 60 per cent of the normally estimated time. Finally, an overall project buffer equivalent to 50 per cent of the critical path is provided to take care of the risk events.

In the above context, the estimation of time for transportation of the WEC tower, machine, and blades are crucial, for which the Bar Chart provides for 29 days time. Based on 6 truckloads per WEC (including main equipment, tower, and blade) and 14 WECs, about 84 truckloads of equipment are required for the project which (based on an average of 4.5 days per truckload) works out to 378 truckload-days of transportation time or 13 truckloads reaching the site every day during the 29 days. This can be interpreted as all the materials required for one location being delivered in a day. If the transporter can be persuaded to deliver the required material for 2 of the 14 locations every day, the transportation time can be halved to 15 days. This also agrees with the TOC approach of the aggressive time being 50 to 60 per cent of the normal time.

With regard to erection, it would be prudent to provide two 220 tonne cranes and two erection crews working simultaneously. Though this may appear an overkill for schedule compression, it is almost imperative to resort to this measure in view of the enormous impact of Rs 72 million damages for missing the project completion deadline for a Rs 600 million contract. This would enable the erection to be completed in 21 days (at 1.5 days per WEC). The inter-location movement time for each crane would remain at one day but since two cranes are provided, the total movement time would be 7 days as against 14 days in the conventional project network. On this basis, the total erection time would be 28 days. The critical path using critical chain approach would be 58 days before providing for project buffer and 87 days including project buffer of 29 days as given in Exhibit 5.

If proper time planning had been done, based on the estimated 87 days project schedule, work at site should have commenced latest by July 2 as against the actual start of July 15, in order to complete the project by the September 30-deadline.
Monitor and Control of Time

Enercon is not concentrating on the critical path and scarce resources are being spread thin. The secret of meeting project schedules is to manage the critical path. For instance, when the crane broke down, they should have first done a ‘what if scenario’ analysis to assess the impact of a two-day delay. With the critical chain approach-based critical path, if the project was on schedule until then, even in the event of crane breakdown and two days being taken for the spares and the technician to arrive for repairing the crane, the project could still be completed on time since there were 29 days as buffer and even if some of the buffer, say 12 days, had been consumed, there was a cushion of 15 days remaining and thus there was no crisis.

With an aggressive but at the same time realistic project network on the above lines, to guide the project planning and execution, it would lead to far more effective monitoring and control of the project schedule than fire-fighting and crisis management.

Procurement Management

As seen under risk management, continuous availability of 220 tonne crane, during the erection period, is the key to maintaining the schedules. On the positive side, Enercon did try to take care of the potential risk by contracting most of the 220 tonnes capacity cranes (4 out of 7 in India) available in the market on lease/hire. But, this is clearly not enough and the procurement policy of the company is questionable considering the Own vs Hire trade-off analysis carried out in Exhibit-6.

The Exhibit shows that the payback on the capital investment of Rs 32 million on the 220 tonne crane is 3.9 years and IRR is 20 per cent. This indicates that it makes business sense to own at least one 220 tonne crane. Considering that Enercon has successfully implemented projects and should have accumulated adequate cash surplus, a proactive decision to purchase 220 tonne crane before the start of the project would have been in order.

Project Integration

Enercon had an innovative business strategy, wherein their competitive advantage stemmed from their ability to differentiate themselves from the competitors by offering the turnkey services inclusive of land acquisition, financial arrangements, and comprehensive project engineering and implementation services as well as operation management after commissioning. Thus, they were not mere engineering consultants or contractors or project managers. This helped them secure a number of projects, but it was extremely important that each time, they deliver without fail to generate goodwill and get more business. To achieve this, excellent project integration is called for.

Integration is perhaps the most important and challenging role of the project manager, but one which is least understood, and hence, failures on this front impact the success of projects.

Planning Inadequacies

As the Project Manager, Prithwiraj should have got preliminary plans made for scope, time, cost, and above all, risk management. It is common to look at risk mitigation options only when one faces a risk; however, a project manager should realize that the degree of risk is maximum at the beginning of the project and gradually declines with implementation. At the same time, cost of addressing the risk is minimum at the beginning and increases as the project progresses.

Execution Inadequacies

Often, people look at project management as merely a coordination activity and this is a cardinal mistake. Coordination is one of the many tasks that a project manager needs to do, the others being (i) making choices (ii) deciding on where to concentrate resources and effort on any given day (iii) anticipating potential issues (iv) dealing with issues before they become critical and (v) trade-offs. The failure of Prithwiraj in the above context were due to not:

- making choices: he should have made a techno-economic analysis between the choice of owning and hiring 220 tonne crane;
- anticipating potential issues: he did not anticipate the transportation delays due to monsoon;
- dealing with issues before they became critical: he allowed the execution schedule to become critical by not learning from the past experience and keeping spare PCBs.

Monitoring and Control Inadequacies

Prithviraj’s statement that 65 per cent of the work would have been complete on August 24 smacks of naivete and inadequate information base for M&C. This is not based on project progress report with systematically calculated supporting data.

The Project Management Institute (PMI), USA has
aggregated the knowledge within the discipline and categorized the field into five broad processes and nine knowledge areas; this is now accepted as the standard practice for project management. If the project management processes are mapped with the knowledge areas as outlined in 'The Project Management Body of Knowledge' (PMBOK), there are 44 activities of which 21 pertain to planning and 12 to monitoring and control. Thus, 50 per cent of the activities relate to planning which is a primary process and 25 per cent relate to monitoring and control which is an overarching process. By effectively implementing these two processes, execution which consumes more time and cost, is automatically taken care of.

The lack of proper integration by the Project Manager has led to a situation where Enercon is in danger of having to offset losses to the client to the tune of Rs 7.2 crores. Thus, in a project situation, the project manager is required to possess good general management capabilities and be highly proficient in integration which is the key to project success. Otherwise, the project objectives are jeopardized and a good business strategy can be brought to a nought.

OTHER INADEQUACIES

Scope Management

The work breakdown structure is the building block on which the time schedule, cost estimates, and the M&C of progress are based. The WBS helps in developing a hierarchy of structure and decomposing the project activities culminating in easily identifiable work packages at the last level. When linked with software package such as MS Project or Primavera, WBS facilitates responsibility accounting, tracking progress and permitting variance analysis of time and cost budgets. In the list of activities given in Exhibit 15 of the case, hiring of crane and movement of crane between locations is absent. If a formal WBS was there, such anomaly could be detected and avoided and Enercon could more effectively use their SAP system to track the project.

Human Resources Management

HR management in projects is a systematic exercise involving HR estimation at the planning stage, hiring/deploying the project team during execution, and motivating and managing the team which is a monitoring and control process. HR planning appears to be inadequate at Enercon. The organization of the project team is not conducive for effective and efficient project management. Two glaring omissions are the absence of procurement coordinator reporting to the project manager and a crane specialist at site. HR planning should also be appropriately linked with other areas like time, risk, and procurement. In this regard, if proper planning had been carried out as outlined in earlier paragraphs, the necessity of two erection crews for using two cranes simultaneously would have appeared almost mandatory. HR planning for the site project team should have been carried out accordingly.

Communication Management

Communication management is also a systematic exercise involving communication planning, distribution of information during execution, and preparation of appropriate progress reports for different stakeholders. In this regard, there was a lack of internal communication as exemplified by the manner in which the Gantt Charts were prepared by the BDO at Vadodara and the installation head at Daman. Obviously, both offices are not on the same wavelength and this is reflected in the confusion in erection and commissioning schedules.

Enercon’s progress report gives the planned and actual dates of start and completion of activities; however one cannot gauge whether the project is on schedule, ahead or behind schedule from the report. Any progress report must bring out these facts for the project manager or top management to take corrective action if necessary. Very often, accurate and timely information can propel stakeholders into appropriate action to put projects back on track. With the progress report made at Enercon, this would not be possible.
Exhibit 1: Shortcomings in Project Management Process at Enerecon

<table>
<thead>
<tr>
<th>Knowledge Area</th>
<th>Planning</th>
<th>Execution</th>
<th>Monitoring and Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk management</td>
<td>No risk analysis and risk handling plan in place</td>
<td>Risks not monitored — resorting to crisis management</td>
<td></td>
</tr>
<tr>
<td>Time management</td>
<td>(i) Activity duration estimation for erection incorrect(ii) CPM network not made No buffer built in schedule</td>
<td>They are not monitoring and controlling the critical path</td>
<td>They should be able to do a ‘what if scenario analysis’ and estimate the impact of 2 days lost due to non availability of crane</td>
</tr>
<tr>
<td>Procurement management</td>
<td>Procurement policy in question — owning vs hiring crane reveals it is better to own</td>
<td>Ad hoc orders such as completing activities that do not require crane — will it help? Order issued without examining the real constraints /bottlenecks No unified approach to problems between project office at Vadodra and the project manager</td>
<td>No proper assessment of work completed— on what basis does Prithviraj say that 65% of the project work will be over by August 24?</td>
</tr>
<tr>
<td>Project Integration</td>
<td>Project management plans probably not made</td>
<td>Information available with Daman and Vadodra offices not identical — the bar charts are different Progress report not reflecting actual status</td>
<td></td>
</tr>
<tr>
<td>Scope management</td>
<td>Work breakdown structure (WBS) absent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HR management</td>
<td>Team does not appear to have a procurement coordinator and crane specialist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication management</td>
<td>Information available with Daman and Vadodra offices not identical — the bar charts are different Progress report not reflecting actual status</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Exhibit 2: Risk Analysis of Enercon India’s Nawapur Project at Inception Stage

<table>
<thead>
<tr>
<th>Risk Event</th>
<th>Risk Driver</th>
<th>Risk Mitigation Measures</th>
<th>Risk Impact</th>
<th>Impact driver</th>
<th>Impact Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delay in financial closure</td>
<td>Limited funding sources of equity and debt</td>
<td>Expand the options of funding sources—i.e., (a) approach more than one bank/FI for debt (b) multiple equity funding sources</td>
<td>Plant commissioning delayed beyond September 30</td>
<td>Project period assumes financial closure within specified period</td>
<td>Quote project period after financial closure completed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Enercon to make good the loss suffered by client-difference between tax payable vis-a-vis 50% depreciation benefits available to client after Sept 30th against 80% otherwise available</td>
</tr>
<tr>
<td>Delay in Land acquisition</td>
<td>Acquisition depends on the one site being considered</td>
<td>Have another site as standby where WECs can be installed; however, this may lead to secondary impact of higher prices for land especially if land acquisition has not been completed</td>
<td>Plant commissioning delayed beyond September 30</td>
<td>Project period assumes land acquisition within specified period</td>
<td>Quote project period after land acquisition and financial closure completed</td>
</tr>
</tbody>
</table>

Contd.
<table>
<thead>
<tr>
<th>Risk Event</th>
<th>Risk Driver</th>
<th>Risk Mitigation Measures</th>
<th>Risk Impact</th>
<th>Impact driver</th>
<th>Impact Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquire private land which may be less time-consuming than government land</td>
<td></td>
<td></td>
<td>Enercon to make good the loss suffered by client-difference between tax payable vis-a-vis 50% depreciation benefits available to client after September 30 against the 80% otherwise available</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>A stage gate whereby pursuance of project is decided after acquisition of land</td>
<td></td>
<td></td>
<td>Loss of goodwill with client and adverse impact on image and future business potential</td>
<td></td>
<td>Use critical chain approach and have project buffer at end</td>
</tr>
<tr>
<td>Non-availability of hired 220 tonne crane</td>
<td>Scarce availability of 220 tonne cranes for hire in the market</td>
<td>Enter into long-term contract of hiring for requisite cranes</td>
<td>Higher operational costs of crane</td>
<td>Idle charges when long-term contracted crane is not in use cost of imported 220 tonne crane, freight, port expenses and inland transportation</td>
<td>Rehire to third party when not in use</td>
</tr>
<tr>
<td></td>
<td>Dependence on hired 220 tonne crane, i.e., not owning 220 tonne crane</td>
<td>Buy crane besides hired crane/s-surplus crane capacity</td>
<td>Higher capital outlay of Rs 3.16 crores</td>
<td>Rehire to third party when not in use</td>
<td>Take up contracting jobs requiring 220 tonne crane</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Possibility of plant commissioning delayed beyond September 30</td>
<td>Tightness in schedule, i.e., no slack in schedule w.r.t to crane activity</td>
<td>Use critical chain approach and have project buffer at end</td>
<td>Complete all activities not requiring crane so that all efforts can be concentrated on crane-related activities after it is repaired transfer 220 tonne crane from another site</td>
</tr>
<tr>
<td>Breakdown of 220 tonne crane during construction</td>
<td>Printed circuit board (PCB) blow out</td>
<td>(i) Keep spare PCB's</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ii) Have a consultant/technician at site for repair of crane during erection period</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Have own crane besides hired crane/s-surplus crane capacity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delayed arrival (beyond August 10) of WEC equipment</td>
<td>Delayed shipping by overseas vendor of WEC equipment</td>
<td>Select established proven vendor with good record of honouring contracts</td>
<td>Plant commissioning delayed beyond September 30</td>
<td>Project period assumes equipment delivery done within specified period, i.e., by August 10th</td>
<td>Penalty and liquidated damages clause in contract</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Enercon to make good the loss suffered by client—difference between tax payable vis-a-vis 50% depreciation benefits available to client after September 30 against the 80% otherwise available</td>
<td>-do-</td>
<td>Use critical chain approach and have project buffer at end</td>
</tr>
<tr>
<td>Delayed clearance at port</td>
<td>Delayed clearance at port</td>
<td>Select established port clearance agent with good record of honouring contracts which has been done</td>
<td>Plant commissioning delayed beyond September 30</td>
<td>Project period assumes equipment delivery done within specified period, i.e., by August 10</td>
<td>Penalty for delayed clearance and incentive for early clearance to the port clearing agent Use critical chain approach and have project buffer at end</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Enercon to make good the loss suffered by client-difference between tax payable vis-a-vis 50% depreciation benefits available to client after Sept 30th against 80% otherwise available</td>
<td>-do-</td>
<td></td>
</tr>
</tbody>
</table>

Contd.
Monsoon and poor approach roads
Build rapport with road authorities (PWD, etc.) to ensure that the road is in good condition to face the fury of monsoon and is continuously monitored and repaired when necessary to facilitate trailer movement as scheduled

Delay in transportation
Select transporter with proven ability carry over dimensional cargo, having a good track record of performance and with adequate fleet of vehicles

Project period assumes equipment delivery done within specified period, i.e., by August 10

Enercon to make good the loss suffered by client-difference between tax payable vis-a-vis 50% depreciation benefits available to client after Sept 30, against 80% otherwise available

Use critical chain approach and have project buffer at end

Exhibit 3: Loss to Client and Enercon due to Delay beyond 30th September

<table>
<thead>
<tr>
<th>Tax Benefit Loss</th>
<th>Rs million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project cost</td>
<td>600</td>
</tr>
<tr>
<td>Depreciation allowance at 80% for full year assuming project is completed before September 30th</td>
<td>480</td>
</tr>
<tr>
<td>Depreciation allowance at 40% for half year if project is completed after September 30 (50% of B)</td>
<td>240</td>
</tr>
<tr>
<td>Loss of depreciation for year(B-C)</td>
<td>240</td>
</tr>
<tr>
<td>Tax saving lost due to delay (30% of D)</td>
<td>72</td>
</tr>
</tbody>
</table>

Expected monetary value of loss due to crane non availability

<table>
<thead>
<tr>
<th>Project construction time at site</th>
<th>days</th>
<th>94</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usage of 220 tonne crane</td>
<td>days</td>
<td>41</td>
</tr>
<tr>
<td>Probability attributable to delay in crane for project delay</td>
<td>%</td>
<td>43.6</td>
</tr>
<tr>
<td>Expected monetary value of loss</td>
<td>Rs million</td>
<td>31</td>
</tr>
</tbody>
</table>

The annual operating costs for a 220 tonne purchased crane is Rs 7.6 million as given in Exhibit 6.
Also, the annual operating costs of a hired 220 tonne crane is Rs 15.6 million/yr.
These costs are significantly lower than the EMV of loss due to crane non-availability and hence one of the two options should definitely be pursued. In other words, there is a case for creating surplus crane capacity to combat the risk of crane breakdown.
Exhibit 4: Project Network Enercon India (with CPM)

CRITICAL PATH: 1-A-B-E-F-G-H

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
<th>Duration (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Microwaving and planning</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>Approach modification</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>Foundation Casting</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>WEC delivery</td>
<td>29</td>
</tr>
<tr>
<td>6</td>
<td>Tower delivery</td>
<td>29</td>
</tr>
<tr>
<td>7</td>
<td>Blade delivery</td>
<td>20</td>
</tr>
<tr>
<td>8</td>
<td>Machine erection</td>
<td>41</td>
</tr>
<tr>
<td>9</td>
<td>11 KU O/d line</td>
<td>30</td>
</tr>
<tr>
<td>10</td>
<td>Pre - commissioning of WEC</td>
<td>14</td>
</tr>
<tr>
<td>11</td>
<td>VCB and inertia gear construction</td>
<td>7</td>
</tr>
<tr>
<td>12</td>
<td>VCB and 11 KU cable</td>
<td>0.5</td>
</tr>
<tr>
<td>13</td>
<td>Commissioning</td>
<td>2</td>
</tr>
</tbody>
</table>

Exhibit 5: Critical Chain based Project Network – Enercon India


<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
<th>Duration (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Microwaving and planning</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Approach modification</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>Foundation Casting</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>WEC delivery</td>
<td>15</td>
</tr>
<tr>
<td>6</td>
<td>Tower delivery</td>
<td>15</td>
</tr>
<tr>
<td>7</td>
<td>Blade delivery</td>
<td>15</td>
</tr>
<tr>
<td>8</td>
<td>Machine erection</td>
<td>20</td>
</tr>
<tr>
<td>9</td>
<td>11 KU O/d line</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>Pre - commissioning of WEC</td>
<td>6</td>
</tr>
<tr>
<td>11</td>
<td>VCB and inertia gear construction</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>VCB and 11 KU cable</td>
<td>0.5</td>
</tr>
<tr>
<td>13</td>
<td>Commissioning</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>Project Buffer</td>
<td>29</td>
</tr>
<tr>
<td>15</td>
<td>Feed Buffer (a)</td>
<td>20</td>
</tr>
<tr>
<td>16</td>
<td>Feed Buffer (b)</td>
<td>2</td>
</tr>
<tr>
<td>17</td>
<td>Project Commissioned</td>
<td></td>
</tr>
</tbody>
</table>

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Exhibit 6: Owning vs Hiring of 220 Tonne Crane for Enercon India

Financial Criteria
The following financial techniques are used for assessing the financial viability of owning a 220 tonne crane versus hiring it from the market:

- Average return on investment
- Investment pay-back period
- Net present value
- Internal rate of return

Basic Data*

<table>
<thead>
<tr>
<th>Description</th>
<th>Rs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total investment for purchasing the crane</td>
<td>31,150,000</td>
</tr>
<tr>
<td>(Addition of total landed cost of Rs 31,650,000 and provision for spares inventory @ 5% of the landed cost)</td>
<td>(31.15 million)</td>
</tr>
<tr>
<td>Annual cost of operating demag 665 crane</td>
<td>7,606,000</td>
</tr>
<tr>
<td>Annual cost of hiring an equivalent crane from the market</td>
<td>15,600,000</td>
</tr>
<tr>
<td>Annual saving by Enercon owning the crane</td>
<td>7,994,000</td>
</tr>
<tr>
<td>(8.00 million)</td>
<td></td>
</tr>
<tr>
<td>Interest payable on capital borrowings</td>
<td>14 % per annum</td>
</tr>
</tbody>
</table>

Additional Assumptions required for Calculations

- Operating life for a crane: 10 years
- Salvage value at the end of operating life: Rs 6.23 million
- (20% of original investment of Rs 31.15 million) Equity-Debt ratio for project financing: 60:40
- Return expected by Enercon on its own equity: 20% per annum
- Net total taxation rate applicable to Enercon: 33% on incremental profits
- Depreciation provision: on straight line basis

Calculations

- Average Return on Investment (ROI)
  - Annual savings by Enercon owning the crane: Rs 8.00 million
  - Return on investment (PBDIT): 31%

Pay-back Period for Investment

- Annual cash-flow (before depreciation): Rs 8.00 million
- Pay-back period for investment (31.15 /8.00): 3.9 years

Net Present Value

- Calculation of Weighted Average Return on Capital (WACC)
  - Post-tax cost of project term borrowings with 33% income tax and 14% market interest rate on 40% project cost: 3.75% per annum
  - Cost of expected return on equity investment on 60% of Project cost at 20% per annum return on equity: 12.00% per annum
  - Total weighted average cost of capital (WACC): 15.8% per annum
  - Net Present Value
    - (Considering 20% salvaged value of investment at end of 10th year): Rs 40.4 million

Internal Rate of Return (IRR)

- Based on all the four criteria considered, it is clear that owning a 220 tonne crane is an attractive proposition. Hence, Enercon should own at least one such crane initially.

* Source: Exhibit 19, Comparative Statement between Owning and Hiring of Crane by Enercon.
This case highlights the difficulties faced by Prithwiraj Rathore, the Project Manager of Enercon India Limited (EIL), a company that installs and maintains wind energy converters (WECs). The case is about project planning and its role in the practical context. Several interesting issues and aspects are touched upon by the authors in this case. Some of these are discussed here.

**Project Network**

The central theme of the case is the project taken up by the EIL to install 14 WECs in Nawapur in Gujarat. Every project of this nature is first planned using project management techniques. The project network is the primary tool used to understand the project. Critical Path Method (CPM) and Programme Evaluation and Review Technique (PERT) are used to analyse the network diagram. Two types of network configurations are possible: activity on arc and activity on node network. The activity on arc representation of the project network is shown in Figure 1.

The basic data for the network is taken from Exhibit 16 that shows the activities and the precedence relationships. The expected duration of these activities is given in Exhibit 15. These are suitably interpreted while deriving the actual values of the duration. For example, activity No. 6, i.e., tower delivery (F in the Figure), requires 4-5 days for each truckload and each WEC has three truckloads. This would give us an estimated time of 168-210 days. This is untrue because some of the activities can be performed simultaneously. We have used 30 days for this activity based on the data given in Exhibit 14. This means that six trucks transport two WECs at a time for 4 days to give us a duration of 28 days. Two days would be an additional buffer given to this activity resulting in 30 days (Table 14).

Only activity A the data for which is available in Exhibit 15 shows only 47 to 63 days. Here, it is assumed that the land identification is over. We have used 47 days in our calculations to compute a critical path comprising activities A-B-C-D-I-L-M with the total time being 142 days.
This is a lower estimate (optimistic estimate) of the project completion time. We also observe in the case that the project was started in April 2003 and was expected to be completed in September 2003. This would give 180 days which is more than the optimistic estimate of 142 days. Even if we had used 63 days for Activity A, it would have been within the planned period of 180 days.

It is to be noted that there is some inconsistency between the data given in Exhibits 13, 14, and 15.

### Duration of Various Activities

As pointed out earlier, the possibility of performing the sub-activities simultaneously influences the duration. Most of the data in Exhibit 15 is given for one WEC and we should not assume that these are sequential. There is also enough evidence for the fact that sub-activities are carried out simultaneously; otherwise the critical path would have exceeded 180 days. This also reiterates the belief that the duration is decided based on a certain level of resource availability and can be reduced by increasing the number of resources.

While it is customary to use the exact duration in the classroom examples in CPM, the duration can be within a range depending on the availability of resources. This aspect comes out very well in the data given in Exhibit 15.

It is customary to include a small buffer when the duration of the activities is estimated. Here too, it appears that some activities or sub-activities have buffers added to their estimated duration. Exhibit 18 shows situations where the actual time taken for implementation is less than the planned time.

### Project Rescheduling

As it happens in all real-life projects, there is a need to reschedule because the existing implementation deviates from the plan. It is a common practice to reset the targets or to ascertain the existing targets midway through the projects. The case mentions that by end June, the decision to finish the commissioning of 14 WECs at Nawapur by the end of September was taken. This also necessitated the shifting of material from the Jangpura site to the Nawapur site.

The decision taken in June did not change the delivery date (or the expected project completion date). This, however, would result in rescheduling several activities. The data in Exhibits 13, 14, and 18 are for the period after June 2003.

If we assume that activities A and B were completed by June 2003 (60 days), computing the critical path again would give us the same critical path C-D-I-L-M with a duration of 88 days. There were 90 days available except that the buffer days had reduced to 2. It also shows that the entire buffer available with the earlier period has been consumed during April-June 2003.

While it is stated that the decision was taken to finish the project in September, the case does not describe any review of the rescheduling of activities to this effect.

### Use of Scientific Tools and Techniques

Project management is one of the areas where the tools of operations research have been applied. The critical path solution identifies the longest path in the network subject to certain ordering of the nodes and arcs. It provides an easy solution and is hence widely used. The case provides data to draw a precedence diagram but does not show any evidence of the critical path being determined.

Exhibits 13 and 14 show bar charts of the project plan. Whether the plan was made using software or algorithms is not clear from the case description. Nevertheless, one may assume that these charts have been made available after some analysis. There is also a mention that EIL offices and project sites are linked by computer networks and that the company uses an ERP implementation. We can assume that some computer-based analysis would have led to the bar charts given in Exhibits 13 and 14.

### Project Planning in Practice

While the data in Exhibits 13, 14, and 16 are meant for project planning purposes, the data in Exhibits 15 and 18 are useful for monitoring the progress. The project planning data (Exhibits 13 and 14) looks too gross and the activities should be broken up further into sub-activities for better planning and control. Exhibit 18 shows the breakup for some activity numbers but the data in Exhibits 13 and 14 have no specific identification assigned to the activities.

It is absolutely necessary that activities (from Exhibits 13 and 14) requiring more than a month should be divided into sub-activities with shorter duration so that they can be planned and monitored better.
Delays and Uncertainties

The case begins with a mention about a snag in the 220 tonne crane for which immediate replacement is difficult. It is also mentioned in the case that transportation and supply of spare parts are difficult because of the remoteness of the site. The time taken for negotiation with land owners and their unreasonable assumption that crops can get affected due to the wind are again matters that have created delays.

There are other unexpected events in a project that are usually not planned. The case mentions that the materials for one of the WECs were broken during transit. This is an uncertainty that clearly is not anticipated during the planning stage. These create further delay in the project. In this particular instance, activity 5 or E (WEC delivery) is not a critical activity and there is a buffer of about 20 days. If there is a further delay that goes beyond the slack, the project would be delayed further.

Project Overrun

The project is to be completed by September 30 and the case reviews the situation on August 23. Based on the network diagram, the project can be theoretically completed by its due date. However, very little extra time is available as buffer.

From Exhibit 18, we observe that some planned activities have not been started on August 23. This is expected to delay the project and result in overrun. The only information provided is the loss to the company in case of a delay. There is no evidence of details of project reviews where reasons for delays are discussed and corrective actions planned.

The loss to the client due to overrun is explained. It is also stated that EIL would have to bear these losses. There is also a mention about the loss of goodwill which is more important considering the market conditions and the opportunities in this industry.

Increased Cost of the Project

Both the project network and the bar charts provide information on the specific activities of the project and their respective time of completion. They do not consider or address cost explicitly. However, there is always an increase in the cost due to project overrun or due to uncertainties and delays. There are several examples of situations that increase the cost of the project.

The compensation to the farmers went up because they understood the desperation in buying the land. There is an additional cost involved in repairing the crane. There are losses due to damages in transit. The cost increased because new roads had to be laid due to monsoon. Finally, the company is worried about the loss of goodwill and hence loss of opportunities if the project gets delayed. All these practical aspects that are usually ignored in theoretical models have been brought out very well in the case.

Rent or Buy Decision

The comparative cost data in Exhibit 19 indicate that buying a crane is more economical than renting it. There is a difference of about Rs 8,000 per year without considering the capital cost. The payback period (break-even period) mentioned in the case is about three years. The explanation or computations are not clear. It is also not clear why the company hires these cranes instead of buying them.

Considering the context of the case where EIL is a market leader with a growing business, it is only apt that they buy cranes, unless there is a strong reason for not doing so. No such reason is given in the case.

Project Crashing and Resource Constraints

Other than the repaired crane, the case does not mention about the resources that affect the duration. From the data on the duration of the activities, one may conclude that several trucks are required to transport the materials to the site. This is not expected to result in a resource constraint. If resource constraints are identified, it will be possible to compute the increase in the durations based on the constraint.

While there is a need to gain time by expediting the activities, there is very little scope in the case to compute the cost of crashing. This could be compared with the loss due to overrun.

Other Observations

There are a few situations that are not very clear for analysing the case. Besides, there are some inconsistencies in the material provided. Some of these are as follows:

- The loss to the client if the project is not completed in time is that the client can claim only half of the 80% depreciation benefits. The cost of the project is Rs 600 million. The method of depreciation is not
mentioned. The life of WECs is also explicitly men-
tioned. It is difficult to calculate the loss due to
overrun. We may assume that it could be in the
order of a few million rupees.

- There is a mention that “asking for a replacement
crane means that an entire project team has to be
relocated.” This is not very clear. We may under-
stand that the cost of the project would increase.

- It is mentioned that “The company has an ISO9002
certificate” (page 107) and elsewhere it is mentioned
that the company had ISO9001 certificate (page 108).
This, however, has no bearing on the case or the
analysis.

- There is a statement that “1.4 million units could
be wheeled at a 4 per cent charge and an expected
loss of 10 per cent.” This is not clear and its relevance
is not known.

The case provides us information about the wind
power industry. It also provides a lot of information
about EIL and EmbH of Germany, their market share,
etc. There is also information about the organizational
structure, location of the site, and ongoing project, etc.
These provide the reader with additional information for
an overall understanding of the context and setting of
the case. Otherwise, they do not contribute to the main
theme of the case.

In conclusion, this is a very useful case for under-
standing the practical issues in project planning, moni-
toring, and project management. This is a descriptive
case with more scope in understanding the issues than
in providing solutions using analytical models. The major
contributions are the following:

- Understanding the issues in project planning and
monitoring.
- Understanding the pressures created on the project
managers when projects are rescheduled and the
time for completion reduces.
- Understanding to live with the uncertainties and
believe that the next day “is another day” where
things can become better.

Case Analysis IV

Balram Avittathur
Associate Professor
Operations Management Group
Indian Institute of Management, Calcutta
e-mail: balram@iimcal.ac.in

Enercon India: Project Planning is a well present-
ed case that describes the project planning chal-
enges of a utility project implementation firm in
the Indian context. It specifically deals with the erection
and commissioning of 14 wind energy converters (WECs)
at the Nawapur site of the Enercon India Limited (EIL)
in the state of Gujarat. The case, dated August 23, 2003,
attempts to portray and review the challenges and hurdles
faced by the project implementation team in its attempt
to complete the project by its due date of September 30,
2003, which was about five weeks away. In this case
analysis, the pending activities of the project are re-
viewed and an assessment is made regarding the un-
certainties in the completion of the same within the
project deadline. It is then followed by an exercise to
calculate the loss owing to the delay in project comple-
tion. The analysis concludes with inferences that could
be made from the two sections.

Review of Pending Activities on August 23, 2003

Referring to the Exhibits 14, 15, 16, and 18, the project
appears well on the course of getting completed within
the deadline of September 30, 2003, provided there is
no further major delay in any of the activities. The case
appears to have highlighted the risk owing to the printed
circuit board (PCB) blow-out in the 220 tonne crane used
in machine erection. The case states that a similar prob-
lem two weeks back was sorted out in two days time.
Assuming that it would take two days this time too, there
is enough slack in the project plan to cover this episode
of PCB blow-out. What is of greater concern are (i)
frequent failure of the PCB (twice in two weeks) and (ii)
non-receipt of material for four WECs and the failure
of the nacelle assembly in one of the ten WECs received.
The EIL has to ensure that the PCB does not fail yet again
after the current blow-out.
The case also highlights the possible delays in the negotiations with the villagers regarding further compensation for the land, which could either contribute to a delay (owing to negotiations) or an increased cost (paying higher price to close the negotiations quicker).

As on date, it appears that the greatest risk for timely project completion arises from the delay in the arrival of the materials for the four WECs. The case does not give a clear picture of the same.

Expected Losses to Client

To appreciate the actual impact of implementation delay, it is important to understand the various kinds of losses owing to the same. The case describes two types of losses to the client firm owing to the delay in the commissioning of the project by its deadline: (i) loss of tax benefit owing to a lesser depreciation expense in the financial year 2003-04; and (ii) loss owing to the purchase of electricity from the Gujarat Electricity Bards (EB) in place of the electricity generated by the WECs during the delay period. The case does not explicitly indicate the amount of electricity that could be generated daily from this project (all 14 WECs put together) given the wind potential in this region, and the distribution break-up of the electricity generated (how many units would be consumed by the client and how many would be sold to the Gujarat EB). Hence, the determination of a third type of loss, i.e., revenue loss for client from the sale of excess electricity to Gujarat EB, is not straight-forward and has to be assessed through other data provided in the case.

The total cost of the project for the client is Rs. 600 million. The delay would result in the depreciation expense falling by Rs. 240 million. This would increase the profit before tax (PBT) of the client by the same amount, which in turn would mean an increase in tax payment by Rs. 72 million (at 30% corporate tax rate) in the current year. However, this need not be viewed as a loss for the client as it would get the benefit in the subsequent year(s).

Regarding the second type of loss as expressed above, though the case does mention a loss of 1.26 million units (after netting for transmission loss) for the client during the delay period, it does not describe the duration of the delay period. Assuming that the above quantity is the use of electricity by the client per year from the Nawapur project, we could conclude that the client would consume about 3,500 units per day. At a cost differential of at least Rs 4.50 per unit (purchasing from Gujarat EB versus getting from the 14 WECs after wheeling charges), the rough estimate of loss to the client on this count can be taken as Rs. 16,000 per day.

The third type of loss as mentioned above is estimated here. The 14 WECs that are planned to be installed are of E-40 56 m rotor diameter type (about 600 KW rated capacity each as described in Exhibit 4). This means a maximum production of 8,400 units per hour or 201,600 units per day. Assuming that the actual production from October 1, 2003 would be about 50-55 per cent of the rated capacity and that 4,000 units out of this would be consumed by the client, it would mean that the client loses the opportunity to sell about 100,000 units per day of electricity to the Gujarat EB at Rs 2.50 per unit (net of the wheeling charge). This would mean a revenue loss of Rs. 250,000 per day.

Ignoring the first cost, each additional day to complete the project would mean a loss of Rs. 266,000 for the client which as the case indicates, has to be made good by the EIL.

Conclusions

From the above analysis, it appears that the project is not in a critical state with regard to completion by the project deadline. The major uncertainty appears to be arising from an internal management aspect of the EIL, which is the delayed arrival of the material for the four WECs.

The daily revenue loss analysis owing to the delay in project completion clearly indicates the premium that the EIL could pay for settling the disputes with the villagers. The Rs. 15 million that the EIL had paid for the 300 acres of land and on which the villagers were trying to extract more compensation, is a small part of the total project expense of Rs. 600 million. The firm has to evaluate the extra compensation it may pay to the villagers against the revenue loss (Rs. 266,000 per day) that it has to compensate for its client as well as the continuation of other project expenses owing to the retention of manpower and equipments at Nawapur site. The firm could even explore the possibilities of profit-sharing or providing WEC-generated electricity at a direct cost (few paise per unit) to the villagers in lieu of further financial compensation. This would enable it to enhance its social equity and ensure that the future projects face lesser problems on this count. The successful completion of projects in densely populated countries like India has hinged considerably on the local-community participation.
work could not commission here as the villagers got a stay order. In fact, EIL offered Nawapur as an alternative site to its clients and promised to execute work as per the old contract and schedule. This site at Nawapur was on a private land. Therefore, EIL had to negotiate with each of the land owners. The acquisition time frame is generally 4-5 months. EIL was very keen to procure the contract in order to retain its client and start work as per the contract laid down earlier. Their eagerness got reflected in the series of negotiations that followed. The land owners probably sensed the eagerness of the other party and the result was hiked land prices. It went up to 30-35 per cent more than the average cost.

Another major problem at the site was the protests by the villagers. Their argument was that the setting up of the WECs would result in a stunted growth for crops. According to the project leader, the concern was not so much for healthy crops as for a healthy return (compensation) for the availability of land. The series of protests resulted in a delay in the execution of projects.

The other option was to hire a new crane of the

**Background**

In 1995, Enercon India Limited (EIL) came into existence as a result of a collaboration between the Mehra family and the Enercon GmbH of Germany with 44 per cent and 56 per cent stakes respectively. Enercon GmbH was established in 1984 by Alloys Wobben and came to be known for introducing gearless WEC, the E40, which delivered optimal power under any wind speed and did not draw reactive power from any grid even during the low wind periods. The wear-and-tear of machine parts was also considerably less.

EIL introduced the gearless design in India at a time when the wind energy business in India was going through a downturn. It offered a complete suit of services ranging from “concept to commissioning.” This meant exploring the potential of high wind location, micrositing wind energy converters (WECs) within a location, interfacing with regulatory authorities for required permission, agreements with Electricity Boards (EBs) for evacuation of power, preparing approach roads, construction of WEC, installing transformers, and internal grid for evacuation of power to the EB substation, and operation and maintenance of the WECs.

**The Problem**

Prithwiraj Rathore was the project leader managing the site at Nawapur. He was responsible for erection and commissioning activities of the WECs at the Nawapur site. Nawapur, a small town in the Jamnagar district in Gujarat, situated on the Porbandar-Dwarka Highway, had immense wind energy potential and hence 14 WECs were to be set up there. The initial site selected was Jangpura and a contract was accordingly laid down. But
required capacity. The information collected revealed that there were only six or seven cranes of the mentioned capacity available for hire in the entire country. Of this, four were already in the EILs premises. Further, replacing a crane would mean a substantial increment in the project cost as the entire project team would have to be relocated to Nawapur site.

Already work was delayed because of agitation, onset of monsoon, and further due to a disruption in the functioning of the crane. The project leader was concerned that any further delay would result in affecting (disrupt) the project completion time which was the 30th of September. Such problems of the project completion date take place because of a variety of factors; and the Enercon project is beset with all of these problems:

1. **Fund constraint**: Fund/resource are a critical issue here particularly when this has to be allocated to multiple projects. In this case, funds were distributed among the 14 WEC centres.

2. **Land acquisition problem**: This issue has been discussed at length which also in its own way contributed to the delay.

3. **Delay in civil works**: The construction of roadways were disrupted by the onset of monsoon.

4. **Lack of foresight**: Because of the lack of foresight on the part of the manager, the problem could not be visualized earlier.

**What is needed now?**

**Managing Constraints**

Systematic constraint management is the need of the hour. Once the constraints of the system are understood, it will have implications beyond just project delivery performance. Constraint management should be applied to scheduling resources, identifying resource constraints, and managing multiple projects.

**Scheduling work/ Resources**: The current method which is followed for generating task-time estimates is one of the main reasons for the increased expense of the project and their inability to finish on time. Therefore, one must add safety (slack or cushion) to generate a task-time-length that would essentially guarantee the completion of the task. The basic estimates for a task are based on individuals who provide values that they feel would give them an 80-90 per cent chance (a high chance) of completing the task. These estimates are further padded by managers who are in a higher position than these managers. Often these are not realistic estimates. Moreover, slack should have been built into the system to offset the effect of any unforeseen calamity (in this case the breakdown of the crane). When it comes to handling such risks, the Project Manager should act as a pessimist and build in as much slack as possible to be of help to complete within the scheduled date.

**Identifying resource constraints**: Often constraints are not rightly identified and cushion is not built in as a result of which constraints and bottlenecks are difficult to handle. The company should have followed a policy of first identifying the bottleneck which exists in the system and then exploiting it to make its throughput efficient. In the case situation described, disruption (breakdown) of the crane and the subsequent actions to be taken should have been identified and proper equipment maintenance procedures laid down so that such a possibility could have been kept at bay. (Case literature reveals that a similar situation had occurred earlier which is indicative of the fact that equipment maintenance was not proper).

**Managing multiple projects**: Managing multiple projects is a challenging task. The major challenges associated with such projects include managing multiple requirements, limited resources, conflicting priorities, multiple risks, which can be resolved through resource pooling, synchronizing resources, and synchronizing schedules. Many projects were being implemented together by EIL. In such cases, it is necessary to know how many men, how much resources (finance), how many of which equipment, would be required, by which project they would be required, and when they would be required.

**Pooling resources**: The need of the hour is to set up a resource pool and associate each project with that pool. Once a resource pool is created, all the resource information that resides in that pool appears in each project file that shares the pool. This resource pool will contain the details of resources-finance, manpower, equipments that all the projects need. All projects are seen as one large consolidated project consisting of many small projects. It would contain one large synchronized schedule consisting of many small schedules for each project. A network for individual projects and a consolidated network for all the projects will be created. Whenever information in the resource pool is changed, it should be transmitted to all the linked projects and vice versa. In such a situation, the manager should see all the projects in one view. The status of work done in any (one) project would thus be reflected in the consolidated report. Only then would one be able to visualize the impact of shifting.
resources from one project to another; that is how the project which is receiving the resource would benefit in terms of saving time and executing the work on time, and how the project which is lending resource is being affected.

**Synchronizing resources and schedules:** For handling multiple projects, one must set a strategic priority for the existing projects. The basic objective would be to provide an order in which the projects are scheduled through the synchronization of resources. Once these priorities, procedures, and processes are put in place, individual project schedules can be developed and placed in the calendar through the synchronizer schedule. If such a schedule is created and further built up with the capacity buffer, the careful scheduling of the common resource would result in a set of schedules that the projects would adhere to.

In the case, the EIL was executing five projects simultaneously. Crane was a constrained resource but no consolidation of working of all the projects was given; that is, EIL did not create a pool of resources (finance, men, equipment, etc.). Each project was managed independently having defined resource and manpower being allocated to them. Therefore, once the problem of a snag came up, one option open to the company was to transfer crane and the entire team of workers from another project to the Nawapur project. However, how far it would be able to save this project and ensure completion as per the scheduled date and how it would affect the other project (in terms of cost and time overrun and also customer goodwill) from which resource is being transferred cannot be ascertained with surety. Had a resource pool been created, each project would have defined its requirement and borrowed that resource from the pool for the defined period. A synchronized set of schedules would have been created and each project would have adhered to it.

Multi-project risks of cross-project interference dwarfs the risks associated with individual projects. If project value is time-sensitive, the delays suffered by the project due to resource time slicing across projects can be very expensive. If multi-tasks, multi-equipments, and multi-resources are synchronized well, the resources could be managed using relay race behaviour. This would also improve the speed of project implementation, and reduce the overall risks associated with the project. Also costs could be brought down substantially, as the projects could work with minimal (fewer) resources. Instead of four or five cranes, a lesser number could be installed by resource pooling and synchronizing schedules of different projects.

**Managing Uncertainty**

This is a very critical issue in project planning. When there is uncertainty, the Project Manager should think like a pessimist. He should visualize the worst situation and try to manage it. Breakdown of a crane or a similar situation is an unexpected occurrence and the Project Manager should have visualized or anticipated such a situation and taken appropriate steps to manage it.

**Fast tracking of projects:** This means that you do work before the scheduled time and increase the degree of overlap in activities as far as possible. Therefore, all work that could be executed early should be undertaken and completed early; as early as possible (earliest time) so that further delay is not caused. Therefore, if any work requiring the use of the crane had been undertaken earlier, the delay caused, because of the defective crane could have been avoided.

**Use of network diagram:** Based on the activity, range of time given for each activity (Exhibit 15), precedence relationship given (Exhibit 16), a network diagram can be drawn (using the higher range as time estimate). These help us identify the activity, that can be delayed. Had resource per activity (money/ manpower) been provided, one could have identified the activities which could have been delayed and resources shifted from these for use of hire of crane.

**Options for the Company**

The company has the option of purchasing a crane or hiring one as it has done in the case of the four sites. Since this is a very critical equipment, it could go in for an outright purchase. The benefits of both the options, however, need to be weighed carefully.

A hire system offers an opportunity to pay a supplier for an asset without outright purchase at the start. This gives the buyer the freedom and flexibility of a cash buyer. This would involve low initial outlay, flexible payment patterns, and a transfer of title on full payment (completion fee). This would, of course, depend upon the terms of contract.

Lease has the benefit of an easy source of finance. The company could easily shift resources by identifying the activities which can be delayed and employed for the lease rental payments. It provides the flexibility of repayment option that best suits the company’s cash
flow needs. Further, it would have the option to defer tax on purchases and thus allow improved cash flow. Also, interest charges can be offset against taxable profits and capital allowances can be claimed.

However, it would also stand to gain if the company opted to purchase the asset. This is because the total cost of purchase (refer Exhibit-19) would be much less than the rental borne. Also, it would lower the tax impact (through depreciation). But, as the procurement involves custom clearances, it would prove to be a time-consuming process and may not be of help for the management of the present project.

However, a very important reason for a preference for outright purchase would be that the crane would be required for all the projects undertaken even in the long-term and it would be able to handle problems in the eventuality of such an incident taking place.

Role of a Project Manager

The Project Manager plays a very vital role. He has to manage resources in such a way that they deliver all the work required to complete a project within the defined scope, quality, and time and cost constraints. The first challenge is to ensure that a project is delivered within these defined constraints. He faces a challenge of making an optimized allocation of resources and integration of inputs needed to meet the pre-defined objectives. These resources are money, men, material, equipment, communication, quality, risks, etc. Foresight of the manager plays a very important role in handling constraints or bottlenecks. His experience, knowledge of project management tools, use of project management software tools, and people management skills, are other credentials that help him manage projects better. Call him by whatever name, project coordinator, leader, or manager, he is responsible for ensuring the overall success of the project.

A review of the case literature reveals a lacunae existing at the strategic planning level. It appears that the project managers were appointed for individual projects. Since multiple projects were undertaken, a project coordinator could have been appointed to oversee the needs of all the integrated projects.

Case Analysis VI

Manmohan Rahul
Associate Professor
Ansal Institute of Technology
Gurgaon
e-mail: mmrahul152@yahoo.com

Shalini Rahul
FPM Scholar
MDI, Gurgaon
e-mail: rahulshalini@gmail.com

“Plans are nothing, planning is everything”

Wind energy market is growing rapidly in many countries and is widely acceptable as a renewable source of energy, which is free of fossil fuel pollution and popularly known as green energy.

There are many companies like Enercon, GE Wind, Nordex, Made, Vestas, etc., manufacturing wind energy converters (WECs) and competing world-wide. Enercon being the second largest company in the world manufacturing WECs with a global market share of 18.5 per cent is second only to Vestas which has a market share of 22.2 per cent.

Enercon India Limited (EIL) is one of the pioneers in introducing innovative rotors in wind energy business and follows the strategy of offering an exhaustive set of services “from concept to commissioning and beyond” of the WECs. This corporate strategy translates into delivering turnkey projects to the clients followed by the post-project maintenance. This can be of immense competitive advantage to EIL if they successfully turn this strategy into reality.

Though the initial response to the installation of wind energy converters by various state/central government agencies and private industrial players was very encouraging due to high depreciation offered on WECs, the next few years witnessed the market for WECs going down and was not very motivating.

The motivation for setting up a wind farm with obvious financial benefits accruing due to large depreciation and savings in electricity cost was clearly offset by the hassles of running WEC productively on a day-to-day basis. It was also realized that the maintenance of WECs was a big issue and could offset/deplete the client’s overall financial gains.
EIL’s installation history of WECs shows that they have strong project management skills especially in installations of heavy wind energy converters. The case is about an erection site in Nawapur, Gujarat where WECs were in the process of getting installed by EIL for a client and the work has stopped because of a technical snag that has occurred because of the PCB blowout of a 220 tonne crane. Mr Prithwiraj, Project Manager for the Nawapur site, is seriously concerned because he has just got out from the land acquisition issue with the villagers and this problem is more appalling because of the approaching turnkey deadline, apprehension of villagers’ agitation in the near future, nearly no buffer days, and heavy losses associated if the project gets delayed.

In the case of Enercon’s Nawapur project which is slated to start within a month’s time, the news of a PCB break-down in a 220 tonne crane is an impediment to timely installation of the WECs. The other issues which require immediate attention of Prithwiraj are: (a) a delay in receiving the components of the remaining four WECs (10 out of the 14 WEC parts have been received) and b) a critically important assembly unit of WEC which has been damaged in transit.

Table 1 gives an estimate of the costs associated with the failed installation of the WECs on the due date. The remaining time is exactly 37 days from the day when a PCB snag is reported.

A delay beyond 30th September would imply that the client could claim only half of the 80 per cent depreciation benefit during that financial year. The remaining tax benefit of 30 per cent would be postponed for a year and can be claimed only in the next year. A simple tax benefit calculation is done to estimate the loss.

The calculation of revenue due to the difference in the electricity cost supplied by the Gujarat Electricity Board and wind power-based electrical energy, which could have been supplied to the client are given in Table 2.

The total loss due to project delay and electricity purchase can be calculated by adding item numbers (d) from Table 1 and (d) from Table 2. Adding (d+d),

\[
\text{Total Loss} = \text{Rs } 10.8 \text{ million} + \text{Rs } 16.048 \text{ million} \times \text{(No. of days the project get delayed)}
\]

In order to save the above losses to the client, the following two alternatives seem to be available to the team of Mr Prithwiraj, the Project Manager of Enercon India:

- Move another project team to the Nawapur site. This means stopping work at some other site, which can only be done by getting the permission from the VP. The chances of another team having excess lead time is fewer but can be considered.
- Get a PCB in two days time as in one of the similar cases of a PCB snag sometime back. During the waiting time, other construction work could be carried out and as soon as the PCB arrives, the crane work can start in full swing. Efforts, can be made to procure the PCB faster by using chopper services, if possible.
- Purchase of new cranes by EIL. Though it may not be feasible right now, a future purchase consideration is strongly needed apart from having annual maintenance of cranes.

Since comparables with cost analysis are not given, what should then be the case decision point? Normally, in all the turnkey projects, the delay clause is covered by the penalty clause where the agency and the client share the losses. Since this is not very clear in the case and moving the team to the Nawapur site or purchase of 220 tonne crane does not seem to be feasible; thus only the second option seems to be available. Since the project management team has just two days’ buffer, the only risk is the tight deadline and if it gets delayed beyond...
two days, i.e., till the 30th September, the client has the risk of losing money. The other loss probably is the perceived loss of company’s (EIL) goodwill in successful project management.

What is required in project planning is a cushion in terms of time and money as a precaution against any uncertainty. Though every project is risky, uncertainty due to any unforeseen circumstance brings more risk. In this case, it is the PCB blowout, delay in arranging material, and villagers’ agitation. So, the best solution is to replace the PCB and complete the project on time even if it means a little higher cost in procuring the parts.

The art of living does not consist in preserving and clinging to a particular mode of happiness, but in allowing happiness to change its form without being disappointed by the change; happiness, like a child, must be allowed to grow up.

— Charles L. Morgan